Information and Communication Technologies in Switzerland







ICT in Switzerland... Among Europe's Top League

Switzerland is a very technology-friendly country. This is particularly true for Information and Communication Technologies (ICT). Switzerland's pro-capita expenditure on information technology in 2000 was the highest in Europe, at more than CHF 2,000. In communications technology, Switzerland - along with the Nordic countries - is in Europe's top league, with 69 telecommunications connections per 100 inhabitants. The figure for ICT market volume, CHF 31.2 billion in 2000, or 8% of gross national product, is also one of the highest in Europe.

Country	Per capita expenditure on IT in 2000 (CHF)
Switzerland	2 175 CHF
Sweden	1 904 CHF
UK	1 431 CHF
Netherlands	1 283 CHF
Germany	1 083 CHF
Austria	998 CHF
Irland	753 CHF
Italy	574 CHF
Portugal	286 CHF
Greece	190 CHF

Source: European Information Technology Observatory 2001.



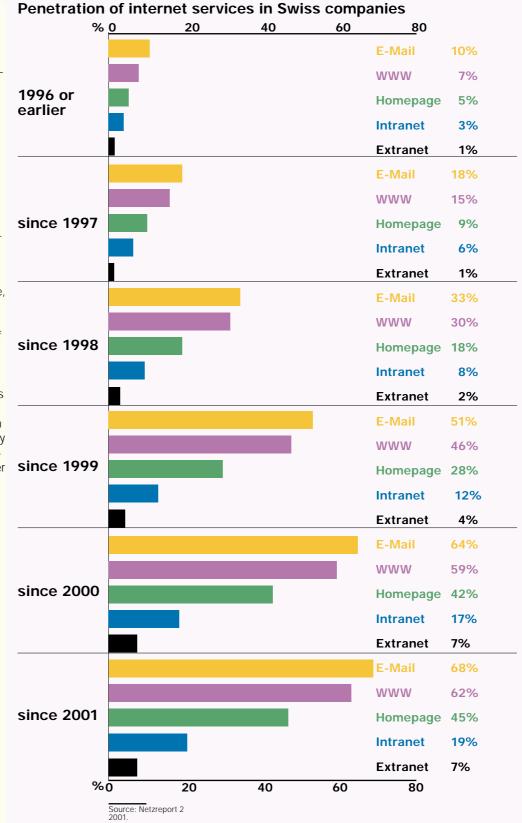
Country	ICT market volume 2000 as % of GDP
Sweden	8.6
Switzerland	8.0
UK	7.7
Netherlands	7.4
Portugal	7.3
Greece	6.4
Irland	6.1
Austria	6.0
Germany	5.8
Italy	5.7

Source: European Information Technology Observatory 2001.

An open market for ICT innovation

Switzerland is very open for ICT innovation, both for business and individuals. In mid-2001, more than half the population had an internet connection, with the profile of internet users closely matching that of the population as a whole. Approximately half of all internet users engage in electronic commerce, buying books, clothing, tickets and travel over the internet. Swiss companies make even wider use of the internet than the population at large. In mid-2001, 84% of Swiss midsized companies in the production and service sectors used the internet. And in certain categories of use, e-mail for example, saturation point has virtually been reached. 60% of these companies purchase some of their products and services online.

In 2001, the total volume of online purchasing by Swiss companies was CHF 15 billion or 5% of all materials and services purchased in the national accounts. Investment by Swiss companies in internet use exceeded CHF 5 billion in 2001, further evidence of their readiness to embrace innovation.



International Presence of ICT Leaders

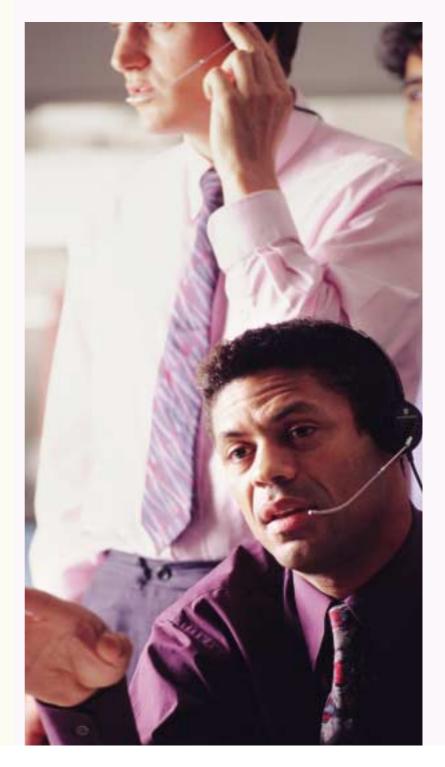
Switzerland is a country of small and medium enterprises (SMEs). Virtually 75% of all employees work in companies with fewer than 100 employees. The ICT sector too is made up predominantly of SMEs, numbering as it does more than 7,000 companies. Now that the ICT market has been deregulated, virtually all the leading names in ICT globally are represented in Switzerland.

This is clearly demonstrated if we list the Top 3 (in terms of sales for 2000) in some of the subsectors of the ICT industry:

- Telecommunications services
 - 1. Swisscom
 - 2. Sunrise
 - 3. Orange
- Web agencies
 - 1. Pixelpark
 - 2. Namics
 - 3. Crealogix
- Software vendors
 - 1. Microsoft
 - 2. IBM
 - 3. SAP
- Outsourcing
 - 1. IBM
 - 2. T-Systems
 - 3. Compaq
- Telecom equipment makers
 - 1. Ascom
 - 2. Cisco
 - 3. Ericsson
- PC vendors
 - 1. Compaq
 - 2. Dell
 - 3. IBM

PC retailers

- 1. Mediamarkt
- 2. Interdiscount
- 3. Portable Shop



Deregulation and competition

A view of Switzerland's ICT sector in terms of supply and demand, illustrates Porter's Diamond, a competition model that describes the structure of industry clusters.

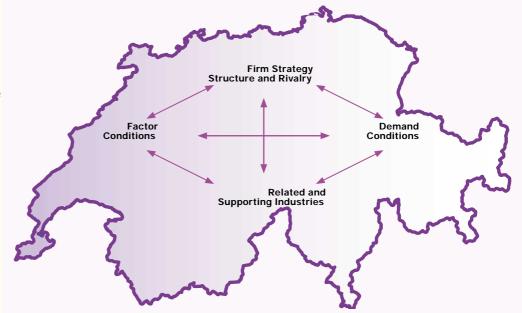
The 'factor conditions', in this case highly qualified ICT staff, are available in Switzerland, thanks not least to ongoing initiatives in vocational training, technical colleges and universities. The 'demand conditions' are marked by sophisticated demand for ICT products and services, with buyers focusing on guality and innovation. The convergence of information and communication technology demonstrates the close links with 'related and supporting industries.' Lastly, competition from national and international ICT companies in a deregulated market delivers innovation and productivity gains, which have helped Swiss companies to achieve significant export sales; examples here include Ascom, Kudelski and Logitech International.



'The intensive exchange of knowledge between universities and private enterprises enables Ascom to develop leading-edge technologies, such as Powerline Communications - voice and data transmission over power lines - in which Ascom is a world leader.'

Urs T. Fischer Ascom President and CEO

Porter's Diamond model of competition





Pixelpark, one of Europe's leading e-business service providers, sees Switzerland as a very attractive marketplace:

- Innovative, international client companies with strong investment potentia
- sophisticated, technology-savvy users (in their businesses and/or private environment),
- creative, highly-trained and usually multilingual employees, and
- partnership with excellent colleges and universities in a variety of sectors

all make Switzerland an extremely important business arena for us.

Bramwell Kaltenrieder Director Key Account Management, Pixelpark (Switzerland) AG

A Leading Position in Research

Switzerland has 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.

Blue chip ICT companies, such as Microsoft, Sun Microsystems, Borland, and Oracle actively recruit Swiss PhDs for their leadership teams. What is valued is the Swiss educational focus on problem solving. As opposed to churning out code, students learn to understand the entire engineering process from vision and analysis to design and testing.

Research in Information Technology

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. Longtime 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 with multimedia output is the aim of IDIAP (Dalle Molle Institute for Perceptual Artificial Intelligence), a semi-private research institute located in Martigny and affiliated with the Swiss Federal Institute of Technology at Lausanne (EPFL) and the University of Geneva.

Computer Graphics is another key area of advanced research in Switzerland, which 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.

Switzerland well Placed to Develop High Tech Industries

Switzerland takes first place in an OECD study in terms of expanding the knowledge intensive industries of the 21st Century. In particular, it ranks first in innovation and entrepreneurship and is best positioned to acquire the new skills and technology necessary for the leading edge industries of the future.

Switzerland is high in the individual league tables rating the level of both knowledge-based services and high- and medium-technology manufacturing as a proportion of its total economy. More than a third of economic output in Switzerland falls into these categories - more than in any other country.

Source: OECD, Science Technology and Innovation Scoreboard, 2001.

'The universities breed quality and simplicity conscious engineers, people who understand what a complete system is,'

Prof. Dr. Thomas Gross

Laboratory of Software Technology, Swiss Federal Institute of Technology

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.

The Swiss Center for Scientific Computing in Manno 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.

Teaching and Researching Communication Technology

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.)

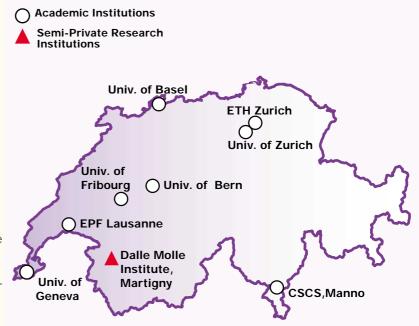
Physical layer researchers profit from outstanding Swiss basic research in physics, applying that knowhow to solving bottlenecks in broadband networking. The Institute for Quantum Electronics of the ETHZ, for example, is developing optoelectronic waveguide components and semiconductor prototypes for 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 becoming known 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 significantly contributed to the development of parts of the MPEG standard now used in audio CDs and digital TV. The institutes and laboratories at Swiss universities closely cooperate with industry where the likes of IBM, Unaxis, Nortel Networks, ABB, Sprint, and HP participate in advanced research projects. In Zurich, for example, IBM opened its wafer-processing lab to a university research group. In exchange students test and refine the design of cutting edge devices. IBM's benefit is, it receives functioning prototypes, but more importantly, IBM has access to a steady supply of trained engineers who can work its newest technology.

Distance learning is one of the most important end-user applications enabled by new telecommunication technologies and new media. The Swiss Virtual Campus, a joint effort, will connect all Swiss universities to boost research in e-learning, as it is commonly called, and create a state of the art teaching infrastructure.



Secure communication has not been neglected here. 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.

Industrial Research in Switzerland: Creativity and Innovation

Swisscom Ltd. operates in one of the most advanced regions of the world with an economy relying on a state-of-the-art telecommunications infrastructure. In this dynamic environment, innovation is a key success factor, and in this context, "technology" is seen as an important common strategic asset of the Swisscom Group. Hence, for the benefit of the Swisscom Group as a whole as well as its individual Group companies, Swisscom operates a central R&D unit.

More business oriented

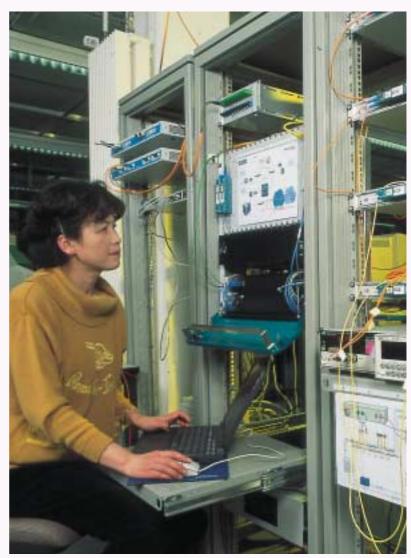
In comparison to ICT activities at universities and technical high schools, the objectives of this unit are much more business oriented and no fundamental research is being carried out. However, a good relationship with above institutions is indeed very important to ensure a steady flow of state-of-the-art knowledge and an effective transition of young talents from their education to a professional career in the business environment.

Swisscom's R&D unit relies on an interdisciplinary team of experts and nurtures a culture of innovation based on breadth and depth of expertise. On the one hand, areas beyond and across the present strategies of the Group companies are being looked at with the goal of recognizing early-on the impact of technological developments and new business models on Swisscom's strategy, as well as finding new business opportunities and promoting technical synergies. On the other hand, concrete innovation proposals are developed based on technical and economic aspects, and the individual Group companies are supported in their current innovation projects by the unit's skilled engineers who at the same time have the necessary scope to look beyond immediate issues.

www.swisscom.com

Current focus

- Person-to-person and person-to-content communication based on an open communication services architecture
- Application service provisioning and electronic customer relationship management
- 'Rich-media' communication services enhanced by broadband access technologies
- IP business support issues such as content billing, defined quality of service, fraud and security technologies for e-commerce
- New broadband opportunities enabled by novel technologies such as 10 Gigabit Ethernet, heterogeneous broadband access networks, or peerto-peer networking
- Electromagnetic compatibility and biological effects of new service technologies such as Bluetooth, 3rd generation mobile communication, wireless local area networks, and digital subscriber line technologies



Impressum H.R. Bramaz

Voice Service Design - Do it Yourself

The aim of open voice services is to give business customers the possibility to create their own speechenabled services, allowing the end user to navigate through a service with his/her voice. At the moment, many of these services use either human operators or dialed digits information. Although voice is the most natural way for humans to communicate, only few services are based on speech technology, mainly because development of such applications is complex and expensive.

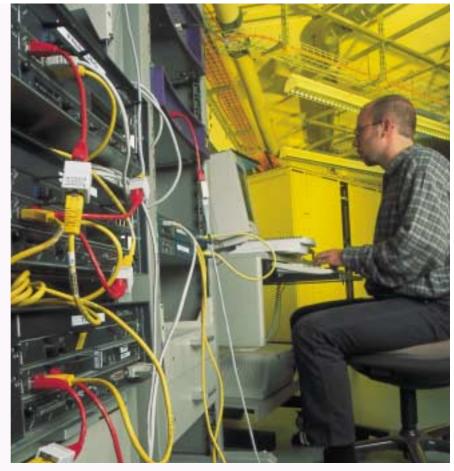
By combining common Internet techniques with state-of-the-art speech technology, a solution to create speech-enabled services in an easy and fast way has been developed. The system is built on a set of webpages, which guide the customer, i.e. the service provider, through the creation and administration of a speech-enabled service: speech recognizer and synthesizer, predefined dialogue patterns, basic administrative functionality. Upon service launch, the corresponding code is uploaded and interpreted on a special gateway making the service accessible over any phone.

The "open voice services" concept will enable Swisscom to promote, over its Portal business, speechenabled services for a wide range of applications.

Internet goes Mobile

There are two outstanding trends in today's telecommunications market: the explosion of mobility service usage based on GSM and the omnipresence of the Internet. With the immanent deployment of GPRS (General Packet Radio Service), mobile communications and the Internet are about to converge and soon, new mobile multimedia service opportunities will be enabled. Traditional service provision is more and more challenged by this development in order to meet customer expectations and security issues.

In the context of an international project within the IST framework (Information Society Technology, Initiative of the European Union), an experimental platform has been developed that allows integrating and testing new mobile technologies with security technologies and multimedia applications. Participation in this project supports Swisscom, on the one hand, in deploying, integrating and testing GPRS core network component interfaces in Switzerland, and enables, on the other hand, to develop a number of residential and business multimedia applications as well as end-to-end system testing.



Impressum H.R. Bramaz

Making Content Smart

Modern networking technologies make an ever-increasing amount of multimedia content available on-line. However, most of this content is not relevant for a specific user and therefore not really useful in a society, which is changing its behavior from mass consumption to individual consumption.

A new concept has been developed which addresses those issues and allows making content both accessible anytime and anywhere, and user-relevant: It is called "Content Hyper-Mediation". This concept is based on making content smart and personal and enables a large range of new services. Emerging technologies in the area of signal processing, data mining and broadband communication allow to automatically recognize multimedia content (including video and audio tracks), personalize it according to an individual user's interest, and adapt it to different access networks. The steps to follow are content detection (by extracting meta-data), user profiling, content re-packaging, and content access adaption (to both, network and end-device). As a demonstrator, an application has been developed making TV-news available for GPRS users on demand, personalized and searchable.

Content Hyper-Mediation is an interesting new business model positioned between content providers and distribution channels such as Portals, based on buying content and re-selling it as multimedia services of high value.

Brain Power for the Swiss Business Area

Creating an interface between education, research and practice

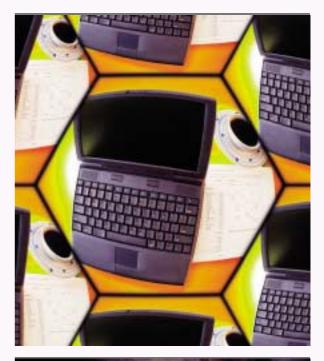
The structure of the Swiss economy and the educational system provide excellent prerequisites for an interface between education, research and practice. Brainpower and high skilled work force have ever been a key factor for Swiss prosperity.

Training of high skilled professionals remains to be an ultimate priority as manpower shortage is unacceptable in emerging fields as ICT or E-Business. The law on Swiss Universities of Applied Sciences (UAS) in 1995 has significantly affected the Swiss university area. It exactly responds to the needs of the Swiss Business Area by transferring knowledge to SME and professional education in contexts of applied R&D!

Three out of six existing official "national competence nets of the UAS" cover the sector of ICT: "Ecademy", "ICTnet" and "IPL-net". The main goal of Ecademy consists in production and systematic transfer of knowhow in the field of E-Business and E-Government, directed towards the needs of business and administration. This is achieved by offering services, e.g. special events for SME supporting basic understanding of E-Business or individual cooperation for concept development, implementation and training of employees.

In 2002 Ecademy launches a nationwide modular post graduate study program, which comprises the relevant centers of excellence and which includes optional subjects in order to optimally match individual needs.

www.ecademy.ch





Switzerland – a Leading **Financial Center**

Switzerland's highly developed and effective banking Listing requirements system makes it possible to secure financing on favorable terms and ensures access to the most modern financial instruments as well as comprehensive advice. In addition to the major international Swiss banks, there are a large number of private, cantonal and regional banks, all in all more than 370 financial institutions and over 140 foreign banks. Switzerland holds a worldwide leading position in crossborder private banking and is one of Europe's leading financial centers for equityinvesting institutions.

SWX Swiss Exchange

The SWX Swiss Exchange is one of the world's leading and most technologically advanced securities exchanges. In 1996, floor-based trading in Switzerland was supplanted by electronic trading. This fully automated trading, clearing and settlement system remains unique in the world. The SWX Swiss Exchange offers its customers first-rate securities exchange services and a broad range of investment products.

Through its various shareholdings and alliances, the SWX Swiss Exchange is active on an international scale. It offers crossborder integrated solutions in specific securities market segments: be it in the form of Eurex, the world's number 1 derivatives exchange; virt-x, the first pan-European exchange for the fully integrated trading of blue-chip shares; STOXX, with its established family of benchmark indices; or EXFEED, the provider of international raw financial data.

Initial Public Offerings

IPOs are highly attractive in Switzerland. Home already to a host of Swiss blue-chip shares such as ABB, CS Group, Kudelski, Novartis, Roche, Serono, Swatch Group, Swisscom, UBS, Unaxis and Zurich Financial Services, the SWX Swiss Exchange is also a very attractive venue for IPOs. Securities issues benefit from the influential role played by institutional investors and the substantial presence of foreign market participants. SWX makes available various market segments in which companies can list their shares. The listing and maintenance requirements for those segments have been conceived to meet the specific needs of investors.

U 1			
Segment Requirements	SWX Main Market	SWX New Market	SWX Local Caps
Track Record	3 years	1 year	2 years
Market Making	no	yes (2 years)	no
Analyst Reports	no	yes (2x2)	no
Equity (CHF)	25 mn	2.5 mn	2.5 mn
Market Cap(CHF)	25 mn	8 mn (free float)	10 mn
Free Float	25%	20%	15%
Lock-up	no	6 months	no
Capital Increase	no	yes (min. 50%)	no
Accounting Standards	FER, IAS,US-	IAS, US-GAAP	FER, IAS, US-
	GAAP + other		GAAP + other
	standards		standards

While the legal requirements for initial public offerings reflect European standards, the related listing costs in Switzerland are well below average. In contrast to NASDAQ, where about 4'300 companies vie for investors' favor, much less effort is required in the Swiss financial marketplace for firms seeking to successfully establish themselves among investors.

SWX New Market

The SWX New Market offers a financing platform for companies from growth industries such as information technology, life science and microand nanotechnology. This concentration in a separate trading segment is aimed at arousing the interest of international investors and helping the listed companies to benefit from the sector-specific know-how of analysts and portfolio managers.

Private Equity and Venture Capital

Switzerland is home to a broad array of venture capital and private equity funds and investment companies that are active in financing applications in the ICT as well as technologies out of other various sectors. A wide spectrum of business and financial support is available to assist start-up and spin-off companies in all stages of their business development.

A list of venture capital firms in Switzerland is available on www.seca.ch.

Further information:

SWX Swiss Exchange Key Account Issuers Selnaustrasse 30 CH-8021 Zurich T +41(0)1 229 22 28 F +41(0)1 229 22 40 swx-newmarket@swx.com www.swx.com



Switzerland – A Prime Business Location for ICT Companies

Switzerland is home to more than 7000 SMEs active in ICT that value a business environment supporting rapid, solid growth in Europe. Leading reasons for such a competitive marketplace, include:

- A highly skilled and quality-conscious workforce, experienced in precision operations - a world leader in terms of productivity
- A sophisticated scientific environment with leadingedge competence
- The longest 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 centers between France, Germany, Italy and Austria
- A cosmopolitan international environment with a workforce conversant in English, French, German 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 first-rate healthcare sector
- Excellent public and private schools
- An excellent lifestyle





Global Ranking of High Quality of Life Cities

Ranking	City	Country
1	Vancouver	Canada
2	Zurich	Switzerland
3	Wien	Austria
4	Bern	Switzerland
5	Sidney	Australia
6	Geneva	Switzerland
7	Auckland	New Zealand
8	Copenhagen	Denmark
9	Helsinki	Finland
10	Amsterdam	Netherlands

Note that Switzerland has 26 cantons that have their own programs with special incentives that may be adapted to your company's needs. Each of the cantons has experts who are able to assess your individual company project and to suggest a location best suited to your requirements.

Source: William M. Mercer Companies LLC, Worldwide Quality of Living Survey 2000.

We Are Ready When You Are...

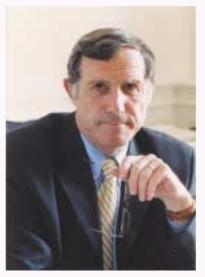
Information and telecommunication technologies open up an enormous market potential. Switzerland holds a strong position in these technologies - clearly stronger than its size would indicate. In several fields, Switzerland even has a considerable lead. This brochure on information and telecommunication technologies is a first introduction to remind you that in Switzerland, you will be able to find what you need.

More information on doing business in Switzerland is also available in our Handbook for Investors, which contains everything, you and your advisers need to know in making your site decision. You will readily notice that it is easy and uncomplicated to start a business in our country.

Our senior representatives for Europe and North America will gladly assist you. As soon as you have identified where in Switzerland you would like to invest, you can count further on the professional and efficient consultation and support services of the Cantonal and regional industry and trade promotion offices.

Whether you are a sizeable investor or an entrepreneur, you are personally welcome in our country. You have my word on it!





Mr. David Syz State Secretary for Economic Affairs seco

Investing and Doing Business in Switzerland

Location: Switzerland will be pleased to provide you with further information about Switzerland as a location for your company.

Please visit our website under:

www.locationswitzerland.ch or www.swissemb.org/ls

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Dalle Molle Institute for Perceptual Artificial Intelligence

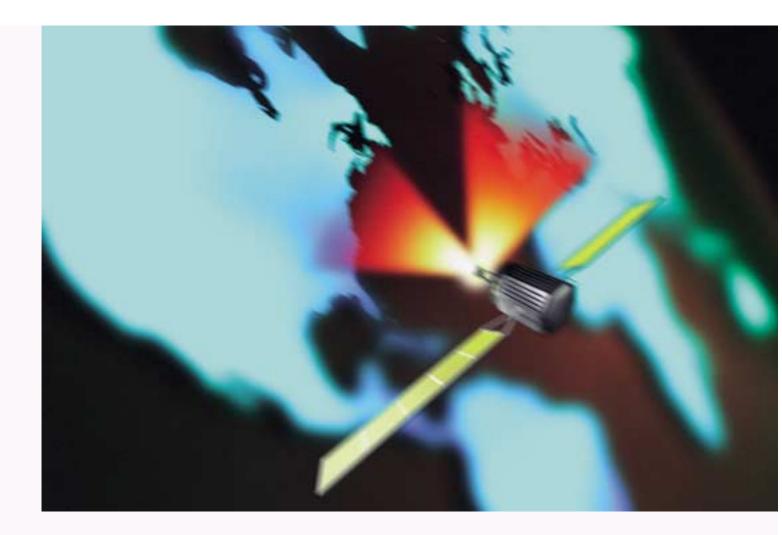
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Location:Switzerland

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