FNRS

Electronic Commerce

Business to Business: Flash Report on Research Opportunities for Switzerland

Research - Trends - Key issues - Opportunities

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Contents

1. INTRODUCTION

The FNRS begin a study about the research opportunities within the electronic commerce (EC) in Switzerland. This study is divided into 3 research fields: (1) Security, (2) customer care, accounting, charging, and billing, and (3) business to business electronic commerce. We are in charge of the business to business electronic commerce research field (3).

1.1. Objectives

The aim of this report is to highlight key research areas for Switzerland within the Business to Business Electronic Commerce (BBEC) field.

1.2. Approach

Our approach is first to refer to a reference model similar to the electronic markets transaction model "EM-RM" (Schmid - Lindemann, Figure 1) we use to investigate BBEC experiences. We describe globally the actual worldwide situation of BBEC. We illustrate the state of the art in the business as well as in the research domains. We analyze the main tendencies, highlight the key issues and then gradually make the research opportunities coming out. In order to get an outside view from academic researchers, we established and sent a questionnaire. We propose a synthesis of the answers with trends and opportunities. Based on this work and our findings, we propose a more general framework and a graphic tool for positioning BBEC research in Switzerland.

1.3. Report

Our report on research opportunities for Switzerland within the Business to Business Electronic Commerce (BBEC) contains the following items:

- Reference to the EM-RM framework
- State of the art:
  - Business
  - Research
- Overview of key technologies used
- Future research
  - Tendencies
  - Key issues
  - Opportunities
- Recommendations

1.4. Validity

This report is a global survey called "flash report". The state of the art, the recommendations and the conclusions are based upon the information available through a global scanning process performed in February 1998. This is not an exhaustive review. The chosen examples illustrate proven experiences and tendencies but doesn't show the state of the art in its entirety.

Our opinion is issued to the best of our belief and in respect of the professional integrity. The report called " FNRS, Electronic Commerce, Business to Business: Flash Report on Research Opportunities for Switzerland" is not valid if the document control sheet, signed by Pioneers Research&Consulting Group Sàrl., is removed.

2. INITIAL FRAMEWORK

As a reference model to investigate the BBEC field, we propose to initially use the EM-RM framework. During all our research we outline the items and variables that are not included in this initial framework. The strategic positioning framework we propose for research in Switzerland will include more variables relevant to situate the research at the state level.

2.1. Market transaction framework

The market transaction EM-RM framework is made of 3 main phases:

- The information phase

  During this phase, relevant information for potential transactions is exchanged. Business partners inform themselves about alternative partners for a transaction and their bids, prices and further conditions.

- The agreement phase

  During this phase, negotiations between a supplier and a customer will be held. At best, it will end by a contract, which determines the rights and duties of the involved market actors.

- The settlement phase

  During this phase, will take place the exchange of the products, the according payment, logistic, insurance and custom services.

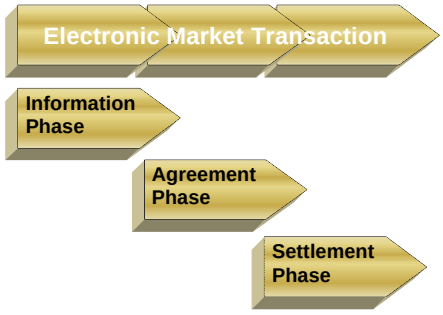

Figure 1: Electronic market transaction framework

We suggest adding three observation levels to these three phases in order to explore business experiences and the state of the art of the research. These three levels are:

- The business models: how the partners are making business, the rules of the game, the access policies, the activities thy are running, the ones they share, the type of business organization between partners : virtual enterprise, networked enterprise, …
- The key services we generally find within the 3 phases of the EM-RM framework such as: search within the environment, comparisons, evaluation, conditions review, electronic contracting, exchange, payment tools, electronic supply chain…
- The information technology used as a communication infrastructure for electronic commerce: human interface, access, session management, functionality and data management.

The resulting table is the following:

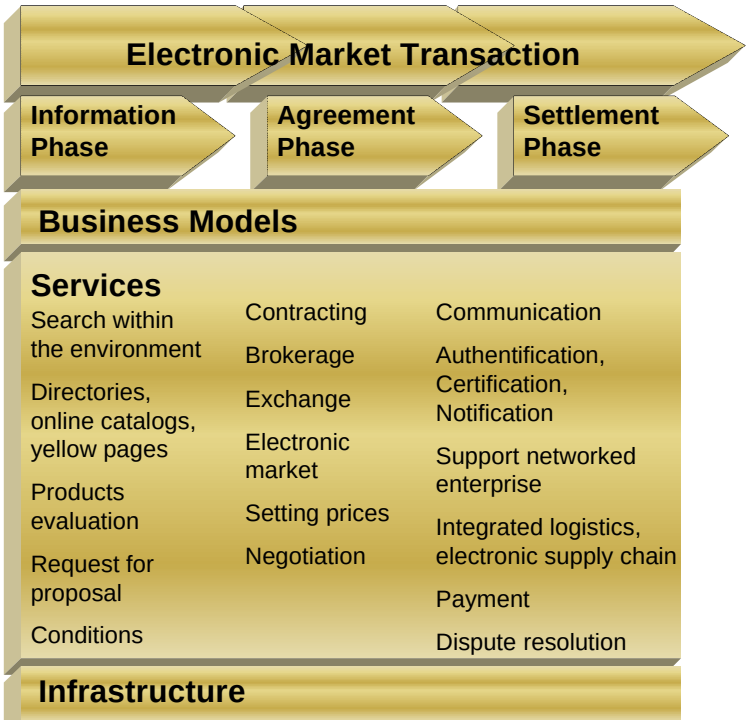

Figure 2 : Initial framework

In the next section we first go through some key business examples outlining major services and referring to the initial framework. Then we review research areas in Switzerland, Europe and the rest of the world just to present relevant illustrative projects and highlight the key findings.

3. STATE OF THE ART

We propose a review of the applications of the electronic commerce in the business and the research domains.

3.1. Business review

In order to illustrate how the electronic commerce is actually implemented in the BBEC area, we relate the main features of some examples within the following sectors: social, services and goods, and take major findings to the fore.

3.1.1. Social

To get an overview of the social area, we went through the healthcare, the education and the human resources/competencies markets to report some illustrations of electronic commerce.

3.1.1.1. Healthcare

The electronic commerce regarding health care is mainly oriented towards the final customers in order to provide information and promote public or private services. Some offers on line catalogs - cross selling - for related products such as sport shoes (New balance Cyberpark USA). The business to business electronic commerce doesn't look so well developed. It focuses mainly on documents (patient's records…) transfer that is well implemented. But lots of work remains to do within the exchange area (Web, EDI). Lets first have a look at some end-user electronic commerce features that could certainly help future research

The healthcare actor's targets are either the population globally, or areas/countries' population or many segmented communities focused on issues such as diabetes, Parkinson, dieting, nutrition, mental health, and wellness. These can be useful also for healthcare professionals or managed care organizations that would like to control demand on the system by providing better and more up to date information regarding services providers to the patients or members of health plans.

The main features are :

- organizing chats, forums and meetings for people or patients within a community,
- providing information such as health news, search subjects, guides, encyclopedia or causes of diseases, find out about medications, view relevant video clips or audio records, find about health resources, check out the latest rating on health resources or medications,
- providing tools to organize to take a health survey (Healthfocus), to get fit with the HealthZone or examine your mental health online (PsychOnline).

Compuserve, America OnLine and others offer access to a very large set of subjects they target populations segmented by issues, others target elderly,

young people, children, parents, are a family oriented service targeting approximately the 37 years old (Prodigy).

http://www.pitt.edu/HOME/GHNet/GHNet.html is a classical and interesting starting point within that field.

http://www.debra.dgbt.doc.ca/~mike/healthnet/ presents interesting information about the use of communication technology in healthcare.

In Denmark, *MedCom95* (Danish Information Society 2000 strategy) is an EDI platform connecting healthcare partners aiming to handle 32 millions prescriptions, 23 million laboratory reports and 6 million medical reports on patients leaving hospitals (1995 figures).

We find some examples of business to business electronic commerce in healthcare in Switzerland: The Ofac offers a private network linking hospital centers, pharmacies and insurance companies that allows to check the insurance cover and offer a billing system. This is an example covering the settlement phase of the framework. Other systems are implemented for electronic inventory management (hospitals, pharmacies) and electronic ordering to the supplier (Galenica). http://www.cid.ch is a site for doctors' community relating to teaching and medical information about radiology and clinical imaging.

3.1.1.2. Education

There are many experiments in distance learning. Some interesting projects are NetAcademy at the University of St.Gall and ADRIANE at HEC Lausanne. The Centre d'Enseignement à Distance in France is an example of distance learning site http://www.cned.fr/. Other examples are available where the University acts as a kind of high-education broker even though they propose a restrictive choice of universities. But the most interesting reference regarding the BBEC is certainly the Syrecos. It is an electronic market of professional education offers allowing matching these offers with the small and medium enterprises (SME) needs.

3.1.1.3. Human resources and competencies

Three factors are actually pushing electronic job markets to new highs: the lack in transparency in this market linked with large incomes for the intermediaries, the increasing number of unemployed workers and the needs for firms to better manage their human capital to be competitive for the knowledge society. Both factors are pulling new comers and demonstrate the vitality of a somehow traditional market. In addition, traditional key players are slow to move due to their internal rigidity, existing computer system and need to rethink the entire approach. The problem most new comers are facing is that habits are slow to change and that the "product" is difficult to describe as each individual is by definition unique. The result is a mix between high end computer technology and old fashioned paper curriculum vitae. But this marriage is far from the perfect match. The most common drawbacks are matching problems due to non standard vocabulary, non automatic translation, lack of flexibility for self-description and insufficient data collection to project a clear picture of the candidate. The first answer to this problem has been implemented in www.skillworld.com. This approach is radically different from the traditional one and intends to present people based on their

competencies and not only on their professional experience or diplomas. The use of a standardized vocabulary classified in a knowledge-tree allows an efficient match between offer and demand as well as the ability to offer a multi-lingual approach. If Skillworld is a market of competencies that allows employers to submit job description and find matching personal CVs with future negotiation services with individuals, less elaborated sites like Talens and Humanline offer on line job opportunities descriptions. Other related references are for example http://www.ceridian.com/ and http://www.cweb.com/.

3.1.2. Services

Many implemented EC platforms are covering the areas of travel/transport, insurance companies, banking and finance and press agencies.

The transport and travel (tourism) business areas use intensively the EC through computer reservation systems and global distribution systems. Some very well known platforms are the SABRE airlines reservation systems, Galileo the leader of the global computer reservation systems market, and the Cargo Community Systems. CCS-CH, EDI network initiated by Swissair, for example provides connectivity among Swiss air cargo forwarders and airlines operating in the Swiss market. Players such as Microsoft-on-line creates links with third parties (Internet) to handle the final transactions and services to the final consumer.

In the financial area we find systems covering many services of the transaction phases. Global financial markets are rapidly transforming into fully electronic markets systems linking financial partners (BES). Services provided by the actors within the financial field covers:

- the information phase with real time delivery of financial information (Reuters, Dow Jones… and information dealers)
- the settlement phase with payment systems (SWIFT network, Eurogiro for the European PTTs) and inter-bank clearing systems like the Swiss Interbank Clearing System (SIC). We can notice that Microsoft on line also begin to offer links on the Internet with third parties to handle the final financial transactions and propose services to the final customer.

Electronic auction systems have been implemented as automated trade execution systems in the field of financial and commodity markets, for example the Swiss SOFEX financial system.

Reuter's Instinet is an example of electronic market access forums that offers many essential services of the transaction framework like: service valuation, seller and buyer identification, matching, negotiation, settlement, insurance and trust brokering.

Leaseplan, a car leasing company links cars suppliers and offers an individualized follow up for the final customers. RINET, IVANS (USA) and Assurenet are examples of insurance industry platforms. Assurenet is a Belgian system linking brokers and insurance companies to communicate and exchange mail and customers files.

3.1.3. Goods

To get an overview of the business to business electronic commerce of goods, we went through the procurement, the retail and the trading areas. The systems available allow linking communities that grow around large companies like General Electric, around a kind of industry (like paper or electric components etc.) or are based on government platforms.

3.1.3.1. Company based communities

TPN (General Electric) and CITIS (McDonnell Douglas) are illustrative cases regarding the company trading communities.

In 1996, General Electric developed the Trading Process Network, a system that connects GE with its suppliers. As a result, the supply chain management has been improved. The procurement unit has halved procurement times and buys raw materials at 10% to 15% lower than what it normally pays. CITIS is a network that allows a better coordination of McDonnell Douglas sub-contractors. CITIS is implemented by Aerotech Services Group Inc., a firm playing the role of intermediary providing many services. For example, the electronic commerce platform provides the followings:

- covers the information phase (access and search engines for data, schemas…)
- provides access to specific tools such as videoconference, CAD, graphics tools, workgroup software…
- covers some services of the settlement phase (authentication, access management, support to the networked enterprise by allowing to convert CAD files to binary code ready for numeric machines and send the code to the sub contractors' machines).

Further items such as electronic certification and updated authentication tools will be implemented soon (settlement phase). They also plan to set up more virtual and networked enterprises.

Wal-Mart's example is interesting to show end to end integration strategy from store systems to merchandising systems and to distribution systems. Wal-Mart runs the following services:

- product replenishment calculations for each store, every night
- handling of more than 10000 queries from buyers and suppliers
- for the major suppliers, Wal-Mart provides them with a profit and loss statement for the goods received.

The buyers and the suppliers (4000) will be soon able to update their joint forecast collaboratively by using the Wal-Mart platform. Wal-Mart platform is based on EDI technology.

Some other examples are available: Leroy-Merlin with its EDI based electronic platform links about 1000 regular suppliers and 59 company owned outlet stores

(purchase orders, logistics). Brun-Passot is a company acting in office supply procurement. The company built as a network providing EDI direct electronic connection with the customers. The interesting thing is that Brun-Passot has been able to make its EDI based platform evolve to an electronic market system called Citiusnet. Sears Canada in the retail sector. uses EDI for connecting all its suppliers for both national and international purchase. Sears had to reorganize all its supply chain management processes, and review the business rules and guidelines in regard to its suppliers. Baxter is another example in the healthcare procurement.

3.1.3.2. Industry based communities

By looking at industry communities, we want to cite the very well known case of paper companies in Finland (Small and Medium Enterprises) that jointly developed an *EDI* based industrial platform (FinnPap/Finnboard) to link themselves with their key customers and international sales offices. Through the platform they provides:

- an on line data interchange with their customers,
- a virtual real time means of placing status inquiries and new orders.

This example also shows how SMEs acting together were able to appear to the outside world as a big competitor, creating a networked company. EDI based electronic commerce typically allows to establish one to one relationships. We recently read that SMEs from Jura, Switzerland, initiated almost the same business model for automotive industry sub-contractors of Peugeot.

Some examples of *marketplaces* are: Polysort that is a web market place for plastic and rubber industries. They claim 550 members. Industry.net is an umbrella site for many industries with 4500 sellers and 300000 buyers.

Auctioning is an other electronic commerce mechanism. In 1997, more than 150 auctioning sites were available on the Internet. The electronic auction systems are based on predefined conditions that buyers must accept. They only match supply and demand through the price criteria. The other criteria such as delivery or payment conditions are not taken into consideration. Some examples are: Fastparts that is an online auctioning system for overstocked electronic parts with 140 traders and $40m inventory and the well known Dutch flower auction.

Amazon.com looks like an *integrated business*. Build on a networked enterprise business model, they propose services we can classify within most of the phases of the EM-RM framework:

- information phase: advertising, catalogs of books, links with readers' communities.
- settlement phases: services to the final consumer, links with third parties to handle the delivery

They don't have specific services relating to the agreement phase such as negotiation or contracting. Comp-U-Card is also a relevant example of a market place allowing to match suppliers' offers and final customer needs The sales

through this electronic market on the Internet is more than US$ 1 bio. http://www.netmarket.com

As we mentioned, Citius is an EDI based electronic platform that can be implemented in various business domains like electronic and electric components, chemical products, computer hardware… The platform mainly offers the services of the information and settlement phases of the framework.

- information phase: on line catalogs, on line information about customers purchases, list of suppliers and rating
- settlement phases: financial transfers, payment, delivery and logistics, services to the final consumer, links with third parties to handle the

3.1.3.3. Government trading communities

The very well known example is the Singapore's TradeNet (EDI based system) that is facilitating trade documentation processing and connecting all the partners - port authorities, customs, freight forwarders, shipping companies, bank and insurance companies - of the nation's seaport and airport. The platform contributes to improve the competitive position of the nation. Transigo and Telstra's are other examples of electronic business platform solutions for Australian government and related industry. In the United States, the government initiated a fabulous procurement platform (CALS) for linking governmental agencies and their suppliers. Initially designed to provide the Department of Defense with computer aided logistical support, the system has been redesigned to support company integration and electronic commerce. The system is available through Internet.

The United Nations is promoting its Global Trade Point Network (GTPN) to stimulate the trade competitiveness and trade efficiency of national economies. The network will connect all the "Electronic Trade Points (ETO)" (some World Trade Centers are trade points) at which public sector and private companies can access. The areas covered are: customs, banking and insurance, transport business information, business practices and telecommunication. Until now, the network propose access to information and documents management tools but execution of transactions over the network will be implemented soon (planed in 1998). The network is being developed using international standards (EDIFact, Internet, X.400). GTPN will be one of the largest trade platform in the world.

http://www.unicc.org/untpdc/welcome.html.

3.1.4. Findings

The Business to business electronic commerce platforms are still mainly based on bilateral exchange EDI technology (about 95 % of *Fortune* 1000 companies use EDI on one way or another). Most of the companies are investigating the ways to go *from expensive EDI private networks to Internet*. EDI based on Internet and other multi-players market mechanisms will be considered. This trend opens the doors to many more and smaller companies that are able to pay for low cost technology. Many companies perceive BBEC as a way to improve the quality of activities, the speed of exchanges and the processing cost price. Business to business *growth*

through the Internet commerce market is exponential (1995: 0 US$b., 1996: 0.12 US$b., 1997: 3.2 US$b.), projections shows impressive growth 1999: 40 US$b. 2000: 134 US$b. It looks that the biggest impact has occurred where electronic commerce matches buyers and sellers who would not previously have found each other.

The trends show that companies are taking advantage of BBEC opportunities. The inter-company relationships are evolving rapidly from bilateral exchange models to certificate trusted third party exchange models and to organized market spaces. Future platforms will not only be commerce (exchanges) oriented. They will offer more inter-business networking services, allowing spaces for building and managing relationships so that companies will share some activities and evolve between cooperation and competition. These trends radically change strategy, management, behavior patterns and professional relationships.

- Companies clearly require approaches, methods and tools covering the so called "business model" area of the framework. That is to say: new *strategies*, new *business models* (strategic networks), *organizational* frameworks (between autonomy and control) and *change management* competencies. Building *communities* of companies, partners, customers, around a common interest (for a short or long term) and playing the right game within these spaces will be a central preoccupation for all the companies that want to grow and be the key player.s The time factor, the ability to change quickly will be a key success factor within BBEC. Opportunities are opened for *tools (software) for designing, managing and operate* companies and inter-companies *relationships* (changes, moves) on BBEC platform.

- Many other opportunities are still opened by looking at the "services", mainly in the *agreement* and *settlement* phases of the framework. For example market based systems with negotiation and discussion services, auctioning systems not only matching supply and demand through the price criteria but also other criteria such as delivery or payment conditions.

- Electronic commerce platforms should *integrate* almost all the items of the framework. Integration will be a natural evolution.

- Questions about the way of *changing* from legacy systems to EC systems or to *integrate* or to federate them (strategy, way of doing, …) are also opened.

- Based on our survey, businesses to business electronic commerce opportunities are available in various business sectors. The soft product such as books and magazines, computer-related products and financial services presently dominates. More developments should be initiated urgently for *small and medium enterprises (SME)*. Key projects could be helpful for Switzerland within services, healthcare and finance areas.

- The *governments* (Swiss confederation and cantons) should have a clear information systems and EC strategy. They should play a key *promoter*, *regulator* and *educator* role within the information system society, EC and BBEC.

- Through our review, we can observe three major items: (1) relationship, (2) exchange and (3) market

    1. *Relationship* that relates to the links between actors. The business models are based on the cooperation and the integration. It is mainly

oriented towards supply chain management with EDI and/or workflow technology. The main advantages for the actors lay in suppliers' costs structure improvement.

2. *Exchanges* that relate to documents exchanges and functionality sharing with a few market mechanisms. The business models are based on the cooperation.

3. Electronic *market place* that is more oriented towards competition, price setting and market efficiency. The impacts are often price reduction and cutting down margins. The advantages are principally for the customers.

3.2. Research review

The aim of this section is to perform a quick review of actual researches, highlighting projects with special interests for business to business electronic commerce. We classify them into three geographical areas: Switzerland, Europe and the rest of the world. Finely we highlight some key findings regarding the research field.

3.2.1. Switzerland

To allow a better comparison between projects and to better identify their scope and field of action, we use the same description scheme for all of them. We position them in our market transaction framework, but we will also focus on their field of research - technical, legal, social, strategic,…- their goal and the economical sector it applies to - media, tourism, healthcare... The following list is not exhaustive. The projects listed have just been chosen for illustration purposes.

- **i The Swiss Chambers of Commerce as Trusted Third Parties in World-wide Electronic Markets.**

  Background: Legal

  Field: Any

  Aim: Exploitation

  Description: Starting for a *legal* point of view, this project focuses on the legal validity of electronically transmitted documents, digital signature and the role of trusted parties. It is intended to be embedded in the G-7 test-bed for a "global marketplace for small and medium enterprises". No specific economical sector is targeted by this project.

  Contact: Dr. Otto Müller, Zurich Chamber of Commerce

- **ii. Swiss Workflow Management in Distributed Environments (SWORDIES)**

  Background: Technology

  Field: Any

  Aim: Conception

  Description: This project examines the systematic development of cooperative process-oriented environment. It deals with analysis of business processes and organizational structure, design of business process meta-model, production of the CPE model by a workflow management systems.

  Contact: Prof. Klaus Dittrich, Institut für Informatik, University of Zurich

- **iii. Auction-based distributed resource allocation**

  Background: Business

  Field: Any

  Aim: Conception

  Description: This project intends to use, on both conceptual and practical level, a market model to electronically support the price negotiation and agreement between suppliers and seekers.

  Contact: Prof. Beat Schmid, intitut für Wirtschaftsinformatik, University of St. Gallen.

- **iv. VEGA (Virtual Enterprises Generic Applications)**

  Background: Technology and Business

  Field: Any

  Aim: Exploitation

  Description: The purpose of VEGA* is to provide Internet-based Information Support Systems for geographically dispersed cooperation processes between SMEs (Small and Medium Enterprises). The VEGA* support systems will enable SMEs to set up and manage virtual enterprises as easily and quickly as possible. The VEGA* Project is a joint project of the Universities of Lausanne (Prof. A. R. Probst, INFORGE), Berne (Prof. Griese, IWI), EPFL (Prof. Cl. Petitpierre, LTI), the Swiss Federal Commission for Technology and Innovation and enterprises (the main contractor is Swisscom). http://vega.unil.ch.

  Contact: Prof. André-R. Probst, Institut d'Informatique de Gestion, HEC, University of Lausanne and Prof. Joachim Gries, University of Bern, www.virtualenterprise.ch and Prof. Cl. Petitpierre, LTI.

- **v. Business Network Redesign. Reorganization of Distributed Processes in Medium-Sized and Large Companies**

  Background: Business models

  Field: Any

  Aim: Conception

  Description: The aim of this project is to achieve simpler and faster goods, information and financial flows. It therefore extends traditional business process redesign to a trans-firm level, using information technology as an enabling factor in redesigning distributed processes.

  Contact: Dr. Elgar Fleisch, Institut für Wirtschaftsinformatik, University of St. Gallen

- **vi. Virtual Software House (VSH)**

  Background: Technology and Business models

  Field: Software development

  Aim: Exploitation

  Description: This is a multi-disciplinary project, which intends to covers all aspect of an electronic market of software components each of them being developed in a sub-project. The project is proposing a coherent business process featuring aspects such as electronic software marketing, secure distribution, online consulting and payment.

  Contact: Dr. Heinz Lienhard, IvyTeam, Zug

- **vii. Mobile Electronic Documents with Interacting Agents (MEDIA)**

  Background: Technology

  Field: Publishing

  Aim: Exploitation

  Description: As for the VHS, this project is divided into sub-projects, all having the same goal: develop a system for archiving and distributing electronic documents. This encompass hypermedia newspaper, enforcement and document authentication methods.

  Contact: Prof. Dimitri Konstantas, Centre Universitaire d'Informatique, University of Geneva

- **viii. Electronic market of competencies for team building**

  Background: Business and Technology

  Field: Any

  Aim: Exploitation

  Description: One weak point in teamwork is the localisation and recruitment of suitable members. This projects, intends to shorten the time for member selection and increase the scope of the search and its quality by providing an internal electronic market place to allow employees to advertise for their competencies and team builder to perform selection. To support this, we are providing a cataloging tool, a search engine, a negotiation phase between suppliers and seekers as well as a settlement phase.

  Contact: Prof. Yves Pigneur, Institut d'Informatique de Gestion, HEC, University of Lausanne

3.2.2. European Projects

Most information concerning European project can be found on the Cordis web site at www.cordis.lu. In the following page, we briefly summarize some of them that we found relevant.

3.2.2.1. Esprit projects

"The European Commission sees the development of electronic commerce as instrumental in maintaining the competitive advantages of European companies and in securing the prosperity of European citizens (consumers and employees)".

To this end, Esprit program is a continually developing program, which aims not only to spur the development of new technology solutions to business needs but also to promote the take-up of such solutions by industry. There are actually 100 Esprit projects dealing with the electronic commerce and 50 more within its partner program, ACTS.

Detailed information on the actual ESPRIT projects is not easy to find on a short-term basis. At this stage, we are therefore only able to provide you with some interesting project title listed in the following Table 1.

Project title	Reference/Acronym
Electronic commerce pilot in the garment industry	24047 / ELEGANT
Electronic commerce for SMEs	24104/ TRADEPOINT
Feasibility study for the establishment of electronic information services for direct marketing in the EC	22288/ DM ON LINE
Electronic commerce at work in Europe	24103/ FACTMERCHANT
SMEs pilot for business process design in order to establish a virtual international consultancy using electronic commerce	24136/ SERVICE
Medical products electronic commerce	25168/ ECHOES

Table 1 : Some ESPRIT projects

3.2.2.2. ACTS projects

ACTS research projects collectively address business, legal, organizational and technical aspects and intend to develop:

- payment systems,
- directory and information brokerage,
- security and authentication systems

to lay down the basis for tomorrow's global, secure, and open electronic marketplace, fully integrated into high speed networks. In the upcoming lines, we describe some of them to give an idea on ongoing projects, their scope and goals.

- **Multimediator: Multimedia Publishing Brokerage Service**

  This project intends to develop an intelligent multimedia brokerage service for supplier and customers in the publishing area and as a general service for a multimedia market place. It will offer the customer the ability to select between various suppliers, negotiate the job or purchase, order and control the work progress. Accounting and billing being performed in parallel.

  For more detail: http://www.infowin.org/ACTS/RUS/PROJECTS/ac096.htm

- **ii. SEMPER: Secure Electronic Marketplace for Europe**

  SEMPER is developing a generic architecture for secure electronic commerce over internet and designing a Java-based prototype of a security toolkit. It will describe implication as various as legal, commercial, social and technical requirements.

  For more detail: http://www.infowin.org/ACTS/RUS/PROJECTS/ac026.htm

- **iii. Kimsac: Kiosk-based integrated multimedia service access for citizens**

  KIMSAC is asserting that everyday computer and telecommunication users need some form of mediation to help the selection of the most appropriate service (given their particular needs at a point in time) as well as the operation of this service. They are therefore developing a Personal Service Assistant,

which acts on behalf of the user in an attempt to address the his/her needs. To help the use of this agent, KIMSAC seeks to integrate interface and multimedia technology from the IT industry.

For more detail: http://www.infowin.org/ACTS/RUS/PROJECTS/ac030.htm

- **iv. European information exchange service between harbor areas**

  EIES intend to set up advanced communications between 4 harbor areas and services by the development of blue pages (harbor yellow pages in hypertext) and to demonstrate the benefits of electronic commerce in the maritime transport sector. The main focus is put on access to information on harbor companies and services, tele-cooperation, integration of EDI and e-mail.

  For more detail: http://www.infowin.org/ACTS/RUS/PROJECTS/ac075.htm

- **v. Common Brokerage Architecture (COBRA)**

  The main objective of this project is to develop an open architecture for distributed on-line brokerage, contribute to a draft European standard for information brokerage architectures and validate the architecture using four pilot applications. These four real-life businesses are broadband multimedia services over ATM, business services within the association of chambers of commerce, use of multimedia assets within the advertising agency and media studio sector and an e-commerce project for business advice services for SMEs. The project expects to foster a new breed of on-line broker enterprises which grasp the opportunities resulting from the need to provide more focused access to world-wide information sources.

  For more detail: http://www.infowin.org/ACTS/RUS/PROJECTS/ac203.htm

3.2.2.3. European Research Consortium for Informatics and Mathematics (ERCIM) projects

ERCIM projects are acting as a lynchpin *between academia and industry* in electronic commerce development. ERCIM projects are divided into working groups that intend to build and maintain a network of researchers in a particular scientific field. The actual coordinator of the Electronic Commerce working group is Christine Vanoirbeek (christine.vanoirbeek@di.epfl.ch) at the Swiss Federal Institute of Technology, Lausanne. The aim of this group is to gather skills in many technical, social and legal domain and to provide a framework for developing new technologies and methods to fully exploit the opportunities offered by electronic commerce. Here are some topics of special interests for this WG. Electronic commerce forms (business to business, to consumers, to administrations), market places, quality of service, extended and virtual enterprises, legal framework, security, electronic payment, communication aspects and multilingual aspects.

- **i. Application renting – a killer application for electronic payment systems**

  This application renting is an internet service called Virtual Workplace, where anybody can rent a virtual workplace for 30 days and have access to collaborative functionality and applications such as file sharing and threaded

discussion, but also to more advanced features such as document conversion, presence awareness, group video conferencing… This is the virtual counterpart of the physical office space renting.

For more detail: Magnus Ingvarsson, SISU, magnusi@sisu.se

- **ii. Open Electronic Trading System**

  OET addresses the needs of computerized trading systems implementing multiphase negotiation protocols for business-to-business commerce combining workflow techniques to inter-organizational EDIFACT messaging. It handles the different stages within a given trade transaction in a situation where the seller and the buyer already have identified each other, and have a common contract based business relationship. OET is part of a larger project called TAPPE from the EC. The aim of TAPPE is to support the building of a common European infrastructure for public procurement.

  ***For more detail**: Aarno Lehtola, VTT Information Technology, Aarno.Lehtola@vtt.fi*

- **iii. Software agent applications in electronic commerce**

  The MIA project aims are to experiment on the use of advanced intelligent software agents (ISA) applied to electronic commerce in the Light Urban Mobility manufacturing industry. As a user-driven pilot project, it intends to improve the commercial processes of a leading vehicle manufacturing industry (Piaggio of Italy) and also to help it provide a greater customer satisfaction. In this sense, it is addressing the following electronic commerce areas of concern: how to market products, how to initial the contact, exchange of pre-sales information and how to perform post-sales support. ISA is supposed to be able to help optimize the time spent in doing menial tasks. It will be used both within the commercial organization and also across the Internet.

  For more detail: Roberto Gagliardi, CNUCE-CNR, r.gagliardi@cnuce.cnr.it

3.2.3. Other countries

As we already mentioned by looking at the business review, the United States CALS project is also relevant from a research point of view. We also present the Electronic Commerce Canada project.

3.2.3.1. USA - CALS:

CALS defines himself as a strategic management concept that uses the best available information technology, management methods and international standards. In fact CALS represents an advanced application of electronic commerce in its broadest sense, integrating all aspects of our framework from the business model to the more detailed infrastructure component. CALS is supposed to increase the effectiveness of organizations by improving sharing and reuse and by re-engineering business processes through the use in real time of distributed digital databases. It also allows the integration of enterprises on a worldwide basis facilitating electronic commerce. It therefore relies on the use of international standards, the network infrastructure and business practices, and is therefore dependent on the development of Electronic Commerce.

3.2.3.2. Canada – Electronic Commerce Canada

This is a voluntary organization composed of people from both the public and private sectors. ECC is a forum for sharing information and discussing ideas and initiatives, as well as, providing the opportunity to network. It also provides free monthly half-day educational awareness seminars for those interested in electronic technologies, trade shows and symposiums to encourage its members to utilize electronic commerce technologies and to accept standards that will increase productivity and improve competitiveness. Some of the technologies addressed are: streamlining processes, interconnectivity, EDI, electronic fund transfer, e-mail, security, electronic document management, workflow processing, middleware, smart cards…

For more detail: http://www.ecc.ca

3.2.4. Findings

When looking at Figure 3 , where we classify the Swiss projects using the market transaction framework, we see that all aspects, at the exception of the maintenance phase (maintain, influence customer relationship), are covered.

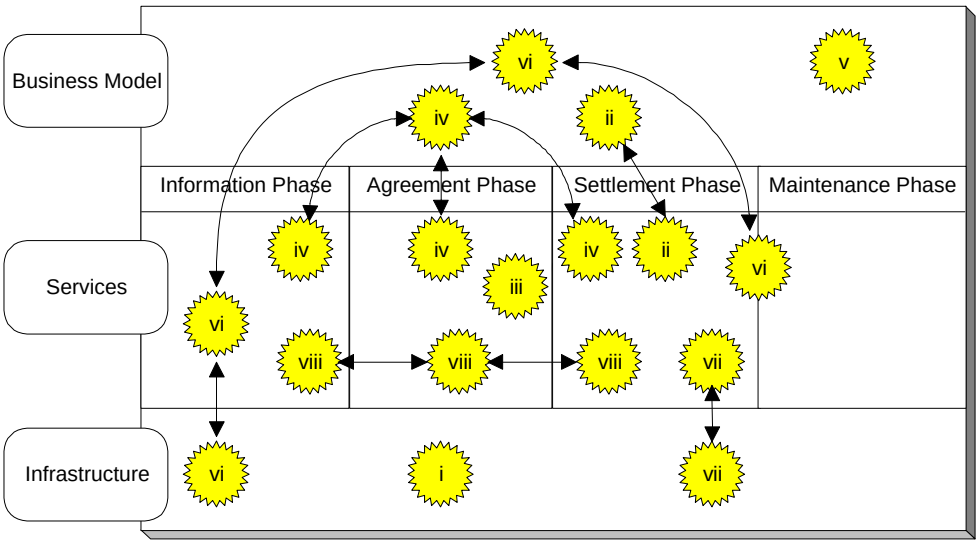

Figure 3: Swiss projects in the market transaction framework

When you have a look to the EC projects or even the US ones, you don't see much of a difference under this aspect. But if you see Electronic commerce as the virtual counterpart of "real" commerce, you would expect to obtain the same diversity in the covered fields (legal, social, political, economical…) and in the sectors it applies to (media, retail,..). Starting from this point of view, the Swiss research gives you the impression to see the electronic market through a keyhole when the EC has a wider view and the US a front seat. This can be easily explained by the size of the research budgets and the size of the country, but is it really all?

Research and development is supposed to be driving belt between technology development and business. In a world were new technologies come up, at an increasing rate, this role is becoming more and more vital. At the end, Universities should track and develop new technologies to handle them to firms for exploitation and promotion. The US and the EC governments understand this and are trying to strengthen this links through ambitious projects.

So what is left to the Swiss research? everything. Electronic commerce is far from being a mature field, and is offering each day new opportunities for countries like Switzerland.

- The *integration* of the electronic commerce services.
- Switzerland is still economically influent, owns experience, quality products and a highly qualified work force.
- Developing electronic commerce research must be achieved through the development of a *supportive framework* including the administrations, firms and Universities.
- We can stress on the *maintenance phase* i.e. the customers or actors retention within the relationship live cycle (maintain, influence customer relationship) as a research field.

4. OVERVIEW OF TECHNOLOGY USED

The goals of this section are to develop a structure for better understanding the relationships between the technology resources and to identify the services that are currently not covered by the marketed technology products.

4.1. A framework

The technology resources enabling Electronic Commerce (EC) encompass almost all the communication and information tools existing today. For instance, supporting the workflow of a customer-supplier chain could require network access layers, APIs to link back-office applications with exchanged commercial data and a common structure of shared technical documentation. Electronic markets require as well network access layers, mechanisms for managing the market and the subscriptions.

We group the information technology (IT) players that are impacting the offer of EC services into the following 14 categories.

1. *Associations, Consortium*

This category groups public organizations in charge of carrying and/or enforcing standards (IETF, CALS, ISO, Singapore Net…) as well as private association of industries and business partners (CommerceNet, Automotive xxx) or software/hardware makers (Object Management Group, …)

2. *Back Office Software Producers*

This category groups software editors selling applications supporting office support (Office suite, e.g. Corel Office, Microsoft Office,…) as well as other office tasks. It includes producers of Document Management Systems (Saros, Xerox Documentum,…), Groupware (Lotus Domino), Collaborative support, Workflow Systems, Database Management Systems (Oracle), Decision Support Systems, Executive Information Systems.

3. *Business Application Software Producers*

This category groups software editors selling application supporting business functions like accounting, production, human resources management etc. (SAP R/3, Baan,…)

4. *Consulting and Resellers*

This category groups consulting companies, systems integrators and product resellers that help companies define their need, operate strategic and planning analysis, manage IT projects, select and implement solutions. (Andersen Consulting, KPMG, IBM, Dec, Logica, …)

5. *EC Products Producers*

This category groups software companies producing and selling software components or solutions that offer direct support to the Information and/or Agreement and/or Settlement phase(s). The category also includes products for Electronic Catalogs (Open Market, BroadVision, ICAT Electronic Commerce

Suite, Bluestone,…), Payment Systems Access (CyberCash, FirstVirtual,…), Shopping tools and agents, tools to link front and back office and Electronic Market Managers (GEIS, IBM Global Service,…).

6. EDI Vendors

This category groups companies that are specialized in producing and/or implementing and/or operating EDI transactions. Examples are Extol, TSI, Harbinger, Sterling Commerce. Some actors like GEIS, IBM, ATT, Swisscos are also big players with expertise in billing systems and value added services for example.

7. Financial Companies (Banks, Credit Cards,)

This category groups financial companies and banks providing services for payment, e.g. Visa, bank xxx,…

8. ISPs

This category groups Internet Services Providers that offer access to Internet and a whole range of added services, going from mailboxing and web content hosting, to electronic market management and workflow support. Examples of major international ISPs are AT&T, AOL and UUNet. ISP could be divided into several categories, depending of their geographic coverage and EC support. The biggest ones are telco's or have been bought by telco's.

9. Internet/Web Software Producers

This category groups the software producers specialized in Internet-based or Web-based products. Examples are Apache Group (Web sites), FTP Software, Netscape products.

10. Middleware and Systems Producers

In this category, examples are Novell and Microsoft. It includes also OS producers. Companies producing Virtual Private Networks are also part of this category. (e.g. AltaVista Tunnel 97, FTP Software Secure Client, Microsoft Routing and Remote Access Service, Sun SunScreen SKIP 1.1)

11. Hardware and Network Hardware Makers

In this category, some examples of hardware companies in the network devices market are Cisco, TheBay Networks, Fore Systems, 3COM.

12. Publishers

Publishers, like ZDNet, are potentially important players in the field of EC, because the infrastructure they put in place in order to reach customers provides an advanced platform for mapping customer needs and producers' offers.

13. Internet Search Engines companies

Internet Search Engines companies are also important players, for the same reason than Publishers. Examples are Yahoo, AltaVista, Lycos etc.

14. Software Development Tools

The classic software development tools companies are Microsoft, Borland, Powersoft, CA, etc.

Many of the main players in Electronic Commerce belong to more than one category. However the role of this classification is to differentiate products. Enabling Electronic Commerce requires the implementation of hardware and software components at various levels of an IT architecture. The Figure 4 presents the coverage of Electronic Commerce services as well as the coverage of the IT architecture layers.

The IT layers represent the different levels of system infrastructure required to operate Electronic Commerce software. For our limited purpose the levels are very simple and broadly defined.

- The first layer includes all the *hardware and low level software components* of computers.
- The second level is composed of all the *network infrastructure* required to make the systems communicate. It includes hardware components, e.g. hubs and cables, as well as protocols and software.
- The next layer has been refereed as *Middleware*. Byte magazine defines Middleware as " software that allows elements of applications to interoperate across network links, despite differences in underlying communications protocols, system architectures, OSes, databases, and other application services". An example of feature offered in middleware products is "remote database access" (e.g. Information Builders' EDA/SQL). Middleware has become increasingly important because it enables distributed communication between heterogeneous systems. The Web could be considered as a very strong middleware-oriented technology.
- The next layer includes all the components required to store and *manage data*, or better: information. It is separated from Middleware, because Database Systems are proprietary technologies, as well as the software allowing to retrieve, analyze and present information from databases.
- Finally, the above layer called "Human Interface" groups all the technologies, paradigms and protocols used between human and computers, as well as their underlying mechanisms. Examples include desktop graphical interfaces (Windows), voice recognition systems, hypertext navigating tools (web browsers) or document structure standards (e.g. SGML)

A darker or lighter color indicates how much the products or services offered by the players are covering the components relating to each IT infrastructure layers. Our judgement is based on a broad survey of current published offers. Each IT layer's components can not be detailed at this stage of the analysis.

Electronic Commerce services are placed at the top of the infrastructure layers. They are not decomposed. However, a broad list of services for each of the EC phases is given in Figure 2.

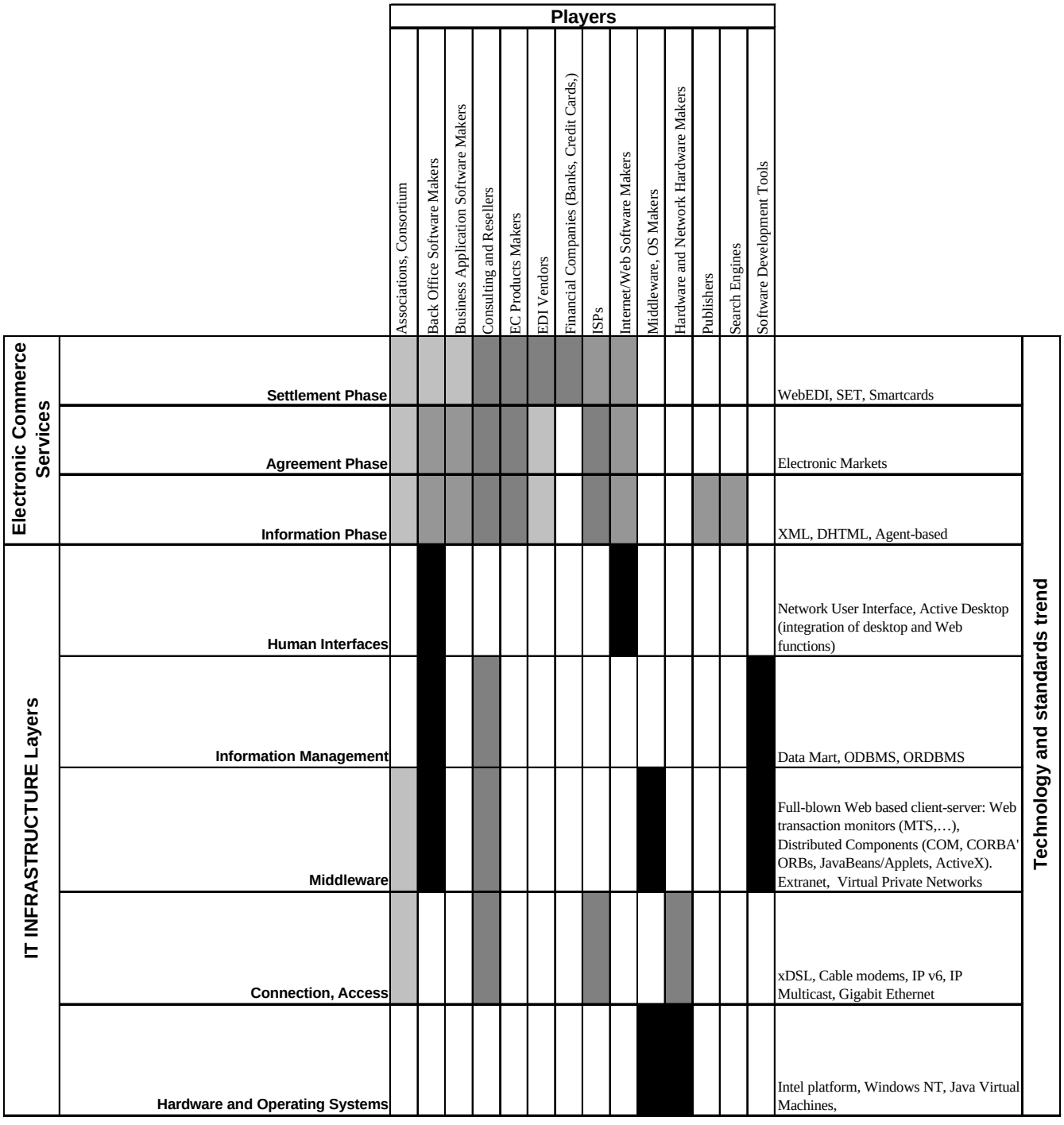

Figure 4 : EC services, IT Technology layers, Players and Trend

It is not possible at this stage of the analysis to identify the exact coverage for each of the services. The gray levels gives an estimate based on a personal judgement, built after a broad survey of published offers (product descriptions and white papers found in producer's Web sites), technical reports in specialized press (Byte, ZD press, Wiley Computer Publishing,….) and reports from Gartner Group.

4.2. The trends

- *Vertical integration of products by acquisition (see Telco's), add-ons or adoption of standards.*

  The products offering EC support can have different sources.

  - They can result from the extension of business applications (e.g. SAP R/3 and Pandesic). Add-on components are offered in order to enable different services, like electronic catalogs linked to the existing database of products. It can be also the revamping of the application in a full-blown Web client-server architecture, easing the sharing of data and processes in Extranet environments (e.g. Baan rewriting all its applications in Java).

  - They are built upon back-office software products and middleware components. A typical example is the Microsoft Internet Commerce Strategy offer based on a suite of back-office products, including EC services at the desktop levels (Microsoft Wallet), commerce site web creation and management tools and integration within the Windows NT server environment. Other examples include Netscape and IBM offers.

  - They relate on Electronic Market management services, e.g. GEIS.

  - They are independent products, specialized in one service, e.g. online electronic catalogs with order processing support.

  - They are pure EDI implementation, requiring subscription to a private network. A trend toward Web-based lightest version of EDI is taking place. In this case, it does not require the subscription to a private network.

  The strong interrelations between the IT architecture layers and the EC components might be a reason why all these sources conduct to the offering of EC services. For example the Microsoft's integration of its Site Server suite that includes server management, Commerce Server and payment architecture (from client browser's features to payment services from external bank or financial institutions)

- *Agent-based software for the EC Information phase*

  Many of the newest products appearing are implemented as agents. For instance, Information Filtering agents like Webturbo or ZDNet personal View, Information Broker agents matching attributes of context providers against interests of their service members like AdHound, or Multiuser Dungeon or Avatars agents where users can interact with each others in a shared space. "Push" publishing mechanisms are also implemented by using agent, e.g. agents on the user's desktops that automatically pull the subscribed information from Web sites on behalf of the user.

- *Products bridging EC data exchange by using lite EDI standard within Web interfaces*

  Use of EDI standards for the exchange of commercial data in Extranet environment is more and more common. In many cases, the standards are "lighted", in order to accelerate the implementation of the processes.

- *Virtual Private Networks over Internet instead of using an expensive private network infrastructure*

  VPNs provide a cost-effective alternative to private networks. They are one of the main components of an Extranet environment implemented over Internet. They are composed of standards-based authentication, encryption, and digital signatures. (e.g. RSA Data Security tools: JSafe (for Java), BSafe (for C++), and SMail (for S/MIME-enabling messaging products). Many vendors are adopting the Internet Engineering Task Force's (IETF's) Secure IP (IPSEC) standard for virtual private networking.

- *ISPs offering more and more Value Added Internet Services*

  For example we can mention: Content hosting and presentation Community Extranets, EM Hosting, EDI outsourcing, Payments Systems, No-stop operation, Electronic Catalog and bidding, APIs interface with enterprise applications…

4.3. The coverage of EC Services

The services that seem partially covered or uncovered will be grouped in the following categories: (1) EC Design Support, (2) EC Decision Support and (3) EC Operational Support.

- *Setup and management of advanced multimedia integration and advanced human computer interface (HCI) within EC services* (1), (2) and (3)

  Examples include:

  - description of products based not only on text and images, but adding multimedia objects, e.g. animated graphs, voice, video, live video, 3D virtual worlds;
  - use of synchronous communication (e.g. video conference) during the contracting phase;
  - tools helping to generate and manage electronic rich representation of catalogs items: for example the tools allowing to generate 3D virtual objects from real items and associating to them other multimedia attributes (sounds, voice, animated graphics,…).
  - virtual reality technology that could help to represent issues in electronic commerce.

  The actual EC products do not include advanced human-computer interactions, but are mostly based on typical use of browsers displaying images and text, sometimes sound and video. If the existing technologies allow building sophisticated electronic catalogs including 3D representation and manipulation of items, the agreement and settlement phases are so far treated as pure paper or form based asynchronous tasks. In practice, parts of the transactions are often based on more rich communications between the parties.

- *Management of Cultural differences (1), (2) and (3)*
  - Languages automatic translation
  - Agreement phase dynamic configurations …

  Most of the existing EC products have been developed in an American and/or European culture of business. Few EC products seem to have addressed the problems of cultural differences, by implementing services for automatic translations of languages. Some companies offer translation services, but it remains in the hand of human agents operating the translation (e.g. WorldPoint Inc. at www.worldpoint.com)

  Other issue is the cultural differences that can affect the agreement phase. EC tools supporting negotiation process should give enough flexibility to the participants in order to adjust their differences.

- *Support to dynamic configurations of EC services, depending on the characteristics of suppliers and customers in the chain (1), (2) and (3)*

  Today's implementation of EC products, especially EDI products, require a lot of customization work at all the different IT layers as well as at the process level. Products should be more easily adaptable to the characteristics of business participants. Moreover, they should provide a way to be configured on the fly, (e.g. like workflow tools supporting dynamic re-ordering of tasks), so that new business practices or new customers and suppliers could be quickly linked, but without requiring to customize every variant.

  - *Electronic Commerce outsourcing Management (1)*

  As shown in the "Trends Section", EC products companies are more and more adding values to their prior service (e.g. ISPs not only hosting electronic markets but providing order processing and payment supports) This might present interesting alternatives to companies, but requires instruments for managing the functions that are outsourced.

  - *Content Management (1) (2) and (3)*

  Content Management remains an issue in the context of Electronic Commerce. Electronic Document Management Systems in Intranet environment offer services for coordinating the sharing of documents, but these services are not sufficient when the processes cross the enterprise boundaries. The management of the content becomes a critical mission when it is shared in EC phases, since it represents the foundation of the contracted exchange between the business participants. Solid management methods and tools are required in order to ensure correct updating mechanisms in a complex environment where all the participants can be part of the editing process and where updating must take place during the ongoing phases.

  - *Relationship Management and BPR (1), (2)*
    - InterProcess Management and BPR
    - Interoperatibility/Integration

Standards (e.g. EDI) and technology products (e.g. middleware) bring a part of the solution to the enabling of Electronic Commerce transactions. However the problem of integrating processes from separated enterprises in an open and changing environment (as opposed to a closed environment built on stable and asynchronous conduit, e.g. EDI batched process over private networks) remains not solved by today's products offer.

No tools seem to offer services for configuring and designing shared processes at the organizational level. The ultimate goal is to be able to monitor the interoperability between processes at the organization level as well as at the IT layers. Current BPR tools usually allows to get an insular and internal view of the organizations. They could be enhanced in order to provide functionality for designing EC processes shared by different enterprises.

4.4. Findings

The framework (Figure 4) presenting the six IT architecture layers (Hardware, Network, Middleware, Data management, Human Computer Interface and electronic commerce products offering electronic commerce transaction services) shows that many of the IT players have deeply enter the market.

A major trend is to provide *value added services* in the offering of electronic commerce products, combined with integration of various components. This "packaging" of electronic commerce is enabled by different ways, for instance:

- by companies' acquisitions (IBM' s Global Services purchase of Advantis, AOL's acquisition of CompuServe's Interactive Service,
- by development of products' add-on s (Pandesic APIs) or
- by vertical integration of existing products (e.g. Microsoft)

Other major trends are:

- the use of *agent-based software for information retrieval*
- *Virtual Private Networks and Web-based EDI* as cost-effective alternative to classic EDI/private network solutions

If the use of standardized technology components (EDI, Middleware, Web) looks to be a good factor for enabling electronic commerce products to penetrate the companies, many opportunities remain.

Most of the tools are firstly oriented towards the linear relationship, supported by EDI technology. The more we look at the electronic markets tools, the more we can consider them as still emergent. The "uncovered" electronic commerce services can be associated to three levels of development:

- *(1) EC Design Support*
- *(2) EC Management Support*
- *(3) EC Operations Support*

There is a lack of *tools that can be a support for designing electronic commerce platforms and the roles of the actors*, tools for *managing electronic commerce platforms* (decision support systems, management support systems) and tools for *operating* electronic commerce platforms.

When we look at the today's products through these three levels of development we report six areas that look "uncovered":

- Setup and management of advanced multimedia integration and advanced human computer interface (HCI) within electronic commerce services (1), (2), (3)
- Management of *cultural differences* (1), (2) and (3)
- Support to *dynamic configurations of Electronic Commerce services*, depending on the characteristics of suppliers and customers in the chain (1), (2) and (3)
- Electronic commerce *outsourcing* management (1)
- *Content* management (1) (2) and (3)
- *Relationship management* and *business processes management* (BPR) (1), (2)

5. RESEARCH - EXTERNAL PERSPECTIVES

In order to get an outside view from academic researchers, we established and sent a questionnaire to the following persons:

- *Dr. Tung Bui, professor, University of Hawaii*
- *Dr. Ravi Kalakota, professor, Georgia State University*
- *Dr. Ajit Kambil, professor, New York University*
- *Dr. Stefan Klein, professor, University of Muenster*
- *Dr. Benn Konsynski, professor, Emory University*
- *Dr. Kalle Lyyinen, professor, University of Jyväskylä*
- *Dr. Richard Watson, professor, University of Georgia*
- *Mr. Michael Bloch, University of Lausanne, now with McKinsey&Co.*

In this chapter, we propose a synthesis of some of their comments and suggestions regarding the trends in business-to-business electronic commerce.

5.1. Main trends in business-to-business electronic commerce

General remark:

- *Business to business electronic commerce is really going to take-off in the next few years.*
- *There are not so many academic research projects in these areas. Most of the work is being done by fast-moving companies trying to develop and commercialize the ideas.*

1. *New organization architectures*

   The movement from a "virtual" hub and spoke organizational model to a more agile community oriented model is clearly evident in many industries, such as online brokerages (e*Trade), online travel (Expedia) etc. This transition to an electronic business framework needs theoretical exploration from different perspectives - economics, technological, and behavioral.

2. *Next generation technological architectures*

   How to create new inter-enterprise systems that mesh very well at the process level (such as forecasting). Examples of this trend are cross SAP integration in different organizations. The problem is difficult because the semantics of each SAP implementation are different and integration becomes challenging. But we can see firms already tackling this difficult problem in the area of collaborative supply chain planning. Examples: cross-route (www.crossroute.com)

3. *Next generation applications*

   What does supply chain management look like in the future? What does customer interaction (sales and service) look like in a world of IOS? There

kind of application questions are very interesting as they influence the two previous questions.

4. *Internet*

   The Internet will have an impact on (a) the inter-organizational value chain, processes and workflow management, (b) the electronic mediation, brokering and market places, and (c) the organization of work such as telework, telecommuting and mobile workers; all of this context beyond the national geographic borders.

5. *EDI*

   This is an established area in through EDI applications and VAN services. What we see now is the movement of these services to Intranets / Extranets and also introduction of WWW based EDI services, which are suitable for SME's. Research projects? That's a difficult question as most of this is relatively established technology.

   Surely none of the universities are focusing on this. Their interest is in the use of agents, catalogues and new service alternatives.

6. *Workflow management*

   The key issues here will be effectively integrating the workflow of multiple organizations and consensus on standards.

7. *Customer relationship and human computer interaction*

   The re-organization of industries into new forms of multi-industry groups coordinated through technology has to be defined in order to confront the customer. Customers increasingly will have a personalized window through which they will interact with firms.

   The human computer interaction issues are still to be resolved, and the means by which different firms configure themselves to provide seamless services to customers is still to be determined. We need to build tools to represent and document competitive strategies that cut across industries to understand emerging models of competition in this area.

8. *Miscellaneous*

   New regulatory and technical regimes for protect intellectual property will emerge.

   - Structural changes come out in many industries (blurring boundaries of industries, new entrants, death spiral of average pricing, channel competition etc.).
   - Major expected changes will appear in marketing, procurement, and logistics
   - Role of information and media as driving industries

5.2. Suggestions for research

General remark:

- *As many of these problems are interdisciplinary - IS departments can play a key role in developing experimental systems and environments to test how people undertake information technology mediated commerce.*
- *In this area, it is important to illustrate research ideas and hypotheses with implemented or assembled demonstrators.*

1. *Search Engines*

   Searching for relevant information efficiently to support transactions is going to be one of the challenges in this new environment. Collaborative filtering, and value addition to information to support search will be a key issues in a firm's knowledge management strategies.

2. *Pricing and auction*

   Valuation of goods and services will shift from posted offer pricing to dynamic pricing. The actual price and resource allocation under different auction models merit study.

3. *Specification*

   What kind of high level specification languages, computer-aided tools and decision support system are well adapted for designing electronic commerce system?

4. *Legacy systems*

   Integration mechanisms for legacy applications; wrapping of services around legacy applications. Coexistence & combination of traditional commerce and electronic commerce.

5. *Electronic messaging*

   Geography has been an important factor in creating clusters of highly successful firms (e.g. Silicon Valley, printing press in south central Germany, leather goods in a region of Italy). Electronic messaging between firms could break down the effect of geography and firms outside these regions may be able to 'hook-in' to these clusters. This could be quite important to Swiss firms because you have the education and language skills to work with many firms in these clusters.

6. *Organizational forms and system architecture*

   New organizational forms (networks, virtual organizations, etc.); management issues (trust, influence, power …); relationship between systems architectures and organizational forms (independence, structural fit, alignment etc.); hybrid coordination mechanisms (combination of hierarchical, network like and market mechanisms); strategic planning (adjusting old concepts & developing new ones). How to structure incentives, organization design and technology

together to enable productive relations among firms? This will mainly use economics as a reference discipline.

7. *Structured business directory*

   In order to assist customer in finding suppliers; requires modeling of supplier's offering; natural language interface is important; requires search engine with knowledge of each site's offering. It could be extended in order to find partners (see `industry.net`).

8. *Diagnostic tool*

   It should allow to ask questions and to receive ideas of presence, linked to a body of knowledge (case studies, return on investment help, Web site skeleton, etc); this could lower entry barriers for SME's

9. *Information center*

   This directory service and the diagnostic tools could be the embryo of or integrated into an "electronic commerce information center" collecting in the same place the resources and giving answers to questions such as "what to do?" (diagnostic tool), "how to do?" (references and experts), and "with whom?" (ISP, information providers, experts).

10. *Competitive intelligence*

    Datamining approach (individual or within a network of companies collaborating); requires search engines, information refineries, discussion groups, intranet for sharing information, groupware tools for collaborating

11. *Visioconference*

    It could be interesting to test various packages (video, audio, screen sharing, on-line meeting) using different telecom solutions with the objective to bring an answer the following questions "what's the right package for a business or a SME?", "what does the video add for a meeting?", "when to choose video over simple audio?", and "What kind of business rules can we design?"

12. *Certification*

    What is the role of third parties (banks, postal services, chamber of commerce, Europay, etc)? How to integrate solutions between suppliers, customers, and third parties? Same question for an electronic markets with their actors, their market operators, and the regulatory authorities.

13. *Micropayments and secure payments (Cf. SECURITY)*

    Which solution will emerge as a leader? Chip card vs. accounts (e.g. FirstVirtual)? Integration with electronic cash system? Package of solution (easy to set up and use)?

14. *Workflow management*

    The impact of electronic commerce on workflow and tools to support inter-organizational workflow merit study. One important question concerns the business rules for routing and processing the documents. What could be the role of XML and object-oriented business models?

15. *EDI*

    How to set-up and use the Internet as a private virtual network; how to simplify messages formats (using for instance SGML and XML); how to integrate openEDI and financial EDI; what will be the impact of OFX (www.ofx.net), a unified specification for the electronic exchange of financial data between financial institutions, business and consumers via the Internet; possible extension in the financial planning and tax.

16. *Logistics*

    How to design a simple EDI-based platform to connect manufacturers and shippers? Is it possible to plug such a platform into a FedEx-like architecture?

17. *Integrated platform*

    It could be interesting to bundle certification, payment and logistics services in one simple generic platform targeting online merchants in order to provide them a Swiss " Pandesic" solution (www.pandesic.com)

18. *Administration*

    A general platform or a workflow environment for dealing with the paperwork processing, information requests and form downloading could be attractive for the government agencies, their customers and suppliers. A good starting point should be to design and implement a platform for managing the request for proposal processes.

19. *Business game*

    A business game with its simulation components (such as the game designed for the Port of Roterdam in The Netherland and the TREAT Laboratory in Australia) should be definitely a good approach to bring electronic commerce ideas and practices in SME's communities.

6. FUTURE RESEARCH

Based on the global survey we performed regarding business experiences, research initiatives (Switzerland, Europe and World), technology used and external researchers' point of view we now:

- situate BBEC within the general environment, review the major trends,
- analyze key strengths weaknesses, opportunities and threats (SWOT),
- propose development axes,
- suggest future research areas for business to business electronic commerce for Switzerland.

6.1. General Environment and major trends

We propose to situate BBEC within its more general environment. The social, cultural, political, legal and regulatory interaction loops clearly emerge as well as the links with the competition within the physical space.

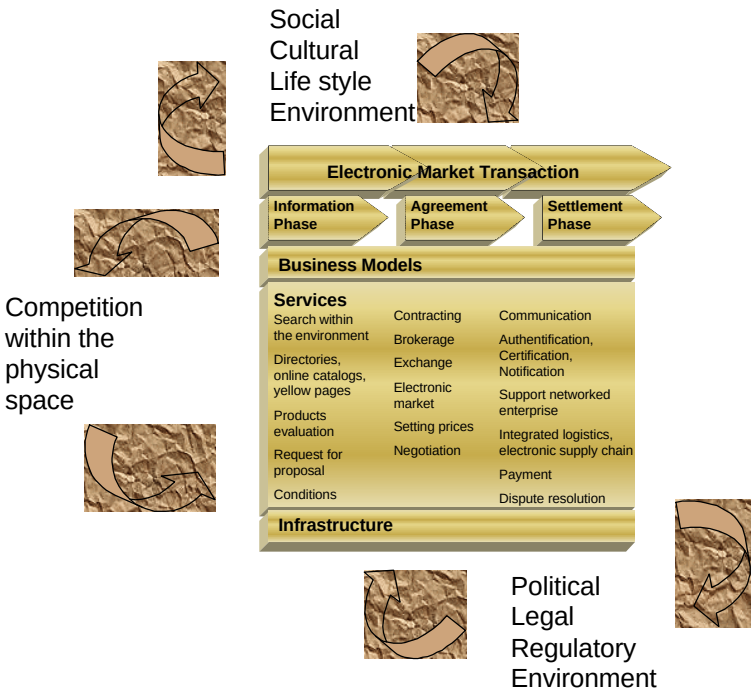

Figure 5 : BBEC environment framework

Social, cultural and life style components certainly influence the BBEC and receive very significant feedback. The key attributes of the population such as individualism versus relationship needs, flexibility facing the changing environment, new requirements of social life linking high competencies with high technology, exclusion versus elite, individual, collective and political power within communities will be very important to consider.

The *legal, the political, and the regulatory environment* will certainly issue key components, standards and rules regarding BBEC.

Other issues lay in considering how the *competition* within the physical space affects the BBEC field and vice-versa. This can have effects for example on forecasting techniques, business models and transactions.

From our survey, we identify *six major trends emerging from BBEC environment*. These trends are globally affecting at once business and research areas.

- *Growth:*

  Business to business electronic commerce is going to experience very *rapid growth* in the coming years. (projections 1999: 40 US$b. 2000: 134 US$b). *Companies are taking advantage of BBEC opportunities.*

- *Time factor:*

  The time factor deeply impacts the rules of the game within the BBEC space. The speed, the agility, endurance, allows fast-moving companies to compete.

- *Inter-company relationships:*

  The inter-company relationships are evolving rapidly to *cooperation* and to *organized market spaces*.

- *Mastering of technology:*

  The mastering of the new technology allows small and medium companies to play fast niche strategies within the BBEC space.

- *Geopolitical power:*

  The new technology and the electronic commerce create "borderless" spaces that nations want to influence or dominate. United States and European Community initiated major research.

- *Regulation:*

  The "borderless" spaces lead to implement more regulation, formulate rules and issue laws (Commerce, standards, tax…).

6.1.1. SWOT

Let's have a look at some perceived *strengths* and *weaknesses* of Swiss research environment as well as the global *opportunities* and *threats* within the BBEC domain.

- *Strengths*

  - Large *global* Swiss companies belong to the top 10 key players of industries like: pharmaceuticals/chemicals, insurance/banking and finance, watches, commodities trading, engines manufacturing.

- Switzerland is a *platform* for *physical commerce* with international axes for road and rail transportation within Europe.
- Swiss products still have a good image of *quality*, *customization* and *security*.
- Swiss workers generally have high level of *education* and *competencies*.
- Swiss research is member of some *European Communities research programs*.

- *Weaknesses*
  - Switzerland still *spends a low percentage of GDP on R&D*.
  - Switzerland is *slow*, *regulated*, *tends to slow down innovation* and presents a *risk aversion* sickness.
  - Switzerland is a *small* country, the rules of the game can't be under Swiss's thumb.
  - The Swiss *market* is still too *protected*, expensive with high costs and unfavorable exchange rate.
  - Swiss research encounters *difficulties to cooperate* and establishing shared platform (between Universities and with firms).
- *Opportunities*
  - BBEC is a *fast growing* field.
  - BBEC provides many places and low financial entry barriers for a *small actor* or a country like Switzerland.
  - BBEC provides many *innovation* opportunities.
  - Internet is a phenomenon of the information *society* that acts as a *catalyst* for researchers, communities and individuals with various professional and interest field.
- *Threats*
  - The main threats for Switzerland and Swiss research is *exclusion*
  - The BBEC is a fast growing field. The *time factor* deeply impacts the rules of the game, the resources allocation and the investments.
  - Ensuring a presence within the BBEC field is common now, being *proactive* becomes of necessity.

Switzerland and Swiss research could take advantage of BBEC opportunities by:

1. *Being proactive on focused, differentiated, innovative niche projects that should exploit the expertise and knowledge experimented within the top physical industries.*

2. *Reinforcing the Swiss action within the European Communities research programs.*

3. *Establishing a dedicated electronic platform helping research teems to cooperate.*

4. *The government should be the promoter of BBEC research as well as companies or communities BBEC initiatives by allowing key resources to focused projects.*

6.1.2. Key issues

We believe that BBEC research areas for Switzerland should meet the key issues facing the community, the economy and the business needs.

The Swiss success depends on the ability to upgrade industry, to compete in sophisticated and highly differentiated industry segments, to regenerate its innovation driven economy and to avoid exclusion.

To be more precise and to be able to position the action - the focused, differentiated, innovative niche projects - within the BBEC research field lets now synthesize our analysis and identify the key differentiation axes.

6.2. Opportunities for future research

We think that we can propose 8 key differentiation axis for the research within the BBEC field. These axis are: technology, strategy, business models, market leading actors, organization, relationship, lifestyle and social, legal and regulation. For each of these axis, we suggest some illustrative themes.

1. *Technology:*

   The themes that make up this axis relate to:

   Telecommunication and network technology, hardware, communication protocols, visio-conferencing, workflow technology.

   Infrastructure and architecture of EC platforms, integration, data mining, data warehousing, object oriented programming, virtual reality.

   Mastering technology life cycle, legacy systems, establishing hardware and software standards.

2. *Strategy:*

   The themes that make up this axis relate to:

   Approaches, methods and tools for designing strategic positioning, strategic analysis tools, forecasting and impact analysis

   Strategy: new roles, new rules, and new links, competition, cooperation, strategies on the market space, key success factors

   Time factor: strategies and actions to quickly enter the market

3. *Business models:*

   The themes that make up this axis relate to:

   New business models, alliances, business scenarios, business models design tools, simulation tools, embedding physical business to BBEC platforms

   Technology life cycles and impacts on business models, changing to electronic commerce based business models, marketing and distribution channels design and management tools

   Effects of market mechanism on equilibrium prices, buyer strategies, distribution benefits

4. *Market leading actors*

   The themes that make up this axis relate to:

   Studies of early adopters, suppliers, success of EC platforms

   Champions' culture, behavior and organization

   Case studies

5. *Organizational implications*

   The themes that make up this axis relate to:

   Impacts on the business processes, impacts on the inter-organizational business processes, integration, coordination, networked enterprise

   Change management from conventional business processes to BBEC business processes

   Individuals and community behavior facing BBEC

6. *Relationship*

   The themes that make up this axis relate to:

   Customer relationship management, cooperation relationships between companies relationships between actors.

   Key services and functionality (electronic contracting, tools regarding the negotiation,… permanent IT support across all transaction phases.

   Actor's behaviors within a relationship, knowledge management

7. *Legal and regulation*

   The themes that make up this axis relate to:

   Fundamental backgrounds for legal requirements, confidentiality for the clients and for the companies, ethics, intellectual property

   Commerce regulation, EC standards, certification

International taxes problems relating to BBEC

8. *Life style, social*

The themes that make up this axis relate to:

Barriers to BBEC, languages, culture, education.

Incentives, linking communities and regions

Life style impacts of BBEC on communities, actors, individuals and communities behavior using EC, post purchase behavior

Based on our survey, we roughly situate the BBEC related research on a positioning graphic (Figure 6). On this graphic, the surfaces are significant for positioning the research. The surfaces don't represent volumes or amounts spent.

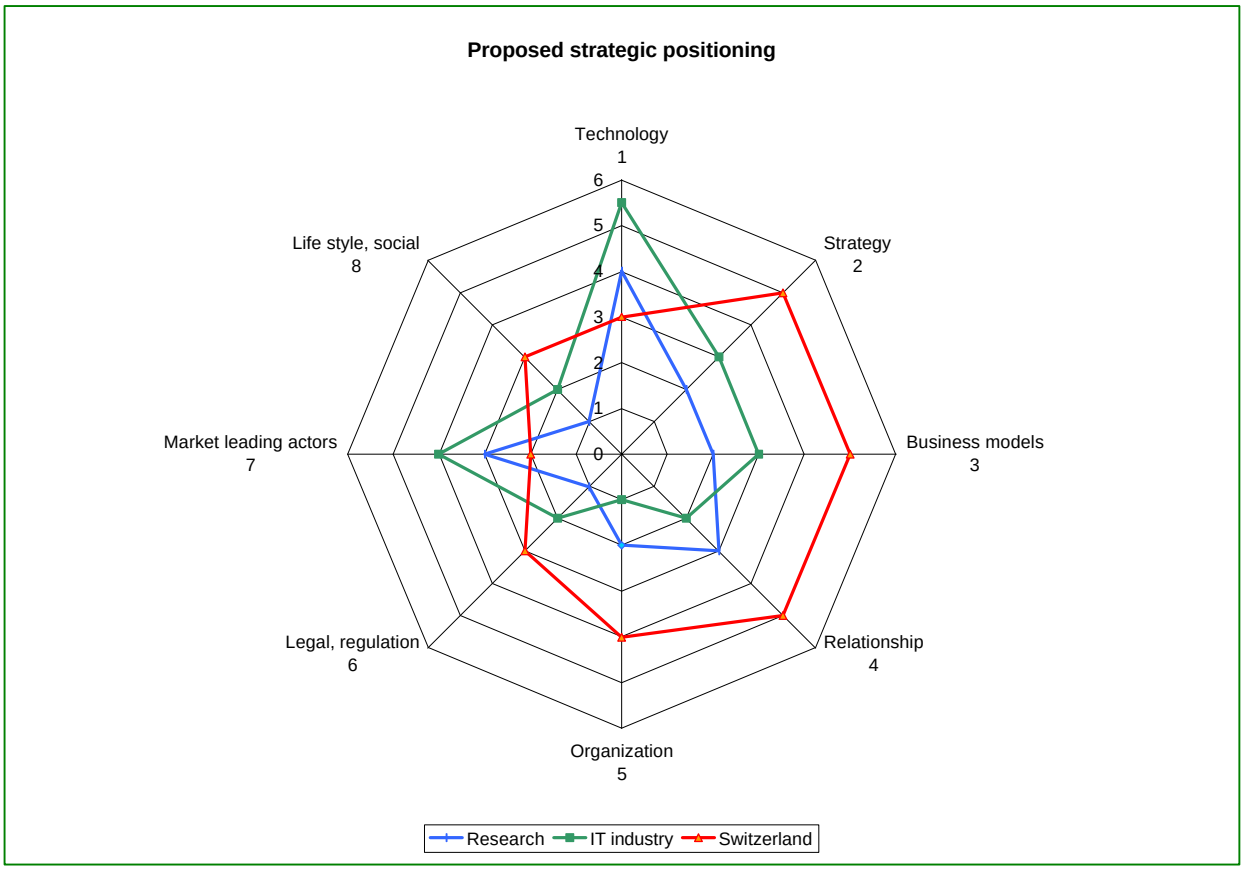

Figure 6 Proposed strategic positioning for BBEC research in Switzerland

- The research performed by the industry players (green line) shows a strong position in research within the technology developments area (IBM, AT&T, Baan, SAP, Pandesic, Microsoft, Fore Systems, Sun, 3Com, Cisco…). The resources the key players spend on this area are just enormous, because their future revenues depend on that research. They also look advanced in the research regarding the market leading actors partly because that research is also part of their strategic scanning processes.

- The international research (blue line) shows key positioning on the axis of the research within the technology developments area. It looks logical, because the international research often comes with industry players. The international BBEC research is also very interested in studies regarding the leading actors and within the relationship research area.

We previously said that the Swiss BBEC research should be proactive on focused, differentiated, innovative niche projects and that these projects should exploit the expertise and knowledge experimented within the top physical industries. Considering the positioning of the international research (blue line) and the positioning of the research performed by the industry players (green line), we propose that the *Swiss BBEC research* could be situated within the red line.

In that case, the Swiss BBEC research projects would be of course technology based and lay emphasis on the relationship, business models, strategy and organization components. The *suggestions for research* we presented at the paragraph 5 "Research - External perspectives" are situated inside the red line surface. Other items of our *findings* (paragraphs 3.1.4, 3.2.4, 4.4, 6.1) can also be situated inside the surface.

We think that BBEC research must keep in mind that this kind of Swiss research should not try to focus on the basic components of EC that are already provided by the key industry players allowing impressive resources in that field. BBEC research should focus on innovative and differentiated use of that technology.

- For example we said that there is a lack of *tools that can be a support for designing electronic commerce platforms and for specifying the roles of the actors*. There is also needs for tools helping *managing electronic commerce platforms* and the companies on these platforms (decision support systems, management support systems). We also need tools for *operating* the electronic commerce platforms.

- Many other opportunities are still opened by looking at the "services", mainly in the *agreement* and *settlement* phases of the framework (Figure 2 : Initial framework). For example market based systems with negotiation and discussion services, more systems with value added services, market mechanisms like auctioning systems not matching supply and demand through the price and other criteria such as delivery or payment conditions. Other examples are regarding the electronic commerce platforms that should *integrate* almost all the items of the framework. Questions about the way of *changing* from legacy systems to EC systems or to *integrate* or to *federate* them (strategy, way of doing, …) are also opened.

- Other research opportunities lay in considering how the *competition* within the physical space affects the BBEC field and vice-versa. This can have effects for example on forecasting techniques, business models and transactions. Tools are required as *a support for designing relationships, cooperations.*

The Table 2 presents titles of the *suggestions for research* (see page 33 for details) and their rough positioning on the axis. The blue bullets show the main focus of the suggestion for research, the yellow bullets show the mix of the other components.

Future platforms will not only be commerce (exchanges) oriented. They will offer more inter-business networking services, allowing spaces for building and managing relationships so that companies will share some activities and evolve between cooperation and competition. These trends radically change strategy, management, behavior patterns and professional relationships.

Suggestions for research		Technology	Strategy	Business models	Relationship	Organization	Legal, regulation	Market leading actors	Life style, social
1	Search Engines	○	○	○	●				
2	Pricing and auction	○	○	●	○				
3	Specification	○		●	○				
4	Legacy systems	●	○			○		○	
5	Electronic messaging	○	○	○	●	○		○	○
6	Organizational forms and systems architecture	○	○	●	○	○		○	
7	Structured business directory	○	○	○	●	○		○	
8	Diagnostic tool	○	●	○	○	○			
9	Information center	○	●	○	○	○		○	○
10	Competitive intelligence	○	●	●	○	○	○	○	○
11	Visioconference	○	○	○	●	○		○	
12	Certification	○		○	○		●	○	
13	Micropayments and secure payments (cf.security)	●	○	○	○	○	○		
14	Workflow management	○		○	○	●	○		
15	EDI	●	○	○	○	○	○		
16	Logistics	○	○	●	○	●			
17	Integrated platform	●	○	○	○	○	○		
18	Administration	○	○	○	●	○	○		○
19	Business Game	○	○	●	○	○	○	○	○

Table 2: Positioning the suggestions for research

6.3. Let's get the show on the road now!

We suggest three examples of possible BBEC research projects. Of course some materials and work in progress already exist within these areas. We just mention some of them but further work will be required to get a focused "state of the art". Nevertheless many research opportunities to make the things happen in Switzerland and to improve the BBEC services are available. Cooperation between Universities and private companies (joint ventures) should become the rule. To face the effects of the time factor, it would help to raise resources and competencies, to use materials and work in progress, and to summon up all Swiss BBEC research strength.

Let's have a quick look at these examples:

1. *Partnership*

   Aim: Helping SMEs to manage their partnerships

   Main differentiation axis:

   Relationship: Relationship management, integration

Other axis:

Business models: Cooperation, alliances

Technology: Workflow, EDI, legacy system

Organization: Supply chain, Logistics

Legal, regulation: Third Party

Example of work in progress: AMAD initiative: creating relationships, sharing activities and processes

2. *Exchanges*

Aim: Helping SMEs to tackle the exchange difficulties on EC platforms

Main differentiation axis:

Business model: Alliances

Other axis:

Relationship: services, integration

Strategy: Cooperation

Organization: Networked enterprise

Technology: high-level specification tool and development of a platform, info-center, electronic directory

Example of work in progress: Some initiatives in strategic scanning tools

3. *Market*

Aim: Inculcate in suppliers' mind the electronic market idea and the effects of EM

Main differentiation axis:

Business models: Market platform, Request for proposal

Other axis:

Relationship: services, integration

Technology: Architecture of EM platform documents management

Organization: Impacts on business processes

Legal, regulation: Third Party

Example of work in progress: TBTNet project

7. CONCLUSIONS

The critical success factors for companies, communities and other actors within the BBEC field are certainly:

- managing the entire customer / actor / community relationship cycle,
- be able to create communities and sub-communities,
- extract a collective intelligence,
- mastering the usage of technology
- cooperate
- facing the time factor pressure
- Personalizing the action, the services.

The Swiss BBEC research should provide tools for helping companies, *small and medium enterprises (SME)*, communities and other actors mastering these critical success factors.

The Swiss BBEC research could reach this goal and take advantage of opportunities by:

Being proactive on focused, differentiated, innovative niche projects that should exploit the expertise and knowledge experimented within the top physical industries.

Reinforcing the Swiss action within the European Communities research programs.

Establishing a dedicated electronic platform helping research teems to cooperate.

The government should be the promoter of BBEC research as well as companies or communities BBEC initiatives by allowing key resources to focused projects.

A. APPENDICE

For your personal notes: