CLUSTER REPORT

BERNE

27 July 2006

DOCUMENT PROPERTIES

Document No.:	FP6-022551/7/WP2/D6		
Document Title:	Cluster Report		
Work package:	WP2 – Regional & Comparative Analyses		
Author(s)/editor(s):	Christoph Beer, Telematic Cluster Berne, innoBE AG		
Dissemination Level:	PU - Public	Nature:	R - Report
Status of Document:	Final Version		
Version:	V1.1		

REVISION HISTORY

Revision	Date	Issued by	Description

ABSTRACT

The available cluster report gives an overview of the ICT sector and industry in Switzerland and in the region of Berne. It shows the evolution and characteristics of the Telematic Cluster Berne (ICT-Cluster), which was founded on 13 December 1996. The cluster analysis focuses itself both the economic-geographical facts as well as the organizational ranges of the sector and the ICT-Cluster Berne. The cluster itself is based on the cluster policy of the canton of Berne, which is supported by the Swiss cluster politics.

CONTENT

1 EXECUTIVE SUMMARY

The available cluster report gives an overview of the ICT sector and industry in Switzerland and in the region of Berne. The Berne Region is equal with the canton of Berne and is a part of Switzerland. Switzerland is in the center of Europe and has a population of 7,261,200 (2001) with a density of 176 inhabitants/km2. The country Switzerland is splitted in 23 cantons. In the heart of Switzerland, the Canton of Berne forms a bridge between the German-speaking region and French-speaking Suisse Romande to the West. The City of Berne is the capitol and the seat of the Federal Government. This makes Berne the ideal location if you wish to take advantage of proximity to Swiss politics and to the main administrative centers.

Some main Characteristics of the ICT sector in Switzerland are: Telecommunications companies in Switzerland turn over some US$ 20 billion annually and employ about 50,000 people, according to SICTA, an industry association. More than 110,000 workers in Switzerland are employed in the IT sector, according to the Federal Office for Professional Education and Technology. IT spending in Switzerland is more than US$ 9 billion a year, according to International Data Corporation. The IT sector ranks third in Switzerland's in terms of sales after the pharmaceutical and financial industries, and is one of the top five employers in the country. When it comes to its ability to participate in the 'Information Revolution' (e-readiness), as International Data Corporation calls it, Switzerland is among the top ten nations worldwide. The IDC 2003 Information Society Index reports that Switzerland outranks the UK, Ireland, Germany and Japan (Location Switzerland 2005: 2). The ICT sector share growth from 7.5% (1995) to 8.6% (2004). About 95% of the ICT companies are SME's.

The region of Berne is one of the favourite ICT-Locations in Switzerland. In comparison with the other regions in Switzerland Berne has a high amount of companies in the field of telecommunications (telco service providers and infrastructure providers) on the supply side that is complemented by a high density of administrative departments on the demand side (public sector: 25, 9 % in Berne; 21,9% in Switzerland). The City of Berne is the seat of the Federal Government. This makes Berne the ideal location if you wish to take advantage of proximity to Swiss public authorities and to the main administrative centres. With Swisscom the biggest and most successful home-grown player in the field of IT and telecommunication services is active in Berne. There is a significantly positive effect for the location, because Swisscom is actively involved in networking with smaller companies as well as research institutes in the region and is also an active member of the tcbe. The ICT sector share growth from 8.2% (1995) to 9.6% (2004). The growth of the ICT sector in the region of Berne was about 45% higher than the growth in Switzerland. The Berne Economic Development Agency was one of the first movers in the field of cluster politics in Switzerland. In the canton of Berne exists four clusters: medical, precision, service, and telematic cluster.

The Telematic Cluster Bern (tcbe) was founded on 13 December 1996 and is embedded in the regional cluster politics. The cluster is today well established and has a long experience in cluster management. It enjoys the confidence of politics, authorities, media, industry representatives, ICT offers and of ICT users. The tcbe is a non-commercial association (Article 60 of the Swiss Civil Code (ZGB)). It has about 200 members. The cluster is characterised by many small companies, only 19 companies has more than 100 employees. The tcbe works with a relatively small budget and less personal resources. Many of the work will be done by the members for free, especially all the work in the board and in the working groups. Two trends are recognizable since the establishment of the Telematic cluster in Berne: The professionalisation of the cluster management (over the time) and change of the priorities of the cluster management from promotion of the location to benefit, support for the cluster members.

2 THE REGION

The Berne Region is equal with the canton of Berne and is a part of Switzerland. Switzerland has a population of 7,261,200 (2001) with a density of 176 inhabitants/km2. The country Switzerland is splitted in 23 cantons.

2.1 SWITZERLAND

The foundation of Switzerland was 1291 and the existence as a modern federal state dates back to 1848. The government is made up of seven members, elected by the Federal Assembly. The government members take it in turns to act as president. The Swiss people can influence political affairs through the highly developed system of direct democracy. Switzerland's position as a neutral state allows it to play an important humanitarian role in world affairs and to act as a mediator between conflicting parties. Switzerland's geographical position with its transit routes over the Alps made it a desirable possession for European great powers through the ages.

Switzerland developed slowly over many centuries, as more and more regions came together to form a loose confederation whose members gave each other mutual support. At times their different interests stretched the bonds between them almost to breaking point. It was only in 1848 that Switzerland became a more centralised federal state. This favoured its economic development and ended any possibility that Switzerland might break up.

Switzerland's economy is based on a highly qualified labour force performing highly skilled work. The main areas include micro technology, hi-tech, biotechnology and pharmaceuticals, as well as banking and insurance know-how. Most of the people working in Switzerland are employed by small and medium-sized enterprises, which play an extremely important role in the Swiss economy. Most businesses are small or medium-sized. In 2001, more

than 99% of enterprises had fewer than 250 full-time workers, employing about two-thirds of the total work force. About 88% were micro-enterprises, with fewer than 10 employees: they provided more than a quarter of all jobs. The largest company is Nestlé, the biggest food company in the world. At the end of 2003 it had around 253,000 employees, more than 97% of them outside Switzerland. The US Business Week magazine put four Swiss companies in the world's top 50 in 2002. It drew up the rankings according to their market capitalisation (i.e. the share price multiplied by the number of shares outstanding.) Novartis, 17th in the world, was the top Swiss company. Switzerland had 10 companies in the Financial Times "Global 500" table for 2004, drawn up in the same way.

Many Swiss enterprises continue to be run by the families which founded them. These include such giants as the pharmaceutical and biotech company Serono, headed by its biggest shareholder, Ernesto Bertarelli, the son of its founder, and the Swatch group founded by Nicolas Hayek.

Businesses in Switzerland have for many years been accused of cronyism by left wing groups. A very restricted number of people - estimated at about 100 - sit on the boards of many different companies, taking decisions with little reference to ordinary shareholders. With the growth of new communication technology and increasing globalisation, companies themselves have started to accept that their administration must become more credible and transparent.

A survey conducted in 2002 showed the impact of globalisation on large firms: it found 40% of board members and 26% of managers were non-Swiss, mostly from Germany, the UK and France. However, there were still few foreign managers in medium and small businesses.

Some of the spotlights Switzerland is known around the world: clocks and watches, cheese, chocolate, mountains, winter, trains, science and red cross.

2.2 The Berne Region

Switzerland is in the center of Europe. In the heart of Switzerland, the Canton of Berne forms a bridge between the German-speaking region and French-speaking Suisse Romande to the West. From Berne-Belp international airport, there are direct flights to numerous European cities. Thanks to good motorway and rail connections, the continental airports of Basle, Geneva and Zurich can be reached in less than in 1/2 hours. And international trains such as the EC (Euro-City), Pendolino or TGV (train à grande vitesse) mean that major European cities such as Berlin, Frankfurt, Munich, Milan and Paris are not far away.

The City of Berne is the seat of the Federal Government. This makes Berne the ideal location if you wish to take advantage of proximity to Swiss politics and to the main administrative centers. Key Federal Administration offices and national organizations are based here, including, for instance:

Swissmedic, the Swiss Agency for Therapeutic Products, which decides on the licensing of all pharmaceuticals

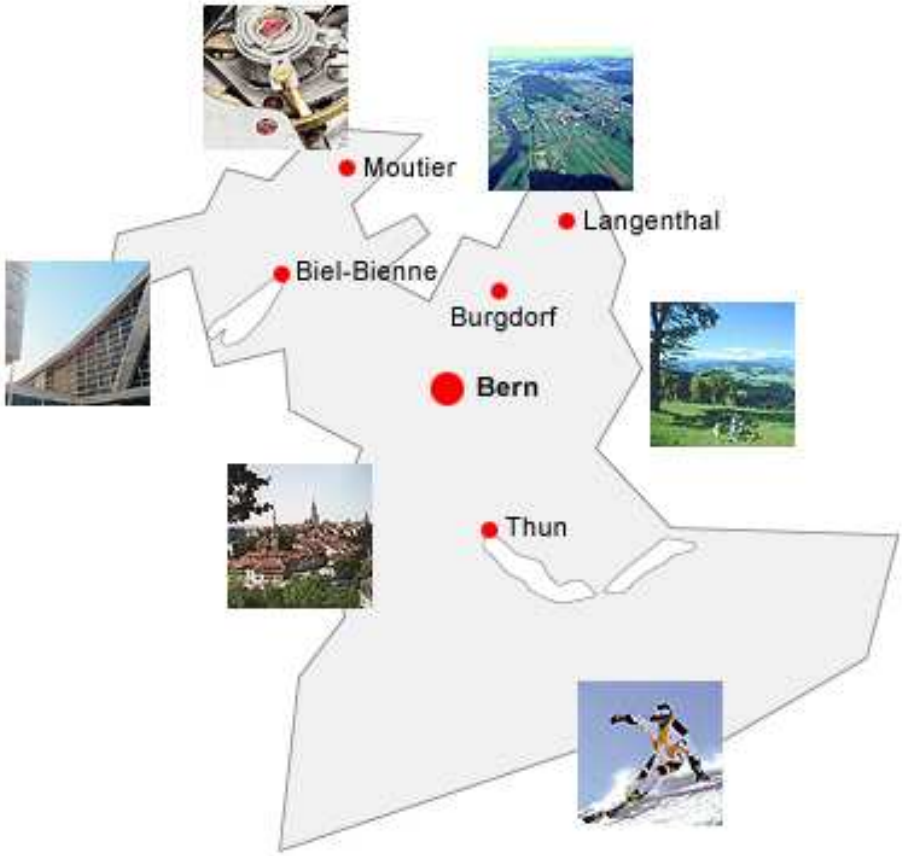
METAS, the Swiss Federal Office of Metrology and Accreditation is the national specialized center for measurement technology and accreditation.

SAS, the Swiss Accreditation Service, evaluates and accredits calibration and testing laboratories as well as inspection and certification bodies for products, management systems and personnel.

OFCOM, the Federal Office of Communications, is responsible for, and supervises, radio and television, telecommunications services and the entire broadcasting system, and telecommunications equipment.

ComCom, the Federal Communications Commission, issues licenses for telecommunications service providers and for the use of the radio frequency spectrum and licenses for the provision of basic services.

The Canton of Berne consists of six economic regions: Berne and surroundings, Biel-Seeland, Emmental, Oberaargau, Bernese Oberland and Bernese Jura. Each region has specific advantages to offer. As a result, a range of companies are established in the Canton of Berne, making up a diversified economic structure.



Berne – a national capital with charm

The Berne Region is the main economic center in the Canton of Berne. The capital of Switzerland, the City of Berne, is known, well beyond the boundaries of Switzerland, as a safe and exceptionally beautiful city. Successful companies are located in the Berne Region, often with their European headquarters, such as Swisscom, T-Systems, Haag & Streit, ZLB Bioplasma, Berna Biotech, ebay, Frito-Lay, Peugeot (Switzerland), Schneider Elektrik, etc. The Bern Region also has the highest density of business consultancies, law practices and trustee companies in Switzerland. Educational institutions such as the University of Berne, with a university hospital, the "Inselspital",Berne University of Applied Sciences, the World Trade Institute, and the International School and French School also make the region attractive.

Biel-Seeland – a multicultural center for the watch industry and communications

The Biel-Seeland is a very dynamic, multicultural economic region, where German and French are spoken, but it retains a link to its traditions – which include the watchmaker's craft. World-famous watches such as Swatch, Omega, Rado or Rolex are made here. The watch industry, and part of the precision industry, has concentrated here thanks to the excellent network of manufacturers, suppliers and schools. Swiss companies such as Feintool, Mikron and the Swatch Group, but also many foreign companies such as Harting, Festo, Movado Group, Fossil or La Montre Hermès have their headquarters in the Biel-Seeland Region. The Federal Office of Communications and the presence of companies such as Orange, Sunrise, IXOS and SAP also make Biel and the Seeland region one of the strongholds of the communications sector.

Bernese Jura – center of the precision industry

The Bernese Jura is the center of the precision industry, both in Europe and worldwide. Over a hundred small and medium-sized companies in the precision industry are active in the region. They include some famous names such as Longines, Sonceboz, Precimed, Swissmetal and Tornos. The international precision industry trade fair, SIAMS – it is held every two years in the Bernese Jura – attracts exhibitors from all over Europe.

Bernese Oberland – tourist destination

As gateway to the Alps, the Bernese Oberland is the Canton of Berne's tourist region. It offers, in particular, a wide range of leisure activities for sportsmen and -women. The Bernese Oberland offers especially attractive opportunities to extreme sports enthusiasts. A significant proportion of companies are, accordingly, in the tourist sector. But industrial companies are also established in the Bernese Oberland, such as Schleuninger, Hoffmann-Neopac, Ruag, Wandfluh, Batrec or Fritz Studer AG

Emmental – a breath of fresh air

The unique hill landscape of the Emmental is the birthplace of genuine Swiss Emmental cheese. Successful companies such as Disetronic, Kambly, Mewag, Aebi, Frama, Kasag, Blaser Swisslube, PB Baumann or Jakob are located in this attractive region. The region is distinguished by low rents and land prices and a high quality of life.

Oberaargau – from design to laser technology

Industrial companies from a wide range of sectors are established in Oberaargau. Firms such as Bystronic Laser, the Amman Group, Motorex, Ruckstuhl, Girsberger, Création Baumann, Güdel or Glas Trösch are based in Oberaargau. This region has the Canton's largest reserves of industrial land. One special feature is the Design-Center in Langenthal, the only one of its kind in Switzerland.

Advanced technology has been part of the Swiss economy for centuries. The regions of Biel-Seeland and the Bernese Jura in the North of the Canton of Berne are regarded as the homeland of the international watch industry. Renowned brands such as Rolex, Longines, Swatch and Rado are produced in the Canton of Berne using precision craftsmanship. The know-how acquired in watch making is now used in other fields such as medical technology, information technology and the automotive industry, engineering industry and precision industry. And you will find a flair for nanotechnology here, too. There is also an excellent network of highly qualified staff, reliable suppliers, attractive partners and possibilities for collaboration with the University and the Universities of Applied Sciences on joint projects. In the fields of precision engineering, telematics and information, the medical sector and the service sector there are clusters in the Canton of Berne which represent concentrations of industry know-how. These networks include manufacturers and suppliers, and also educational institutions, industry associations, research institutes and other key players

The Canton of Berne is ideal not just as a business location, but also as a place to live. Berne combines a high quality of life with safety. A wide variety of leisure activities, with museums, concerts, theatre, open-air performances and international sporting events make the Canton of Berne a unique location. In under an hour you can be skiing in the Bernese Alps or sailing on one of the magnificent lakes in the Bernese Oberland or Biel-Seeland. The Jura's gently rolling hills invite you to ramble or go cross-country skiing. The City of Berne is included in UNESCO's World Cultural Heritage List, and the Jungfrau-Aletsch-Bietschhorn region is listed as UNESCO Natural Heritage. Famous holiday destinations such as Grindelwald, Interlaken or Gstaad are to be found in the Canton. As Federal Capital, Berne is also the seat of all embassies and of international organizations. Many international companies are located in the Canton of Berne. International schools, associations, clubs, church services in foreign languages, and much else besides, make life easier for expatriate staff in Berne, so that they really feel at home here.

3 ICT SECTOR

The data basis in the ICT sector as a whole (defined by NACE categories) is very poor in Switzerland. There are only few up to date analyses, which are almost all provided by the OFCOM, ComCom, OECD or ICT Switzerland. Mostly, only basic information is presented concerning either the telecommunications services sector or the IT services sector. There is no detailed information about the ICT sector as a whole, as the Swiss ICT sector and the ICT Clusters have not yet been analysed in depth. I validated my findings (statistical data and literature review) with the help of 11 face to face interviews, as well as numerous telephone interviews with representatives of ICT companies (global players, SMEs/Telco services, IT services), members of well known national ICT associations, members of public authorities and universities (see annex p. 102).

3.1 OVERVIEW OF THE NATIONAL ICT SECTOR

The national ICT-Sector has the following structure

	Total Turn Over (Mio. Euro) (2001)	Number of Employees (2001)
NACE Categories	National	National
30.0 - Manufacture of Office Machinery and Computers	468.6	3,986
31.3 - Manufacture of insulated wire and cable	1,026.4	6,637
32.2 - Manufacture Telecommunication Equipment	1,368.3	5,436
32.3 – Manufacture of Consumer Electronics	146.9	1,038
33.2 - Manufacture of Instruments and Appiliance	3501.4	17,088
33.3 - Manufacture of industrial process control equipment	569.5	7,806
64.2 – Telecommunication Services	12,360.4	30,129
72 – IT Services	11,497.2	65,265
TOTAL	**30,938.7**	**137,385**

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BfS (Swiss Federal Statistical Office; Mr. Wüthrich) Census of enterprises: **2001** and Federal Tax Administration Berne (Statistics and Documentation: Mr. Daepp)

Evolution of the national turnover in the sector

	Total Turn Over (Mio. Euro) (National)	
NACE Categories	2001	2004
30.3 - Manufacture of Office Machinery and Computers	468.6	605.1
31.3 - Manufacture of insulated wire and cable	1,026.4	962.1
32.2 - Manufacture Telecommunication Equipment	1,368.3	988.3
32.3 – Manufacture of Consumer Electronics	146.9	166.7
33.2 - Manufacture of Instruments and Appiliance	3,501.4	3,728.3
33.3 - Manufacture of industrial process control equipment	569.5	560.5
64.2 – Telecommunication Services	12,360.4	13,307.7
72 – IT Services	11,497.2	11,458.7
TOTAL	**30,938.7**	**31,777.4**

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BfS (Swiss Federal Statistical Office; Mr. Wüthrich) Census of enterprises: **2001** and Federal Tax Administration Berne (Statistics and Documentation: Mr. Daepp)

National sector share in the Gross Domestic Product (GDP)

	Nominal GDP/Head (employee) Total (Euro)
1995	58325
1996	58853
1997	58692
1998	60330
1999	61446
2000	65249
2001	67298
2002	70202
2003	68515
2004	69094

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BAK (Basel Economics)/ *ICT data aggregated* out of NACE classifications: 30-31; 32; 33; 64; 72

	National (nominal) GDP	
	Total (in Mio. Euro)	ICT Sector's Share (%)
1995	230,784	7.5%
1996	232,891	7.9%
1997	232,385	7.7%
1998	242,192	7.9%
1999	248,634	
2000	266,776	8.1%
2001	279,714	8.3%
2002	293,458	8.6%
2003	285,827	8.5%
2004	288,690	8.6%

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BAK (Basel Economics)/ ICT data aggregated out of NACE classifications: 30-31; 32; 33; 64; 72

Nominal GDP 2004 in Mio. Euro

NACE	Nation	Region	Share Region/Nation in %
A30	135	39	29.1%
A3132	3,777	260	6.9%
A33	7,444	800	10.8%
A64	8,602	1,767	20.5%
A72	5,057	591	11.7%
GDP	288,690	34,993	12.1%

Source: BAK Basel Economics 2006

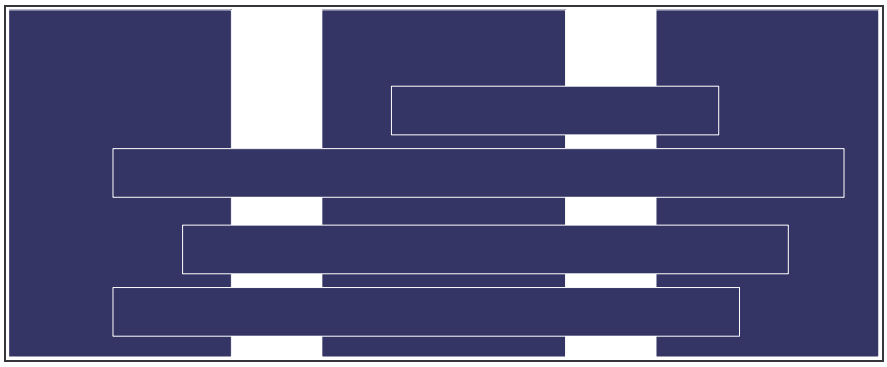
3.1.1 Main Characteristics

Main Characteristics of the ICT sector in Switzerland:

- Telecommunications companies in Switzerland turn over some US$ 20 billion annually and employ about 50,000 people, according to SICTA, an industry association.
- More than 110,000 workers in Switzerland are employed in the IT sector, according to the Federal Office for Professional Education and Technology.
- IT spending in Switzerland is more than US$ 9 billion a year, according to International Data Corporation.
- The IT sector ranks third in Switzerland's in terms of sales after the pharmaceutical and financial industries, and is one of the top five employers in the country.
- When it comes to its ability to participate in the 'Information Revolution' (e-readiness), as International Data Corporation calls it, Switzerland is among the top ten nations worldwide. The IDC 2003 Information Society Index reports that Switzerland outranks the UK, Ireland, Germany and Japan (Location Switzerland 2005: 2).

Information and Communication Technology, ICT, is an important sector of the Swiss economy. A trend in recent years has been the increasing number of start up companies in mobile communications, integration of IT solutions, Internet, network security, encryption systems, bioinformatics, and packaged software. This suggests that innovation and entrepreneurship is an emerging facet of the Swiss ICT cluster. There is a large pool of multi-lingual IT professionals experienced in developing software and solutions for a wide range of industries, including software for the control of manufacturing and automation equipment, mobile, Internet, banking, and pharmaceutical applications. In terms of where ICT workers are employed, it is primarily in the banking, logistics, transport, and automation sectors. Others are consulting firms that specialize in integrating software and networking solutions. Emerging sectors, such as bioinformatics, embedded systems, lab automation, wireless and mobile communications are also strong sources of new jobs. Most focus on supplying software to specialized niches, as opposed to consumer and enterprise-oriented software (Location Switzerland 2005: 2).

According to the ICT value chain the sector in Switzerland may be characterised as follows:

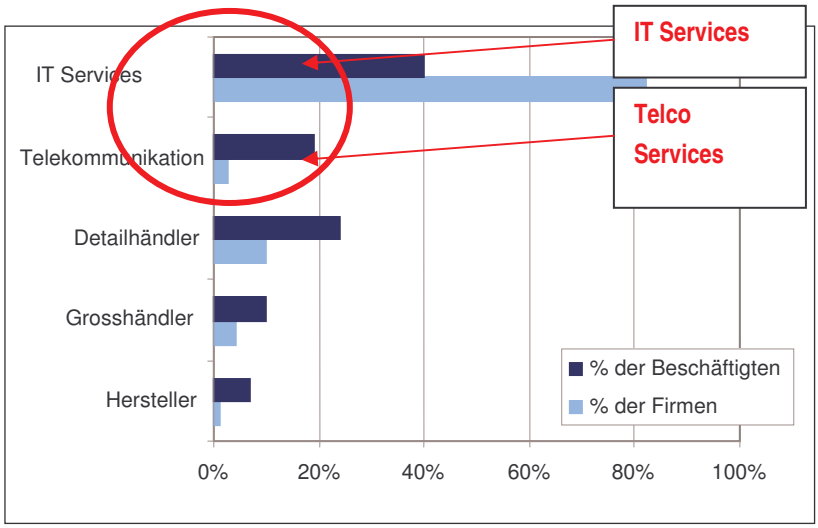


Source: Sieber 2006: 5

The ICT sector in Switzerland is characterised by companies, which are active in the following segments of the ICT value chain:

- 1% of the companies are infrastructure manufacturers
- 3% are telecommunication service providers
- 82% are software services providers

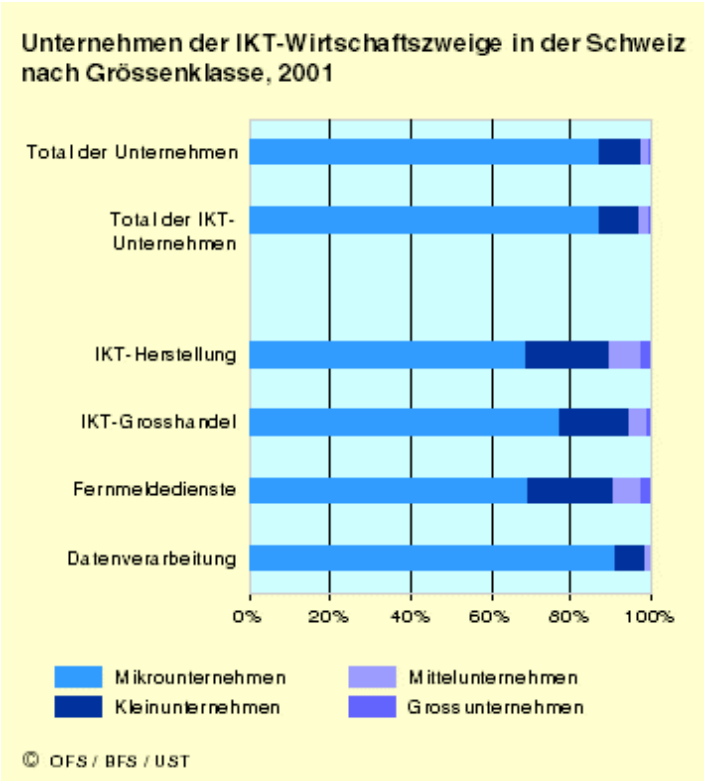
- 4% of the companies are active in the field of wholesale
- 11% of the companies are active in the field of retail trade



Source: Sieber, 2006: 8

There are about 13 640 companies active in the ICT sector. The Swiss ICT sector is mainly characterised by service providers in segments of IT and Telecommunications. There are 11 143 service providers in Switzerland (Sieber 2006: 8). Most companies in the field of telecommunication service provision are large companies (> 100 employees). Most companies in the field of IT service provision are smal companies (< 20 employees).

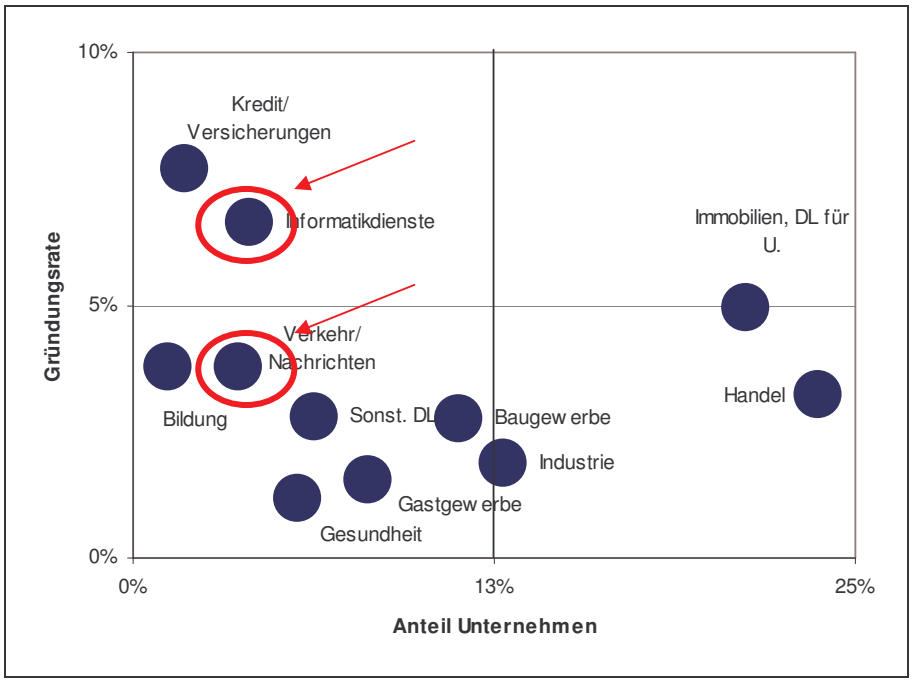
Size of ICT companies in Switzerland



Source: BfS (Swiss Federal Statistical Office), April 2006

The software services segment (7%) ranks second after the financial services in Switzerland concerning growth. In addition to the IT services industry the telecommunication services are among the growth drivers in the Swiss economy. On average start ups in the field of software services employ 2,4 employees in Switzerland (Sieber 2006: 9).

Dynamics of the ICT sector in Switzerland (2001)



Source: Sieber 2006: 10

Swisscom remains the largest telecommunication provider in Switzerland although its market share has continuously decreased over the past 5 years. The former national provider had to reform its organisation considerably in order to become a competitive company. Swisscom posted annual sales of 6.4 billion euro in 2003 and has around 16,000 employees. Swisscom offers a comprehensive range of telecom products and services and is clearly positioned as the leading provider of mobile, fixed voice, data services and Internet-based services. Swisscom operates as a Group since January 1, 2002 (BAKOM 2003: 5).

The **Swisscom Group** is currently structured into six companies:

Swisscom Fixnet AG comprises all national and international activities in fixed-network telephony including network infrastructure and wholesale. Swisscom Fixnet also covers the largely autonomous business areas of Operator Services (directory enquiry services), Payphone Services (public payphones), Cards (phone cards, prepaid cards), Bluewin Ltd. and subsidiary companies cablex AG, Telecom FL AG and Swisscom Directories AG.

Swisscom Mobile AG Since April 2001, Swisscom Mobile has been operating as a public limited-traded company in which Swisscom has a 75% share and the Vodafone Group the other 25%. With 3.6 million

customers and a market share of 62.9%, Swisscom Mobile is the leading provider of mobile communications in Switzerland (December 2002).

Swisscom Enterprise Solutions AG

Swisscom Enterprise Solutions AG implements telecom solutions for international companies as well as small and medium-sized enterprises.

Swisscom IT Services AG:

Swisscom IT Services plans, constructs, integrates and operates basic applications as well as highly complex IT solutions for processing large data volumes.

Swisscom Systems AG

Swisscom Systems AG provides a comprehensive range of services (maintaining, financing, renting, and leasing products) in the field of private branch exchanges (PBXs) (BAKOM 2003: 5).

Besides Swisscom there are only smaller home-grown companies active in the Swiss telecommunications and IT market. Among the smaller IT companies, which are mostly companies with a strong regional or national focus there are only few Swiss companies, which are active on international niche markets. However, some of the successful exceptions are Unaxis and Kudelski delivering cutting edge technology to the world's ICT market. At the same time many emerging packaged software firms are located in Switzerland. Some examples are:

Esmertec

More than 65 million mobile devices are running Esmertec's software to enable games, advanced messaging and applications. The company employs more than 100 people.

Swissbit Group AG

This Bronschhofen-based company sells more than US$ 100 million worth of memory products a year. It was created via a management buyout of a division of Siemens Switzerland AG. Swissbit Group produces 4 million units a year and reports sales of its memory modules which are found in PC, servers, USB flash memories and compact flash cards. It employs 200 people.

Comfone AG (Berne)

More than 40% of the existing mobile network operators in over 100 countries worldwide use Comfone's roaming services. Comfone enables a billion mobile phone calls each month to roam over networks around the globe. The company employs a staff of 70 in Switzerland, with sales teams in Europe and regional sales divisions in Latin America and Asia Pacific.

Geneva Bioinformatics (GeneBio) S.A.

Since 1997, GeneBio has strived to shape biological knowledge by applying its efforts to the following areas: Discovery: with a focus on the identification of context- sensitive information that characterizes proteins in dynamic networks, offering its clients and partners leading innovative tools and solutions that shape heterogeneous information into relevant biological knowledge. In addition, GeneBio distributes leading knowledge databases that provide a high level of annotation as well as in-depth up-to-date information.

Swisscom (Eurospot)

Swisscom Eurospot is a subsidiary of the Swisscom Group and has offices in Germany, the UK, the Netherlands, France, Spain, Italy and Portugal. Swisscom Eurospot is one of Europe's leading providers of High- Speed Internet Access-and Conference Services for hotels and conference organizers. Its pan-European network already spans more than 2,700 points of presence, including well-known chains such as NH Hotels, Hilton, Kempinski and Holiday Inn, plus the locations made available by Swisscon Eurospot's roaming partners: Swisscom Mobile, Telia Homerun and Sonera (Location Switzerland: 2005).

Some of the largest employers of ICT professionals in Switzerland are foreign firms. Companies such as Siemens of Munich, Germany, EDS Corporation of Plano, Texas, Dell, HP, Reuters and Orange SA of France and T-Systems have invested in Switzerland. Siemens Switzerland, whose turnover in 2003 was US$ 1.2 billion, employs about 3,200 people across Switzerland developing software and solutions for use in telecommunications and networking equipment, automation, building controls, and transport systems. EDS Corporation employs some 1,000 people in Switzerland. Its latest milestone was the investment in a new Air Transportation Center of Excellence in Zurich. This supports the company's global and regional growth strategy for its portfolio of applications development, maintenance and management services for airlines, airports and aircraft maintenance service providers. Hewlett-Packard, the leading technology solutions provider from Palo Alto, California, invested in Geneva, locating its EMEA headquarters there, employing over 600 people in strategic functions including R&D. Reuters, the global information company, providing information tailored for professionals in financial services, media and corporate markets, established in Geneva its regional headquarters for Europe, Middle East and Africa. The company employs directly around 450 professionals in Geneva. In the telecommunications sector, France's Orange SA employs some 1,500 people. The company's Swiss operations are based in Lausanne (Location Switzerland 2005). Mostly all well known global players in ICT are located in Switzerland, too.

Altogether the ICT sector in Switzerland is characterised by a few bigger telecommunication service providers and many small IT service providers. Among those Swisscom is still dominating the market. In the IT services segment, SMEs with only few employees and mostly regional or national foci prevail.

3.1.2 Evolution of the ICT sector in Switzerland

The "ICT start-up boom" began in 1996 with a business-driven, high demand for ICT services coupled with a high amount of Venture Capital, which was available during this time in Switzerland and the other EU member states. It was easy for IT Specialists to create their own businesses and the IT sector grew very rapidly. Especially in Switzerland this was translated into many ICT career changers, which went into the field of computer sciences for financial reasons:

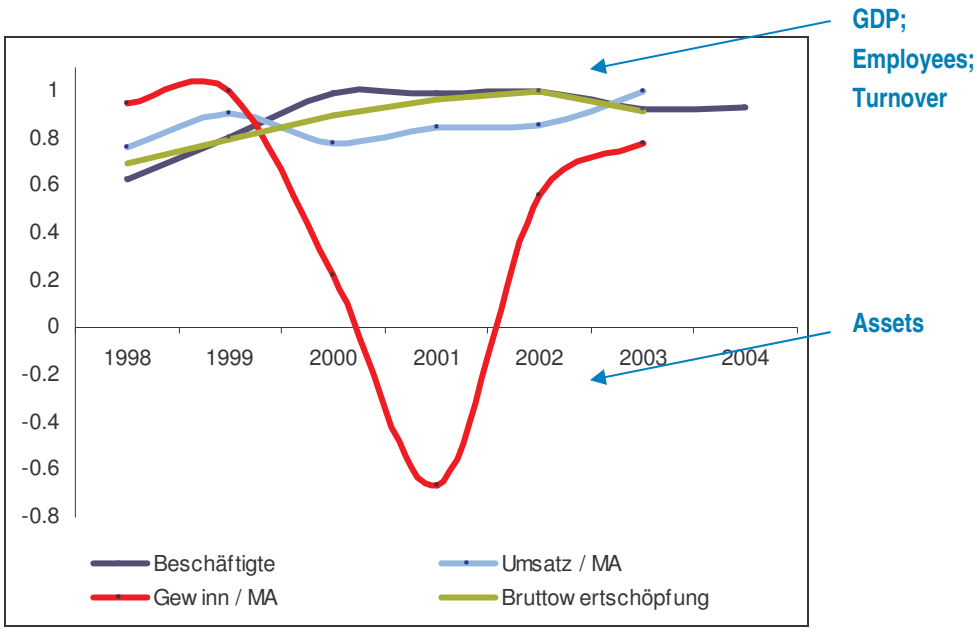
"In the late 90ies, because *of the lack of computer scientists, the companies almost employed everybody who said he knew how to work with the computer. Half of the computer scientists in Switzerland today have totally different career paths. Some might have been carpenters and just bought a PC at that time and got freelancers in the segment of ICT*" (INT_8).

SMEs with less than 20 employees appeared in high numbers in the Swiss market. Between 1998 and 2001 over 4000 new IT companies appeared (Sieber 2006: 11). In the field of telecommunications services new opportunities appeared with the privatisation and vertical disintegration of the former PTT monopolies. New competitors came into the telco market and the field of mobile communications and broadband internet services

witnessed a strong hype until the year 2000. In the hardware sector (Telco and IT) the boom attracted global players, as Switzerland has no dedicated hardware manufacturers. Another reason why so many global players in ICT came to Switzerland is the central geographical position on the European continent, which provides them with easy access to the most important European markets.

The convergence of technologies (computer and telecommunications) led to synergies in both the IT and telecommunication segment. Yet, after the end of the 2G mobile communications boom in 1999/2000 a first slow down hit the industry. Finally in 2000-2003 the sector went into a full blown recession in all segments. A reason for this was the ultimate burst of the "ICT Bubble" and a slow-down of the whole business segment after the millennium-effect, because most clients had their IT infrastructure adapted and modernised before the millennium (mostly it was even self-inflicted as a lot of IT provider charged their clients very high for the millennium projects). The general economic slow-down among all clients led to a massive reduction of budgets in the field of ICT. Similarly, dependent industries like application and content provision suffered from this generalized IT crisis (INT_10). The VC market was also affected with funds drying up almost overnight for ICT ventures in Switzerland. Today, there are almost no venture companies that support SMEs in IT on the national level (INT_8; INT_10). Nevertheless on the regional level there is still a financial support for SMEs by cantonal organisations like the BEDA (Berne Economic Development Agency).

The development of the software services providers in Switzerland (employees, GDP, turnover, assets)

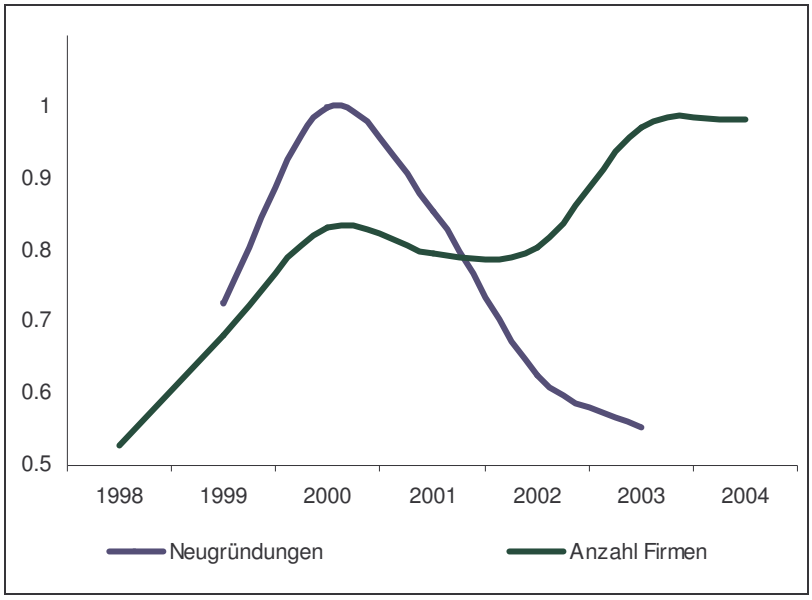


Source: Sieber 2006: 11

In the telecommunications field two concurrent events caused the economic slump: First, the weak consumer demand for mobile devices and services and second the exorbitant costs for the UMTS licences (see: Germany and Great Britain). However, in Switzerland the licences were not sold at such high prices as in the neighbouring countries and this is one reason why the Swiss Telco services industry and especially the Swiss former monopoly player Swisscom did not suffer similarly deep stock price devaluation like the German DTAG. In

international comparison Swisscom is well positioned as a company. Following the 2001 fiasco consolidation in the industry affected both SMEs as well as bigger players in ICT. More generally there have been fewer new IT companies founded since 2001 the crisis having rendered new ventures more risk-borne.

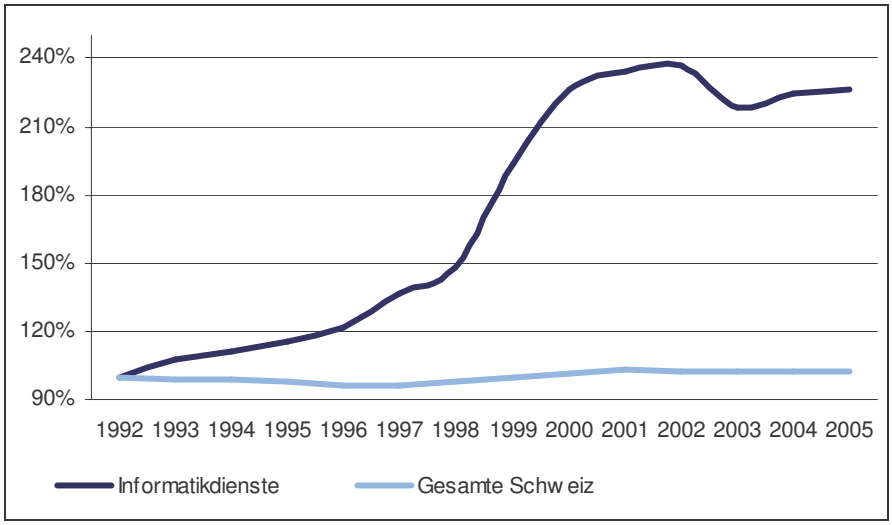
Evolution of new Companies in the field of IT service providers



Source: Sieber 2006: 12

The economic slow down led to falling numbers in economic growth and employees in the segment of ICT until the year 2003. The employment numbers decreased about 8%. About 5000 Jobs were lost in the IT services segment. The employment rate has stabilized in 2003 and has come back to a moderate growth of 1,9% in IT services for the period 2004-05. This is far above the Swiss average:

Employment rate in IT services compared to Swiss average



Source: Sieber 2006: 13

Since 2004 there has been a relative stability in the IT market segments in Switzerland as the companies that survived the depression seem to be in a healthy competitive position now. However, the statistical figures still show weaknesses in the field of growth in ICT. As experts state these weaknesses can be still traced back to the economic slow down in 2001 to 2003. As of 2006, however, the number of employees in the field of ICT is on the rise again and the forecasts for growth in this sector for the next 12 months are very positive (INT_9). Some experts even argue: "To call it "depression" is a little exaggerated because there have only been two years of decreasing returns, but a relative stability in employees and already in 2003 there was an increasing trend again. That means it was only a more or less light slow down of the industry, which was very much internationally affected. But the industry is now back on the growth road in Switzerland" (INT_8). "We argue that there is a lot of investment again in the market of ICT in Switzerland" (INT_6). However the future in telco services segments is very volatile and not easy to forecast. The former PTT monopoly company Swisscom still plays a leading role in the Swiss market and will probably also dominate the market in the medium term (INT_10; INT_8). The overall 2004-05 recovery is also mirrored in the behaviour of the global players in software and hardware segments. They decreased their investments in Switzerland during the breakdown of (2000-2003), but are currently increasing their efforts again.

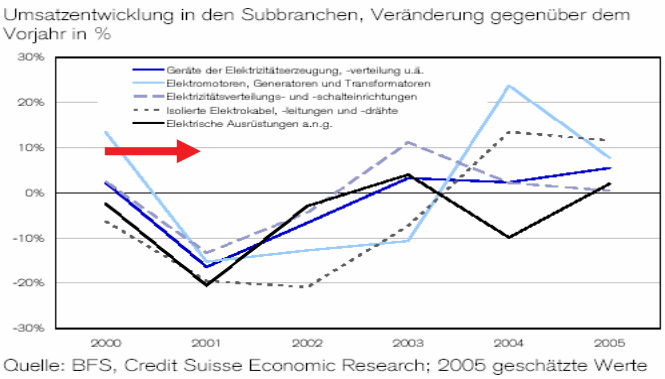
The Evolution and trends in the ICT market according to NACE categories

In the following section I will present the evolution of the different ICT categories in Switzerland in detail. The growth drivers in ICT are telecommunication services and IT development and services. The hardware and telco infrastructure segment is not very developed in Switzerland. For the sake of completeness the following picture details all segments of the sector:

Evolution of NACE Category 31.3 (manufacture of insulated wire and cable) in Switzerland

In the field of hardware there is a clear connection to software services and telco services. "If there is a slowdown in the services segment the infrastructure and hardware segments suffer concurrently" (INT_8). In the field of insulated wire and cable there has been a depression in 2001 to 2003, because of the general economic slow-down in the EU and USA and the saturation of important markets. That led to higher competition and concentration in the business. For Swiss companies know-how and high tech are especially important in this segment. Thus increased investment in the short and medium term will particularly benefit this part of the industry. Such immediate recovery effects notwithstanding Swiss companies will face increasingly stiff international competition even in the high-tech arena (Credit Suisse 2006: 17).

Evolution of NACE Category 31.3 (manufacture of insulated wire and cable) in Switzerland (Turnover)



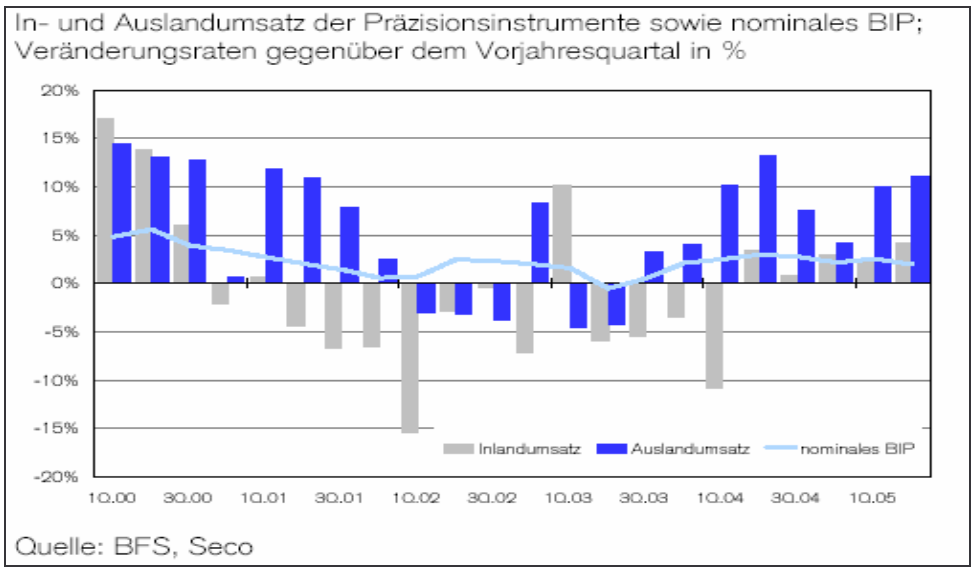
Source: Credit Suisse 2006: 17

Evolution of NACE Category 33 (manufacture of instruments and industrial process equipment) in Switzerland

The demand in the field of telecommunications equipment and consumer electronics will increase because of the convergence of telecommunication services with computer hardware. The Swiss industry does not benefit that much from this segment, because it is mostly dominated by international players (see: Nokia etc.). Swiss companies in this field are niche players which are focused on high quality customised systems. Customers come from all industry segments, but mostly emanate from the machine- and watch industry, as well as high precision instruments industry. The consumer electronics segment focuses on lucrative market niches. Innovation and high quality production are the USP (unique selling proposition) for Swiss companies. The trend is positive for this segment too. Credit Suisse forecasts that stronger efforts in R&D will help the Swiss players to stay competitive on the international scale (Credit Suisse 2006: 18).

In the field of instruments and control equipment, the watch as well as medical devices industries are very successful. Against the backdrop of an aging society the segment is almost naturally profitable. However, increasing pressure to cut health costs leads to a strong demand for innovation. The trend in this sector in Switzerland is very positive because of the highly qualified workforce and good R&D facilities. This sector is among the strongest in Switzerland concerning growth (not in numbers of employees and companies), but however it is very sensitive concerning demand changes. Especially in 2006 there will be a significant export growth in this segment in Switzerland (4%) (Credit Suisse 2006: 19).

Evolution of NACE Category 33 (manufacture of instruments and industrial process equipment) in Switzerland (national and international turn over and GDP)



Source: Credit Suisse 2006: 19

Evolution of NACE Category 72 (IT Services) in Switzerland

The convergence of different technologies and systems makes it almost impossible to differentiate between hard- and software consulting on the one hand and databases and database–services on the other hand. Two major trends are observable: First, individual solutions in the field of IT gain importance. The development of a process

logic associated with consulting activity becomes more and more important beside the mere development and implementation of software. Second, there is a trend towards outsourcing pure software development or even entire IT-service packages in countries with lower labour costs.

A growth in demand of software services is forecasted for 2006 in Switzerland. The growth will not be as high as in the past, because the clients are more restrictive in placing contracts. These constraints notwithstanding SMEs with a clear focus on IT packages which include a high amount of process consulting could prove to be the winners in such a competitive environment. The problem is that most Swiss IT companies are regionally embedded and tend to have stable and closed customer relationships (Credit Suisse 2006: 33). While these localized companies are reputed to have a good service mentality, and on average exhibit high productivity and an excellent quality they are also known for a low degree of specialization and a lack of unique core competencies: *"90% of all Swiss IT companies are organised like a service industry, for example like a hairdressers shop. That doesn't mean because there is a special demand structure the companies also generate special competencies. It's more or less still a "simple" service business with no special core competencies on industry segments or branches"* (INT_8).

Evolution of NACE Category 72 (IT Services) in Switzerland (gross value added and employees in the segment)

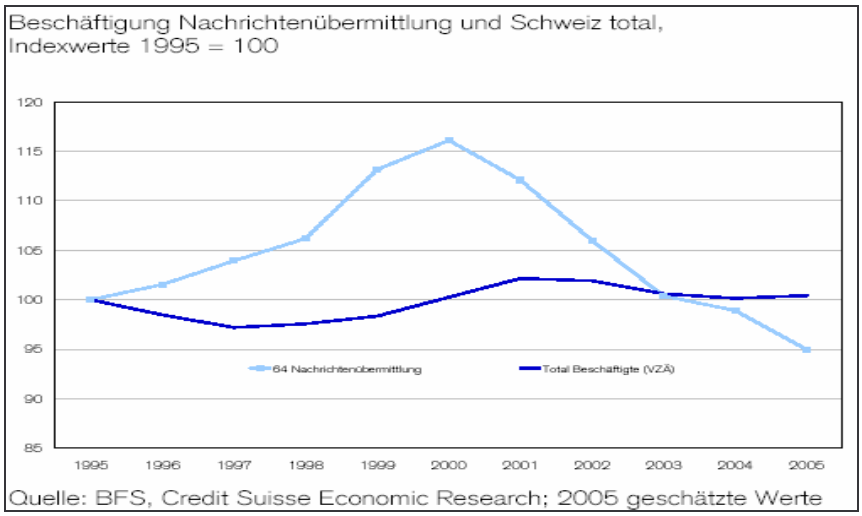
Source: Credit Suisse 2006: 33

Evolution of NACE Category 64 (Telecommunication Services) in Switzerland

The service providers in telecommunications operate in very dynamic markets, which are characterised by rapid technological advances. As broadband access numbers increase monthly, one of the main growth drivers is the convergence between telecommunication, information technology and media (entertainment, content). Thus "triple play" is heralded as the winning business strategy where a one-stop shop combines services in the fixed, broadband and mobile segments. This trend especially favours the former monopoly company, the Swisscom, as it has the most advanced infrastructure in all three segments. But on the other hand competitors like Cablecom invent innovative business solutions in collaboration with mobile providers (Sunrise) in Switzerland. The year 2006 will get a positive year for service providers in Switzerland, especially as the broadband segment is growing rapidly. But also the competition is increasing among the providers and VOIP becomes a real threat. Experts forecast that in 2010 half of the expenditure on telephony will be in the field of VOIP. This will lead to immensely

falling prices in fix net and mobile calls and a need of new business models (entertainment etc.) (Credit Suisse 2006: 29).

Evolution of NACE Category 64 (Telecommunication Services) in Switzerland (employees)



Source: Credit Suisse 2006: 29

3.1.3 External factors which influence the ICT sector

As the growth segments in the ICT sector as well as the ICT cluster in Berne are mainly characterised by a few large telecommunication service providers and a great number of small SMEs in the field of software development and services, the focus of the framework conditions in Switzerland will be on those segments. The following section will be structured into four main topics:

- Telecommunication Services
- Software development and services
- Technological, political and research framework conditions in Switzerland

Conclusion: The Swiss ICT sector in the international value chain and future trends.

3.1.3.1 Telecommunication Services

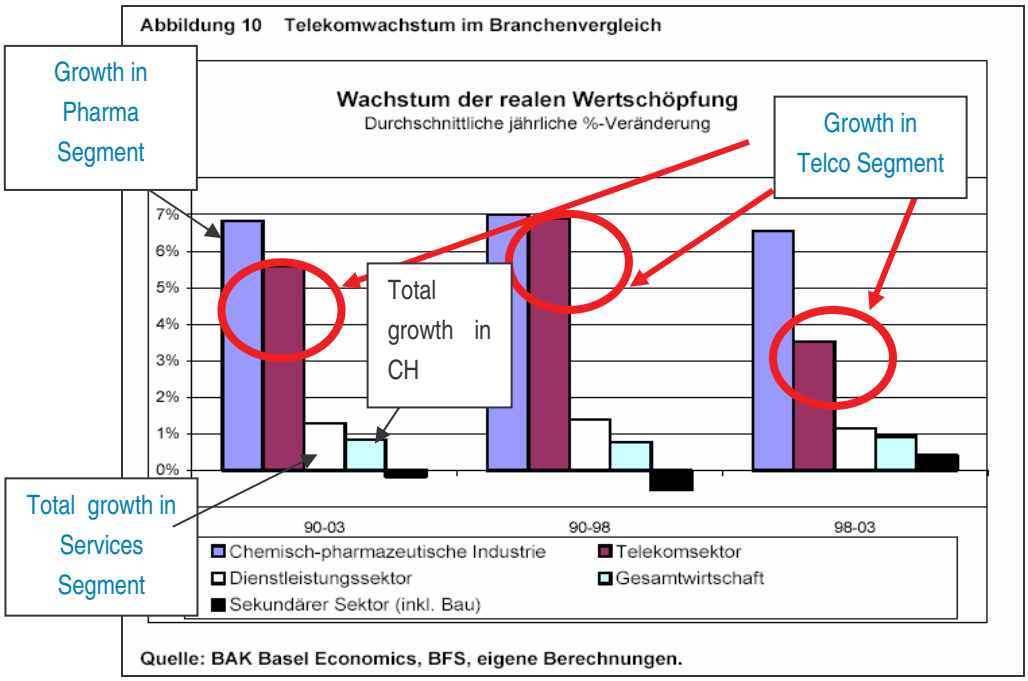
Industry Structure: Economic Role

The value of the Swiss telecommunications market (including cable TV services) was 7.666 billion euros in 2004, placing Switzerland 10th, in decreasing order, among the countries of the European Union. Switzerland is behind Sweden (8.28 billion euros) and Belgium/Luxembourg (8.074 billion euros), but ahead of Austria (6.397 billion euros). In 2004, the Swiss telecommunications market was segmented as follows: mobile telephone services make up 47% of the market, fixed telephone services 25%, fixed-network data services 17% and cable TV services 11 % (BAKOM 2005a: 3).

Besides the IT segment the telco services industry is the most important part of the Swiss economy. In the year 2003 the telco services segment accounts for 2% of the whole GDP. In comparison to 1990 this share has doubled. While the employment rate is low (only 0.7% of the total workforce) the segment has a comparatively high GDP per employee (180.054 Euro) almost three times the Swiss average. The Telco services sector is one

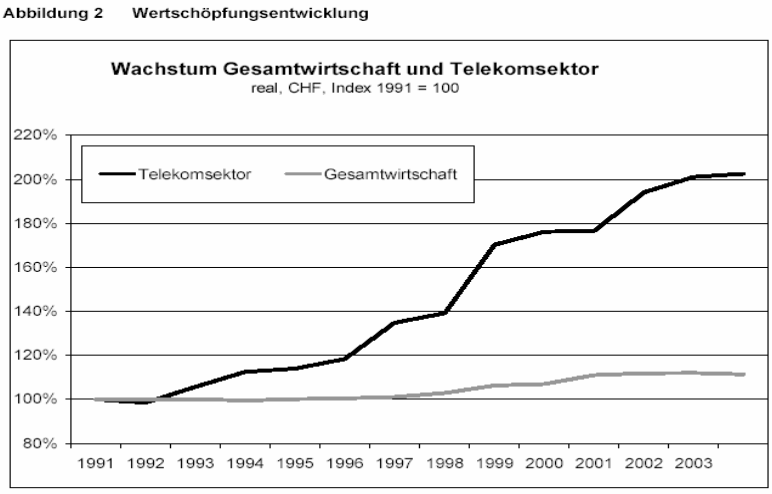
of the main drivers of employment growth and GDP-percentage growth in Switzerland. The contribution to the overall growth in Switzerland was 10% between 1995 and 2003. The performance was particularly high in the period prior to the liberalisation, then slowing down in the 1998 to 2003 period (ICT Switzerland 2004a: 5).

Growth of GDP in the telco services segment compared to other growth sectors in Switzerland 1990-2003



Source: ICT Switzerland 2004a: 23

The development of the GDP in telco services compared with the total GDP in Switzerland



Source: ICT Switzerland 2004a: 6

In advanced countries telecommunication services also deliver an important input for other sectors. 65% of the telco services output are delivered to other sectors in Switzerland. 31 % are directly absorbed by end users and 4% are exports. An analysis of the customers shows that the customers themselves are mainly in growth segments. The extraordinary importance of telco services for other growth sectors even enhances the economic role of the segment (ICT Switzerland 2004a: 7).

Industry structure: Switzerland compared to the European Union

Following the example of developments in the European Union, Switzerland saw a veritable influx of telecommunication service providers at the time of the first phase of liberalisation (+ 112.6% between 1998 and 2001). Since 2001, the trend has reversed, as a very slight fall has been recorded (- 2.1% between 2001 and 2003). In 2004, a marked renewal of interest was indicated by a 20% increase in the number of suppliers.

Fixed network communications market

In August 2004, Switzerland had a total of 127 operators in possession of a licence and therefore authorised to operate a public network, and 145 operators authorised to offer public voice telephony services. These figures – which are relatively high considering the cramped territory – put Switzerland in the first quarter of 25 European countries. We note that since August 2003 the number of public network operators has increased by 10.4% whilst the number of players in the voice telephony market has increased by 31.8%. The high number of operators able to provide public voice telephony services should not hide the fact that this is merely an indication of the potential for competition. The reality is much more subtle, since only 36 operators out of 127 are genuinely active in the market. This represents a little over one in four, which bears witness to the ease with which it is possible to obtain authorisation to engage in activity in the Swiss market, in terms of administrative procedures and financial resources.

- **Fixed voice telephony**

With the liberalization of the market, a large number of competing telecommunications providers are now operating in Switzerland on national or regional level. While Swisscom still operates possesses over 99% of subscriber lines and 72% of local traffic because of its local loop monopoly, alternative providers (Sunrise, Tele2, etc.) operate more than half of the regional and national traffic.

Sunrise Telecommunications/TDC Switzerland

The current status of Sunrise is the result of a merger in November 2000 between the two main competitors to Swisscom, Sunrise (fixed telephony) and diAx (fixed and mobile telephony), which were both majority owned by TDC. TDC bought the remaining shares from the Swiss railways and investment bank UBS. The company is now traded as TDC Switzerland but the brand Sunrise has been retained for the time being.

Tele 2 Switzerland

Tele2 Switzerland is wholly owned by Tele2AB, a Swedish operator active in 23 European countries. In Switzerland, Tele2 offers fixed telephony, Internet and Mobile telephony services via its MVNO Network. Tele2 is the second alternative operator for fixed telephony on the Swiss market.

Source: BAKOM 2003: 7

When one wishes to assess the competitive situation which prevails in the voice telephony market, it may be useful to combine the data presented above with a computation of the combined market share. In this context, it should be noted that this indicator expresses the number of competitors who share 90% or more of a given market. Generally speaking, the great majority of the countries of the European Union have no more than four major competitors in the voice telephony market. With a value of three, Switzerland is therefore within the average range. However, there is potential for improvement, since in countries such as Sweden and the United Kingdom at least nine operators share 90% or more of the market.

The market shares won by these alternative operators also provide essential indications of the basis for competition and how vigorously it has developed. In this regard, we note that in Switzerland the market shares of the historic operator, expressed as a percentage of revenue on the fixed network, are clearly below the averages for the 15 European Union countries – for all the market segments considered:

Segments	Shares of the Swiss historic operator	Average shares of EU historic operators
National calls (local + long distance)	65.7%	72.1%*
International calls	48.4%	59.9%
Calls to mobile networks	61.9%	66.5%

* Simple average (local + long-distance / 2)

Source: BAKOM 2005a

In Switzerland, the evolution of market shares observed between December 2000 and December 2003 presents a contrasting image depending on the segments in question. In fact, the historic operator's market share in the segment of calls from the fixed network to mobile networks has fallen significantly; on the other hand, the historic operator has made slight gains in terms of national and international calls. Nevertheless, in all cases, whether in Switzerland or the EU countries, one can only be struck by the considerable and continuing divergence which exists between the market shares of the different segments examined. The presence of these differences seems to indicate that the potential for increased competition has not yet been totally exhausted in certain segments of the market (BAKOM 2005 a).

Both in Switzerland and in the countries of the European Union, since liberalisation users have had at their disposal a plethora of operators able to offer them voice telephony services. As far as actual recourse to these new alternatives is concerned, it should be noted that in Switzerland 34.6% of users have turned to a new entrant to carry their national and international calls; this roughly corresponds to the European average calculated for August 2004 (31.1%). In terms of local calls, 31.5% of users used an alternative operator – 11% more than in the European Union (EU15). On the subscriber connection side, Switzerland exhibits some differences from its European neighbours. Indeed, although on average 6.5% of European subscribers use an alternative operator for their connections, in Switzerland the figure is only 0.06%. It must therefore be concluded that Swiss users had virtually no freedom of choice on the date in question. However, the situation should improve perceptibly if the local loop is unbundled and as a result of the large-scale roll-out of telephony services on the cable networks (BAKOM 2005a).

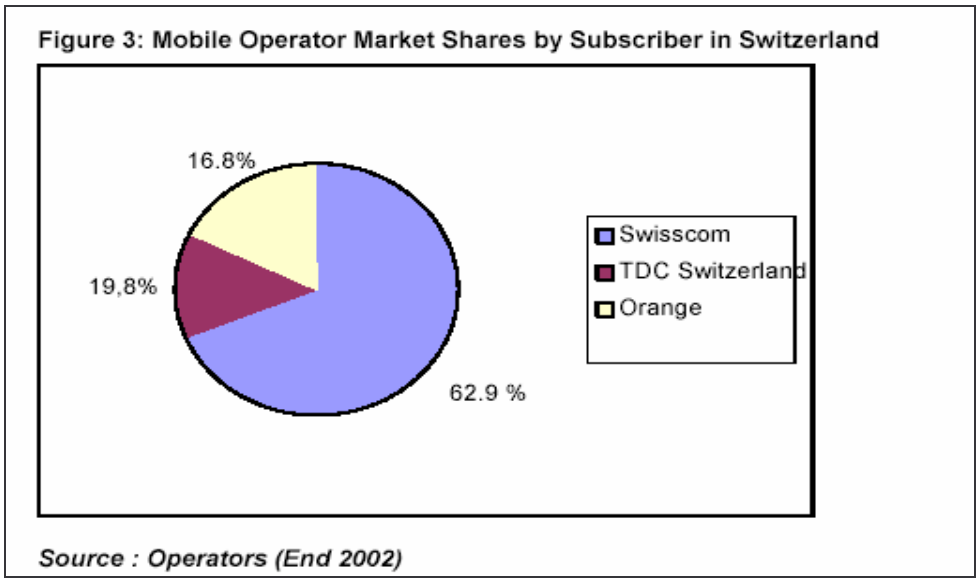
Fixed telephony prices

In terms of prices for fixed telephony in 2004 Switzerland exhibited a highly contrasting situation depending on the market segments in question. Regarding the basic rate for an analogue connection, it is worth mentioning that Switzerland is above the weighted European average (14.36 euros), with a monthly price, including VAT, of 16.48 euros. Although Switzerland has clearly and for some time been one of the most expensive countries in Europe, as time passes the gap is gradually closing. If fact, in the majority of the Union countries, since liberalisation there has been an increase in connection costs such that they reflect the real costs more accurately. However, since January 1995, the price of an analogue connection (price for connection) has not changed in Switzerland, apart from the repercussions of successive increases in VAT. Compared with other countries, Switzerland also occupies a disadvantaged position from the viewpoint of the price of local calls. This situation is explained essentially by the introduction in spring 2002 of a single national tariff, independent of distance. However, the situation is quite different in the national calls market segment, since Switzerland is within the third of countries with the lowest prices. More precisely, the cost to a Swiss user of a three-minute and a ten-minute call is clearly below the weighted European average. Finally, as far as the price of international calls is concerned, Switzerland occupies an exceptional position since it is almost impossible to find a country in which prices are more attractive. What is more, the prices proposed are well below the European average. Seven years after liberalisation, competition on prices seems to continue to play an important role since one cannot yet observe any price levelling phenomenon. Thus if one compares the historic operator with its main competitor, one finds that the cost of various kinds of call – varying as a function of duration and the destination – is in general 10 to 20% lower with Sunrise. Naturally, in individual cases there are some even more advantageous alternatives on the market (BAKOM 2005a).

The mobile telephony market

In August 2004, the mobile telephone penetration rate was 87%, exactly matching the weighted average for the countries of the European Union (EU15). The growth of the Swiss mobile phone market between 2003 and 2004 was slightly higher than the European average (6.1% compared with 5.7%).

In 2004, four providers were active in the mobile telephony market (Sunrise, Orange, Swisscom, Tele 2), three of which operating a second-generation network plus one provider limited to reselling telecommunication services (Tele2). Tele2 is now also active in Zurich and has its own regional network. The number of providers operating a network in Switzerland is within the range which applies to the Union countries (between two and five). With regard to the number of providers who do not operate a network but who do offer telecommunication services, Switzerland is clearly one of the groups of countries in which this alternative is not very highly developed. In some other countries, on the other hand, this type of provider far exceeds the number of operators with a network. By way of illustration, we can cite the United Kingdom, Sweden and Lithuania which have the highest numbers: 59, 21 and 21 respectively.



Source: BAKOM 2003: 8

First, Switzerland, along with Slovenia and Cyprus, is the country in which the subsidiary of the historic operator has the highest market share, measured as a percentage of the number of users. More specifically, Swisscom Mobile claims to have 61% of the market; this value is well above the European average (42%). Indeed, when one looks at the evolution of the distribution of market shares between the historic operator and its competitors since 1998, one can see that the Swiss situation in 2004 corresponds, more or less, to that prevailing on average in the Union countries in 1998. If the low number of new entrants reflects the difficulties involved in gaining a foothold in a market suffering from such a delay – difficulties which are all the greater in a sector in which the coverage rate and the quality of services play a major role – it also seems to highlight the unshakeable attachment of Swiss users to their national company. We would point out that this latter assertion also seems to be corroborated by the fact that there are price differences between Swisscom and its main competitors, Sunrise and Orange, differences which are becoming more substantial as the level of consumption increases. Secondly, using mobile telephones in Switzerland is very expensive compared with Europe, regardless of the volume of consumption in question. In all the cases examined, the prices are clearly above the average European values (BAKOM 2005a).

Broadband access and prices

In Switzerland, broadband access is offered mainly via ADSL technology and cable modems. The quantitative importance of the other means of access (satellite, optical fibre, PLC, WLL, leased lines, 3G) can be considered as a negligible component of the overall broadband market.

Swisscom has been offering ADSL access with various bandwidths since October 2000. Although other companies (28 direct resellers 4 in July 2004) also provide these services, they are nevertheless dependent on Swisscom's wholesale offering. Indeed, fully unbundled access, shared access to the subscriber line and bitstream access has not yet been concretely implemented in Switzerland. For the time being, therefore, reselling remains the only means available to the alternative operators, apart from the construction of their own access network, for them to market their own products. In Europe, Switzerland therefore (again) constitutes an exception.

Like Denmark and Austria, Switzerland can be considered as a small market within the European Union. With 1,066,000 broadband connections in July 2004 (656,000 ADSL and 410,000 via cable modem), it represents about 3.6% of the European volume. In July 2004, Switzerland had one of the highest broadband access penetration rates in Europe: 14.5% of the population. Only Denmark (14.7) and the Netherlands (15.6) have higher rates. Following the example of developments in most of the European Union countries, between July 2002 and July 2004 the Swiss broadband access market enjoyed a high rate of growth, regardless of the type of access (+550% for ADSL connections, +116% for cable modem connections and +266% for all broadband connections), and is therefore exhibiting a dynamism which is comparable to that of the early days of mobile telephony). Since July 2003, the upward trends has, moreover, continued since at the end of 2004 Switzerland had 802,000 ADSL customers, of whom 490,000, or a 61% market share, were with the subsidiary of the historic operator, Bluewin. In Switzerland there are almost 400 cable operators; about fifty are active in the broadband internet market. Cablecom is by far the largest operator. At the end of 2004, the number of cable modem connections was almost 480,000, of which 285,000 were with Cablecom, which represents 59% of the market. We note finally that the successive launch of offerings by the two large operators, Swisscom and Cablecom, reflects the intensity of competition in this market, at least in certain regions.

- **Internet market[8]**

Sunrise Telecommunications / TDC Switzerland
Sunrise is Swisscom's major competitor on the Internet market (dial-up and ADSL) with 557'000 Internet customers as of May 2003[9] or a market share of approximately 23.7%.

Cablecom
Ownership: Cablecom was purchased by the British NTL in March 2000. It is Switzerland's leading cable TV operator with a 53% market share and 1.5 million subscribers in 12 cities.
Services: In addition to offering CATV service, Cablecom also owns one of the country's largest ISPs, SwissOnline, which has around 150,000 Internet customers, and offers a broadband cable modem service under this brand.

NTL has a strategic network upgrade program for this subsidiary covering some 75% of the country. This is the key for attracting business-to-business customers with high-tech carrier services and broadband Internet access.

Source: BAKOM 2003: 8

In July 2004, Switzerland differed from the other European countries mainly in the following three respects:

- Compared with 2003, the split between ADSL access subscriptions and cable modem access subscriptions widened in 2004 (62/38%). In effect, as the broadband market develops, this proportion is changing in favour of ADSL which can rely on better national coverage and which benefits from publicity campaigns launched by resellers of the Swisscom wholesale product. In this regard, Switzerland is on a par with Belgium, the United Kingdom, Sweden and the Netherlands;
- The low proportion of broadband access, in an international comparison, held by the historic operator's subsidiary in the market as a whole (36%). This proportion puts Switzerland in 5th place, between the

United Kingdom (25%), Malta (33%), Lithuania (34%) and Austria (35%), of the European countries in which the historic operator (or its subsidiary) has a relatively low market share;

- The relatively balanced distribution, in an international comparison, in the ADSL market between the subsidiary of the historic operator and its direct competitors (59 and 41% respectively). The Swisscom subsidiary's market share increased by 3% between July 2003 and July 2004, rising from 56% to 59% (BAKOM 2005a)

Leased lines retail tariffs

In the retail leased line market segment, Swisscom is still the only operator offering national coverage. Swisscom offers leased lines which are priced differently according to destination, distance and bandwidth. Because of its substantial national coverage, Swisscom enjoys a high degree of flexibility in fixing the prices billed to end customers. In other terms, this means that the Swisscom offerings can easily be adapted in reaction to cheaper prices set by its competitors and brought down in order to be more competitive. Unfortunately, we do not have any information on the tariffs for 2004 as Swisscom no longer sends information about this segment of the market to the Teligen foundation. Nevertheless, by looking at the years prior to 2004 and taking account of the charges levied by Swisscom, on the basis of the information sent by the operator to the Teligen foundation for international comparisons, in the majority of cases the leased line charges, in or between towns, for 64kbit/s and 2Mbit/s, are below the European Union average, varying between 12% below the average for 200 km 64kbit/s leased lines and 41% for 2 km 64kbit/s leased lines. Looking at the changes in charges since 1998, it can be seen that for the two bandwidths and two distances in question, a very big fall occurred between August 1999 and August 2000. Between 1998 and 2003, prices fell for distances of 2 km and 200 km by 30 and 43% respectively for the 64kbit/s bandwidth and by 43 and 91% for the 2Mbit/s bandwidth. In comparison with the average falls in Europe, Swiss rates have been more consistent, particularly inside the cities (2 km distance). However, one would have to look at 1998 price levels to get a better idea of the situation (BAKOM 2005a).

Demand-side: Switzerland an attractive telecommunication services market

Technology Trends in Switzerland

In Switzerland technology trends are congruent with those in the European Union as Switzerland seeks to adapt all these European Standards (WIMAX; WLAN; UMTS etc.). Because of the countries' size high penetration of the newest technology generations can be swift. Within service packages telecommunication and IT technologies are merging into one product today. Especially broadband and mobile services are still growth drivers in the telecommunications segment in Switzerland. The Swiss economy is strongly influenced by Swisscom the leading player in this field. Swisscom is not only a strong domestic contender but it is also the most successful player in the telco business abroad. Its internationalisation strategy is characterised by high quality niche technologies in the field of WLAN (Swisscom Eurospots) and mobile office technology (Mobile Unlimited). Another trend are the TIMES segments, means Triple Play (service packages in the segments of mobile, fix net and internet), but also gaming and entertainment (TV etc.). The question for all players active in service provision is how far to go into the content and media business: "As Carsten Schloter (CEO Swisscom) in the Neue Züricher Zeitung (April 2006) pointed out the Swisscom will look totally different in five years. The core business is melting like ice in the sun. The tariffs are decreasing and we have to find a solution for this. New segments like the entertainment business might be helpful" (INT_5).

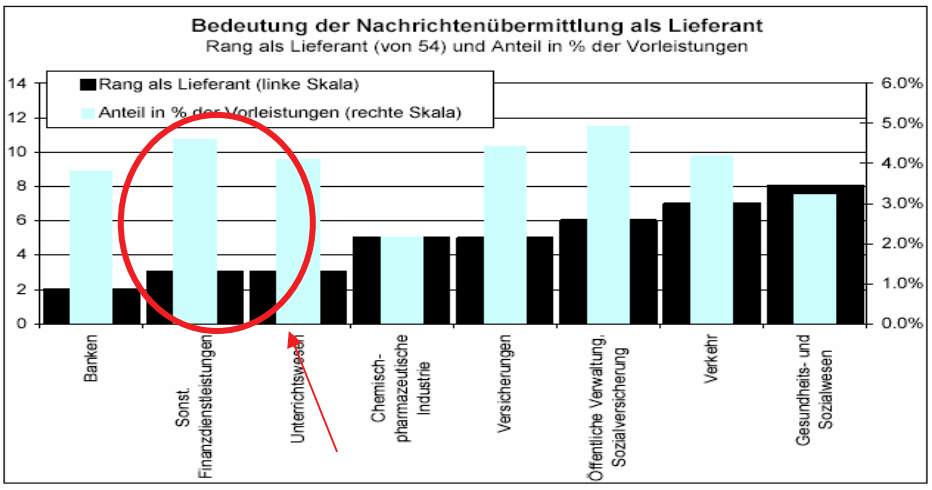
Demand and Competition

In advanced countries telecommunication services also deliver an important input for other sectors. 65% of the telco services output are delivered to other business sectors in Switzerland. 31 % are directly absorbed by end users and 4% are exports. An analysis of the customers shows that they mostly stem from growth segments in the economy (ICT Switzerland 2004: 7). In absolute numbers the most important customers for telecommunication services are public authorities and departments (5-6%). Similarly important are retailers and the construction industry, as well as chemical and pharmaceutical industries, machinery, consulting, insurances and the financial, services and health sector (listed in decreasing order from 3% to 1,5%). The different sectors can also be divided into different customer groups. Swisscom for example distinguishes between the few (but important) global players as their biggest clients, the many SMEs and the private clients. In every market segment there are different competitors, who fight for the attractive clients. In the segment of global players Swisscom has to compete on a world scale. Therefore the bigger telco service providers have global alliances (Swisscom and Vodafone etc.) as well as alliances with big software companies like Microsoft to be able to provide service packages for their multinational clients abroad. In the segment of SME and other companies the Swiss companies have to compete against other European service providers like Orange, Cablecom and Sunrise (BAKOM 2005a).

Telco services are particularly important for the financial and pharmaceutical sectors. Switzerland may also be a test market for some global players. It is a small country with a very good infrastructure especially in the field of cable. Due to this good basic infrastructure it might also be an attractive market for service provision in other segments (Cablecom) (INT_5). *"Because maybe it is a small market here in Switzerland with a challenging client base it might be interesting for some global players to test their products here. If they fail it is only a small market and the risk is low. If they win, the service might be adapted in Germany, Italy, France or so"* (INT_8).

Most important clients of telecommunication service providers

Abbildung 14 Bedeutung der Nachrichtenübermittlung als Lieferant



Quelle: BFS, Input-Output-Matrix, eigene Berechnungen.

Source: ICT Switzerland 2004a: 29

With 2673 Euro in the 2004 Switzerland has the highest per capita spending on Telco services worldwide (Bakom 2005a). Especially Swiss SME and also private customers still seek Swiss solutions. The high market share of Swisscom illustrates this significantly (INT_5). *"The brand Swisscom is still very strong and a lot of Swiss customers still rely on this brand, because it is their home-grown company. With foreign companies they don't feel the same way"* (INT_4).

3.1.3.2 Regulation

As Switzerland is not part of the European Union, the country has no obligation to comply with EU laws and regulations. However, EU directives are often used as guidelines to amend and revise the Swiss law. The development of communications towards a global information society and the envisaged liberalization of telecoms market in the European Union put significant pressure on the Swiss telecom system. Switzerland launched the reform of its telecommunications sector at the same time as the European Union, and the liberalization came into effect on the same date as in the EU countries (January, 1 1998). Nevertheless, after five years of liberalization, the Swiss legislation shows some weaknesses in comparison with the EU objectives and regulatory framework. While the European Union clearly laid down the objectives for competition in telecommunications, for instance local loop unbundling, the Swiss Telecommunications Law is less specific on telecom competition objectives, leaving more room for interpretation. In Switzerland, the federal law that implemented the liberalization and the regulation of the telecommunications sector (LTC) came into effect on January 1, 1998 (BAKOM 2003: 10).

Table 5: Telecommunications Law (LTC)
Of April 30, 1997 (status of January 1, 2003)

General provisions Chapter 1	Objectives : 1. Ensure that a range of cost-effective, high quality and nationally and internationally competitive telecom services are available 2. Ensure reliable universal services for the whole population at affordable prices and with a defined quality 3. Ensure respect of personal and intangible property rights 4. Allow effective competition 5. Regulate the transmission of information by means of telecommunications techniques
Universal service Chapter 2, Section 2	The universal service is assured through licensing, based on a periodical open invitation to tender. The Communications Commission is the authority which grants the license. The Federal Council has the competencies to change the detailed rules for implementation (scope and quality of services as well as price caps). The Commission (ComCom) and the Office (OFCOM) ensure that the US is provided properly. The financing of US is assured by the operators' contributions. Universal service content: Public telephone service, emergency calls, directories, public telephone cells, transcription service for people with impaired hearing.
Interconnection regulation Chapter 2 , Section1	Prices for interconnection are negotiated between the operators wishing to interconnect their networks. When after a negotiation period of 3 months no agreement can be reached, the ComCom may be requested to rule on the interconnection prices and conditions. There is no ex ante price setting for interconnection but as a principle, prices should by cost-oriented. Interconnected operators are requested to forward the conditions of their interconnection agreement to the OFCOM.
Rates regulation Chapter 2 , Section 2	The Federal Council fixes prices caps for USO; for all other services primacy is left to competition to regulate retail prices on the market.

Source: BAKOM 2003: 10

Even after the liberalisation of telecommunication services the state has various sector specific regulations, mainly in the field of:

- pricing (end customer pricing; inward movement price)
- market entry/access (number of competitors, licences, unbundling)
- ownership (states share in incumbent)
- quality of services
- tarif quota (UMTS coverage etc.)
- technical requirements and orders (carrier pre selection, number portability)
- environmental requirements and orders (UMTS – NIS orders) (ICT Swizterland 2004a: 8)

All those regulatory decisions have a direct or indirect influence on investment and innovation in ICT in Switzerland.

National regulatory bodies

The Swiss Regulatory Agency was established in 1992, to accompany the full liberalization process. It is composed of the Federal Office of Communications (OFCOM) who acts as the operative arm of the Federal Communications Commission (ComCom) established in 1997. The Swiss regulator is converged, i.e., it deals both with telecommunications and broadcasting. It is the OFCOM that is regarded as the Swiss NRA, but the OFCOM cannot be considered independently of its decision-making body, the ComCom, as in the end, it is the ComCom who makes decisions on telecommunications matters and the OFCOM that implements them. This regulatory structure with shared responsibilities between the ComCom and the OFCOM is quite particular and is due to the Swiss' attachment to the principle of shared competencies and separation of powers (BAKOM 2003: 11).

The ComCom is the body that grants licenses for telecommunications service providers, designates interconnection conditions in the first instance, when service providers cannot reach an agreement14, awards universal service licenses15 and licenses for the use of radio communication frequencies16. In addition, the ComCom approves national numbering plans and the national frequency plan17 and regulates the terms of application for number portability and the free choice of supplier18 . The ComCom also takes measures, based on the OFCOM proposals, in the case of infraction to the Law, and has the competency to withdraw licenses19. For a number of its tasks, the ComCom has delegated the administrative competencies to the OFCOM (BAKOM 2003: 12).

The OFCOM has the duty to promote efficient competition and to guarantee that market forces can freely work. It also guarantees that basic services are provided in all parts of the country and for all sections of the population. While the ComCom is the statutory regulatory body, the OFCOM is the administrative executor of the ComCom and the Federal Council (BAKOM 2003: 12).

Licensing

Any operator providing a telecommunications service involving extensive independent use of telecommunications installations used for transmission must have a license (LTC Art. 4). Operators who do mere reselling of services only need to register with the OFCOM. The ComCom auctioned UMTS licenses on December 6, 2000, for CHF

205 million (€ 138.5 million) The award procedure was completed with the granting of licenses at the end of January 2001 to Orange, TDC Switzerland (sunrise), 3G Mobile and Swisscom (BAKOM 2003: 19). Because of infrastructure problems and the insecure market conditions 3 G mobile refused it s UMTS licence (BAKOM 2003: 12).

Interconnection

Since January 1, 2000, interconnection prices have been fixed in accordance with new principles which the Federal Council laid down in the decree on telecommunication services and which are based on the Long Run Incremental Costs (LRIC) model. Consequently, prices are calculated by the costs incurred directly by interconnection services, on the current basis of the additional long-term costs generated by the use of the infrastructure (BAKOM 2003: 20).

It cannot be emphasised too strongly that the level of interconnection charges plays a key role in determining the possibilities for new entrants to access the market under fair conditions. These changes also determine the intensity of the competition which reigns among the different telecommunication services providers which are active in the market. From this viewpoint, interconnection has to remain an essential preoccupation for the regulatory authorities. For all the interconnection services considered in this report, it should be mentioned that the prices charged in Switzerland are high compared with the European average. In Switzerland, unlike in other European countries, there is no local interconnection between fixed networks but only regional and national interconnection. Despite a reduction of 13.2% in the regional interconnection charge between 2003 and 2004, Switzerland belongs to the group of the most expensive countries, although it is far behind exceptions such as Lithuania, Latvia, Slovakia and Malta. The termination charge for regional interconnection exceeds the weighted European average by 23%. Despite a drop of 9.9% in the termination charge for national interconnection, in this segment Switzerland also belongs to the group of countries with the highest charges. More precisely, eight countries indicated higher charges, including the four above-mentioned countries.

As far as the level of interconnection charges on fixed networks is concerned, following two procedures initiated by TDC Switzerland SA (Sunrise) and MCI WorldCom SA, in a decision on 7 November 2003 the Federal Communications Commission enjoined Swisscom SA to reduce prices retroactively by about 25% to 35% for the years 2000 to 2003. Swisscom SA appealed against this decision in order to establish whether or not the interconnection charges really are overpriced. In October 2004, the Federal Court decided to refer the matter to ComCom. The latter reaffirmed theorder of magnitude of the price cut. It is possible to appeal against this new decision. Finally, if one examines interconnection costs for call termination on mobile networks, it has to be stated that the mobile telephone operators active on the Swiss market were charging prices in 2004 which were among the highest in Europe, notwithstanding a significant fall between 2001 and 2002 (-21%). With a weighted interconnection charge of 22.72 euro cents, Switzerland exceeds the European average (EU15) by 54%. In 2004, in no other country were such high prices charged. One interesting fact is that the interconnection charge for call termination on mobile networks is on average more than 12 times higher than the double transit termination charge from fixed network to fixed network. At the European level (EU15), this ratio reaches nine times if one considers only those operators who have been designated by the national regulatory authorities as being strong in this market and rises to 11 if only the other operators are considered. We should mention once more that the high level of termination charges demanded by Swiss mobile telephony operators has aroused some concern among the regulatory authorities in Switzerland. In this respect, we recall that on 15 October 2002 the Competition Commission initiated an investigation against Orange, Swisscom Mobile and Sunrise; its conclusions are expected (BAKOM 2005a).

"Especially in the field of interconnection there are several legal proceedings, which are still not solved and which point in the direction that the Swiss economy paid much too high prices in the field of telecommunications for years" (INT_3).

Leased Lines

In October 2000, the ComCom ordered Swisscom to provide local access to leased lines at LRIC-based rates, and on a non-discriminatory basis. Swisscom appealed this decision, and the Federal Court ruled one year later (October 2001) that the ComCom did not have the authority to take such a decision. Because of this decision by the Federal Court, the ComCom sees an urgent need for legislative action against the high prices of leased lines.

Despite the cost-orientation and international standard requirements laid down in the LTC, the rates charged in Switzerland for access to leased lines are still very heterogeneous and can be high in the regions where Swisscom possesses the absolute monopoly over this service. In the main metropolitan areas where alternative operators are competing for this service, the incumbent's prices have already been forced to decrease (BAKOM 2003: 20).

Number Portability and Carrier Selection

Number portability, which is designed to improve competition, has been available in Switzerland since 1 March 2000 and enables users to retain their telephone number when they switch from one operator to another operator. Ever since it was introduced, there have been more numbers ported on the mobile networks than on the fixed network. In 2003, 16,693 numbers were ported on Switzerland's fixed network, an increase of 29% on 2002, while 118,113 numbers were ported on the mobile networks. However, there was a surprising reduction in the numbers ported in 2004 (down 31% on 2003). The fee that Swisscom charges alternative operators for number portability is relatively high compared with European Union countries (20.23 euros for fixed network portability and 18.93 euros for mobile portability). Especially in the field of number portability and carrier selection the Swiss telecommunication industry was among the first to implement this systems and this is a clear advantage (INT_3).

Local Loop

The local loop was expected to be unbundled by the year 2000, but this step in the liberalization has not happened as of 2006. Swisscom will hold a full monopoly until January 1 2007. After this date the local loop will be provisionally unbundled for about 4 years. In November 2000 already, the ComCom issued an injunction and ordered the incumbent to immediately implement bit stream access and draft a full unbundling 'Reference Interconnection Offer' ("RIO"). The Federal Court overruled this injunction in October 2001. In spite of this, the ComCom has continued to energetically promote unbundling as a key step towards greater competition and towards strengthening Switzerland's position as a business location, but the Federal Court claimed that the ComCom did not have authority over those issues. With the new legal provisions in order by 2007, the authority of ComCom should no longer be challenged (BAKOM 2003: 21). However the limited time of unbundling with a subsequent legal uncertainty will probably hamper competitors' investment in favour of Swisscom. "In this segment we are clearly behind the other countries in the EU which already had the unbundling in 2002" (INT_3).

Ownership of the Incumbent

At the moment, the majority of Swisscom Group shares are owned by the Swiss Government. Thus the Department of Finance owns 62.7% of the company with only 27.3% publicly traded. In the first years after liberalization, Swisscom's management seemed to be unconcerned by the government ownership, but at the moment, there are critical voices against this ownership as the government actively intervened into Swisscom`s

internationalisation plans in Austria in 2004 and Ireland in December 2005 (Eircom Case). Presently there are discussions to fully privatise Swisscom, but so far the government decided against such a step. The proponents of the full liberalisation of Swisscom argue that it would be beneficial because the state would not have to protect his financial interests any more (INT_3). Liberalization proponents also argue that the actual market segment does not provide the company with enough growth possibilities. Additionally investment in new technology segments is very expensive and the company does not have full flexibility to react on new challenges (INT_5). Despite these arguments there is a stall in the privatization talks mainly inspired by political conservatism. *"You can see at the moment in Switzerland that there are these two poles and there is a strong discussion about what to do with Swisscom. There maybe a change in the long run"* (INT_5; INT_3). If the privatization came through this would need a change of law because the state ownership is guaranteed in the LTC with a minimum of 50% plus one of Swisscom shares.

Universal Service

After liberalization, Swisscom has been designated as the universal service provider for a transitional period of five years. In 2002, the universal service license was re-allocated to Swisscom, the only candidate for the license. In case several operators are candidate for the universal service license, the license is to be granted to the applicant who has submitted the best bid, according to the terms of the LTC (BAKOM 2003: 23). With the new TKG ADSL should be a universal service standard too (INT_3).

Competition

As Swisscom owns most access lines, it also controls the domestic access leased line market. There are competitors in Switzerland using capacity rented from Swisscom to offer data services, but again Swisscom has the majority market share, particularly for domestic services. Due to Switzerland's role as a financial and international organization center, global providers have a presence in the international data market. Swisscom also dominates the mobile sector, with its mobile subsidiary accounting for 62.9% of total subscribers. The Swiss population has the choice between 4 mobile operators of which one VMNO. The incumbent had a monopoly until 1998, but since then the new entrants have succeeded in conquering about 40% of the market.

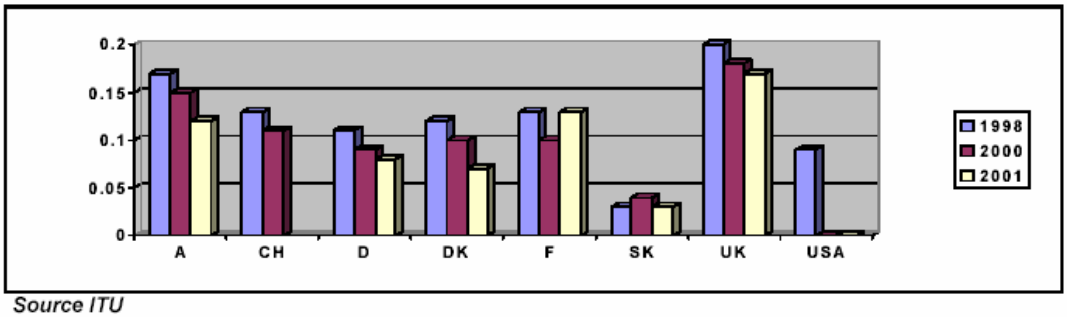
For the internet, the incumbent's ISP Bluewin, has the majority of Internet connections, followed by far by its main competitor TDC. For broadband services, Bluewin has the majority of DSL subscribers in Switzerland with 56% of all DSL subscriptions. Swisscom owns the totality of subscriber lines and offers wholesale DSL to Bluewin and to its competitors. In addition Cablecom, which covers mainly urban areas, offers cable modem service. As the Swiss telecom regulation is not based on pro-active practice or asymmetric regulation principles, but rather on competition promotion, there are still service areas where the incumbent holds a dominant market share position. However, dynamic competition in the fixed-line services and the mobile telephony has made the incumbent's market share decrease dramatically since the start of liberalization. This shows that the Swiss regulatory authorities, by promoting a competitive marketplace, have greatly helped competitors to evolve towards a viable situation, in spite of Swisscom's de facto advantages (BAKOM 2003).

End-user prices and quality of services

Considering telecom service prices, the 1998 liberalization reached some success quite rapidly. In 1998, the general telecom service prices39 decrease was still weak, with only 2.6 %. But the year 1999 saw a dramatic price drop by 14.7 %. In the first ten months of 2000, telecom service prices even declined by 16.8%. Since 2000 however, prices have stagnated with even a light increase between 2001 and 2002 due to a change in the tariff structure. Since the liberalization, prices generally decreased for both the private and commercial sectors in

Switzerland: respectively –8,6 % for private and – 24,6% for commercial activities. In international comparison, the current Swiss end-users prices are average, as shown in the tables below (BAKOM 2003: 19).

Figure 6: Fixed voice Telephony, 3 minute local call, average charge in PPP €



Source ITU

Source: BAKOM 2003: 29

Concerning the quality of telco services Switzerland holds the leading position in comparison to Germany, France, the UK and Italy. There above average availability in telco infrastructure (cable- and broadband access; DSL und CATV). Additionally Swiss clients benefit from the highest quality increasing after liberalisation in 1998 in Europe (ICT Switzerland 2004: S. 3).

Environmental Requirements

In Switzerland the requirements in the field of electromagnetic radiation for mobile infrastructure are 10 times higher than in other countries in the EU. This is a big problem for all mobile service providers as there are not many sites in Switzerland where to place the infrastructure. New investments are not in favour of this legislation. Another problem is that the public opinion in Switzerland is very critical against mobile infrastructure in fear of electromagnetic radiation. This lead to protest on the community and regional level against more infrastructure implementation in the field of UMTS. This decelerates the fast implementation of UMTS in Switzerland and is especially risky for new entrants in the Swiss market, which do not have a GSM infrastructure. This is one of the biggest problems in Switzerland together with the conservatice regulation, which might hinder important innovation and investment (4 G etc.) in the future (INT_2).

Legal Certainty

According to the LTC, the Swiss NRA has the competencies required to enforce and guarantee equal market conditions for all players. The Telecommunications Law (LTC + ordinances) sets up relatively comprehensive rules and mechanisms of regulation. However, because of the Supreme Court's ruling options, the Swiss telecom competitors are facing strong legal uncertainty. First, as we have seen earlier, there have been 6 cases (out of 24 submitted to the appreciation of the Supreme Court) in which the regulator's decisions in favour of the new entrants have been overruled or suspended. Although 6 cases are not that many, they still show that the Swiss legislation leaves room for interpretation, in which the judicial power has the ultimate power of arbitrage. In particular, it demonstrates hesitation on behalf of the Swiss authorities between a competitive telecom market and an incumbent monopoly status. For new entrants, this has led to strong legal uncertainty over the past 3 years. The uncertain outcomes as well as the length of the procedures have been a particularly heavy burden on new companies.

3.1.3.3 Conclusion

In Switzerland, the consumer demand for communication services has increased over the past few years. The telecommunications sector not only guarantees a basic service offering for all segments of the population, but also makes a contribution to the overall economic development by means of large investments in new technologies. Thus it is hardly an exaggeration to say that the future evolution of the information industry is an important factor for the growth perspective of the Swiss national economy. After several years of liberalization, a consumers' perspective reveals a wealth of notable changes and successes: In infrastructure provision the country is among the leading countries worldwide. In the field of technological innovation Swisscom is especially successful in niche markets (INT_5). Furthermore the Swiss government has elaborated the 'Strategy of the Federal Council for an Information Society in Switzerland' in 2006, which focuses on the expansion and improvement of the Internet, e-governement, e-learning and e-health within the country. A special working group within the OFCOM is in charge of implementing this strategy. So far its actual impact is limited to the deployment of Internet in schools and the administration (e-government, e-health).

However, there are still weak areas in the telecommunications market development due to the regulatory and legal framework. The ComCom received a very wide range of statutory competencies. However, the current situation is extraordinarily different from the 1997 LTC projects, mainly because of the Federal Court's ability to overrule the NRA's decisions. At the moment, the main challenges of the regulatory system are:

The Federal Court's ability to overrule ComCom's and OFCOM's telecom specific regulations (i.e., interconnection and access issues)

The unclear language of the LTC (which leaves room for contradictory interpretation and may paralyze the sector's development towards a competitive marketplace)

A lack of resources of the OFCOM (financial, number of legal experts)

The weaknesses of the Competition Commission (resources and expertise in telecommunications market matters) which has sometimes problems to properly apply the competition law to the telecom sector.

There is little competition in all telecommunication markets: There are almost no mobile reseller in Switzerland because of the national "mobile cartel" (INT_3)

Asymmetry of information and resources in favour of Swisscom

Ex-post regulation vs. ex-ante regulation in the EU: legal procedures are very slow (in favour of Swisscom) "Especially the legal uncertainty in the field of the local loop, ex-post regulation, UMTS and LTDC interconnection tariffs, the quarrels between the the regulatory bodies all hinder investment and innovation in Switzerland" (INT_3).

One objective of the 1997 Telecommunications Law reform was to have a 'light' general legal framework that would permit further adaptations to the sector's needs. At that time, the legislators did not know how the liberalization of the telecom market worked. For this reason the legal mechanisms adopted a learning approach, in order to make self-regulation and adaptation possible depending on the future market's needs. This approach was considered as the choice for telecom Law makers, as further adaptation could be enforced by regulatory prescriptions or law amendments.

Yet, evidence has shown that within the current legal framework the NRA does not have the ability to enforce necessary regulation in the most relevant areas i.e., where markets are distorted by dominant players or political interference. In the areas where effective competition among providers could be established, the Telecommunications Law has reached the objectives desired by the Legislator. For consumers it is undeniable that diversity of today's telecom services and their widespread availability have made Switzerland a more attractive place than before the liberalization. Despite this positive impact for consumers, the liberalization process is facing a rocky path ahead. The main reason for this is the continuing Swisscom de facto monopoly. There have been some discussions to fully privatise Swisscom, but the government so far decided against it. The proponents of the full liberalisation of Swisscom argue that it would be beneficial because the state would not have to protect his financial interests any more and finally there could be more competition (INT_3). *"If you put together the players active in the field of telecommunication you do not count more than ten: Swisscom Fix net and Mobile, Orange Mobile, Sunrise Fix net and Mobile, Cablecom (TV, Fix net), Tele 2 and some smaller specialised players in field of business systems like COLT, MCA Worldcom etc., as well as other niche players like Green.ch (internet data services). But actually there are only few players which are active in the Swiss telecommunication market. And only about 3 players have their own infrastructure"* (INT_3). *"Especially in the field of interconnection there are several legal proceedings which are still not resolved and which suggest that Swiss businesses paid much too high prices in the field of telecommunications for years"* (INT_3).

Even for consumers competition between operators is not yet fully functioning, mainly because of the incumbent's resistance and the unclear Telecommunications Law leaving too much room for interpretation. Also, for various communication services, competitors are limited to resell products and technology, defined by the incumbent and thus have no possibility to offer services adapted to their own customers' needs. The regulation of leased line prices which the NRA was ready to implement has been rendered impossible by the Federal Court's decisions. The lack of competitive pressure in these areas provokes negative economic consequences and leads to restricted freedom of choice for end-users.

As mentioned earlier, the modification of the Swiss Telecommunications Legislation is on the move. It was decided by the government that the local loop should be unbundled for 2-4 years after January 1st 2007. This is a problematic decision again, as a mere 2-4 years unbundling period does not provide the competitors with a long-enough development horizon to justify the hefty investments that are necessary to enter the market. Simply said, such a time regulated unbundling is ill adapted to spur competition on the "last mile" (INT_2).

A further problem is that the overall regulatory density is high especially as infrastructure coverage and environmental and security prescriptions are concerned whose obedience make it difficult for service providers to implement new mobile technologies in Switzerland (INT_5). Thus the Swiss requirements in the field of electromagnetic radiation for mobile infrastructure are 10 times higher than in other countries in the EU. This is a big problem for all mobile service providers as there are not many sites in Switzerland where to place the infrastructure. Another problem is that the public in Switzerland is very critical against mobile infrastructure for fear of electromagnetic radiation. This leads to public protests on the community and regional level against more infrastructure implementation in the field of UMTS. This decelerates the implementation of UMTS in Switzerland and erects market entry barriers for providers without own infrastructure (Tele 2). *"For example the city of Berne decided to delay any discussion on the role of infrastructure pending a binding resolution by the Federal Court"* (INT_3). *"This safety thinking is favourable in IT but hinders new technology developments in telecommunication services"* (INT_4). There is a strong conservatism and not a real innovative climate among the central actors (CTI etc.) in Switzerland. *"In the USA or other countries there is more competition, which favours innovative ideas and*

an innovative atmosphere" (INT_9). Too many segments in Switzerland are highly regulated (mobile infrastructure) and especially the former monopoly companies (Swisscom, Swiss Post) are still state protected and very inflexible, which does not contribute to the growth, competition and innovation in the whole sector.

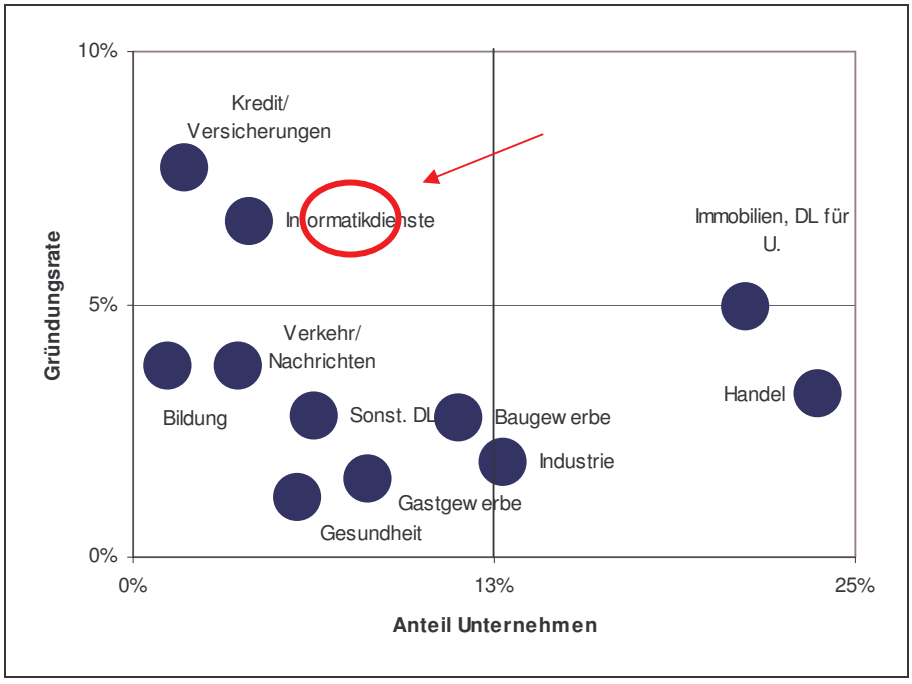
This is making Switzerland a particular case regarding the telecoms sector, as the European Union is actively trying to improve the general conditions for new players in the market and to increase competition. Furthermore, Switzerland is running the risk of missing technology and market trends, possibly making the Swiss telecom sector an unattractive market, with the risk of paralyzing competition and provoking the degradation of IT offers and hampering the dynamism of the entire economy.

3.1.4 Software Development and Services

Industry Structure:Economic Role

70% of the whole GDP in Switzerland stems from the service sector. Within the service sector the software sector is very important for the Swiss economy exhibiting the highest growth (7.6%) among all segments in the service sector. The growth rate between 1999 and 2000 even amounted to 12 %. While the financial sector has the highest GDP share in the service sector its growth rates were lower than those of the software sector. Clearly, the 11 329 (2001) Software companies in Switzerland are very important for the Swiss Economy. The segment has a growth beyond the average of about 4.8 billion euro (7.5 Mia CHF) of gross value added. That is almost 1/5 of the finance sector`s share (ICT Switzerland 2004b: 3).

Economic role of the IT sector in Switzerland



Source: Sieber 2006: 10

82.74% of all companies in ICT work in the software sector. The companies employ only 51.62% of the employees in ICT. That means most of the companies are very small. Among the bigger top providers in

Switzerland are five companies in the IT segment: IBM, Swisscom IT Services, EDS, SAP, T-Systems (INT_6). The majority of the 63 401 employees in SMEs work in software development and services (consulting). The field of wholesale and retailers only accounts for about 8.000 employees. The average salary in the software sector is 7680 CHF (4870 Euro). This is higher than in other sectors in Switzerland. Particularly high wages are paid in telecommunications and the financial sector.

From 1998 to 2001 there was a big hype in the software sector. The software development and service segment grew about 50%. In the segment of wholesale and retailing there has been a consolidation in the same period. Equally, the number of employees has increased by 60% between 1998 and 2001. Most Swiss companies have only one branch (subsidiaries are not very common). Additionally, most IT companies in Switzerland do have a very regional customer base. Face to face contacts help to reduce transaction costs and create trustful relationships, which result in a high customer loyalty (INT_1; INT_5).

The biggest part (30%) of the Swiss software sector depends on foreign standard software (Microsoft, SAP, IBM, SUN, Packed SWS etc.). Standard Software manufacturers are working together with sales partners, which implement their software for the end user. This business model is the basis for many Swiss IT companies. This is also called leverage effect. The highest leverage effect is created by Microsoft and IBM software. Therefore the Swiss Software sector is particularly dependent on collaborations with foreign partners (standard software, application software, systems software). But however 20% of the IT companies rely on Swiss application software. For those companies the Swiss Software is still as important as foreign software.

In application software domestic manufacturers are as important as foreign manufacturers

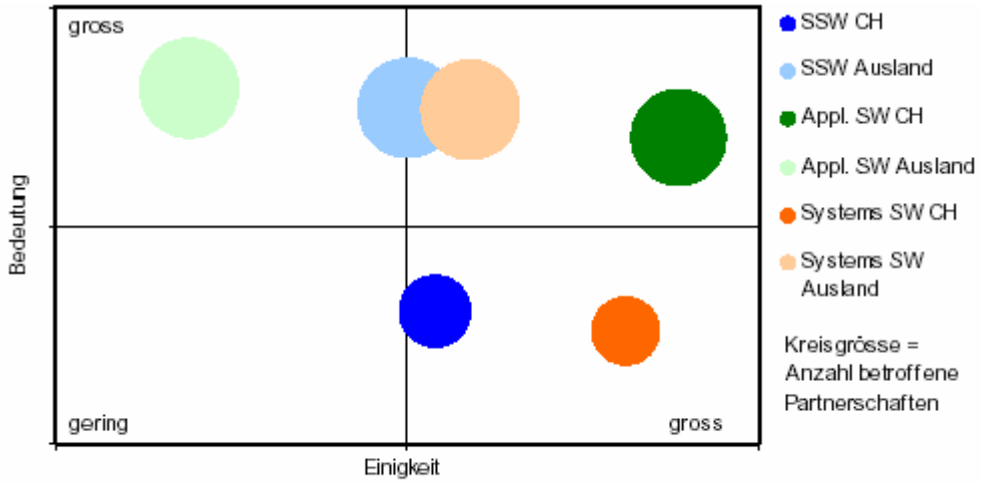


Abbildung 2: Bedeutung der Partnerschaften vs. Einigkeit.

Source: ICT Switzerland 2004b: 14

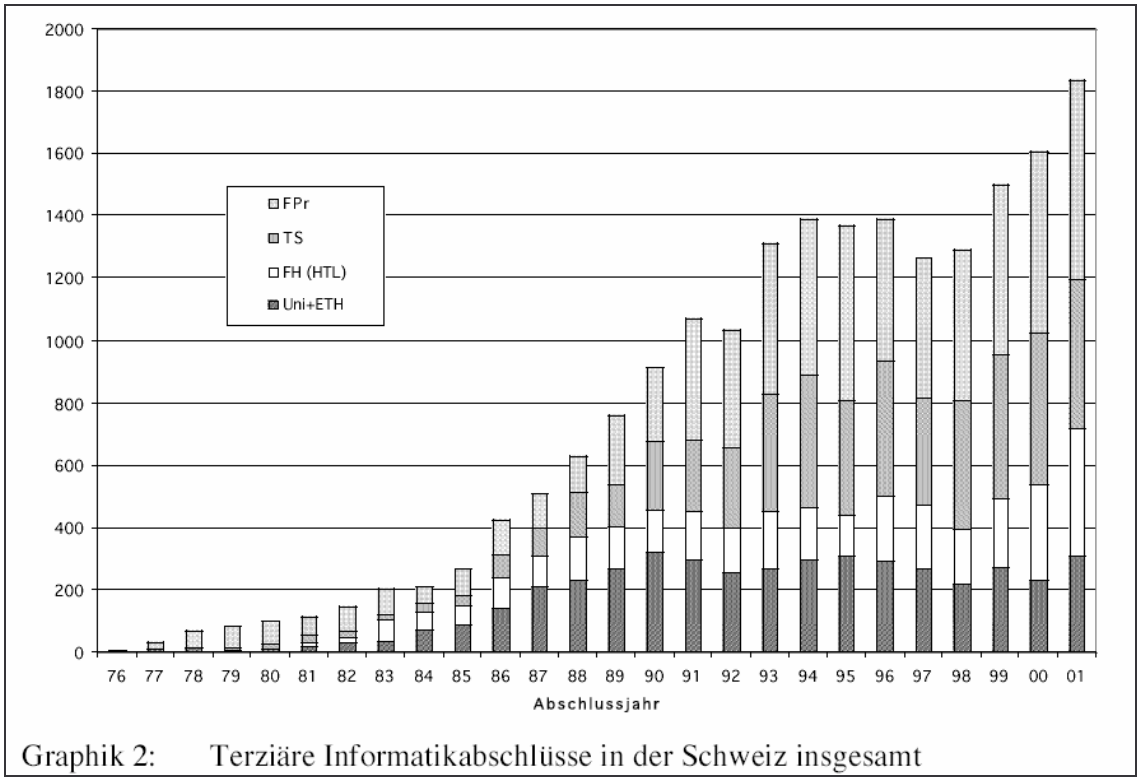
In application software domestic manufacturers are as important as foreign manufacturers. Ties to foreign companies remain strong, however. Especially among companies which focus on the implementation of software foreign partnerships are very important. There are only 8% of the companies which work independently. Among

software developers (19%) and retailers more companies work independently (16%). Altogether partnerships with foreign standard software providers and home grown application software providers are very important for the Swiss software sector (ICT Switzerland 2004b).

Career changers as a speciality of the IT sector in Switzerland

Qualified human capital is the key resource for the software and the ICT sector. The following section shows the educational status of ICT employees in Switzerland:

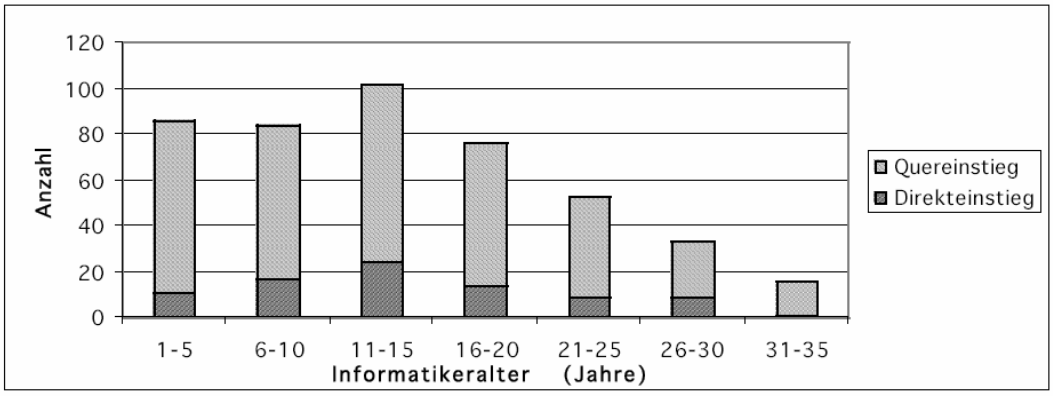
Educational status in software sectors



Graphik 2: Terziäre Informatikabschlüsse in der Schweiz insgesamt

Source: Stanoevska-Slabeva 2004: 3

In Switzerland the Universities and technical colleges (apprenticeships) have offered software courses since the 70ies. In the 80ies the Swiss Federal Institutes of Technology (ETHs) and the universities of applied sciences (FHs) joined in the educational effort. Especially the University of Applied Sciences in Berne in this field is very progressive.



Graphik 4: Das Informatikeralter von Direkt- und Quereinsteigern

Source: Stanoevska-Slabeva 2004: 5

On the whole, however, only few people have a higher degree in software studies. There are lot of 'career changers' in Switzerland. Most of the software engineers come from crafts industries or business schools which are not always ICT related (Stanoevska-Slabeva 2004: 5). Especially for the future a lot of experts forecast a shortage in well educated computer scientists in Switzerland. "In the future there will be a problem. There will be many employees in the field of informatics which are unemployed because of their low qualification and on the other hand there will be a lack of highly qualified computer scientists in Switzerland. There will be unemployment among computer scientists and a lack of computer scientists at the same time" (INT_8). ICT initiatives like i-CH (Informatikausbildung Schweiz) try to work against this trend by establishing ICT related competencies on a national scale (apprenticeships), but there has to be done much more in the field of university degrees in computer sciences in Switzerland (INT_8 more information about i-CH in the section: Q-3-1; Q-3-2).

Demand structures and competition

Competition in the Swiss IT market is still underdeveloped because it is a small market. Increasingly, however, Swiss companies face competition from well known global players and other international SMEs. Especially in attractive market segments bigger players rule the game. Among the top providers in Switzerland are five companies in the IT segment: IBM, Swisscom IT Services, EDS, SAP, T-Systems (INT_6). Swisscom IT Services, as a home-grown company, provides different market segments with tailored IT and telecommunication service packages as well as process consulting. As there is a convergence between IT and telecommunication technologies both segments can not be divided easily. This explains why all large telecommunication providers have alliances with players in the IT market (INT_5). There is an overall high productivity and flexibility in the market: *"This is a crazy market. One day you get a job, the next day your client may have changed his mind. We SMEs have to be highly flexible especially with regards to our working time"* (INT_2). Internationally, Switzerland is well known for its high work hours, quality and productivity (see: www.berninvest.ch).

Software sector Input-Output Matrix

Sektor	Nr.	Vorleistung Bezüge	Vorleistung Lieferung	Bruttopro-duktion
Landwirtschaft, Forstwirtschaft	1	6	2	12'779
Bergbau / Gewinnung von Steinen und Erden	2	0	4	1'675
Herst. von Nahrungs- und Genussmitteln	3	0	38	27'803
Textilgewerbe	4	2	6	3'045
Herstellung von Bekleidung und Pelzwaren	5	0	3	1'505
Herstellung von Lederwaren und Schuhen	6	0	1	367
Be- und Verarbeitung von Holz	7	3	9	6'010
Papier- und Kartongewerbe	8	12	22	4'708
Verlags- und Druckgewerbe, Vervielfältigung	9	60	275	11'458
Chemische Industrie, Mineralölverarbeitung	10	18	324	44'095
Herst. von Gummi- und Kunststoffwaren	11	5	23	6'891
Herst. von sonst. Prod. aus nichtmet. Mineralien	12	0	29	4'799
Erzeugung und Bearbeitung von Metall	13	0	21	4'962
Herstellung von Metallerzeugnissen	14	9	207	17'244
Maschinenbau	15	1	292	31'646
Herst. von elektrischen und Informatik-Geräten	16	143	325	17'253
Herst. von Radio-, Fernseh-, Nachrichtengeräten	17	5	30	6'261
Herst. von med. und optischen Geräten; Uhren	18	0	71	25'391
Fahrzeugbau	19	0	7	1'481
Herstellung von sonstigen Fahrzeugen	20	0	38	3'673
Herstellung von Möbeln, Schmuck, Spielwaren	21	8	29	5'728
Recycling	22	0	9	1'197
Energie- und Wasserversorgung	23	91	148	25'048
Baugewerbe	24	262	40	44'885
Handel, Reparatur von Autos; Tankstellen	25	21	46	9'360
Handelsvermittlung und Grosshandel	26	148	312	39'149
Detailhandel; Reparatur von Gebrauchsgütern	27	25	183	32'921
Gastgewerbe	28	72	27	21'879
Landverkehr, Schifffahrt, Luftfahrt	29	88	231	21'511
Nebentätigkeiten für den Verkehr; Reisebüros	30	1	228	10'413
Nachrichtenübermittlung	31	129	821	19'138
Kreditgewerbe	32	543	38	60'079
Versicherungsgewerbe	33	42	148	35'105
Immobilienwesen	34	24	5	7'365
Verm. beweg. Sachen, Dienstleist. für Unternehmen	35	384	556	50'959
Informatikdienste	36	3'074	3'074	13'362
Forschung und Entwicklung	37	0	424	4'125
Öffentliche Verwaltung; öff. Sozialversicherung	38	31	1'054	59'998
Unterrichtswesen	39	2	35	1'865
Gesundheits- und Sozialwesen	40	0	168	33'742
Abwasserreinigung, Abfallbeseitigung	41	24	165	4'689
Interessenvertretungen, Kultur, Sport	42	11	125	13'428
Persönliche Dienstleistungen, private Haushalte	43	31	6	4'220
Summe der Vorleistungen / Lieferungen		5'275	9'600	
Bruttowertschöpfung / Endnachfrage		8'087	3'762	
Bruttoproduktionswert		13'362	13'362	753'214

Tabelle 9: Input-Output-Daten der Informatikdienste.[14]

Source: ICT Switzerland 2004b: 18

The software industry is one of the few sectors in Switzerland which does not benefit from other segments of the economy. But the Software segment itself is highly interrelated. However the other sectors benefit from the IT sector at an estimated 8.5 billion euro (13.4 Mia. CHF). With 700 million euro in projects the public sector is the biggest IT client. Other big customers are found in the telecom as well as in the financial sector (ICT Switzerland 2004b). Given the prevalence of the public sector for IT contracts the Federal Departments have to follow a transparency policy in their purchasing activity. That means that objective criteria are used to find IT providers. Nowadays large projects can also be contracted to international providers which effectively erodes the formerly stable, regionally anchored (public) customer local provider relationship (INT_8). "Especially the Swiss Post might be an attractive client in the future, if they would start to outsource their IT services. But until now they haven't done it" (INT_6). E-business is an equally attractive future market segment in Switzerland that different countries and companies have a chance to work on. Especially in the field of insurances and the financial sector as well as the health and government sector new IT solutions are on the way. This is a chance for all players in the Swiss market (INT_6). Bigger players compete in the field of multinationals and bigger SMEs. The customer base of the SMEs active in IT in Switzerland is mostly characterised by smaller companies in all segments and sectors (INT_2). *At the moment there are different trends in the segment of IT: "Of course outsourcing of business processes is always important. Sometimes companies outsource some elements sometimes there is a trend back to take things in again. These are periodic waves, which influence our business. At the moment we do have an outsourcing trend again"* (INT_6).

Switzerland an attractive IT user country

"The IT industry in Switzerland is not an industry per se it is more a craft. It is more a handicraft business. It is mostly small enterprises, which develop specific services and products on request of their clients. It is mostly not companies that are highly innovative or have a special idea, or are active in innovative segments like bioinformatics per se: Just to say because of the clients that are active in pharmaceutical or financial industries, the IT sector might be highly innovative in this segment too is a false impression. We don't have a single Swiss company that successfully sells financial software on a worldwide scale" (INT_8).

"20% of the IT companies rely on Swiss application software. For those companies the Swiss Software is still as important as foreign software. But we don`t have a special product competence in Switzerland it's just more or less service in the IT segment. But because of our high e-readiness and per capita income we are an attractive user country" (INT_8).

National regulative contexts play a relatively low role in IT services in Switzerland. This said the post 9.11 era has promoted data security issues to heightened awareness with security being a particularly acute concern in the traditional Swiss banking (see: "Bankenkonvention" in Switzerland) - as well as insurance- and health-software systems (INT_3). *"I'd really suggest that Switzerland is also one of the leading countries concerning the implementation and use of data security applications. There is a really high demand in financial and insurance contexts. The people in Switzerland have high security needs"* (INT_3). There is really a lot of money here in Switzerland, which is spent in ICT and that is why all the big players are here too. It may be also a test market" (INT_2). *"ebaY for example ran a pilot test of a new service called "the Exchange Points" in Berne where - instead of sending your parcel by post you meet your business partner at an ebaY exchange point at the railway station. Google had other services tested here because Switzerland is a small, multilingual market with a high per capita spending and excellent infrastructure. And if it works here you may also implement your service in Italy,*

Germany or France" (INT_2). The per capita spending on IT is very high and the infrastructure favours IT applications (INT_3). The attractive IT users in Switzerland are very important for the national and international players in IT.

Technological, political and research framework conditions in Switzerland

The Swiss Infrastructure

According to IDC, Switzerland is among the top ten countries worldwide, when it comes to the quality and depth of its ICT infrastructure. The infrastructure is described as the penetration of traditional fixed lines, broadband access lines, mobile phones, PCs, Internet users and Internet servers per million population. It also looks at the quality of Internet connections and levels of e-business development, of online commerce and of Internet/web literacy. The affordability of Internet access, telecoms market competition, security of the Internet infrastructure, government support for ICT development, laws governing the Internet, ICT skills of the workforce and quality of ICT supporting services are also factors in the ranking.

Mobile market	1998	1999	2000	2001	2002	2003
Mobile subscribers ('000)	1,698	3,058	4,639	5,276	5,736	6,177
contracts ('000)	1,108	2,004	2,932	3,121	3,421	3,581
prepaid ('000)	590	1,054	1,707	2,155	2,315	2,596
Fixed market	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
PSTN access lines ('000)	3,884	3,622	3,382	3,240	3,163	3,086
ISDN access lines ('000)	334	531	727	861	913	924
Total access lines ('000)	4,274	4,153	4,108	4,101	4,077	4,010
of which ADSL ('000)	–	–	1	33	195	487
Broadband market	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
ADSL subscribers ('000)	–	–	1	33	195	487
Cable-modem subscribers ('000)	6	14	52	120	260	350

Source: BAKOM

Source: Location Switzerland 2005: 4

E-Government in Switzerland

The move toward making public services and information more available via the Internet, called e-government, is underway in Switzerland. Driving the effort is a decision by the Swiss government in 2003 to make sure that the country moves into the top third of the European e-government rankings by the end of 2005. To reach this goal,

the eVanti.ch project was launched. Because the goals of the Information Society initiative have not been properly reached yet, the government had implemented a second strategy paper in 2006 ("Strategy for an Information Society 2006").

The Federal Administration gave its endorsement of the use of Open Source Software at the end of February 2004. The state considers Linux as a 'future potential standard operating system for the desktop'. At the same time an inter-departmental project called the 'Information Society Initiative' has been underway since 1998 to promote the use of information and communications technologies. Its goal is to encourage students and teachers to exploit the latest in Internet, mobile, and computing technologies. Run by the Interdepartmental Committee for the Information Society (ICIS), its website is www.infosociety.ch (Location Switzerland 2006: 4).

Basic and applied research

Telecommunications research and education at Swiss universities is comprehensive, from the physical layer (where electrical impulses, light or radio signals, are converted into a bit stream), to the network layer (where information is switched and routed) and up the applications layer (where end-users get the benefit from high-speed or wireless or mobile networks.) Physical layer researchers profit from Swiss basic research in physics, applying that know-how to solving bottlenecks in broadband networking.

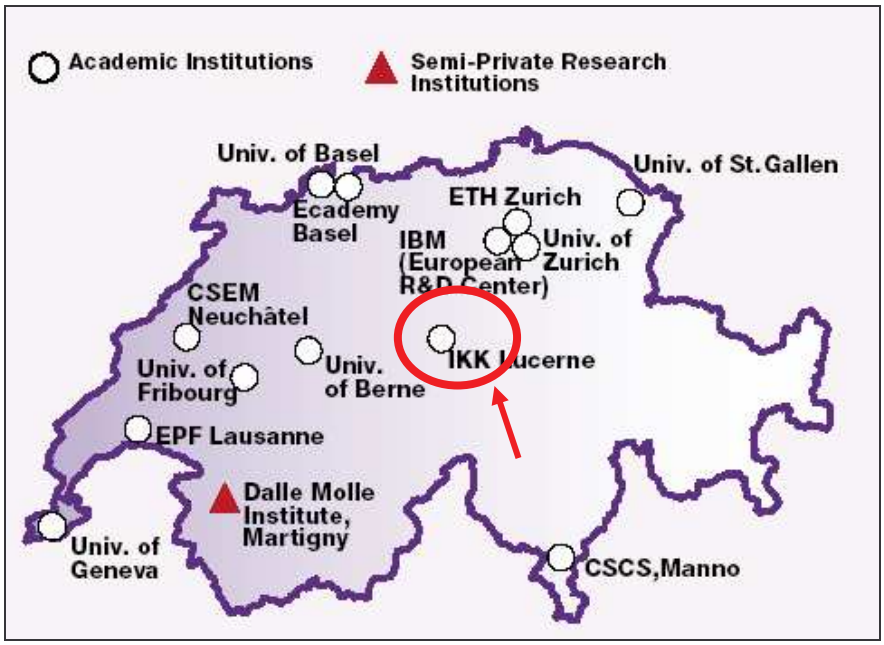
The Institute for Quantum Electronics of the ETHZ, for example, is developing optoelectronic waveguide components and semiconductor prototypes for fiber optic networks. Exploiting the Swiss tradition in microprocessors and advanced sensors, researchers at the ETHZ are working on ubiquitous computing projects, trying to wirelessly connect objects, including clothing, forming a world-wide distributed system several orders of magnitude larger than today's Internet. The Electrical Engineering department is working on the required hardware, while the Distributed Systems Group addresses the design and how to implement the infrastructure needed to enable communication and cooperation between the various smart objects.

Two aspects of mobile communication are addressed at the EPFL. The Institute for Computer Communication and Applications is renowned for its Terminode Project, exploring the concept of a mobile network without a fixed infrastructure. In this project, the terminals are the nodes. The approach to the research includes the physical, network, and applications layers. At the Mobile Communication Lab, information and coding theory is applied to wireless communications, working towards a vision of communications and access to information any time, anywhere.

Swiss universities have made significant contributions to signal processing for efficient transmission of audio and video data. For example the Signal Processing Laboratory at the EPFL has contributed to the development of parts of the MPEG standard now used in audio CDs and digital TV. Secure communication has not been neglected mhere. Switzerland has built an outstanding reputation for excellence in security theory. Currently, the Cryptography and Information Security Research Group at the ETHZ is developing new algorithms for encryption and new applications supporting the development of the information society.

The University of Fribourg is one of the very few places in the world to offer an Executive MBA degree in Telecommunications Management, as well as an Executive Diploma in Telecommunications Management. The IBM Zurich Research Laboratory is a prestigious European R&D Center in the world. Among other activities, the IBM Center in Zurich is very active in mobile computing and e-business. It track technologies that are key to mobile computing such as the Wireless Application Protocol (WAP) (Location Switzerland 2005: 10).

Academic institutions in the field of ICT in Switzerland



Source: Location Switzerland 2005: 11

Core competencies in research

Switzerland takes up a leading position in teaching and researching ICT technologies. Advanced degrees in ICT topics can be earned at the two Federal Institutes of Technology, one in Lausanne and the other in Zurich, as well as at several cantonal universities. Three quarters of basic research in Switzerland is performed at these institutions.

Higher education in information technology is concerned with how to create better software systems, attacking various aspects of the software hierarchy. For example, the hyper-database research group and the information and communication systems research group at the Swiss Federal Institute of Technology in Zurich (ETHZ) are specialized on middleware systems and heterogeneous database systems. Flexible, open software system design is a topic of the Software Composition Group at the University of Bern. Long-time data archiving is the focus of study for the Database Technology Research Group at the University of Zurich.

Improving the user interface to replace the mouse and the keyboard with more natural input modes such as speech, pen, body movements, or even direct capture of brain activity, improving systems to access indexed archives of multimedia content, improving technologies that support human to human communications, these are the objectives of IDIAP (Dalle Molle Institute for Perceptual Artificial Intelligence, www.idiap.ch), a semi-private research institute located in Martigny. The company leads several national and international projects in these areas, including a National Center of Competence in Research (www.im2.ch) and collaborates with EPFL, ETHZ, and major universities in Switzerland and abroad.

Computer Graphics is another key area of advanced research in Switzerland. This is enabling a wide range of applications in science, engineering, art and entertainment. The MIRALab, an interdisciplinary creative research laboratory, at the University of Geneva, is known for advanced simulations of human structures and movements.

In Zurich, the Computer Graphics laboratory of the ETHZ explores new fundamental methods for interactive image acquisition and generation, scientific visualization, as well as virtual reality and medical simulation. Research at the Institute of Computer Science at the University of Basel is directed towards the development of numerical algorithms applied to the solution of a wide range of technical and scientific problems. Building on a foundation that includes the invention of the computer languages Pascal, Modula and Oberon, the Institute of Computer Systems of the ETHZ works on the advancement of programming languages and operating systems. Located in Manno, the Swiss Center for Scientific Computing (CSCS) provides the Swiss scientific and computational community with high performance computing and networking resources and hosts a research group in computational sciences. It promotes scientific computing via collaborative research and development projects with academic and industrial partners in Switzerland, Europe and worldwide. CSCS is part of the ETHZ (Location Switzerland 2005: 10).

Bioinformatics

Switzerland's universities produce excellent researchers and informatics specialists. This combined with a thriving pharmaceutical industry and government funded research at the universities has proved to be rich soil for building a bioinformatics cluster in Switzerland. Companies such as Novartis, Nestle, F. Hoffmann- La Roche Ltd, and Serono are the anchor firms in the Swiss bioinformatics cluster (Basel; 1 hour to Berne). They are not only consumers of bioinformatics products and services, they are also collaborators and co-developers. In addition, startup companies in the field of bioinformatics are flourishing in Switzerland, winning market share, creating jobs, and establishing their products as key suppliers to the global biopharmaceutical industry.

As for education there is a Masters degree in bioinformatics available through collaboration by the Swiss Institute for Bioinformatics and the Faculties of Sciences and Medicine of the University of Geneva and the Faculty of Sciences of the University of Lausanne. The Swiss Federal Institute of Technology in Zurich also offers courses in bioinformatics through an interdisciplinary program at its Institute of Computational Science. Zurich-based researchers have developed a powerful new bioinformatics programming language known as DARWIN and they are participating in BioOpera, an important component in grid computing for bioinformatics (Location Switzerland 2005: 5).

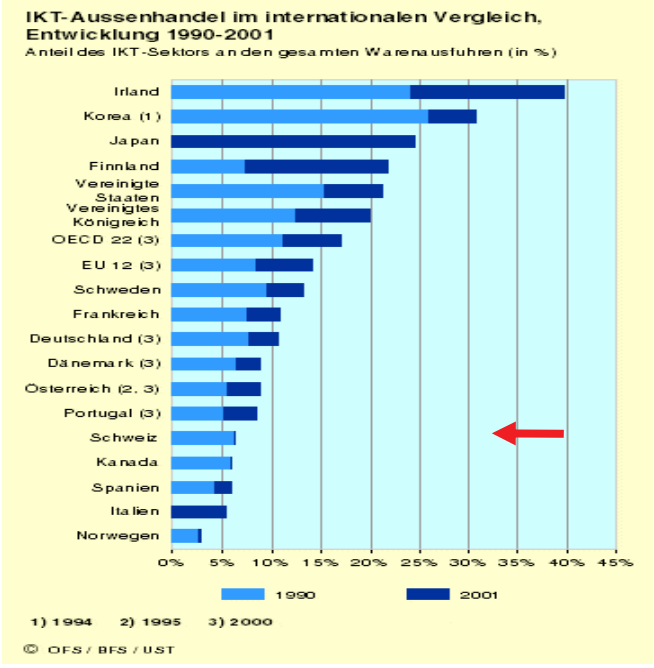
CERN

Two research groups in Switzerland, the European Organization for Nuclear Research, known as CERN, and the Swiss Institute for Bioinformatics, are playing key roles in developing a whole new generation of ICT technologies known as 'grid computing'. Geneva-based CERN is the same research organization that laid the foundation for the Internet revolution when British researcher Tim Berners-Lee created the hypertext protocols for the World Wide Web. In many ways, grid computing is like the Internet and the Web. A grid network makes available the processing power from clusters of connected computers, whereas the Web makes available applications and content on each connected machine. CERN is managing and driving the development of the European Union-funded DataGRID project, already in its second phase of development. The other major grid project underway is the Swiss BioGrid. It supports large-scale computational applications in bioinformatics by utilizing distributed high-performance computing, high speed networks, massive data collections and archives, as well as the necessary software tools and data integration capabilities. Five university research teams are involved in the projects, as well as Novartis AG in Basel, Switzerland (Location Switzerland 2005: 10).

3.1.4.1 Conclusion: The Swiss ICT sector in the international value chain and future trends

Switzerland is an intermediate country compared to leading ICT countries like Finland, Sweden, and Denmark and bigger export countries like the U.S. or Germany. Switzerland's growth drivers in the field of ICT are the software development and services sector, which is mainly characterised by many small companies, as well as the telecommunications service sector which is dominated by a few large players. Switzerland is still very dependent on international companies. In the field of computer hardware as well as telecommunication hardware (Microsoft, IBM, Nokia etc.). Nonetheless Switzerland has a few success stories in niche hardware technologies (Mobile Unlimited etc.), which are also sold internationally. Especially in the ICT segments of medical devices and other precision instruments as well as watches Switzerland is among the leading countries. All in all, the Swiss export in ICT is still very marginal compared to other countries:

Export rate in ICT compared to other countries

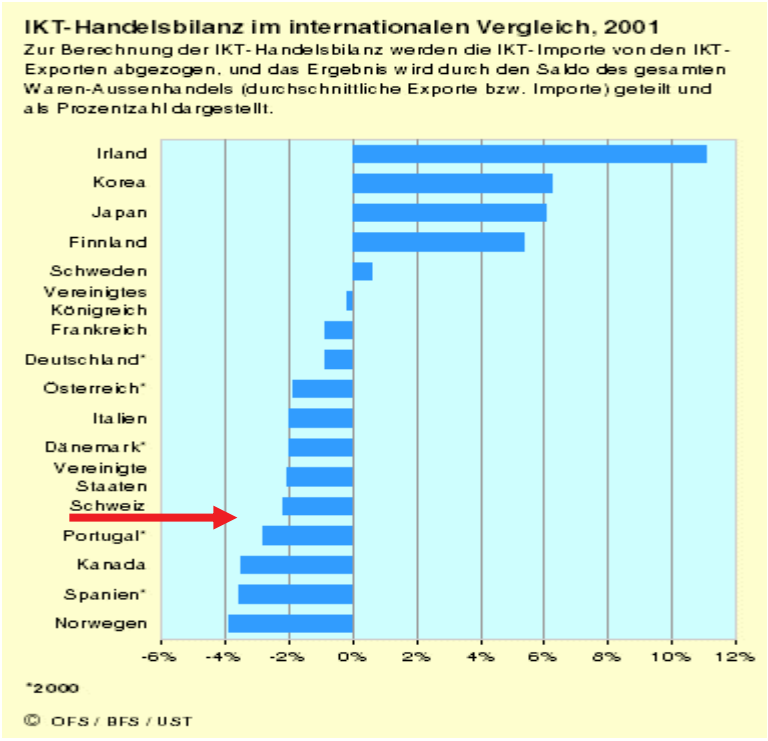


Source: BfS. www.bfs.admin.ch

As already mentioned, the growth drivers in ICT export are niche technologies in telecommunications (32%) and of course scientific instruments (medical devices etc./ 37%). *"Especially in niche segments like mobile technologies (Swisscom Eurospot, Comphone AG; Mobile Unlimited, Bioinformatics etc.) Swiss companies have also pioneered leading technological innovations, which are interesting for other players"* (INT_5). But the core competencies of ICT companies in Switzerland are NOT in the field of product innovation coupled with a focus on special service segments, but rather in the field of a strong general service quality, a high productivity and close relationships to regional and national clients (which are mostly SMEs in all sectors). Because a good reputation plays an important role in service industries the Swiss SMEs benefit from their strong regional customer relationships. A lot of the customer relationships result from informal contacts and regional networking: *"Switzerland's economy is characterised by SMEs with highly qualified human capital. The high living standard*

specifically contributes to strong motivation, a good working atmosphere and thus a high productivity. Swiss products are well-known for their quality" (INT_11).

Export rate in ICT compared to other countries



Source: BfS. www.bfs.admin.ch

Switzerland's economy is dominated by the tertiary sector and that is why its balance of trade in ICT - like in many other advanced small 'service-based countries' - is negative. *"Switzerland is no manufacturing country but a user country. There are some components of the value chain that could be made in Switzerland in the hardware sector but to a much lesser degree. It is the same for the IT and telco services segments. There are some high quality service providers which are specialised on international niches, but to a much lesser extent. The biggest software export really works within a company like UBS ant thus never makes it to the balance of trade figures. We don`t have an export oriented ICT market in Switzerland. In general we are an end-user country in the field of IT and telecommunication infrastructure and software. And in using IT and telco services infrastructure we are not bad!"* (INT_8). Additionally 20% of the IT companies rely on Swiss application software. For those companies the Swiss Software is as important as foreign software.

Table 2.2. Classification of EU Member States with regard to the development of their ICT sectors

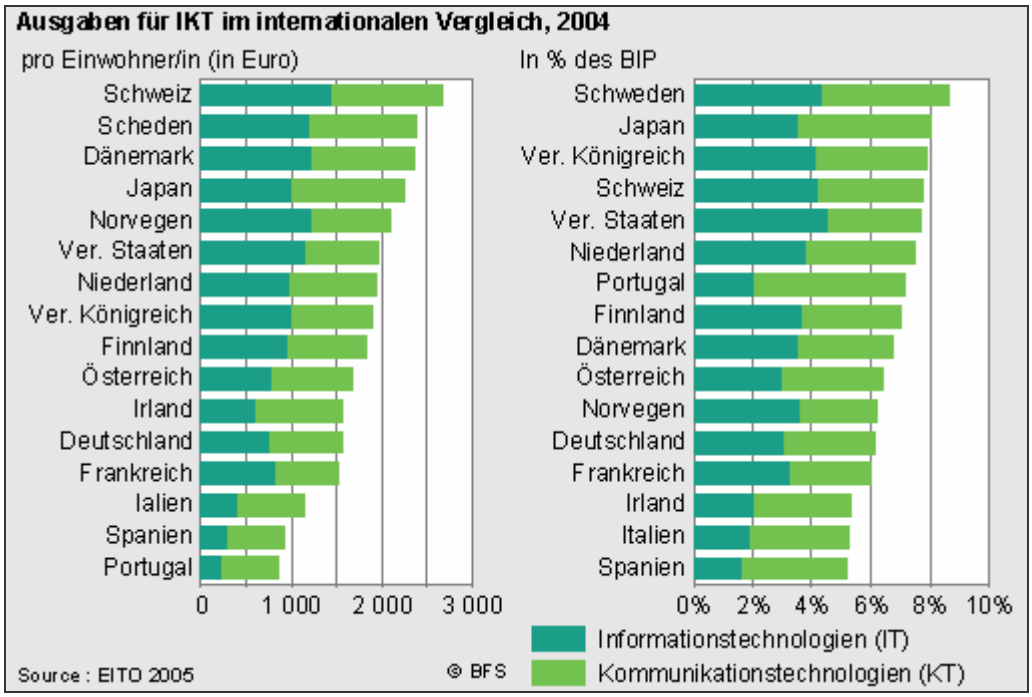
Switzerland

Independents	Intermediates	Dependents
Finland	Austria	Greece
France	Belgium	Luxembourg
Germany	Denmark	Portugal
Italy	Ireland	
Netherlands	Spain	
Sweden		
United Kingdom		

Source: Friedewald et. al. 2005: 12

The Swiss telecommunication infrastructure and services are excellent and the per capita spending on ICT is very high by international standards:

Spending on ICT in Switzerland in international comparison compared to GDP of the country



Source: BfS 2006 (www.bfs.admin.ch)

Future trends and challenges in IT in Switzerland

Atop the international IT trend (convergence between IT and telecommunication technologies through web based systems) there is also a Swiss trend to professionalize the services (INT_12). The specialisation on business processes and business consulting is getting more and more important. A clear indication for this is that IBM

bought PWC (INT_8). The core competence of the IT companies will be in the field of consulting und business process reengineering with the help of user friendly IT. There will be much more flexible relationships between the clients and the service providers with the help of new software. Equally, there will be a need of qualified and highly skilled computer scientists and consultants in this field. (INT_8; INT_9). On the other hand there will be a standardisation in software development. Concurrently outsourcing of standardised software development processes in low cost countries will increase. Future challenges in the field of IT will be to provide the country with enough qualified human capital (INT_2). 'e-health' and 'e-government' are particularly promising new segments for for all IT players in Switzerland. The major challenge will be to handle the cantonal fragmentation (INT_6): "Federalism really hinders fast governmental decisions in e-health and e-government. There is a information society strategy in Switzerland but it is not as ambitious as in the other European countries, like the e-Europe Strategy 2010 for example" (INT_3).

Future trends and challenges in telecommunication services in Switzerland

Future developments in telecommunication services are not easy to forecast in Switzerland, because regulation still plays a major role in the Swiss market. Much will depend on how the "last mile" will be unbundled in Switzerland and how the government will treat Swisscom in the future.

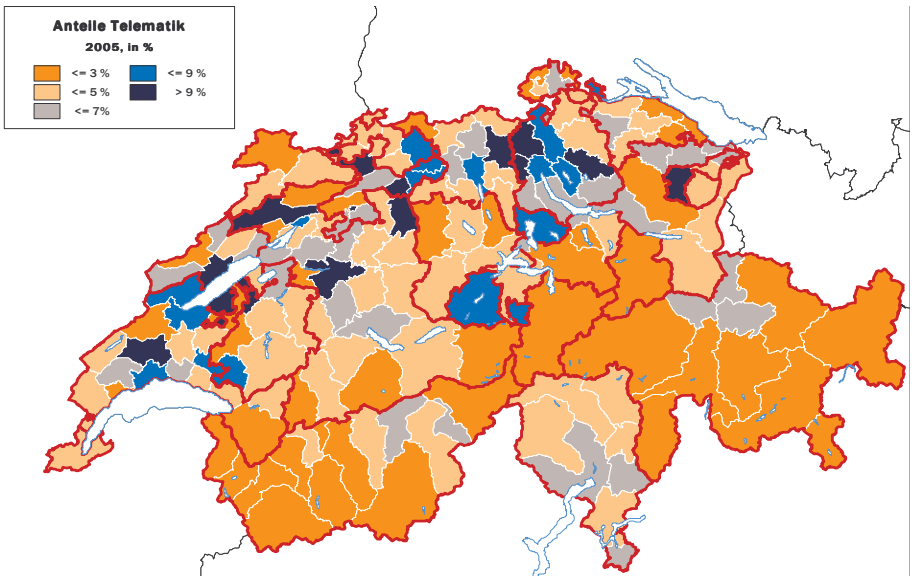
Additionally different business scenarios are possible: For example a duopoly situation could occur (INT_4): On the one hand Swisscom could operate as a successful full package provider in the field of broadband, mobile and fixnet (Triple Play) adding a new role as player in the TIMES market (entertainment, content) spurred by its alliance with Vodafone. On the other hand Cablecom could build on its core competence as a content provider and expand into the mobile and fixnet areas in alliance with Sunrise. Pending a clear regulatory situation, however, many other development scenarios remain possible.

If the new regulatory framework is as yet unclear the threat of the VOIP technology to the traditional fixnet players is very real and industry forecasts speak of a dramatic price erosion in this segment by 2010. The concerned companies have to find alternative growth strategies that might lie in the content and media entertainment sector (games, TV). At the moment it is still unknown for which content there will be a market. Furthermore the providers are still searching 'killer applications' for UMTS.

A further problem zone in the field of telecommunications may arise because of the site regulations in mobile communications, as more and more bandwidth is needed for total mobility services*: "In Switzerland there will be only ½ GHZ possible because of regulatory obligations, but according to actual forecasts in the EU we will need about 2 GHZ for future services. I do not know how Switzerland will solve this problem, especially if new killer applications arise on UMTS"* (INT_4). Even if many uncertainties litter the development path of the Swiss ICT development one soothing certainty remains and is even applicable worldwide: The telecommunication business will look totally different in 10 years (INT_4).

3.2 Overview of the regional ICT sector

The Berne region is one of the favourite ICT-Regions in Switzerland.



The regional ICT-Sector has the following structure

	Total Turn Over (Mio. Euro) (2001)	Number of Employees (2001)
NACE Categories	Regional[1]	Regional
30.0 - Manufacture of Office Machinery and Computers	109.9	2538
31.3 - Manufacture of insulated wire and cable	5.3	39
32.2 - Manufacture Telecommunication Equipment	479.2	1132
32.3 – Manufacture of Consumer Electronics	14.8	12
33.2 - Manufacture of Instruments and Appiliance	156.5	1006
33.3 - Manufacture of industrial process control equipment	79.7	611
64.2 – Telecommunication Services	8396.7	19421
72 – IT Services	1247.0	8536
Total	**10489.3**	**33295**

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

[1] It has to be taken in consideration that the regional turn over is calculated on the bases of tax statistics, with its entire possible disadvantages; means there could be mavericks (big companies), which could lead to a wrong impression.

Data Source: BfS (Swiss Federal Statistical Office; Mr. Wüthrich) Census of enterprises: **2001** and Federal Tax Administration Berne (Statistics and Documentation: Mr. Daepp)

Evolution of the regional turn over in the sector

	Total Turn Over (Mio. Euro) (Regional)[2]	
NACE Categories	2001	2004
30.3 - Manufacture of Office Machinery and Computers	109.9	127.3
31.3 - Manufacture of insulated wire and cable	5.3	3.9
32.2 - Manufacture Telecommunication Equipment	479.2	291.0
32.3 – Manufacture of Consumer Electronics	14.8	31.3
33.2 - Manufacture of Instruments and Appiliance	156.5	167.4
33.3 - Manufacture of industrial process control equipment	79.7	71.3
64.2 – Telecommunication Services	8396.7	8595.6
72 – IT Services	1247.0	1752.2
TOTAL	**10489.3**	**11039.5**

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BfS (Swiss Federal Statistical Office; Mr. Wüthrich) Census of enterprises: **2001** and Federal Tax Administration Berne (Statistics and Documentation: Mr. Daepp)

[2] It has to be taken in consideration that the regional turn over is calculated on the bases of tax statistics, with its entire possible disadvantages; means there could be mavericks (big companies), which could lead to a wrong impression.

Regional sector share in the Gross Domestic Product (GDP)

	Regional GDP/Head (employee) Total (Euro)
1995	54758
1996	54635
1997	53611
1998	54616
1999	55409
2000	58600
2001	61571
2002	64624
2003	63205
2004	63580

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BAK (Basel Economics)/ *ICT data aggregated* out of NACE classifications: 30-31; 32; 33; 64; 72

	Regional (nominal) GDP	
	Total (in Mio. Euro)	ICT Sector's Share (%)
1995	28925	8.2%
1996	29120	8.7%
1997	28489	8.6%
1998	29385	8.8%
1999	30064	9.0%
2000	32002	9.1%
2001	33861	9.2%
2002	35583	9.7%
2003	34716	9.6%
2004	34993	9.8%

Calculated at the official conversion rate of 1 Euro = 1,5773 CHF (April 2006)

Data Source: BAK (Basel Economics)/ *ICT data aggregated* out of NACE classifications: 30-31; 32; 33; 64; 72

Nominal GDP 2004 in Mio. Euro

NACE	Nation	Region	Share Region/Nation in %
A30	135	39	29.1%
A3132	3777	260	6.9%
A33	7444	800	10.8%
A64	8602	1767	20.5%
A72	5057	591	11.7%
GDP	288690	34993	12.1%

Source: BAK Basel Economics 2006

3.2.1 Main Characteristics

In comparison with the other regions in Switzerland Berne has a high amount of companies in the field of telecommunications (telco service providers and infrastructure providers) on the supply side that is complemented by a high density of administrative departments on the demand side (public sector: 25, 9 % in Berne; 21,9% in Switzerland). The City of Berne is the seat of the Federal Government. This makes Berne the ideal location if you wish to take advantage of proximity to Swiss public authorities and to the main administrative centres. *"There are some companies which come to Berne even just to be near the public authorities and to do lobbing"* (INT_11). Key Federal Administration offices and national organizations are based here, including, for instance COMCOM and OFCOM, the Federal Office for Communications, which is responsible for, and supervises, radio and television, telecommunications services, the entire broadcasting system and telecommunications equipment. The Federal Departments adhere to a 'transparent contracting'-policy which forces them to do due diligence in their purchasing activity. Large projects are open to international bidders so that regional providers might loose against foreign firms (INT_8). *"That means the Federal Department can loose a very good IT provider in the region only because somebody in Germany has a lower price. Other criteria like trustful relationships, which are important at ICT market transactions don't count any more (…) That is also why the companies don't specialise on the Federal Departments even if they are an attractive regional client basis"* (INT_8). But there are attractive projects with public departments especially for global players and bigger companies*: "T-Systems did a full outsourcing project for the university hospital and railway services. These are really attractive clients for global players too"* (INT_6). E-business is next on the list of attractive market segments where international bidders can hope to capitalize on. Not all contracts go abroad as the federal government for example has also has a software and IT provision contract with local BEDAG (INT_6). Inevitably such players contribute to the knowledge and growth of the region's ICT segment.

Neither the financial sector (Bern: 3.2% and Switzerland: 5.3%) nor the international headquarter industries (pharmaceuticals, chemicals, UN) dominate in Bern as much as they do in Zurich, Basel or Geneva. But even the international headquarters are no stable variable. For example SUN head a bigger project with the Federal Department in Berne and that is why they opened a temporary subsidiary. They reduced the subsidiary because no further projects came forth (INT_8).

One characteristic of the Berne region may be the great number of SMEs in other sectors, which rely on Swiss IT and service providers in the region. Especially SMEs in the Berne region prefer Swiss companies as service providers. The advantages of the 160 SMEs in Berne in the IT sector might be the hundreds of SMEs in other segments (medical, design, energy, watches etc.), which are a more or less a stable regional customer base.

With Swisscom the biggest and most successful home-grown player in the field of IT and telecommunication services is active in Berne. There is a significantly positive effect for the location, because Swisscom is actively involved in networking with smaller companies as well as research institutes in the region and is also an active member of the tcbe (INT_3).

According to figures compiled by the Federal Tax Administration, the Canton of Berne has the most moderate rate of tax of all major Swiss cantons, which adds to its attractiveness as a location for companies. Thus three of the five top providers - IBM, T-Systems and Swisscom IT Services - are located in Bern (INT_6). T-Systems even has its' Swiss headquarter (global account management client) in Berne (INT_6). This may be an advantage for SME companies too (knowledge spill over, learning). With the Berne Economic Development Agency (WFB) putting a lot of work to support foreign investors there are in fact attractive conditions for global players in the

Canton. There are strong ties between the cluster organisation and the governmental bodies in Berne, too (INT_11).

Furthermore the multilingual skills of the human capital in the Canton Berne are an advantage for the location and attract many investors. A lot of call centre functions are located in the bilingual city of Biel/Bienne. Similarly, T-Systems has decided to move to Berne because of the language skills in the heart of Switzerland (INT_6).

The geographically central position of the Canton Berne in Switzerland is an advantage for all companies who are located here, because they are able to reach the attractive market in Zurich, as well as Basel, Lausanne and Geneva within an hour (INT_3). Berne is in the centre of Switzerland and benefits from a very efficient transport infrastructure. Whether by plane, train or car, almost every major city in Europe is only a few hours away. This central location enables companies to exploit European markets from the heart of Europe.

Taken the core competences of the companies it is obvious that there is no specialisation in Berne.

4 ICT CLUSTER

4.1 EVOLUTION OF THE ICT CLUSTER

The cluster emerged in the mid 90ies when the ICT Boom swept from the U.S. to Europe after liberalisation and deregulation policies had been implemented there. In Switzerland the first companies to realised the change were the big financial institutes like the Credit Suisse and the large insurance companies, which started to adopt a lot of computer technology in the 90ies (INT_2). The first cluster initiatives as well as the starting point for ICT-SMEs in Berne arose in the mid 90ies when a rapidly changing regulatory environment coupled with fast-evolving technological developments opened up opportunities for young companies. Home to various applied technical colleges as well as a large university the initial Berne cluster was fuelled by ideas emanating from these institutions and was soon home to a palpable number of start-up companies. Deregulation, privatisation and liberalisation in the field of telecommunications and postal services also generated a spin-off boom with large companies like the Swisscom and Ascom (former PTT infrastructure provider) shedding young firms. As the new technologies propagated in businesses the public sector in general but also hospitals or railway companies began to recognise the usefulness of new ICT technologies. This dawning along with the excellent ICT infrastructure in Switzerland created an attractive market in the Canton Berne for well known global players in the field of IT, Telco Services and Infrastructure like IBM, SAP and T-Systems, Orange, Siemens, Cablecom as well as for the former PTT monopoly companies like Swisscom IT Solutions and Post Information Technology Services. Equally hundreds of SMEs in the region benefited from the situation. Networking between all actors was supported in a targeted manner by the cluster organisation tcbe, which itself was created in 1996 (Fischer 1996):

The Telematik Cluster Berne association was officially founded in December 1996 with the development of the "Verein Telematik Cluster Bern". An important impulse for this initiative was the program "Sechs Offensiven für Bern" and the economic concept of the city ("Wirtschaftskonzept der Stadt Bern") in the year 1996. At the beginning of 1996 incubators (public authorities, university members etc.) carried out a study, which also incorporated suggestions to strengthen the ICT location Berne. After the analysis the founders of tcbe realised that the ICT actors in the region lacked a meeting platform to exchange useful market and technological know-how. They also found that there should be an active promotion of the region in the field of ICT to attract customers as well as foreign investors. This should strengthen the existing potential in the ICT sector foreseeing a positive feedback between the nascent sector and the high concentration of administrative activity (former PTT; Ascom etc). The tcbe team also aimed at strengthening the image of the training and education location (apprenticeships) by a host of events be they formal or informal. Networking and location marketing became intertwined through exhibitions, fairs, conferences, consulting and information services etc. Today the Telematik Cluster Berne (tcbe) focuses on collaboration between business, training/tuition, trade associations and local authorities. The cluster association boasts a heterogeneous membership ranging from public authorities, research and training institutes to private companies (Fischer 1996).

Some milestones in the history of the tcbe are:

1998: "Telematik Tag" (TTB): First ICT Cluster day with speeches and workshops uniting over 250 participants

tcbe established itself also as federation of employers in computer sciences (secondary education) together with regional education authorities; tcbe homepage with company profiles, newsletters and networking possibilities for tcbe members

1999: Presentation of Cluster members and the tcbe in the city of Berne; "Schulen ans Netz" e-learning initiative of cluster members, especially Swisscom; tcbe realised 50 apprenticeships in the field of ICT; Job Fair; Venture Capital as key topic; Cluster organisation acts as matchmaker between companies and Venture Capital

2000: 3rd. Cluster day - Mr. Brand presents Swisscom`s e-portfolio; Prof. Hotz-Hart speaks about ICT research networking among the Universities of applied Sciences; software outsourcing to India is a hot topic for the cluster organisation and its members; partnering activity with Indian software companies; lack of software specialists as another central topic; BEA Expo in September 2000 (Economic Fair Berne); results of a regional survey point out that there is a lack of apprenticeships and training opportunities in Berne; Standards in the field of ICT training/tuition (content) for secondary education are set and implemented in april 2001; tcbe tries to provide the cluster with new educative infrastructure – a training center for secondary education is created.

2001: The Cluster day 2001 is combined with a three day expert conference on ICT topics and the BEA Expo (economic fair) which has a focus on ICT this year; tcbe continues to provide essential information for its members through newsletters; economic fair of the chamber of commerce; tcbe involved in "Informatikoffensive 2001" an governmental initiative to strengthen the secondary ICT education in Berne carried out by i-be (http://www.i-be.ch/), which also led to the implementation of the same initiative on the national level i-ch (http://www.i-ch.ch/index_d.cfm). Tcbe is also working on the development of standards in ICT education.

2002: Overall economic crisis in ICT, but cluster membership increases to about 210 members; successful i-be initiative creates new apprenticeship training positions; further initiatives in the field of basic and advanced training; special awareness of the importance of the content sector (media and broadcasting) for the ICT; integration and networking potential of content related players in the ICT Cluster are analysed; some functions of tcbe are incorporated in innoBE (a governing body of all cluster initiatives in Berne)

2003: Economic crisis in the field of ICT; A teaching association (Lehrmeistervereinigung) could be implemented by tcbe and i-be; different task forces/work groups (Education/Training; Business Networking; Quality/Customer Benefit) were established in the organisation structure of tcbe

The tcbe starts the professionalization of the cluster management; the first step is an agreement for project management with innoBE AG

- task force (working group) "Business Networking": workshops in the field of marketing and sales management;
- task force "Customer Benefit": regional provider database, where only tcbe-members are presented
- task force "Education/Training": further initiative in standard setting for training in the field of secondary education
- ICT Cluster days: Topic: E-Government und E-Health
- Tcbe clarifies the creation of a sub organisation media and entertainment (content) in collaboration with the city of Biel. The establishment of the sub organisation does not take place
- "Cross clustering" with medical devices, consulting and environmental engineering clusters at the overall Berne Cluster days initiated by the Berne Economic Development Agency (WFB)

2004: task force: "Business Networking": Module: knowledge diffusion among cluster members;

task force "Innovation": workshop about patenting in ICT

Training/tuition initiatives are incorporated in the i-Bern GmbH, which was also involved in defining training methods and contents for secondary eduction in the region

EU project NICE (Networking Clusters in Europe) is being initiated with ICT Clusters in Germany (Paderborn), Finland (Tampere), Turkey (Ankara) and the Czech Republic (Ostrava)

2005/2006: Further professionalisation of the cluster management; Outsourcing of the office in January 1. to innoBE AG. Now innoBE AG is responsible for the whole management of the association telematic cluster Berne. The i-Bern GmbH is responsible for the for the whole management of the activities in the field of education / apprenticeship.

- tcbe has actually 191 members; collaboration with openBC a virtual networking platform provider
- task force "Business Networking": meeting of 60 companies, which discuss about new technology trends in ICT
- task force "Customer Benefit": Weekly Newsticker in the field of procurement in the public sector (Newsticker für Ausschreibungen)
- task force "Innovation": workshop about mobile technology trends in Asia
- task force "Communication": Advancement of the cluster journal focus tcbe, which informs about ICT-topics like CRM, e-governement, e-health and ICT training and education (about 6000 readers)
- ICT Cluster days gain more and more importance in 2006 about 1000 participants over 4 days (Comunal day, Government Day, Health-Day and Management Day)
- EU Project NICE (Networking Clusters Europe): Initial meeting in Dec. 2005 in Gelsenkirchen and excursion to ICT companies in North Rhine-Westphalia

Two trends are recognizable since the establishment of the Telematic cluster in Berne

- professionalization of the cluster management (over the time)
- change of the priorities of the cluster management: promotion of the location -> benefit for the cluster members

Especially the Telematik Cluster Days are a well established meeting platform for the cluster members and the industry in Berne now. *"It is a very important forum for the regional ICT industry where you can exchange useful information with potential clients and collaboration partners in an informal atmosphere in Berne"* (INT_10). At the moment start up and spin off activity have quieted down compared to earlier days. The market seems to be more or less consolidated in all ICT segments in Berne. There are new opportunities in the field of e-government und e-health, which are actually just waiting to be seized and which are especially important for the administrative capital Berne with its wealth of public and national institutions. (BIT; Kayo etc.). Currently one also expects that standards in e-government might be set in Berne.

The region of Berne is also a leading region with regards to cluster policies initiated as early as 1998. Almost 40% of all employees work in one of the six identified clusters. About ¾ of all projects in the field of economic development are located in one of the clusters (beco, 2004). The tcbe mainly consist of 160 SMEs with less than 250 employees but the cluster also has heavyweights like Swisscom, T-System, Orange, SAP and IBM as its members. Currently the association has about 200 members representing 110.000 employees including universities, representatives from the political authorities, industrial federations like SICTA, regional support organisations and other organisations from all areas of the ICT sector. Many of the IT companies are active in business application of standard business software. Many of the SMEs do have a regional client basis where SMEs, the financial sector and public departments play an important role. This is why safety and security related aspects play an important role form any tcbe members. (for example banking applications, data communication

etc.). Due to the membership of Swisscom and several related companies the communication sector is very important in the tcbe.

Taken the core competences of the companies into account it is obvious that there is no specialisation in Berne. The cluster specificities are training/tuition, with special focus on apprenticeships. Players are the Canton with his vocational school (GIBB) as well as the i-Bern GmbH initiative (secondary education). I-Bern GmbH pioneered standards in the field of secondary ICT education, which were also accepted nationwide (INT_3). Another Berne specificity might be lobbing and standard setting activities of the most influential players with view to all the Federal Departments and Associations (like SICTA as standardisation organisation in Switzerland, as well as the ComCom and OFCOM) (INT_11). Cross-clustering with the other clusters (Medical, Energy and Business Services) is another Bernese speciality.

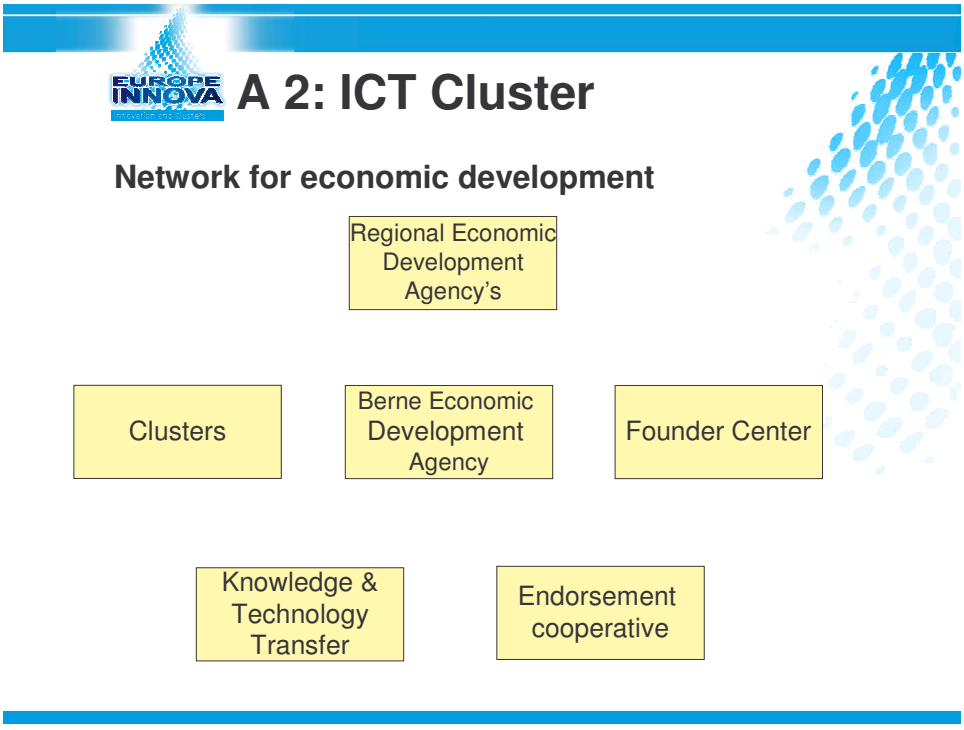
4.2 STATUS QUO

The Telematic Cluster Bern was founded on 13. December 1996 is today well established. It enjoys the confidence of politics, authorities, media, industry representatives, ICT offerers and with the users.

The tcbe is a non-commercial association (Article 60 of the Swiss Civil Code (ZGB)). That is why there is no requirement for an entry in the commercial register and we are governed by the statutory provisions set out in the Swiss Civil Code.

The tcbe has 191 Members. The cluster is characterised by many small companies, only 19 companies has more than 100 employees.

The tcbe is a part of the network for economic development in the Canton Berne:



The following partners are involved in the network:

- Berne Economic Development Agency (www.berneinvest.com)
- innoBE AG (www.innoBE.ch)
- founder centre (www.grueze.ch)
- Cluster Organisations: Telematic Cluster Bern (www.tcbe.ch), Medical Cluster Berne (www.medizinal-cluster.ch) Service Cluster (www.wbcb.ch)
- Regional Economic Development Agency's
- endorsement cooperative (www.bg-ccam.ch)

innoBE AG, the centre for cluster-management in the canton Berne, has the following three fields of competence:

Innovation management:

- development of innovation strategies and conversion of innovative projects
- definition and screening of cooperation partners
- customer and "lead user" questionings
- "idea solution" identification (creativity; technology; innovation)

Transfer of technology and knowledge:

- search for collaboration partners from economics and science
- identification of technology offers and customers
- support during the project
- transfer services within the partner network of the promotion of economic development in Berne

Cluster management:

- Cluster and project management
- organization of events
- cross clustering

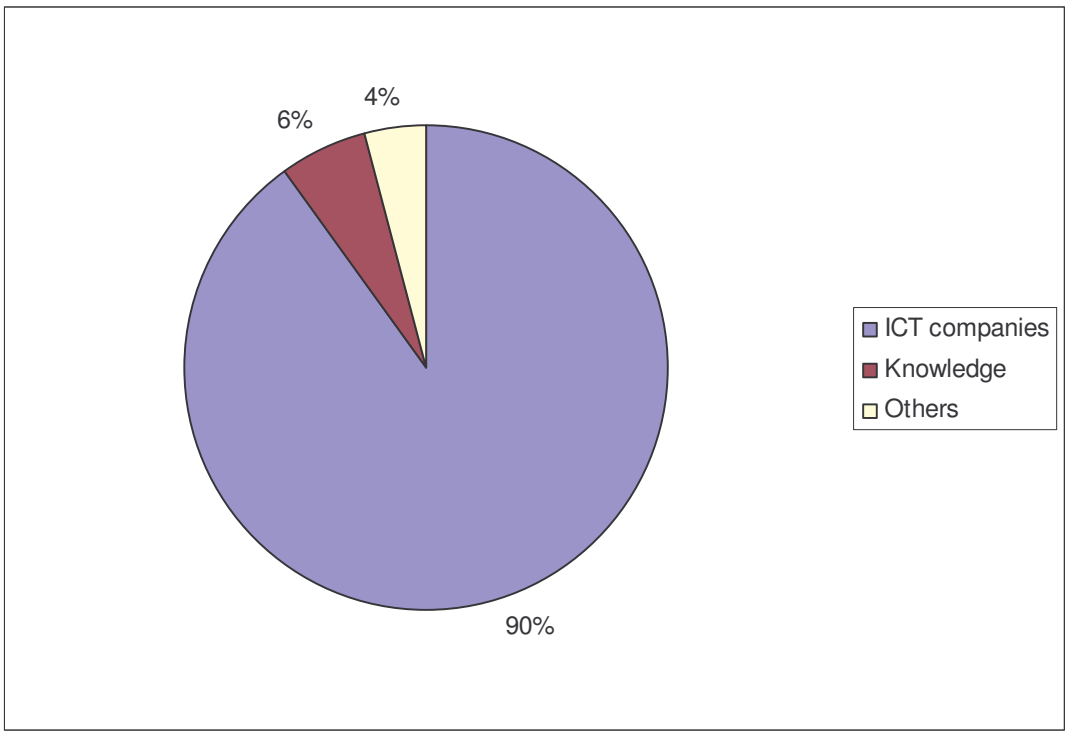
On behalf of the WFB (Berne Economic Development Agency) SMEs are supported free of charge up to three days concerning the topics: management, technology and knowledge transfer.

Within the tcbe (Cluster organisation) also other cluster members (public authorities, universities of applied sciences, schools, companies etc.) are active. Examples are the five permanent task forces:

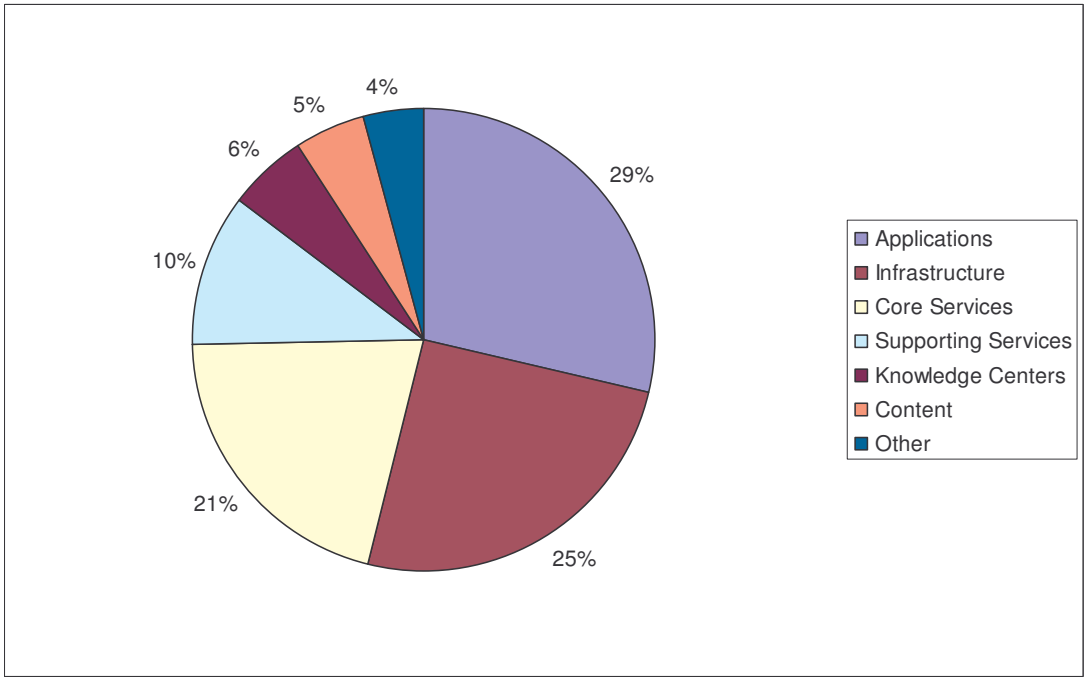
- Education (regional schools are involved like the GIBB)
- Business Networking (T-Systems, Heidiger AG, Sohard AG; innoBE)
- Know how transfer (Delec AG; BEDA; innoBE)
- Quality (Ruag Electronics; University of Applied Sciences Berne; innoBE)
- Innovation (Swisscom, T-Systems, InnoBE)

4.2.1 Clusters Structure & Competitive Position

The members are by the majority (90%) ICT oriented companies. The allocation into the individual fields of activity is relatively balanced. In our cluster is no specialisation visible. The peculiarity is the large variety, which can cover the cluster with its members.



Data Source: tcbe cluster-membership data base (April 2006)



Data Source: tcbe cluster-membership data base (April 2006)

		Total Number[3]	Share of Total
ICT companies	Applications	55.84	29.23
	Content	9.31	4.87
	Core Services	40.31	21.1
	Supporting Services	19.92	10.42
	Infrastructure	46.62	24.4
	Other (please specify)	0	0
Knowledge Centres	Research Institutes	1	0.52
	Universities, Colleges	3	1.57
	Other (please specify)	7 Schools for IT tuition and training (apprenticeships)	3.66
Other Members	Incubators	2	1.04
	Public Authorities	2	1.04
	Chamber of commerce	1	0.52
	Other (please specify)	3 SICTA (telco industry association) Lehrmeistervereinigung (IT teachers association) Kantonalbernischer Arbeitgeberverband (employee association)	1.57
	TOTAL	**191**	**100.0 %**

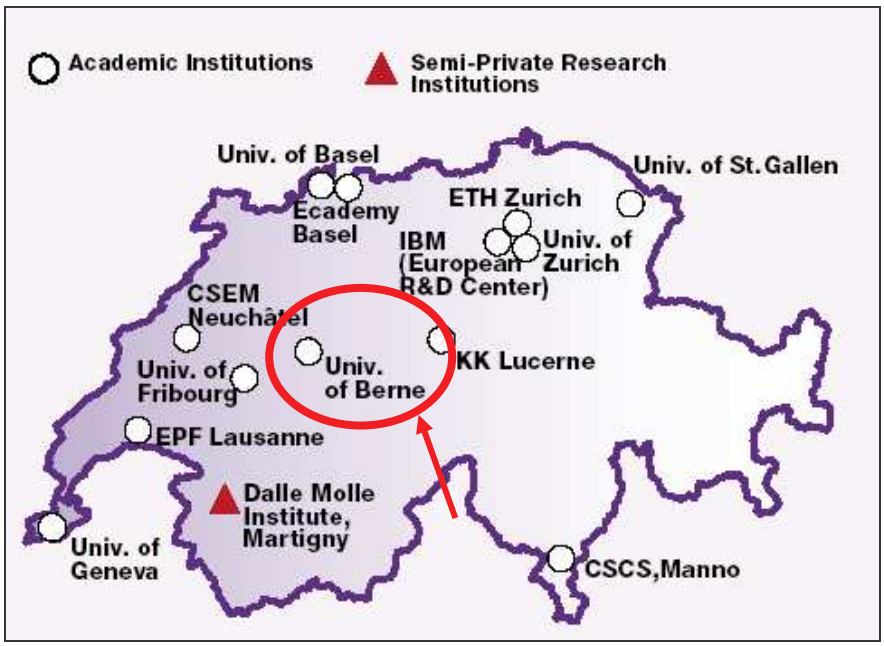
Data Source: tcbe cluster-membership data base (April 2006)

4.2.2 Factor Conditions (location of firms, human capital, infrastructure)

Most of the tcbe members have their company seat in the region of Berne. Only about 4% of the members are branches of international or outside based companies.

In Switzerland is it difficult to recruit well educated ICT personal. The skills of the ICT-workers are one of the most important capitals for the ICT companies. The tcbe supports as one of the key theme the education, especially within all ranges from the IT Tuition up to the university. In our region exists four schools for IT Tuition, the University of Applied Sciences Berne and the University of Berne. All other schools are reachable from Bern in about 60 minutes.

[3] There are a lot of companies, where no clear core competence could be identified. They do have competencies in different segments.



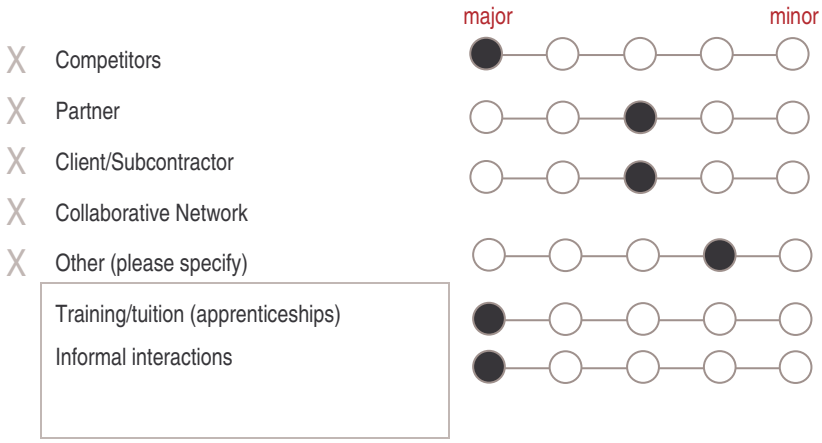
Source: Location Switzerland 2005: 11

4.2.3 Firms' Strategies, Structures and Rivalries

All key players in the region of Berne are member in the tcbe. One of the most important companies is Swisscom with the effect as an incubator and as leader in the field of ICT in Switzerland. Swisscom supported actively the activities of the tcbe and has a seat in the board.

The industry distribution of the members is very heterogeneous. All partial industries are represented as members. About 95% of the ICT companies in the region of Berne are SME's.

The relationships between the cluster members are very different:



There exist several different tools, activities for the active interlinking between the members

- X Joint projects
- X Periodic meetings
- X Formal knowledge exchange
- X Informal interactions
- X other (please specify)
  - Management workshops
  - Conferences, fairs, exhibitions, presentations

Main areas of co-operation within the cluster

- X Information and communication
- X Training
- X Standardisation
- X Marketing & PR
- X Other (please specify)

Special focus in training/tuition (apprenticeships) and in the field of standardisation close collaboration between industry association (SICTA) and regulative authorities

Normally co-operations between companies are not only driven by the cluster, one of the success factors is the network. But the cluster could be the most important platform for the personnel network.

4.2.4 Strength & Weaknesses

Strength

- Long experience with cluster management
- Integrated in the cluster policy of the canton of Berne
- Strong networking platform
- Success in interclustering
- Some projects with image (Telematiktage, IT-Tuition, ..)

Weakness

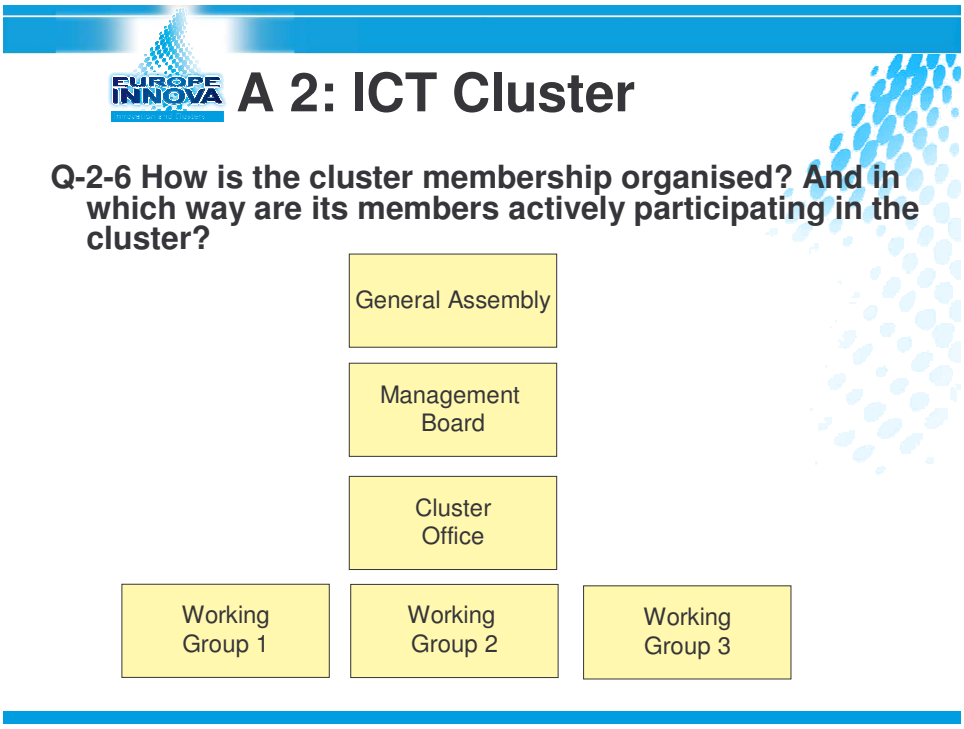
- Critical mass, many of the companies don't use the cluster
- The resources are on the minimum
- consider before the competition
- not enough joint projects
- Our member are often local orientated, instead of an international focus

4.3 Organisational framework & Cluster Management

The tcbe is organized as an association and has no shareholders.

4.3.1 Organisation

The organisation has the following structure. The top level is the general assembly. The second level is the management board (it has 10 members, 3 observers without voting rights and the cluster manager). The third level is the cluster office. The fourth level are the working groups.



There is an annual general assembly, where the guidelines and the cluster strategy will be defined. Every Member has the full right to vote and can bring in requests. The acceptance of the annual account as well as the release of the budget and annually planning takes place at the general assembly. The general assembly elects also the management board. This way the members can influence who will be in the board.

4.3.2 Cluster membership

There exist three different categories of membership in the Telematic Cluster Berne:

- Full Membership (provider of ICT Services): They have access to all services of the tcbe. They have full right to vote at the general assembly of the members.
- User Membership: They have access to all services of the tcbe. They have full right to vote at the general assembly of the members
- Formation Membership: They have limited access to the services of the tcbe. The access is focussed on the services in the field of education and apprenticeship.

Full members pay an entrance fee depending on the company size.

Entrance Contribution:

>25 Employee	CHF	800.00	Euro	ca. 550.00
25 – 100 Employee	CHF	1'600.00	Euro	ca. 1'100.00
> 100 Employee	CHF	3'300.00	Euro	ca. 2'100.00

All members pay an annual member fee depending on the company size. The formation members pay 2/3 of the annual fees.

Annual Contribution:

>25 Employee	CHF	150.00	Euro	ca. 100.00
25 – 100 Employee	CHF	300.00	Euro	ca. 200.00
> 100 Employee	CHF	600.00	Euro	ca. 400.00

4.3.3 Cluster Management resources (without i-Bern GmbH)

The following table shows the personal resources of the cluster.

Number of Persons	Status		Working time spent on CM (weekly hours)	Main tasks
	Part time	Full time		
1	X		10	Responsible for the cluster business Managing the cluster Interface to the members Project-Management Organisation of events and know how transfer
1	X		4	Administration Member Administration Accounting
1	X		1.5	President
8	X		0.2	Member of the board/ Steering committee, definition of the strategic and main activities of the cluster

The following table shows the annual budget for cluster management

	Annual Budget [1]		
	Total (Euro)	Personnel (Euro)	Share of Personnel Costs (%)
2001	207'075[3]	[2]	
2002	404'753[3]	10'197[2]	2.51[3]
2003	133'468[3]	47'446	35.56[3]
2004	92'662	38'427	41.47
2005	95'520	41'258	43.18

Calculated at the official rate of 1 Euro = 1,5773 CHF

[1] This amount contains a tied financing of the Berne Economic Development Agency to innoBE for the cluster management, who is not visible in the cluster budget

[2] This amount is not in detail available

[3] This amount includes costs for the education; this part is now delegated to i-Bern GmbH

The steering committee / members of the board work honorary. Many of the work are not visible in the accountings.

There exist two channels for funding the cluster, a basic founding through the economic development agency and the membership fees and a project funding.

		Basic Funding	Project Funding
X	Public funded by the regional government [1]	18'980.00	31'700.00
X	Member funded	31'700.00	
X	Other (please specify) Earnings through projects		12'640.00

Calculated at the official rate of 1 Euro = 1,5773 CHF

This amounts bases on the accounting from the year 2005

[1] This amount contains a tied financing of the Berne Economic Development Agency to innoBE for the cluster management, who is not visible in the cluster budget

The resources for the cluster management are on a minimal base. The advantage is that the cluster focuses the activities on this with the biggest benefit but sometimes is it not possible to support the members as it should be.

4.3.4 Cluster Management responsibilities

		Rating			
		1	2	3	4
X	Cluster events, Workshops, Conferences			X	
X	Fostering co-operation		X		
X	Internationalisation		X		
X	Supportive lobbying & government relations			X	
X	Consulting of Start-ups			X	
X	Positing of the cluster nationally and internationally			X	

1=infrequent 2=forthcoming 3=periodical 4=daily

5 POLICIES

Q-3-1: What cluster-related policies do exist on national/regional level and of what type are they?

Appellation	Policy Level		Type of Policy			
	National	Regional	1	2	3	4
Promotion of the "Location Switzerland" (attract foreign direct investment)	X	X				XX
Education policy		X			X	
R&D Policy: indirect region and sector focus	X					X
Support of SMEs (regional, sector focus)		X			X	
Berne Cluster strategy (1998)		X		X		
EU framework programs (R&D)						X

(1=interventionist, 2=direct, 3=supportive, 4=catalytic)

Only catalytic cluster policies on the national level, but actual debate in Switzerland to implement a cluster policy with stronger high tech focus (ICT, Pharma) in the new regional policy of 2008

In the following the term 'region' denotes the Swiss political unit of the 'canton' (Kanton). Regional policy in Switzerland is mostly organised on a cantonal scale. That means there are differences between the cantons in Switzerland in their policies and instruments like for example the support of SMEs (INT_11).

The first active phase of Swiss regional policy initiatives can be dated back to the mid 70s. The aim of the traditional Swiss regional policy focused on the support of economically underdeveloped mountain regions. The aim was to balance living conditions between the mountain areas and the other Swiss regions to avoid mass migration from the mountain regions to the prosperous centres. Especially loans and infrastructure aid were provided until the mid 90ies (top down approach). In the light of the changing macroeconomic environment (new technologies, flexible production, deregulation, globalisation etc.) several proposals to reform the old regional policies appeared. According to the NOREP (new regional policy) the regional policies in the mid 90ies focussed more on growth regions, flexible industry networks and an efficient use of subsidies. Instruments that were set up during this time were Interreg programs between Switzerland and the EU (1995), the Regio Plus program for rural areas and Innotour a program to strengthen networking and innovation in the field of tourism. Again there is no evidence of a direct cluster policy targeting high tech sectors (Luzio, 2004: 28-58). A lot of actors criticized that the present new regional policy (NOREP) did not change the traditional way of regional policy in Switzerland in an effective way.

Swiss economic growth problems led to the formation of an expert commission of the OECD and the seco drafting recommendations for a "new", new regional policy (NRP – should be passed probably in 2008) in

Switzerland. *"There was an analysis of the seco which showed five clusters on a national level in Switzerland. Additionally Michael Porter and Silvio Borner did a study together about national clusters in Switzerland and they of course found sectoral growth clusters like the watch industry (jura) and the pharma complex in Basel. Borner argued very much in favour of national clusters. The underlying theoretical concept is that of National Innovation Systems. He also said the possibilities of Switzerland are limited and if one was to have a cluster policy it would only make sense on a national level. Still, a concrete cluster policy on a national level has yet to emerge"* (INT_7).

On the national level there is only an indirect (catalytic) cluster policy. There is traditionally no direct industry support in Switzerland and thus direct (interventionist) cluster initiatives are regarded very critically. However there are promotion policies to attract foreign investment on the national level, which do have a strong regional and sectoral bias. Dr. Thomas Hafen (seco) mentions the following emphases in the promotion of Swiss regions (Barjak 2004: 26):

- Biotechnology (Basel, Zurich, Geneva)
- Medical devices (Lausanne – Zurich)
- Micro- and Nanotechnology (Lausanne – Zurich)
- Technical devices and Instruments (sensor technologies etc.) (Jura)
- ICT (Berne, Zurich, Luzern and other big cities)
- Shared Services and Headquarter Functions
- Environmental engineering

But as there is no direct cluster policy on the national level it is contested among experts how much the promotion of the location Switzerland is even catalytically focused on clusters. (INT_7). This is the same with R&D support by the state (see the next section 1; 1.1; 1.2). So far there are only R&D and the location Switzerland-policies on the national level, which focus indirectly (catalytically) on the support of regional clusters and sectors. With the referendum concerning new regional policies (NRP) this will probably change to a clearer cluster focus in 2008.

The vision of the NRP might strengthen the competences of the region (Canton) establishing the approach of public private partnerships (PPP) in those regional projects (bottom up approach). The OECD commission made the following suggestions for the NRP (NRP):

- The aim is to support all regions in Switzerland not only economically undeveloped regions.
- The role of the national departments will be much more passive, conceptual and coordinating.

The task of the national departments in the field of regional policy will be to implement long term programmes and coordinate them with sectoral policies. Especially the support of regional competencies through R&D (CTI), education and training in special sectors will be an important national task.

The endogenous potential of every region should be strengthened. Especially the active promotion and marketing (also on an international scale) of the regions capabilities and competences is one of the main instruments besides the strengthening of networking among actors and institutions and the support of entrepreneurship.

The foundation of technology centres and associations are some of the instruments. Especially networking between different actors and institutions is the aim. On the national level, synergies between regional and sectoral policies should be met (bottom up).

The commission especially pointed out the importance of supporting innovation and networking among high technology sectors through cluster activities. Within this concept the importance of cluster building and support is mentioned. The OECD report also focuses on the role of the "Fachhochschulen" (Universities of Applied Sciences) to support regional economic activities in Switzerland.

At the moment there is a lively debate about how much this new regional policy should be different from traditional Swiss policy, which had its focus on the support of economically underdeveloped rural regions. However the current trend with the NRP shows that political actors are aware that the strengthening of the countries economic core competencies in sectoral or geographical clusters is getting more and more important (INT_ 1; INT_7; INT_11). An indicator for this is the growing number of conferences and papers on this topic. Thus the BAK Basel Economics company is currently involved in two bigger projects on ICT and pharmaceutical clusters in Switzerland on behalf of the Swiss government.

5.1 The region Berne as a national first mover in cluster policy

"For us a cluster policy is the responsibility of the Canton" (INT_11).

Cluster policy is mostly defined on a regional level. The initiative for geographical cluster policy came 'bottom up' from metropolitan locations like Zurich, Bern and Basel but not from the national level (INT_7). In the beginning of the 90ies there was an intercantonal initiative ("Espace Mittelland") where cities like Berne, Fribourg and Neuenburg were involved. The aim was to establish an intercantonal cluster support, but the Cantons could not find a common ground and this triggered Berne's own Cluster policy (INT_7). Subsequently, the Berne Economic Development Agency has established all Cluster organisations and programmes in Berne. Initially these efforts were not thematically defined but only aimed at a subsidiary support. Most of the initiative should come from the business side (INT_11). Nonetheless the Canton Berne can be said to have an active cluster policy since 1998. First initiatives go back to 1996. Berne was the first mover among the Swiss regions at this time. Today, the aim of the cluster strategy in Berne is to strengthen the local and regional economy through networking among companies and training and research institutes. The Berne Economic Development Agency (WFB) is central in promoting and supporting the cluster organisations. There are three main instruments in direct cluster support according to the WFB (see also section: Q-2-6 for more information about the regional network):

- Promotion of the ICT Cluster on an national and international level (attract investors)
- Direct support of SMEs (with a Cluster focus: tax issues, financial support of products, formal and informal networking between companies as well as companies and research institutes, technology transfer via cluster organisations and technology parks; information about international research programmes etc.)
- Partial financing of the cluster organisations and innoBE AG (INT_11)

The beco mentions that in the year 2001 90% of the supported companies where in one of the defined clusters. In Berne there are six cluster initiatives, which are partially supported by the WFB as well as financed by membership fees: Telematik: ICT, Medical Engineering, Technical devices and Instruments (sensor technologies etc.), Business Consulting, Environmental engineering/Energy, Design.

Creation of value was the main criteria for the selection and thus the clusters were defined on the stratum of already existing companies and not initiated as development policies. Most of the Clusters are organised in a cluster association. Four clusters show this organizational setup: ICT Cluster Bern (tcbe), Medical Cluster (MCB), energy-cluster Berne (energie-cluster.ch) and Business Consulting Cluster (WBCB). The two other clusters are organized as supporting competence centres: Environmental Technologies Thun (ZUT) und Technology Transfer Centre Energy in Berne (TEVE), as well as the Design Centre Langenthal (beco 2004).

With the help of the WFB, the University of Berne, the universities of applied sciences and the 'Gesellschaft für Fertigungstechnologie' innoBE AG was founded, which is an organisation for knowledge transfer between science, the economy and the political authorities. *"Most of the innoBE members come from economy so they know the economy's needs. There are people from Swisscom, T-Systems involved there in the task forces"* (INT_7). The organisation is non-profit and aims at strengthening the different cluster economies with the help of knowledge and information. A special focus is on the generation of innovation through SME support. Especially products which are closed to the market are supported. There are also conferences and management workshops, as well as Cluster Days and networking projects with Universities and advanced technical colleges (For further information see: www.innobe.ch). Projects are realised in collaboration with the different cluster organisations and competence centres, as well as technology transfer centres at the universities like Unitectra (beco 2004).

Other instruments which focus on networking and support of SMEs in the Canton Berne are the "Gründerzentrum" (Centre where infrastructure is provided for SMEs; initiative of WFB) and Technology Park Berne. Further economic associations like chambers of commerce are involved in this common effort in strengthening the region and are closely interlinked among each other (for further information see: http://www.innobe.ch/3336/3464/3499.asp / see also Q-2-6).

A speciality of the ICT Cluster Berne is its leading position in the field of informatics apprenticeships. Berne was one of the first regions that truly implemented training standards in this field that had already been adopted by the other Cantons in Switzerland (INT_ 1). Inspired by the regional i-Bern GmbH initiative, a national association for standards in secondary education in the field of applied computer science called I-CH was set up as an organisation, with the goal of fostering training/tuition in the field of secondary education. Today, Berne is very active in the field of secondary education as the "Lehrmeistervereinigung" (teaching association in the field of secondary education in applied computer science) has its seat in Berne. *"A problem in the field of secondary education is to get qualified trainees and to create enough apprenticeships in the field of computer sciences at the moment. i-Bern GmbH wants to mediate in this field"* (INT_3).

The Berne Economic Development Agency (WFB) is actively involved in the cluster strategy. The basis for the activity is the Wirtschaftsförderungsgesetz (economic development law 1998) which was adopted in January 1998. To strengthen the economic growth the WFB promotes the location (Berne) abroad, mainly in Germany, Italy, France and the U.S. together with the organisation "Location Switzerland" (Standort Schweiz). The organisation portrays the advantages of Berne and acquires potential investors, mainly in the field of technical devices and Instruments, ICT, medical engineering, service industries, environmental engineering and design. The WFB itself supports the economy with consulting, networking and financial services. A further main focus is the support of innovative SMEs in growth sectors.

Since its 1998 inception the WFB accompanied 512 projects, which resulted in 8500 new jobs and about 1.5 billion euro (2.4 Mia. CHF) in investment. 106 projects where targeted at the settlement of new enterprises, 206

were targeted at supporting existing companies and 113 at supporting entrepreneurs. About 75% of the projects in between 1998 and 2004 went into one of the defined clusters in the region:

Technical devices and Instruments (sensor technologies etc.) : 171 projects

- ICT: 96 projects
- Service Industries : 49 projects
- Medical engineering/pharma : 48 projects
- Environmental technologies : 31 projects
- Design: 24 projects

251 companies annually report about the development of their projects. 80% of the companies could realize their projects or are still realising them. 2867 jobs were created in the region as a result of the support between 1998 and 2001. The actual investments topped expectations by 266 million euro (413 Mio CHF) (beco 2004). (For additional information on the WFBs responsibilities see also section: Q-2-6)

With the new regional policy the Canton Berne and the WFB could even gain more competencies in the field of cluster policy.

5.2 National and regional Cluster programs

There exist some national and regional programmes.

National programs – Catalytic or *very* indirect

Promotion of the "Location Switzerland" (attract foreign direct investment) – Focus on Switzerland's clusters and acquiring international expertise:

Biotechnology: Focus on main clusters in

Basel, Zurich and Geneva.

Micro and Nanotechnology mainly in the northern arc from Lausanne to Zurich

ICT in all areas in the northern arc from Geneva to Zurich, but also in Berne.

R&D Policy (Swiss Science Foundation and CTI) – Investment in the knowledge base of cluster areas

Swiss Science Foundation (basic research programs): Among others also focus on innovative ICT projects.

CTI (applied research programs): Focus on Life Sciences, Micro- and Nanotechnologies and ICT.

Regional programs: supportive and direct

Business development agency Berne (WFB): Cluster promotion and Marketing; FDI (together with "Location Switzerland")

innoBE AG: Organisation to strengthen networking among all the clusters in Berne; cluster promotion

Cluster organisations:

Tcbe: Association to strengthen the ICT Cluster Berne

MCB: Medical Cluster Berne

WBCB: Organisation of the Business Consulting Cluster Berne

energie-cluster.ch: Energy cluster organisation Berne

Supporting Competence Centers :

ZUT Thun: Centre for Environmental technologies

Technology Transfer Center (TEVE)

Technology Park Berne

Design Centre Langenthal

All in all, the annual budget for regional policy projects in Switzerland now amounts to 38.2 Mio Euro (60 Mio CHF). This could even increase with the NRP (70 Mio CHF). There is a slow trend towards more support of cluster regions and high tech sectors in Switzerland on the regional and national level. *"That doesn't mean to create clusters from the scratch, but to focus on strengths in Switzerland and to use the scarce resources efficiently. No subsidies of industries per se"* (INT_11). But the trend on the national level is still very slow because the lobby of traditional compensation policies with respect to underdeveloped mountain and rural areas is still strong. "It will be also the point that many clusters have to open up because they are so small and maybe have to go together with other regions in Switzerland. In comparison to international clusters we mostly don`t have the critical mass. Maybe it will be more or less the whole arc from Zurich to Geneva that is a real ICT cluster in Switzerland or maybe also Switzerland as a whole" (INT_7). There have been initiatives in Switzerland to do intercantonal cluster management like the "Espace Mittelland" project, but political fragmentation impeded further efforts. The cluster organisations work together, but the Economic Development Agencies remain competitors. A recent example is the AMGEN case, where political actors from different regions competed against each other to get the investment. Finally the national authorities intervened to mediate between the quarrelling fractions until AMGEN decided to invest in Ireland, politely noting that the Swiss "administrative chaos" hadn't helped. A further point of concern is the distribution of subsidies to clusters with the same focus in different regions. Put clearly, interregional competition may hinder a successful cluster development.

Despite interregional competition, the cluster initiatives on the Bernese regional level have had time to grow and have matured to a certain stage. Direct comparisons with other cantonal cluster efforts are difficult, however, since there is no universally accessible and comparable database of regional cluster initiatives and regional SME support in Switzerland (For more information on cluster studies in Switzerland see also: Barjak, F. (2004): Analyse der Innovations- und Wettbewerbsfähigkeit von Branchenclustern in der Schweiz – State of the Art. Publikation der Fachhochschule Solothurn).

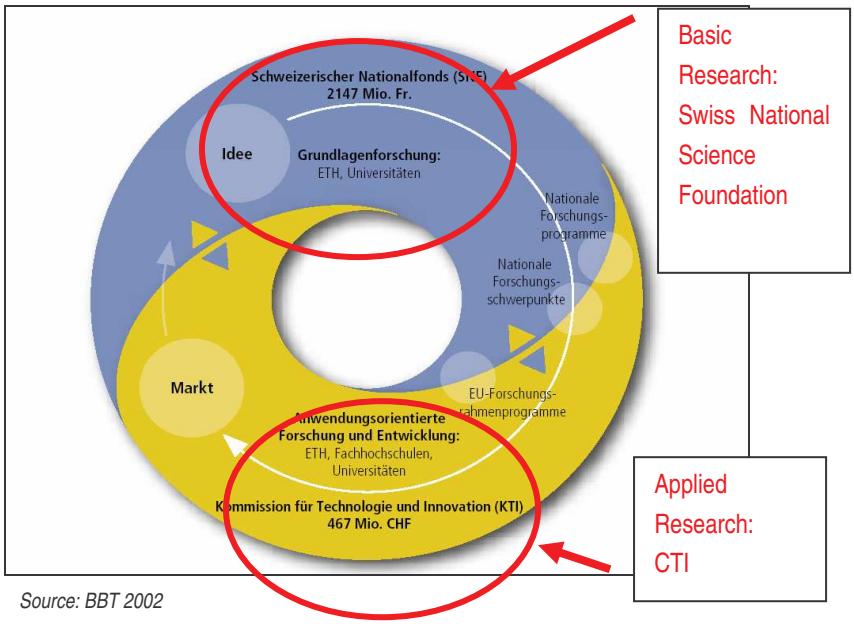
5.3 ICT-RELATED POLICIES/PROGRAMS EXIST

Appellation	Policy/Program Level		Type of Policy/Program			
	National	Regional	1	2	3	4
1.) R&D Policy:	X					
CTI (applied research)	X			X		
Swiss Science Foundation (basic research)	X				X	
2.) Support of SMEs/Entrepreneurs	X	X			X	X
Infrastructure policies (TKG – universal service infrastructure)	X				X	
3.) Information Society (e-health, e-government)	X	X			(X)	X
Cluster policies		X			X	
4.) Investment policies (tax policies)	X	X				XX

5.) Education policy (e-learning)	X	X				XX
Telco-Regulation (TKG) (see section Q1-2)	X		X			
6.) EU framework programs (R&D)					X	
7.) PPP (Private Public Partnership) in all political fields	X	X			X	X

"With the NRP (new regional policies in Switzerland (2008) the state wants to strengthen growth sectors. But again there is no explicit sectoral ICT policy. Implicitly there are strategies to strengthen the ICT as a growth sector (Strategy for the Information Society in 2006). Implicitly the state also focuses on networking and regional innovation systems, or clusters. But there are no real priorities for direct industry support. It is a priority to support successful industries regardless if they are ICT or not" (INT_7). "There is no direct national and regional ICT policy in Switzerland" (INT_11). Mostly the national level gives the framework strategy, but the concrete definition and the contents of regional policies are in the hands of the cantons (INT_7). As Dr. Hafen mentions in his speech at the foundation of the 'Energie-Cluster' Berne, Switzerland traditionally has no direct industry policy. But he recognises that the state has to allocate the scarce resources very carefully. Policy areas where the state supports industry activities at the national and regional (cantonal) level in the field of ICT are:

R&D policy in Switzerland (only national scale)



Source: BBT 2002

Swiss National Science Foundation (mainly basic research):

In the section 2 (Mathematics and Informatics) 250 projects (68 in the field of informatics) have been carried out in the year 2004; Subsidies in this field amounted to 4.7 Mio euro (7.3 Mio CHF) in the year 2003 and 5.1 Mio euro (8 Mio CHF) in the year 2004.

Swiss National Science Foundation (Nationalfonds):

- NCCR IM2: Interactive Multimodal Information Management, SNF- 2001-2004: 2.5 Mio euro (3,85 Mio CHF) per year
- NCCR Co-Me: Computer Aided and Image Guided Medical Interventions, SNF- 2001-2004: 2.7 Mio euro (4,25 Mio CHF) per year
- NCCR MICS: Mobile Information and Communication Systems, SNF- 2001-2004: 2.5 Mio euro (3,85 Mio CHF) per year

(Source: Dr. Stefan Bachmann; Schweizerischer Nationalfonds; April 2006)

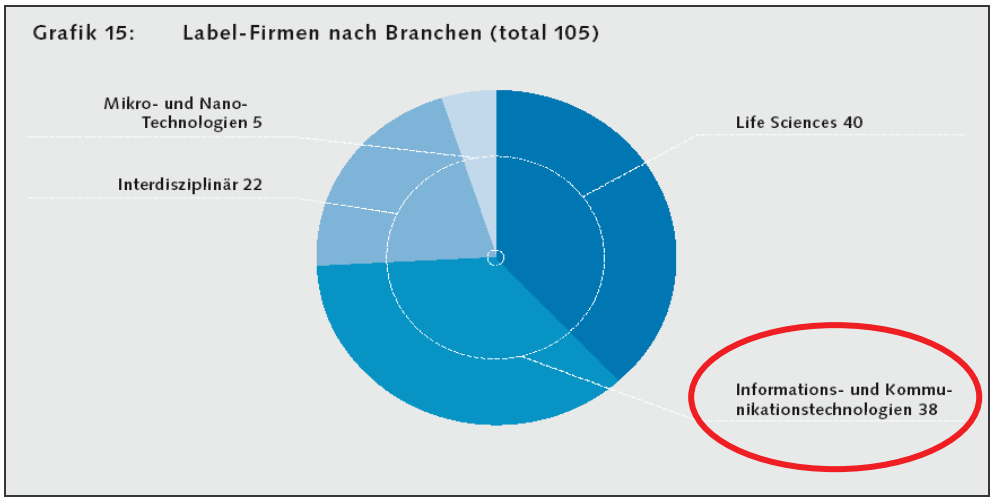
Details on all projects supported by the Swiss National Science Foundation are enclosed in the NCCR brochure "FNSNF (2006): National Centres of Competence in Research. Bern". It informs about the visions, the research topics and actual projects of the national competence centres in Switzerland. Several sections specifically outline ICT projects and competence centres, as well as ICT related topics (FNSNF 2006).

CTI (Commission for Innovation and Technology – applied research):

The CTI is a program anchored at the BBT the Department for Industrial Training and Technology. The aim of this program is to support the knowledge flow between universities and industry. Thus primarily projects with a clear focus on applied research are funded. The CTI has a strong focus on Life Sciences and micro- and nanotechnologies (Hafen 2004: 7).

The CTI supported 35 projects in the field of ICT in 2005 with an amount of 14.1 Mio Euro of R&D costs (22 Mio CHF). CTI financed about 5.9 Mio euro, which went to the universities and the companies spend 8.2 Mio euro (12.8 Mio CHF): 21 projects together with the universities of applied sciences (Fachhochschulen), 8 Projects with ETHs, Projects with universities, 1 project with other institutions *(Source: Thomas Bachofner; KTI; April 2006).*

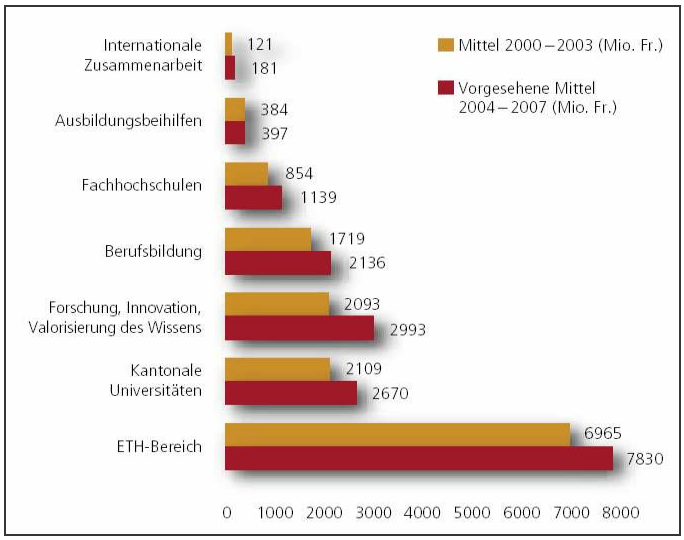
The number of SMEs which resulted out of CTI support in 2004 in comparison to other sectors



Source: KTI/CTI 2004

"The CTI has different categories. ICT is blue that means there is an active support of ICT. Pharmaceutical industries are in the category green; means there is also active promotion in the field of support" (INT_10).

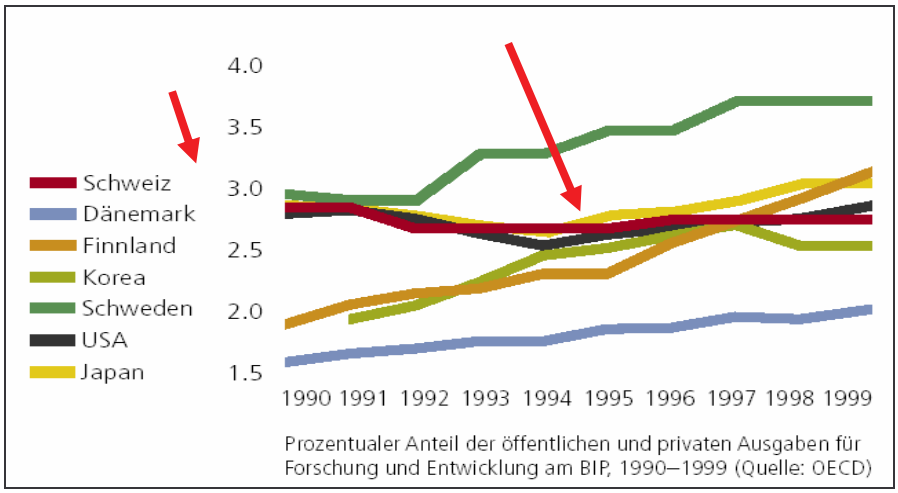
Resources for R&D spending in total (not only ICT) in Switzerland 2000-2007



Source: BBT 2002

„As a small player it is very difficult to get support from the CTI. It is not easy to get support. You always have to have a business plan and give a proof of principle. If you have a name like IBM or so it is no problem. But when you start as a student you do have nothing" (INT_2).

International ranking of total (public and private) R&D expenditures in all sectors: 1990-1999



Source: BBT, 2002

5.3.1 Support of SMEs/Entrepreneurs (on national and regional scale)

Another kind of policy is the support of SMEs and entrepreneurs. On the national level there is no clear focus on the sector of ICT. According to the Bonny Act there is an almost equal support of all SMEs in the country. On the regional level the WFB applies an indirect focus on the development of clusters through its SME support. 90% of the supported companies are in one of Berne`s clusters. Especially the field of ICT (96 projects 1998 – 2004) is the second most important field after the support of technical devices and Instruments (sensor technologies etc.) (1998-2004: 171 projects) (beco, 2004 and Mr. Weber; Department of SME support/seco, April 2006). Most interview partners mentioned that it is still not easy for a young company to get support by the government (INT_2; INT_10).

5.3.2 Information Society, Infrastructure policies

Even after the liberalisation the state has to provide a universal infrastructure in the field of telecommunications. This is also a way to support the ICT sector indirectly. As the new LCR (Telecommunication Law) will be signed in by 2007 the state may seize the opportunity to define minimum standards for basic infrastructure that has to be provided by the competing companies. The higher the standard (broadband access and ADSL as basic infrastructure) the higher the demand for ICT sector will be (Sabine Brenner; BAKOM; April 2006). Concerning internet diffusion, homepages and PCs Switzerland is in a leading position in Europe.

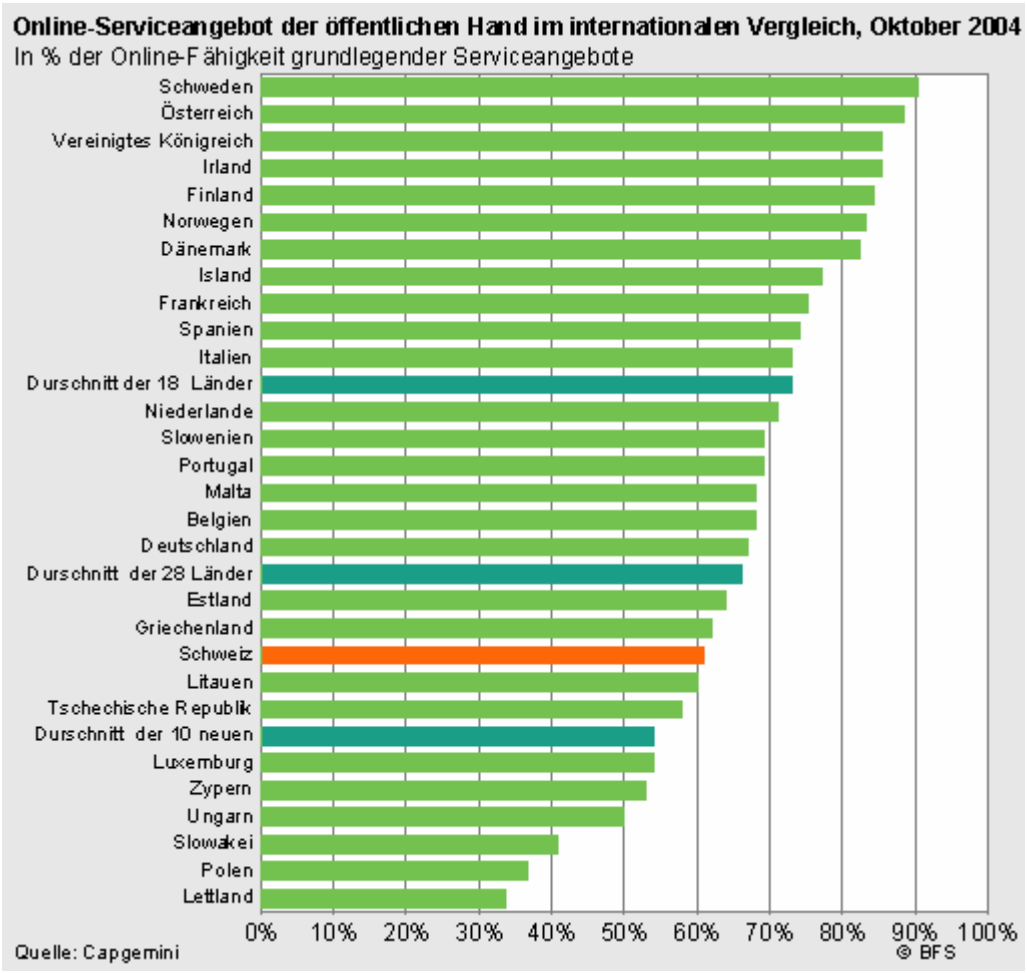
Internet infrastructure penetration in international comparison

Source: www.bfs.admin.ch; april 2006

"A problem still is that many SMEs would be more efficient with the use of ICT but they don't have the capacities to work with new technologies. PPP initiatives and collaboration could really help" (INT_7). An additional effect will be to strengthen the information society in Switzerland. The initiative of e-government and e-health, as well as PPP (Private-Public-Partnership) Initiatives on the educational level ("Schulen ans Netz": www.swisscom.ch; Help Points see: http://www.swisscom.com/GHQ/content/Media/Medienmitteilungen/2005/20050601_01_HelpPoint.htm?lang=de) also aim at strengthening the information society in Switzerland, with infrastructure provision in 4000 schools and "Help Points" to inform about the new ICT Technologies in Switzerland. Another initiative on national level to strengthen the e-capabilities among the Swiss society is the "Moving Alps" project (www.movingalps.ch), where the strengthening of the rural identity through ICT is a focus. Another program supported by the seco (national level) is an Auto-ID project in the Wallis Region. This should strengthen a high technology niche in the ICT segment. The judicial basis for this venture was the Bonny Act (see: www.seco.admin.ch – Auto-ID).

At the moment however Switzerland is not very advanced concerning e-health and e-government implementation. Below the EU average Switzerland has a clear catching-up potential for online services like e-government:

Online services of public authorities in international comparison



Source:www.bfs.admin.ch; april 2006

In the strategy paper on the information society in Switzerland 2006 the central government has pointed out that the ICT Technologies are an important instrument to increase the prosperity in Switzerland and to secure sustainability. The aim is to coordinate ICT for the benefit of the whole country. This should also be a guideline for the regions.

National ICT Strategy 2006:

- The state should provide a framework for inexpensive, reliable and qualitative high standing services and infrastructure
- There has to be a protection from abuse of these technologies, especially with the help of securing technologies
- An equal access for all members of the population must be guaranteed e-learning (developing the information society in Switzerland), Collaboration with the international Information Society (standards etc.), e- government und e-health (to increase the efficiency and reduce administrative costs)
- To reach these ambitious goals there should be collaboration between administration, economy, science and society. The Government supports such collaborations on the national, regional and international level.

5.3.3 Investment and Tax Policies (national and regional scale)

Investment policies were implemented on the national level in 1996 with the Feral Act on the support of Location Switzerland. On the national level there is an annual support of 19.1 Mio euro (30 Mio CHF) for investment and promotion activities. In the face of growing international competition the importance of this instrument increased considerably. Every region in Europe seeks to attract strong investors. Such inward investments are particularly important for the Swiss ICT sector, as there are no Swiss global players in the field of ICT. Beside Swisscom none of the players is big enough to be active in the international business. The Location Switzerland (national level) and WFB initiatives (regional level) bring important investors into the country and region. In Berne for example IBM, Microsoft, T-Systems, Siemens and SAP are located. They do not only provide the region with jobs, but create knowledge in the region and also give opportunities and help for SMEs. On the regional as well as on the national level there is a focus on strengthening ICT catalytically:

"Location Switzerland" promotes the ICT location Switzerland with the following arguments:

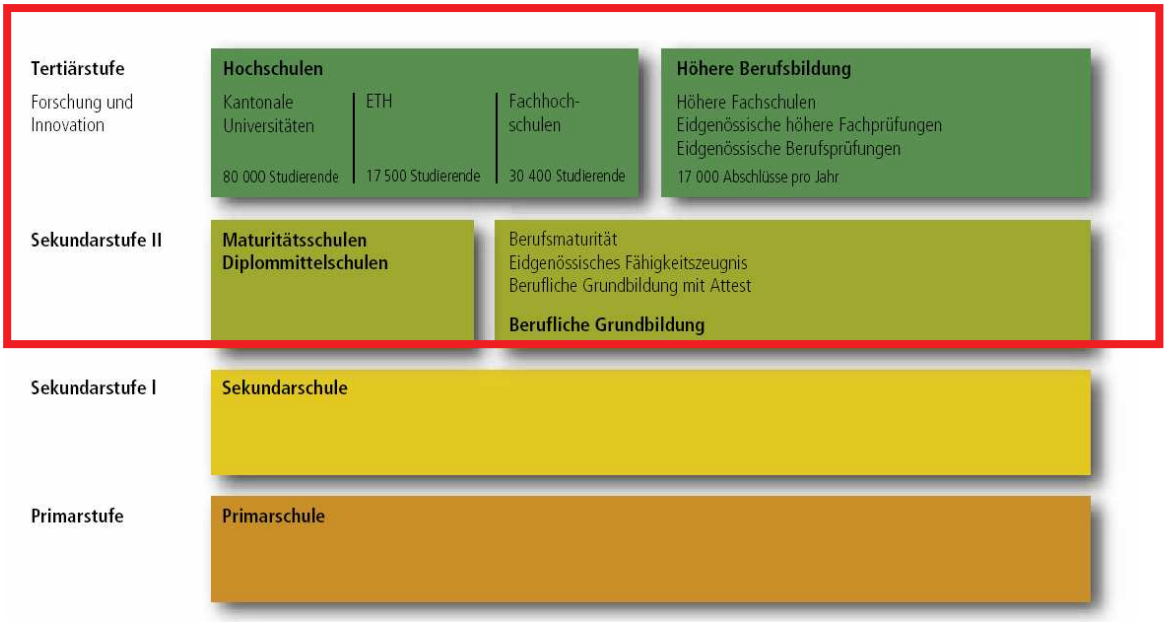
- A highly skilled and quality-conscious workforce, experienced in precision operations – a world leader in terms of productivity
- A sophisticated scientific environment with leading edge competence
- More working hours per year of any nation in Europe and a flexible labor market
- A moderate tax regime for companies and individuals
- A liberal regulatory framework and a responsive, efficient administration
- Unrestricted access to the European market of more than 360 million consumers for all products and services from Switzerland
- A central location at the crossroads of Europe, in the heart of one of the world's leading high-tech manufacturing centre between France, Germany, Italy and Austria
- A cosmopolitan international environment with a workforce conversant in English, German, French and Italian.
- Other good reasons to invest in Switzerland:
- A long tradition of watch-making combining precision skills, extraordinary craftsmanship and a unique understanding of materials and alloys
- An excellent transportation infrastructure
- A health-conscious and well-off population that provides a base for the growth of a fist-rate healthcare sector
- First-rate public and private schools
- An excellent lifestyle

(Location Switzerland, 2005: 5 ff.).

"Swiss industry and trade promotion activities focus on achieving and improving overall market conditions. In addition, it offers investors a number of attractive financial assistance packages. The promotion of Switzerland as a business location is closely coordinated with industry and trade, and the Cantons. The highly market-oriented organizations effectively employ all available instruments to achieve overall customer satisfaction" (Location Switzerland, 2005: 5 ff.).

5.3.4 Educational Policies (national framework and high regional competencies)

Background information: School System in Switzerland



Source: BBT, 2002

All interview partners mentioned that the technical colleges play a key role for the ICT sector in Switzerland. As they are organised on the regional level, the region also develops the education strategy in this field (Mr. Fuhrer; Department for Education Berne). The national level only sets an abstract framework (see: strategy paper about the development of the information society in Switzerland, January 2006). But the region may define the contents, instruments and methods within this framework to carry out the strategy. As Mr. Fuhrer of the Department for Education in Berne mentioned the region is now developing an overall strategy (contents and methods) for e-learning and ICT education and advanced training in schools and technical colleges, as well as for the information society as a whole. Besides this some PPP projects were done together with the Department of Education (Bildungsdepartment) in Berne (see the following section). The OECD underscores the exemplary importance of collaborations with universities of applied sciences (FHs) for the knowledge flows in the region:

"A lot of innovative ideas came out of Universities of Applied Sciences. Other universities are not so important for the sector. Especially networks between former students are important business contacts in a region today" (INT_2).

If immediate ICT products have much to do with the universities of applied sciences the cutting edge core technologies that were invented in Switzerland all came out of one of the leading Federal Institutes of Technology, or various Universities and Basic Research Institutes in the other parts of Switzerland (for Swiss research core competencies see section: Q-1-5 3). As some Interview partners mentioned there might even loom a shortage in high qualified computer scientists in the future in Switzerland, as this education is not very popular among students at the moment (INT_10; INT_9). *"There are few real specialists in the field of IT and too many self-proclaimed specialists and career changers with no suitable education. This could become a problem in the future. In the statistics that means there are unemployed computer scientists, but on the other hand there is a*

lack of qualified computer scientists. On top of that that there will be need of business analysts and business process analysts" (INT_8 see also: Büch 2005). It should be an actual governmental task to solve this problem. *"A problem in the field of secondary education is to get qualified trainees and to create enough apprenticeships in the field of computer sciences at the moment. i-Bern GmbH wants to mediate in this field"* (INT_3).

In the Canton Berne there is an active technology transfer policy by the Berne Economic Development Agency and the innoBE AG ("technology pull-function"; meet companies demands), which try to promote Innovation in the field of ICT too. There are several research institutes and schools active in this field in the Canton Berne:

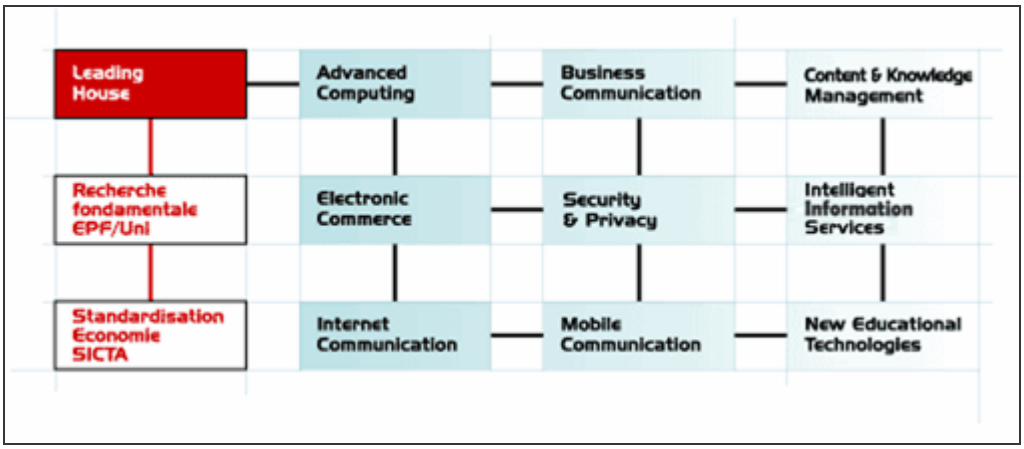
While the Universities of Applied Sciences in Berne and Biel focus on microelectronics and communication technologies, as well as e-commerce, the applied technical college in Burgdorf has a more general competence in the field of computer sciences. The University of Berne hosts an institute for informatics and computer sciences (artificial intelligence etc.) as well as a school for information management and commercial information technology (WISS). For further information see: http://www.innobe.ch/3336/3446/3457.asp. There are two technology transfer departments in Berne: one at the universities of applied sciences (BFH) (http://www.bfh.ch/index.php?nav=5) and the other at the university of Berne and Zurich (http://www.unitectra.ch). They have a "technology push" function.

5.3.5 PPP- Projects and Networking among private Actors in the field of ICT (regional and national level)

Following the new regional policy prerogative many ICT projects are based on a PPP approach today. An example is the Swisscom initiative "Schulen ans Netz" where the private player Swisscom collaborating with the region is building up computer infrastructure and e-learning instruments in the schools for free (www.ppp-sin.ch; April 2006). Other examples include mobile communication fora, which inform the society about the chances of mobile technologies.

The e-power initiative brings together industry actors and the administration to solve special technological problems in the field of e-government. Thus administrative barriers in the field of taxes and AHV petitions (red-tape) could be reduced for SMEs by electronic solutions (Joseph Deiss, Bundesrat Septemer 2005).

Another initiative in the field of networking is the ICTnet (www.ictnet.ch; April 2006) initiative that brings together different Universities and technical colleges. Especially Universities of Applied Sciences all over Switzerland are involved in this research-network bringing together the following competences:



Source: http://www.ictnet.ch/org.php?lang=fr&index=4; April 2006

Standardisation organizations like the ComCom and industry representatives like the SICTA (National Association for companies in the field of telecommunications) are also involved in this research network. The PPP projects do not primarily focus on the Berne area but are mostly carried out on the national level.

5.3.6 Associations

Besides those activities many different organisations and associations also have a strong focus on ICT. ICT Switzerland (www.ictswitzerland.ch) is the governing body of most organisations and associations in the field of telecommunications and software engineering. The main goal of ICT Switzerland is the strengthening of the ICT location Switzerland and the promotion of ICT technologies in society and economy. ICT Switzerland primarily represents the interests of the ICT sector in Switzerland. It is not a government initiated organisation. Other organisations incorporated in this governing body are:

- asut (Association of providers and customers in the field of telecommunications: Main goal: fair regulatory conditions in the telecommunication market)
- ATED (E-learning and computer science association in the Italian speaking part of Switzerland; Main goal: Strengthen e-learning competencies among the population)
- /ch/open (Swiss open systems user group)
- F@I (Association in the French speaking part of Switzerland; e-learning and computer science)
- FGsec (The Information Security Society of Switzerland: Information and help in security issues)
- GRI (Association in the French speaking part of Switzerland: providers and customers in the field of computer technologies)
- GST (Association to support the knowledge about software technologies)
- ISACA (Information Systems Audit and Control Association: Security Issues)
- ITG (Association for ICT (Electrosuisse): Provides help in the field of ICT problems for their members)
- SARIT (Swiss Association for Research in Information Technology:
- connects Swiss IT research groups with ERCIM, the European Research Consortium for Informatics and Mathematics and its exchange program for researchers,
- is one of the three European Supporters of ICSI, the International Computer Science Institute in Berkeley, connected to the University of California at Berkeley,
- operates a permanent office at ETH Zurich and a contact office at EPFL Lausanne to promote and administrate exchange programs, fellowships and other activities for IT researchers from and to Switzerland))
- SGMI (Association for Medical Informatics: promotion of medical computer science)
- SI (Swiss Informatics Society: promotion of software technologies and computer sciences)
- SIK (Swiss Informatics Conference: Exchange of knowledge for regional and national governmental computer and software departments)
- simsa (Swiss Interactive Media and Software Association: 350 companies: Promote content and innovative applications in Switzerland)
- SVIA (Association for education and training issues in computer sciences)
- SVIB (Association for education and training issues in computer sciences)
- SwissICT (Biggest ICT user association in the field of ICT with 2250 members: promotion of Information society among the Swiss population and economy)
- TUG (Telecom User Group: useful services like conferences, information etc.)
- VITS (Association of teachers in the field of ICT and ICT Experts)

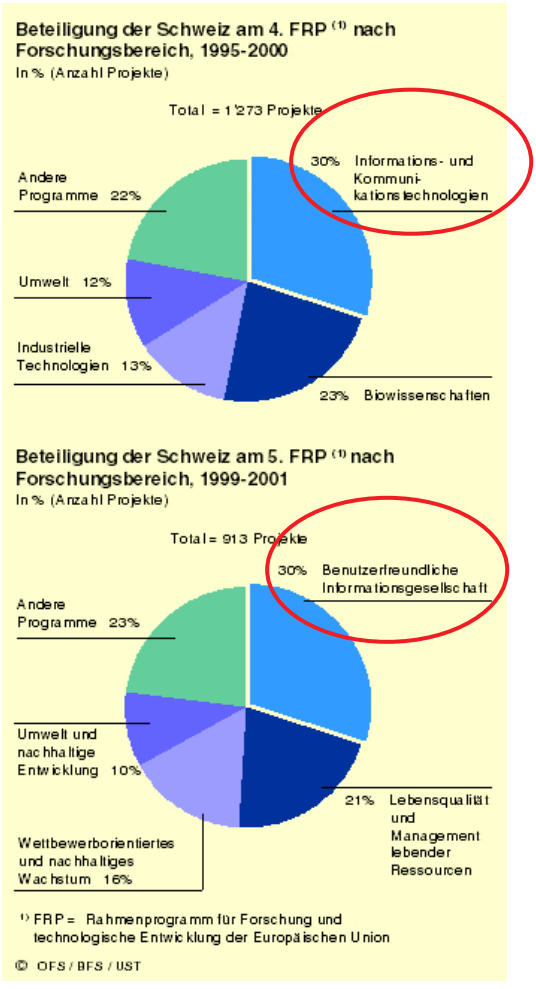
- VIW (Association of computer scientists and technicians: networking)

There are also other associations which are not incorporated in the ICT Switzerland association. One of the most famous among them are: SICTA and I-CH. The SICTA should be highlighted: SICTA is the Swiss Association for Information Technology industries, which includes all the telecom players. As the incumbent is a member, they do not work on issues such as interconnection and pricing problems. SITCA works on issues such as health and security of mobile telephony, the LTC reform, IT development and promotion, and also participates actively in the federal consultation working groups on telecom issues and standardisation in Switzerland (BAKOM 2003: 18; INT_ 4).

5.3.7 EU policies in Switzerland (mainly regional focus)

As Switzerland is not directly involved in the EU there is no need to implement EU policy directives on the national level. On the other hand Switzerland has a lot of bilateral contracts in different fields. Additionally attractive working conditions lead to a migration of highly skilled German and French ICT experts (see: actual CEO Swisscom: Carsten Schloter). On the other hand Switzerland is also able to take part in EU Research Framework programmes:

ICT Involvement of Switzerland in the 4. and 5. EU research framework



Source: www.bfs.admin.ch; IKT; April 2006

In the 4th and 5th EU framework program most of Switzerland's projects were in the field of ICT (30%). On the national level there is also a strategy to watch and scan important European policies and to analyse the possibility for implementing them in Switzerland. There is a continual expert group on the topic of the ICT development too (INT_ 1).

5.4 Conclusion: ICT Policy in Switzerland

There are numerous initiatives in the field of ICT on the national and regional level. In infrastructure and e-readiness Switzerland is in a worldwide leading position. Concerning growth rates in ICT, however, Switzerland is only in the middle field and in absolute terms does not play an important role internationally, even though the foundations are laid (Sutter 2004: 1).

In recent years the national government at last recognised the importance of the sector for further economic growth and initiated several strategies in the field of ICT. The most important efforts concern regulatory provisions in the field of telecommunication services and data and customer security. Within the field of e-government, e-health and e-learning Switzerland still lags behind other EU countries. The federal structure of the country hinders the fast roll-out of e-government and e-health projects (INT_11). There are signs that the central government finally recognises this and some initiatives point in the right direction. Additionally in the recent past the overall economic growth 'crisis' in Switzerland has led to a trend to identify growth segments in the ICT sector and to support these segments with R&D, infrastructure (universal service) and investment (Location Switzerland) policies. On the regional level there are demand oriented policies like the strengthening of e-health and e-government initiatives, complemented by many private public partnerships to foster the information society and e-learning. There are different initiatives in the field of research too. Various associations in the field of ICT promote the sectors interests. Most of them are incorporated in the governing body ICT Switzerland. There are several politicians which promote ICT. But as Fritz Sutter, president of the asut und member of the board of directors of ICT Switzerland points out there is a dangerous fragmentation of the Swiss ICT potential. There are enough institutions and powerful actors in the field of ICT, but nobody seems to have an interest in the lead. Even among the public authorities nobody seems to be responsible for the ICT sector. This might be different in Ireland, Finland and Sweden, where political activities are much more supportive and centralised (Sutter 2004: 4). All in all, the political efforts on the national and regional level are strong in the ICT sector, but pale in comparison with the well organized agriculture lobby, which manages to garner subsidised worth 2.2 billion euro (3.5 Mia. CHF) annually.

"Switzerland needs future ICT trends. This is a basic future resource for our economy. Precondition for this is a good infrastructure and modern regulation. But on the other hand it also needs somebody who takes the lead in the sector guaranteeing the sector the attention it deserves" (INT_3). "There is still a high security mentality in Switzerland and some conservatism among all actors in the public authorities. In the U.S. there is much more venture capital around. And among 100 risky investments you may have one Amazon, one Yahoo. But also in Switzerland the ICT trend is on the move (…) and as fresh people come in the right position there will be new opportunities for the business in Switzerland too" (INT_2).

Relevance of the following government policies for the cluster development

Type	Scope	Rating 1	2	3	4	5
Firm-oriented support	Financial support of firms' projects					●
	Advice and consulting for individual firms				●	
Attraction	Policies to attract outside firms to the cluster			●		
Support infrastructure	Physical infrastructure				●	
	Knowledge infrastructure					●
	Specific service or technology centres			●		
	Other cluster organisations				●	
Provide information	On technology fields		●			
	On general business fields				●	
	On market/ export fields			●		
Support training, research, recruiting	Education and training programs					●
	Research programs					●
	Mobility schemas				●	
Support collaboration	Networking and collaboration programs					●
	Foster social interaction					●

6 CONCLUSIONS

The tcbe reached in the last 10 years a certain critical mass. Developing on this foundation, it applies to support now the existing strengths as well as strengthening the position of the region of Berne as one of the prominent ICT-location in Switzerland. An important step on this way is the securing of necessary resources in both financial and also personnel (in quality and quantity). In the further one it applies to support the internationalization of our members with concrete activities. An important success factor is the European Union project NICE. The tcbe is anxious that a delegation from firm representatives will visit all individual sites of the project, in order to initiate business relations and strengthening our network.

6.1 CLUSTER MANAGEMENT'S CORE COMPETENCIES

The skills of the cluster management are very variegated and are different on the three organizational levels:

Management board / Steering committee: The board represents different sectors, the members are active as lawyers (Specialised on telecommunication), as entrepreneurs, as head of application development, as teacher or professor at the university of applied science or as head of the regional or cantonal economic development agency.

Cluster President: The cluster president has a long experience as former director of the chamber of commerce of canton Berne (17 years). Since 1985 he has held a seat in more than 20 boards of directors in half of which he acted as president. He also has experience in founding and financing start up companies. He was an active politician with 16 years experience as member of the state parliament and a further 6 years as member of the communal parliament.

Cluster manager: The Cluster Manager has over 20 years experience in the ICT-Sector. He worked in different jobs like international management consulting, project management, development of business applications and hardware oriented programming. He has a technical background with a post-graduate education in economics. He now works in the field of knowledge and technology transfer, innovation management and cluster management.

There exist a couple of key factors for a successful cluster-management:

Professional Cluster management: The success of the cluster management is based on a dynamic team. The cluster management needs variegated know how and experience. It is therefore not possible that a single person has the whole knowledge for managing the cluster, but it's extremely important that a professional manager is able to tap into the necessary competencies through his / her personal network of experts.

Identification of the whole sector: The members of the cluster must represent the ICT-sector. The Key-Players have to have an active role, for example in the management board. The cluster has to represent the small companies as well as the large international companies.

Interface function: The interfaces between the cluster and the political arena as well as the close collaboration with the government are very important.

Active network: An active network inside and outside of the cluster is necessary.

A cluster is like a company, for success we need a team, but in the first place we need a leader too.

6.2 What can other regions learn form the experience made by tcbe

The tcbe possesses 10 years experience in the range of cluster management and is embedded in the regional cluster politics. We have special knowledge in managing a cluster, interclustering (co-operation with other clusters, industries) and in the field of the training. The tcbe initiated a new apprenticeship, the IT tuition. Transfer of an interest community into an association of apprenticeship principals. InnoBE, where the cluster is managed, is in Switzerland a centre of competence in the field of cluster management and innovation.

6.3 Relevant topics for the cluster management workshops

From the view of tcbe the following topics should be treated at the cluster Workshops:

- Cluster-Monitoring
- Funding of a cluster
- Initiation of Joint projects, what are the key-factors for success
- Cluster-Member: Co-operation versus competition
- Interclustering
- Internationalisation