

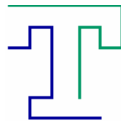
CONFIDENTIAL

# Country Report Switzerland

## for AAL\_SSA

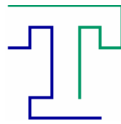
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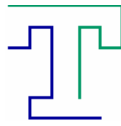


## Content

1	User Needs and Demands for AAL-Applications (Socio-cultural and Socio-economic Factors) .....	4
1.1	The effect of demographic change/development on AAL .....	4
1.2	The development of IT-infrastructure and its effect on AAL .....	4
1.3	Public acceptance of AAL applications .....	4
1.4	The structure of the Swiss social security and health system .....	5
1.5	Income structure of private households .....	11
1.6	Market structure .....	11
1.7	Related industries that are involved.....	12
1.8	Representatives of the target group.....	12
1.9	Standards.....	14
1.10	Blind spots .....	15
2	Technological Progress: State of the Art.....	15
2.1	Technological fields challenges .....	15
2.2	Potential fields of application and societal demand .....	35
3	National Programs .....	41
3.1	National programs already funding areas related to AAL.....	41
3.2	What kinds of instruments do exist for this purpose?.....	41
4	Structure of National Public Funding .....	46
4.1	What is needed for the implementation of a national AAL program in your country? .....	46
4.2	Actors .....	48
4.2.1	Decision makers .....	48
4.2.2	Sponsors .....	48
4.2.3	Owners/Hosts .....	49
4.3	Structures .....	50
4.3.1	Format of funding (programs, projects) (11).....	50
4.4	Legislation Processes, Balance of Power .....	54
4.5	Federal, Central Regional Considerations and Requirements.....	55
4.6	What is the Benefit of going European? .....	55
4.7	Time Frame for National Budgetary Planning Processes.....	55



4.8	Estimated Share of National Budgets Likely to be agreed upon .....	55
4.9	Requirements of Formal and Informal Lobbying .....	56
5	Cross Border Activities.....	56
6	Sources and Links .....	57



# **1 User Needs and Demands for AAL-Applications (Socio-cultural and Socio-economic Factors)**

## **1.1 The effect of demographic change/development on AAL**

covered by VDI/VDE-IT

## **1.2 The development of IT-infrastructure and its effect on AAL**

covered by VDI/VDE-IT

## **1.3 Public acceptance of AAL applications**

### **Important Swiss organisations and campaigns that contribute to the dissemination of AAL relevant topics (cf. chapter 1.8)**

In the following, various Swiss organizations are briefly described, which are active players in the field of gerontology and related topics that significantly contribute to the raise of awareness towards AAL-related issues and applications.

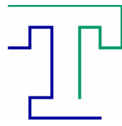
**The CTI-ISA** (Innovation for successful ageing) promotion campaign (cf. chapters 3 and 4 for a detailed description) aims at the promotion of application oriented research for the development of solutions that use the potential for innovation offered by the demographic change. The campaign contributes to the creation of awareness among Swiss industries to actively address this potential in the form of the development of new products and services for the ageing population. It is therefore an indirect approach towards the needs of the end-user target group via the industry.

**Viva50plus**, the Swiss organisation for demographic and inter-generational issues aims at the creation of an international permanent platform for the discussion of generation's issues. It creates and develops solutions for products and services that are of interest to both specialists and the general public and seeks to raise the general public's awareness to generational issues. From 2005 onwards, Viva50plus will organise the World Ageing Congress in St. Gallen, where specialists from politics, economics and research will work on topics of demographical challenges.

The university institute 'Ageing and Generations' (**INAG**, [www.ikb.vsnet.ch/INAG](http://www.ikb.vsnet.ch/INAG)), is to reinforce on-going international gerontological discussion at a university level. It aims at a) the promotion of interdisciplinary exchanges and discussions in the sphere of ageing and generations, b) the promotion of pan-Swiss and multilingual perspectives and co-operation in applied gerontological research and learning and c) the promotion of the link between basic research research and professional work in the sphere of ageing.

### **Acceptance of technical aids**

Within the framework of a pilot study of the National Research Program (NRP32) 'Ageing', the conditions under which electronic aids could be used in the service of disabled elderly people was examined (1). The research project was carried out in close interdisci-



plinary collaboration with the Sociological Institute of the University of Neuchâtel and the Swiss Foundation for Rehabilitation Technology Fondation Suisse pour les Téléthèses, [www.fst.ch](http://www.fst.ch)) also in Neuchâtel (2). In the course of the project two different forms of electronic aids were used:

- a. active technical aids, i.e. aids that require active and voluntary intervention on the part of the user (such as remote-controlled appliances) and
- b. passive technical aids, i.e. aids that start work automatically and independently of the intervention of a user (such as a door that opens automatically or the triggering of an emergency signal in case of a fall)

The acceptance of active technical aids requires careful counseling and frequent explanation. Provided this is achieved, even breakdowns and technical problems in the initial stages do not lead to long-term problems. The introduction of active electronic aids leads neither to a new organization of daily life nor to new activities on the part of the elderly people but the aids are primarily used to continue life as before under easier conditions. Furthermore the use of such devices neither promotes the isolation of the elderly people (less contact, as more independent) nor increases social contact. The overall feeling security for both the relatives and the target persons is increased by the use of technical aids.

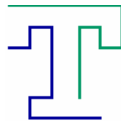
Passive electronic aids proved particularly valuable for non-specialized old people's homes as they make it possible to admit a mixture of patients. Thanks to suitable aids (e.g. safeguarding electronic security system for desoriented elderly people 'Quo vadis' of the FST) both the private sphere of residents can be better safeguarded and the safety of confused people better guaranteed. Fewer conflicts occur and the burden on staff is reduced, which also benefits the elderly residents.

### **A brief glance at the current ICT situation in Switzerland (3)**

In 2001, Switzerland exhibits with 3'242 Euros the highest per capita expenditures for information and communication technologies (ICT) compared to other OECD member states. 9% of the GPD were afforded for ICT. In 2000, 61% of the Swiss households used a PC. In 2001, 33% of the Swiss population used the Internet several times per week (Pastor 2002). Swiss enterprises used ICT as intensively as the leading Scandinavian countries in Europe. The Internet is being increasingly used by active senior citizens (from 1997 to 2001 an increase of 16% in the population over 50 years), and corresponding courses find a large echo. Since May 1998 there has been a special senior citizens web, which is supported by the EURAG, the Pro Senectute and Migros ([www.seniorweb.ch](http://www.seniorweb.ch)). Switzerland generally provides a favorable environment for the application of assisted technologies based on ICT.

## **1.4 The structure of the Swiss social security and health system**

The Swiss system of social security is organized as follows:



Federal Office of Public Health (OFSP)		Federal Social Insurance Office (OFAS)		
Sickness Maternity	Accidents and occupational diseases	Old-age, survivors and invalidity (1st pillar) and supplementary benefits	Occupational benefit plans concerning old-age, survivors and invalidity (2nd pillar)	Linked individual provident measures (3rd pillar)
<ul style="list-style-type: none"> <li>- Recognized sickness funds (public and private funds)</li> <li>- Private insurance institutions subject to the Federal Law on Insurance Supervision of June 23, 1978, and authorised to provide social sickness insurance</li> <li>- Joint institution which pays for the cost of legally required benefits in the event of bankruptcy of an insurer</li> <li>- Swiss Foundation for health promotion</li> </ul>	<ul style="list-style-type: none"> <li>- Swiss National Fund for Accident Insurance (CAN): this ensures about 52% of workers</li> <li>Other insurers               <ul style="list-style-type: none"> <li>- Private insurance institutions subject to the Federal Law on Insurance Supervision of June 23, 1978</li> <li>- Public accident insurance funds</li> <li>- Sickness funds pursuant to the Federal Law on Sickness Insurance of March 18, 1994</li> <li>- Substitute fund, managed by the above-mentioned insurers (except CAN); this pays the legal benefits to the workers being victims of an accident whom the CAN has not the competence to insure and who have not been insured by their employer</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Compensation funds (public or occupational)</li> <li>- Central compensation office</li> </ul> <p>Also for invalidity:</p> <ul style="list-style-type: none"> <li>- Invalidity insurance cantonal offices</li> <li>- AI Office for insured persons residing abroad</li> </ul> <p>For supplementary benefits:</p> <ul style="list-style-type: none"> <li>- Cantonal compensation funds, except in GE (Geneva), ZH (Zurich) and BS (Basel city)</li> </ul>	<ul style="list-style-type: none"> <li>- Registered provident institutions</li> <li>- Safety Fund (Central Office for 2nd pillar included)</li> <li>- Substitute institution</li> </ul>	<ul style="list-style-type: none"> <li>- Banks (blockes accounts)</li> <li>- Private insurance institutions (insurance policies)</li> </ul>

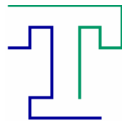
Table 1: The organization of the Swiss social security system (4)

## Public Health in Switzerland

Social sickness insurance gives everyone living in Switzerland access to adequate health care in the event of sickness, and accident if they are not covered by accident insurance.

## Organisation

Social sickness insurance is operated by a number of insurers. Only those which meet the conditions set out in Swiss legislation, and which are not profit-making, are author-



ised to handle social sickness insurance. They must apply the legal provisions in an identical manner and separate from other insurance (for example, complementary insurance according to by private insurance law). If an insurer becomes insolvent, the cost of its statutory benefits are taken over by a joint body funded by contributions made by the insurers on the basis of their social sickness insurance premiums.

The role of the insurers is not restricted to reimbursing the cost of services provided to insured persons. They also work together with the cantons to encourage health promotion. Insurers and cantons operate a joint body whose aim is to promote, co-ordinate and evaluate steps aimed at promoting good health and preventing illness.

### **Insured persons**

All persons domiciled in Switzerland must take out sickness insurance. Every family member is insured individually, regardless of age. Anyone arriving in Switzerland with the intention of staying must take out such insurance within three months. Parents are allowed the same period in which to insure their newborn children. The insured may choose any sickness insurer he wants, and the insurer must accept him irrespective of his age and state of health, and without any reservations or qualifying period.

### **Risks covered**

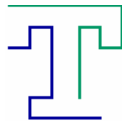
Social sickness insurance pays benefits in the event of:

- **sickness:** defined as any impairment of physical or mental health which is not due to an accident and which requires a medical examination or treatment or which necessitates absence from work.
- **maternity:** which includes monitoring pregnancy, delivery, and the mother's subsequent convalescence.
- **accident** (if not covered by accident insurance): defined as any unexpected and involuntary injury to the human body resulting from an extraordinary external cause which is harmful to physical or mental health.

## **Social insurance in Switzerland: The three pillar system**

### **The first pillar**

Basic insurance is founded on three federal laws: the Federal Law on Old-Age and Survivors' Insurance (LAVS), the Federal Law on Invalidity Insurance (LAI) and the Federal Law on Supplementary Benefits to the AVS/AI (LPC). The LAVS has been revised ten times since it came into force, the LAI and the LPC three times. The 11th revision of the AVS and the 4th revision of the AI are being elaborated at the moment. The AVS is the most important branch of Swiss social insurance from the point of view of expenditure. This insurance is mandatory for the whole population. Since AVS and AI pensions are not sufficient to cover basic requirements, the granting of supplementary benefits (PCs) by cantons enables the constitutional mandate to be carried out. The LPC does not require cantons to grant PCs, but if these do so within the framework of federal legal standards the federal government pays subsidies to them. All 26 cantons have passed legislation to this effect and in fact grant PCs. The main benefits paid by the AVS com-



prise old-age pensions, pensions for children for whom persons entitled to old-age pensions are responsible, and widows', widowers' and orphans' pensions.

The AVS is funded on a "pay-as-you-go" basis, where current pension financing sources are used to fund the retirement benefits of the currently retired population, the balance of the accounts being guaranteed by a "compensation fund" (buffer fund). The AVS is financed by the contributions of insured persons, by those of employers, by contributions from public bodies (Confederation and cantons), by interest from the compensation fund and by income arising from recourse measures taken against responsible third parties.

The AI is also funded on a pay-as-you-go basis. Creation of a separate fund is not planned, but fluctuations are dealt with by the AVS compensation fund. This means that all AI income and expenditure is put down on the credit or debit side of the fund. However, the AI's operating account is kept separate from that of the AVS. The AI's sources of financing are the same as those of the AVS.

The AVS is applied - under the supervision of the Confederation - by employers, professional compensation funds, cantonal compensation funds, federal compensation funds and a central compensation office. The AI is applied - also under the supervision of the Confederation - by the same bodies that apply the AVS, but in cooperation with the AI offices which are established in each canton. Cantons designate the bodies mandated to receive and examine requests, to fix and pay the PCs.

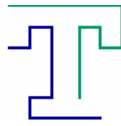
### **The second pillar**

While the AVS and the AI are designed to cover to an adequate extent the basic requirements of elderly people, survivors and disabled persons, the purpose of occupational benefit plans is to supplement these and in this way to enable such persons to maintain their previous standard of living "in an appropriate manner".

Benefits comprise old-age, survivors' and invalidity pensions. An insured person may also pledge his right to providence benefits or on certain conditions pledge a sum up to the amount of his vested benefits or receive an advance payment up to the amount of his vested benefits in order to finance a principal home property for his personal requirements or to amortise a mortgage on such home property.

The occupational benefit plans is a fully-funded system. This consists of building up a capital sum intended to cover the payment of future pensions. Each pension institution is free to choose its own financing method provided that its financial equilibrium is guaranteed.

The mandatory occupational benefit plans are applied by pension institutions inscribed on the Occupational Benefit Plans register. Such institutions must take the form of foundations, cooperative societies or public law bodies. Employers are required to insure their personnel through affiliation to a registered pension institution.



### **The third pillar or individual private provident measures**

Finally, with respect to individual provident measures (the third pillar), Article 34 quarter, paragraph 6, of the federal constitution lays down that "the Confederation in collaboration with the cantons shall encourage individual providence, notably through fiscal measures and policies which establish rights of ownership". In this way, the third pillar is constituted by a number of recognised providence forms assimilated to occupational benefit plans (binding pension contracts with insurance establishments or banking foundations) which benefit from fiscal measures (third pillar a), by certain types of individual providence, such as life insurance schemes, individual savings schemes (third pillar b), and by the ownership of one's residence.

### **National data on long term care (5)**

#### **Funding system**

Compulsory insurance is financed by contributions of insured and by funding from the national government to offset cantons' share in finance of premiums and coverage of low-income groups. Federal share is based on the minimum contribution of cantons. Total health care expenditures in 1990 were financed to 25.2% by public entities (federal government, cantons and communes), 32.5% by social insurance, 11.6% by private insurance and 29.0% through patient cost-sharing. 26 cantons have their own funding-systems. Freedom of trade and commerce in Swiss health care system limits the cantons' scope of influence and organization. Cantons have most influence in the hospital sector, where they have the power to close beds. In the area of general practitioners they have no influence on number of doctors or on the use of specialized expensive treatment.

#### **Responsible levels of health care administration**

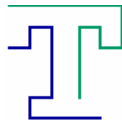
Confederation: Health care insurance, fighting infectious diseases, medical license exams, and protection against radiation, environmental toxins, and food safety. Cantons: health services; preventive care; public health regulations. Negotiations between insurance companies and providers to fix payment rates. Communes: elderly, social assistance, home care, social assistance.

#### **Summary of facilities / provision of long-term care**

There are 26 different cantonal systems. Most home care services (80%) are private non-profit organisations, 13% are communal organisations and the rest are other private and public organisations. 59% of all home care facilities provide nursing services (prescribed by doctors and covered by health insurance), home services and meals on wheels (which are not covered by health insurance). Another 40% provide additional services such as transportation services, social services and counselling. There are residential homes for the aged and for invalids as well as nursing homes.

#### **Assistance to caregivers**

Caregivers earn pension entitlement (AVS) related to duration of care. Caregivers are entitled to supplementary AVS/ AI benefits if they provide care for a minimum of three



months. Some cantons also provide allowances to these caregivers. There is also a system of respite-care in day-care centers or short-stay hostels.

### **Free choice and competition (Long-term care)**

Persons in need of long-term care are entitled to the services of professional caregivers (provided as benefits-in-kind) or cash benefits to pay for the services of less costly non-professionals or family caregivers. Non-profit home care institutions have regional monopoly power.

### **Reimbursement of assisted technologies using the example of telemedicine (6)**

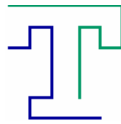
A suggestion over the admission of medical treatments into the service catalogue and also over reimbursement for the employment of information and communication technology in the medicine has been formulated by the Swiss federal commission for general expenditure, whose tasks are fixed in the regulation over the health insurance (SR832.102). The service catalogue is contained in the appendix 1 of the nursing for the sick payment regulation (SR 832.112.31). So far no requests were placed to take up telemedicine applications in to the service catalogue. Also a discussion about telemedicine and the connected special features was so far not listed in the achievement commission.

Telemedicine applications are today being recompensed after the same approach like conventional treatments. A telepathological diagnosis is treated like a diagnosis, which has been provided by a pathologist, locally. If telemedicine treatments are cheaper than conventional treatments, the appropriate mechanism health service profits from savings. Should the telemedicine treatments cost more, the costs must be taken over by the appropriate health service. If telemedicine makes new treatments possible, which are usually not contained in the service catalogue, this costs are not being refunded or they are being paid in analogy with conventional treatments. As an example, Helsana offers a compulsory health insurance, named PREMEDI-24. With this insurance the customer can save contribution fees, by calling the telephone consultation "medi-24" before consulting the physician.

In contrast to the compulsory health insurance, the health insurance companies have large liberties with additional insurances. The organization of the contribution fees and with the tariffs is complex and has been based on a multiplicity of factors of influence. Telemedicine thereby so far did not play a substantial role. It would be conceivable that the health insurance companies support a supplier with the structure of telemedicine infrastructure and negotiates in response to this for deeper lump sums. Certain telemedicine applications could be taken up to service catalogue of additional insurances.

Besides this, it is possible that health insurance companies offer special insurance models for older humans, which include a telemonitoring program for the health. Clients who are sportily active, could profit from deeper contribution fees with additional insurances if they voluntarily undergo to an accompanying telemonitoring health consultation. Like this, insurances could offer those customers privileges, who behave healthy.

Health insurance companies partly recompense telemedicine costs, which promise cost savings. An example for this is the call center "medi-24". Clients of different health insurances, e.g. Helsana, Progrès and Winterthur profit free of charge of this service. Additionally to the possible cost saving of the free health consultation it represents also a customer connection instrument for health insurance companies and physicians. In-



investments in mechanisms of the health service, e.g. for the setting up of telemedical networks are usually not supported by the health insurance companies. This applies in particular, if only indirect cost savings can be expected but not an efficiency gain or that the investments primarily improve the supplying quality and sometimes extra costs for the health insurances arise.

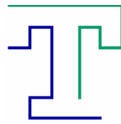
## 1.5 Income structure of private households

covered by VDI/VDE-IT

## 1.6 Market structure

The following table gives a non-exhaustive overview about producers and organizations that act in the field of the development of products and services in the context of assisted living.

Area	Producer/Organisation	Short description of products
Communication technology	Leitronic AG 5621 Zufikon leitronic@leitronic.ch www.leitronic.ch	easyAlarm; Supervision systems of patients, old people, babies as well as house supervision with wireless sensors
	Remeda Allemann + Partner GmbH 8003 Zürich info@remeda.ch www.remeda.ch	Remeda-Chip; supervision of desoriented persons by a chip, which is implemented in the garment
Aids	Strack AG 8200 Schaffhausen www.strack.ch	Extensive selection of aids for old and disabled persons. Strong collaboration with Otto Bock Switzerland
Security systems	Burkhalter Group Hohlstrasse 475 8048 Zürich <a href="http://www.burkhalter.ch">http://www.burkhalter.ch</a>	Installations, Services, Telematic, Security, Automation
	GF Marcel Hufschmid AG, Zug Industriestrasse 55 6302 Zug <a href="http://www.hufschmid-elektro.ch">http://www.hufschmid-elektro.ch</a>	Installations, Services, Telematic, Security, Automation
	Kaba <a href="http://www.kaba.ch/">http://www.kaba.ch/</a>	Automatic door locking device, locking and access admission
	ABI Sicherheitssysteme AG CH-8552 Felben-Wellhausen info@abi.ch www.abi.ch	Various alarm system comprising highest protection against false alarm
Assistive systems	Phonak <a href="http://www.phonak.ch/">http://www.phonak.ch/</a>	Hearing aids, remote controls for hearing aids fitted into watches and bunch of keys, ordinary remote controls, FM multi frequency systems, Nemo Tech. Digital Mechanical Processing



	GHE-CES Electronic AG <a href="http://www.ghe.ch/">http://www.ghe.ch/</a>	Technical aids for aurally handicapped people, writing phones, picture phones, faxes, alarm clocks, watches
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Table 2: Overview about products and services offered by various Swiss companies in the context of AAL

The major players in research as well as industries are listed in chapter 2 with respect to the various AAL-related fields.

The major organisations that act as representatives of the target group are listed in chapter 1.8.

Pilot project within the scope of smart houses:

### **Projekt *Futurelife***

<http://www.futurelife.ch/>

FUTURELIFE is a project of a one family house in Hünenberg, canton Zug, where new technologies are tested continuously. It wants to push open the doors of the future and to pass on to you the experiences of the inhabitants and the ideas of the experts.

The family Steiner (two adults, two children) has committed itself to install continuously new appliances, devices and systems in the house during the next years and to test their every days usefulness.

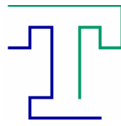
## **1.7 Related industries that are involved**

The **age foundation** ([www.age-stiftung.ch](http://www.age-stiftung.ch)) supports residential projects for elderly people in the German part of Switzerland in order to broaden the offer of financially affordable residential property for senior citizens. Specifically supported are innovative models, that comprise a public component, i.e. groundbreaking projects that can be used in other locations.

An example for a regional acting organization that covers the topic of self-determined living of elderly and disabled person in the canton Zurich is the organization **benabita** ([www.benabita.ch](http://www.benabita.ch)). It aims in the development of a residential model for elderly and disabled persons that encompasses the environment and fosters various living possibilities for this target group.

## **1.8 Representatives of the target group**

In the following, the largest, nation-wide acting associations in Switzerland are listed. There are many other organization that represent the requirements of senior citizens in Switzerland on a cantonal and regional level, which are not mentioned here.



**Pro Senectute** ([www.pro\\_senectute.ch](http://www.pro_senectute.ch)) is the biggest foundation for consulting and other services for old people in Switzerland. It is present in all 26 cantons and offers the following services:

- Social work, which comprises individual consulting in life organization in the age and financial support
- Home care
- Education
- Sports
- Information

Pro Senectute with its strong nation-wide presence and well established, state-supported structures (as a Swiss foundation) has a big influence on the dissemination, lobbying and acceptance of all relevant senior-citizen relevant topics. It is an important mouthpiece for the requirements of the older generation in the context of the demographic change.

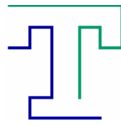
The **Swiss Foundation for Rehabilitation Technology** (Fondation Suisse pour les Téléthèses FST, [www.fst.ch](http://www.fst.ch)) offers individual services (information, education, care) for the use of technical aids for disabled persons. The activities concern the improvement of communication, the control of the environment at home and the improvement of safety for old persons suffering from dementia. With respect to the involvement of end-users in the development of assistive technologies, the FST is an important institution in the field.

**Schweizer Seniorenrat SSR (Swiss senior citizens council)** ([www.ssr.csa.ch](http://www.ssr.csa.ch)) represents the economical and social issues towards the state, organisations, institutions, media and public. With respect to the demographic development, where the elderly generation will constitute over 25% of the overall population, the SSR aims to influence the legal regulations towards the requirements of elderly people. This does not mean to create special privileges for senior citizens, but to elaborate regulations that consider the requirements of elderly people appropriately.

The **SVS** (Schweizerischer Verband für Seniorenfragen, Swiss organisation for senior citizens, [www.seniorenfragen.ch](http://www.seniorenfragen.ch)) is a nationwide umbrella organization for regional and cantonal senior and pensioner organisations and represents the requirements of elderly people in the Swiss society.

The **VASOS** (Verinigung aktiver Senioren- und Selbsthilfe-Organisationen der Schweiz, Association for active senior citizens and self-help organisations in Switzerland, [www.vasos.ch](http://www.vasos.ch)) is a national umbrella organisation to promote the integration of senior citizens in the community.

**The SHAB** (Schweizerische Hilfsmittelberatung für Behinderte, ([www.shab.ch](http://www.shab.ch)), an organisation for consulting services with respect to accessories for barrier-free living of disabled persons. It is an independent, nationwide acting organisation with the aim to assist disabled persons and their relatives in the acquisition of accessories for barrier-free living. The organisation offers a comprehensive documentation about important accessories for assisted living available in Switzerland. The SHAB hosts a permanent exhibition 'Exma VISION' for accessories for assisted living and barrier-free living. In IV depots, the SHAB administers accessories for mobility enhancement (e.g. wheelchairs), which are financed by the IV (Invalidenversicherung, invalidity insurance). The SHAB is



an important interface for the respective target groups to the access of solutions for assisted living.

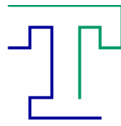
**Zentrum für Gerontologie (ZFG, Center for gerontology):** the center for gerontology at the university of Zurich aims at the interdisciplinary connection of research and education on all fields of gerontology of the university of Zurich, the ETH Zurich and universities in foreign countries.

## 1.9 Standards

With respect to networks in the home/building area, the following standards have to be considered (7)

### 1. Information and communication technologies (ICT)

- IEEE 802.3: ethernet bus system
  - 10/100 Mbps
  - 1/10 Gbps
- IEEE 802.11: wireless system
  - 54 Mbps wireless LAN (5GHz) P802.11a
  - 11 Mbps wireless LAN (2.45 GHz) P802.11b
  - Range: 100-300 m
- Bluetooth
  - SIG (special interest group): Ericsson, Nokia, IBM, Toshiba and Intel
  - 1 Mbps wireless LAN (2.45 GHz)
  - Range: 10 m
- Others
  - UpnP: universal plug and play for peer to peer networks
  - HomeRF: wireless home networking



2. Control/command communications in buildings (CCCB)
  - KNX/EIB
    - Meets the requirement of standardisation and encompasses control of bus power line, light, heating and climatisation, household appliances, security, audio/video and communication
  - AMX/Crestron
    - Does not meet the requirement of standardisation and encompasses control of light, audio/video and communication
  - PEHA, Luxor, Twiline
    - Do not meet the requirement of standardisation and only encompass control of light
3. Broadcast and communication technologies (BCT)
  - HAVI: home audio interoperability
    - Grundig, Hitachi, Matsushita, Philips, Sharp, Sony, Thomson, Toshiba
  - FireWire/i.LINK IEEE 1394a
    - 400 Mbps

### 1.10 Blind spots

No blind spots are identified at this stage

## 2 Technological Progress: State of the Art

### 2.1 Technological fields challenges

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#### New Materials

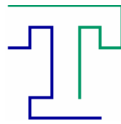
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##### Research

In the following, the properties of nanosized materials are presented with respect to possible applications that may be relevant for AAL applications.

##### Nanostructured materials - properties

Nanostructured materials are metal or ceramic bulk materials made up of crystals sized at the nano-scale (usually less than 100 nm). The properties mostly depend on the grain boundary area, since up to 50% of atoms are located in grain boundaries of nano-sized materials. Nanocrystalline metals exhibit superior mechanical (hardness, strength) and lower thermal and electrical properties compared to their bulk analogues. Nanocrystalline oxide ceramics show improved mechanical properties (wear resistance, improved bonding abilities to metals and show an increase in ductility (superplastic properties) at low temperatures, which make them favourable for protective coatings.



### **Nanostructured materials - applications**

- Ferromagnetic materials for applications in information storage
- Hydrogen storage (Mg, Zeolites, Me-organic Nanocubes)
- Energy storage (Honeycomb carbon nanostructures, nanostructured metal oxide batteries)
- Supercapacitors
- Materials for MEMS and NEMS such as sensors and actuators

### **Research competencies**

#### **EPFL Lausanne**

##### **Prof. Heinrich Hoffmann**

Institute of Materials

Powder Technology Laboratory (LPT)

<http://ltp.epfl.ch/>

Research topics:

- Powder Synthesis
- Nanoparticles for Medicine
- Powder Processing
- Construction Materials
- Biomaterials

#### **ETH Zürich**

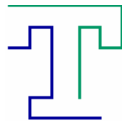
##### **Prof. Sotiris Pratsinis**

Department of Mechanical and Process Engineering

Institute of Process Engineering

Research topics:

- Simulation of Particle Dynamics
- Electrosprays
- Wet Oxidation of Model Substances
- PECVD with Pulsed Microwave Plasma
- Wet Oxidation of Model Substances
- PECVD with Pulsed Microwave Plasma
- Packaging of nanoparticles
- Tubular reactor for reactions in liquid-gas-mixtures
- Large Scale Structures in a Turbulent Flow over Heated Waves



**EMPA** (Eidg. Materialprüfungs- und Forschungsanstalt, Dübendorf)

**Dr. Thomas Graule**

Division High Performance Ceramics

Research topics:

Synthesis of ceramic materials, development of process-technology, optimisation of materials for distinct applications and testing of ceramic materials and devices

### **Nanoparticles/powders - properties**

Nanoparticles show completely new or improved properties based on specific characteristics (size, distribution, morphology) compared to their bulk analogues. They are made of a wide range of materials (metal, metal chalcogenides) and are generally designed and manufactured to meet the needs of the specific application aimed at.

### **Nanoparticles/powders - applications**

- Power/energy (dye solar cells, solid oxide fuel cells, hydrogen storage)
- Health care/medical (implants, controlled release of medicals)
- Consumer goods (white goods, coatings, water and stain repellent textiles)
- Electronics (High density data storage, EMI shielding, electronic circuits, displays)

### **Research competencies**

*cf. above section 'nanostructured materials'*

### **EPFL Lausanne**

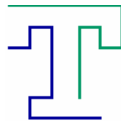
**Prof. Jan-Anders E. Månson**

Laboratory of polymer and composite technology

<http://lrc.epfl.ch/>

Research topics:

- Materials tailoring
- Surface and interface engineering
- Process kinetics and rheology
- Hybrid materials and process integration
- Material mechanics and internal stresses
- Life cycle engineering
- Equipment and test method development
- Implementation and scaling



## **Nanocapsules**

Nanocapsules are essentially hollow nanoparticles, where different types of substances can be added (fragrances, enzymes, catalysts, oils, adhesives, polymers) The possible encapsulation of biological material, the controlled and directed release of the included material render them suitable for drug delivery purposes.

### **Nanocapsules - applications**

- Drug delivery
- Cosmetics
- Magnetic recording and magnetic fluids
- Textiles

### **Research competencies**

#### **University of Basel**

#### **Prof. Wolfgang Meier**

Department of Chemistry

<http://www.chemie.unibas.ch/PC/index.html>

Research topics:

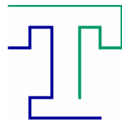
- Interactions between synthetic polymers carrying 'anchor' groups (e.g. hydrophobic moieties, receptors/ligands) with model colloids (e.g. microemulsions, liposomes, latex dispersions or proteins) and biological cells.  
zyme assays;

### **Single-Walled and Multi-Walled (Carbon) nanotubes - properties**

Carbon nanotubes are small carbon cylinders, which graphite sheets are rolled-up to form long, thin spiral patterns. They consist of a single shell (SWNT, single-wall carbon nanotube) or more (MWNT, multi-wall carbon nanotubes), where each shell fits into the other like a Russian doll. Nanotubes of both kinds exhibit extraordinary mechanical properties (strength, flexibility), electrical (electrical (anisotropic) conductivity better than copper) and thermal properties (thermal (anisotropic) conductivity better than diamond).

### **Single-Walled and Multi-Walled (Carbon) nanotubes - applications**

- Polymers & ceramics (electrical conductivity and strength, ductility)
- Energy (supercapacitors, fuel cells, solar cells)
- Nanoelectronics (field emission display, lightning elements)
- Sensor/actuator equipment
- Health and medical (molecular drug delivery, scaffolds for medical patches)



## **Research competencies**

### **EPFL Lausanne**

#### **Dr. Richard Gaal**

Institute of physics of complex matter (DP-IGA)

<http://nanotubes.epfl.ch/>

Research topics:

- Electronic, structural properties and synthesis of nanotubes, and nano-structured carbon materials (fullerenes like C60, carbon onions, carbon nanohorns)
- High Temperature Superconductivity (tunneling, resistivity measurements)
- Mechanical properties of carbon nanotubes and biological polymeric structures

### **Thin films and surfaces - properties**

Materials structures based on the deposition of one or more materials layers on a surface with the aim to introduce a specific functionality on the surface. Technologies used are PVD, CVD, patterning and replication techniques.

### **Thin films and surfaces - applications**

- Optics (Transmission, waveguides, anti reflection)
- Mechanics (wear abrasion resistance, hardness, scratch resistance)
- Electrical (conductivity, insulation)
- Chemical (water repellence, barriers, antimicrobial surfaces, anti-fogging)
- Magnetic (data storage)
- Thermal (thermoelectric devices)
- Biology/medicine (biosensors, medical implants)

## **Research competencies**

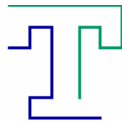
### **ETH Zürich**

#### **Prof. Nicholas Spencer**

Department of Materials

Chair Surface Science and Technology

[http://www.rereth.ethz.ch/werk/selb.spencer/spencer.proj\\_overview.html](http://www.rereth.ethz.ch/werk/selb.spencer/spencer.proj_overview.html)



Research topics:

Surface functionalization and characterization, with a particular emphasis on their application in tribology, implant materials, and biosensors

- Nanochemical Imaging
- Organic Thin Films
- MOCVD
- Biocompatibility of Ti
- Nanotechnology and Biomembranes
- Biocompatibility of Polymers
- Tribology

### **ETH Zürich**

**Prof. Marcus Textor**

Department of Materials

Biointerface group

<http://www.mat.ethz.ch/>

Research topics:

Fundamental aspects in the behaviour of materials in contact with biological milieus and the design and making of surfaces that elicit biospecific responses. Useful developments for the field of biosensors, biomaterials/medical implants and carriers for targeted drug delivery

### **Industry (selection)**

**Balzers:** development of coatings and coating processes, systems and production equipment

**AWM Mold Tech Ltd.** is involved in the entire value-added chain of plastics injection molding: from product design through mold development and manufacturing to the production of individual components in large volumes. Together with universities and other institutions we are also closely involved in the development of nano-technology.

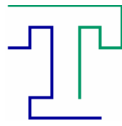
**CSM Instruments** is a precision manufacturer of advanced mechanical surface testing equipment. Adhesion of paints, optical thin films or hard coatings can be defined using one of our scratch tests. These span the nano to the macro range to analyse the widest range of materials.

**DACS Dvorak Advanced Coating:** solutions powder analyser for analysis of powder particle distribution (non destructive testing), nanoparticle modified polymers (hard-chrome replacement), powder feeder

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**Microelectronics, Micro System Technology and Nanotechnology**

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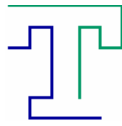
## Research

Switzerland was among the early adopters of MNT. This topic was first included in the LESIT Program (1992-1995), and then followed by dedicated programs such as MINAST (1996-1999) and TOP Nano 21 (2000-2003). These efforts could rely on a well-established and innovative industry in the field of Microtechnology and on pioneer work accomplished by university groups in Neuchâtel, Lausanne, Zurich and Buchs as well as by the CSEM S.A.. Today, Switzerland holds a leading position with (8):

- Worldwide recognized scientific and technological competences
- Well educated engineers and scientists
- Industrial production capacities
- Many companies involved in or at least aware of MNT
- Several start-up companies focused on MNT

Thanks to the long lasting efforts made so far, a state of the art infrastructure for MNT exists in Switzerland and is available for researchers in public or private R&D laboratories. Below is a list of some of the infrastructure for MNT:

CMI (Lausanne)	Microtechnology centre from the EPFL. 900m <sup>2</sup> of clean room with up to date micro processing equipment. Focus on training, research and hosting of external users.
COMLAB (Neuchâtel)	Common facilities for CSEM and University of Neuchâtel. 600 m <sup>2</sup> of fully equipped clean room. Focus on research and technology transfer.
EICN (Le Locle)	Microfabrication and optoelectronic laboratory with a small area clean room. Focus on education, research and technology transfer.
ETHZ-PEL (Zurich)	Research laboratory with focus on CMOS compatible micro and nano technology. Clean room with post processing capability
First Lab (Zurich)	New center for Micro- and Nanoscience of the ETHZ. 900 m <sup>2</sup> of fully equipped clean room facility. Focus on III-V components for high speed electronics and photonics.
HTA Biel (Biel)	Microfabrication center for plastic moulding.
IBM (Rüschlikon)	Research on MEMS based storage, display and telecom devices.
NTB (Buchs)	Institute for Microsystems Technology at NTB. 180 m <sup>2</sup> of fully equipped clean room facility. Focus on research and technology transfer with emphasis on packaging and assembly.



PSI-LMN (Villingen)	Laboratory for Micro and Nano Technology at PSI. 300 m <sup>2</sup> of clean room, half of it for nano structuration of semiconductors. Focus on research.
PSI-SLS (Vilingen)	Swiss Light Source. New, state of the art synchrotron radiation facility for research in the nanoscale

### **Research competencies**

#### **Université de Neuchâtel**

##### **Prof. Nico de Rooij**

SAMPLAB (Sensors, Actuators, Microsystems Laboratory)

<http://www-samlab.unine.ch/activities/bio-chem.htm>

Research topics:

- Bio and chemical MEMS
- Sensors and actuators (RF-MEMS)
- Optical MEMS

#### **CSEM Centre Suisse d'Electronique et de Microtechnique SA, Neuchâtel**

##### **Prof. Dr. Hinderling**

<http://www.csem.ch/fs/microelectronics.htm>

Research topics:

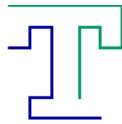
The research effort conducted in Microelectronics is mainly oriented towards the development of innovative circuits and systems that exploit the capabilities of advanced CMOS technologies to provide new highly integrated solutions for the realization of low-power devices. The main focus is on standard digital CMOS technology and on low-power and low-voltage (typically sub-volt) operation.

- Wireless Sensor Networks
- Vision Sensor Systems
- Digital Signal Processing
- RF-MEMS

### **Industry**

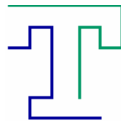
More than 200 companies involved in individual projects in the MNT-programs mentioned above could be listed. Some 90 companies, such as Unaxis, Swatch, Intersema, RMT, Siemens Building Control, Sensirion, to name a few, participated in MINAST. In addition, of course, many companies carry out their project developments on their own.

This industry also developed a manufacturing infrastructure with clean room facilities, such as:



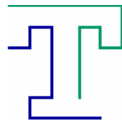
Colibrys (Neuchâtel)	Large industrial production line for microsystems (>1200 m <sup>2</sup> ), with assembly and test facilities. Focus on custom solutions for medium production volumes.
EM-Marin (Neuchâtel)	Industrial production line for ultra low power CMOS circuits. Limited production capacity for chemical post processing of Silicon.
KATZ (Aarau)	Plastic Training and Technology Center supported by the plastic industry, with research activity in micro and nano molding techniques.
Leister (Sarnen)	Industrial production line for microsystems. Focus on microfluidics and micro-optics.
Microsens (Neuchâtel)	Industrial company focused on research and development in chemical sensors. Production capacity for high precision membranes.
MICS (Neuchâtel)	Industrial production line for chemical sensors.
Mimotec (Sion)	Specialized industrial company (spin off of EPFL) focused on SU8 Micro-moulding technology.

Year	Name	Web	Origin	Staff (in CH)
1998	Acqiris	<a href="http://www.acqiris.com">www.acqiris.com</a>		30
1999	Acter AG	<a href="http://www.acter.ch">www.acter.ch</a>	ETHZ	13
1998	Alpes Lasers	<a href="http://www.alpeslasers.ch">www.alpeslasers.ch</a>	Uni-NE	5
1996	Autodose	<a href="http://www.autodose.ch">www.autodose.ch</a>		15
2000	Avalon Photonics Ltd	<a href="http://www.avalon-photonics.com">www.avalon-photonics.com</a>	CSEM	34
2001	Beam Express		EPFL	2
1992	Bitplane AG	<a href="http://www.bitplane.ch">www.bitplane.ch</a>	ETHZ	12
1996	CLA Clinical Laboratory Automation	<a href="http://www.cla.ch">www.cla.ch</a>		10
2001	Colibrys SA	<a href="http://www.colibrys.com">www.colibrys.com</a>	CSEM	125
1999	CP Automation	<a href="http://www.cpautomation.ch">www.cpautomation.ch</a>		55
2000	Crystal Vision Microsystems		EPFL	2
2000	Cytion	<a href="http://www.cytion.com">www.cytion.com</a>	EPFL	20
1992	DELTA Engineering	<a href="http://www.delta-engineering.ch">www.delta-engineering.ch</a>	ETHZ	1
1999	DiagnoSwiss	<a href="http://www.diagnoswiss.com">www.diagnoswiss.com</a>	EPFL	4
2001	Didel	<a href="http://www.didel.com">www.didel.com</a>	EPFL	5
1998	DSPFactory	<a href="http://www.dspfactory.com">www.dspfactory.com</a>	Uni-NE	15
1998	EndoArt SA	<a href="http://www.endoart.ch">www.endoart.ch</a>	EPFL	13
1998	ER Systems	<a href="http://www.ersystems.ch">www.ersystems.ch</a>	Ascom	10
2000	e-vision	<a href="http://www.evisioninc.ch">www.evisioninc.ch</a>	Philips	10
1998	FastCom	<a href="http://www.fastcom.ch">www.fastcom.ch</a>	EPFL	26
1995	Ferrovac GmbH	<a href="http://www.ferrovac.ch">www.ferrovac.ch</a>	ETHZ	3



2000	Giga Tera AG	<a href="http://www.giga-tera.ch">www.giga-tera.ch</a>	ETHZ	20
2000	IPo1	<a href="http://www.ip01.com">www.ip01.com</a>	Uni-NE	6
2000	IR-Microsystems	<a href="http://www.ir-microsystems.com">www.ir-microsystems.com</a>	EPFL	3
1994	ISE Integrated Systems Engineering AG	<a href="http://www.ise.ch">www.ise.ch</a>	ETHZ	45
2000	Kroll Thin Film Technologies			1
2000	Luciol Instruments	<a href="http://www.luciol.com">www.luciol.com</a>		3
2000	Magtrol	<a href="http://www.magtrol.com">www.magtrol.com</a>		50
1997	Medlight	<a href="http://www.medlight.com">www.medlight.com</a>	EPFL	4
1997	MicroBlox	<a href="http://www.u-blox.ch">www.u-blox.ch</a>	ETHZ	40
1998	MicroChemical Systems	<a href="http://www.microchemical.com">www.microchemical.com</a>		18
1998	Microcid	<a href="http://www.microcid.com">www.microcid.com</a>	Microswiss	8
1998	Mimotec SA	<a href="http://www.mimotec.ch">www.mimotec.ch</a>	EPFL	9
1995	MSE MEILI-Multiphase Systems Engineering	<a href="http://www.msemeili.ch">www.msemeili.ch</a>	ETHZ	2
1997	Nanosurf	<a href="http://www.nanosurf.com">www.nanosurf.com</a>	Uni-Basel	7
2000	Nanoworld		Uni-NE	5
2000	Omnisens SA	<a href="http://www.omnisens.ch">www.omnisens.ch</a>	EPFL	4
2001	PhotonFocus AG	<a href="http://www.photonfocus.com">www.photonfocus.com</a>	CSEM	3
1997	Rainbow Photonics AG	<a href="http://www.rainbowphotonics.ethz.ch">www.rainbowphotonics.ethz.ch</a>	ETHZ	6
1994	Schmid & Partner Engineering AG	<a href="http://www.speag.com">www.speag.com</a>	ETHZ	15
2000	Selexis		Uni-Lausanne	3
1999	Sensile technologies SA	<a href="http://www.sensile.com">www.sensile.com</a>	EPFL	7
1998	Sensirion AG	<a href="http://www.sensirion.ch">www.sensirion.ch</a>	ETHZ	40
1999	Sensorix	<a href="http://www.sensorix.ch">www.sensorix.ch</a>	ETHZ	8
1998	Sentron	<a href="http://www.sentron.ch">www.sentron.ch</a>		6
1999	SenTec	<a href="http://www.sentec.ch">www.sentec.ch</a>		11
1999	Sercalo Microtechnology Ltd.	<a href="http://www.sercalo.com">www.sercalo.com</a>	Uni-NE	11
1998	Seyonics SA	<a href="http://www.seyonics.com">www.seyonics.com</a>	Uni-NE	7
1998	Shockfish	<a href="http://www.shockfish.ch">www.shockfish.ch</a>	EPFL	11
1996	SinusPoint	<a href="http://www.sinuspoint.ch">www.sinuspoint.ch</a>		27
1999	Smartdata SA	<a href="http://www.smartdata.ch">www.smartdata.ch</a>	EPFL	13
1995	Time-Bandwidth Products	<a href="http://www.tbwp.com">www.tbwp.com</a>	ETHZ	9
2000	VHF Technologies	<a href="http://www.vhf-technologies.com">www.vhf-technologies.com</a>	Uni-NE	7
2000	Wavemind	<a href="http://www.wavefinders.ws">www.wavefinders.ws</a>	EPFL	4
2001	Xemtec AG	<a href="http://www.xemtec.ch">www.xemtec.ch</a>	CSEM	2
1997	Xemics	<a href="http://www.xemics.com">www.xemics.com</a>	CSEM	106

Table 3: List of start-ups that were founded within the frame of MNT programs run in Switzerland (8)



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## Energy generation and control techniques

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### Research and Industry (9)

#### Solar Cells

Thin film alternatives to crystalline solar cells based on mono- and polycrystalline silicon are Copper Indium Diselenide (CIS), and Cadmium Telluride (CdTe). With respect to production costs, CdTe exhibits superior potential. Doping the absorber layer of CIS cells with gallium (CIGS) increases module quality and efficiencies close to 8-9% are achieved on the market place, identical to that of CdTe cells. The CIGS layer is the most promising candidate for thin absorber materials.

The most efficient solar cells in research are made of Gallium Arsenic (GaAs) with an efficiency of 30% and the worst performing are the Dye Sensitized solar Cells (Grätzel or DSC cells) that convert sunlight to energy similar to plants. Irrespective of the relatively low performance, the DSC cells are regarded as a long-term alternative for a cheap and environmentally friendly energy production.

Institute / Company	Projects / Products
Université de Neuchâtel, A. Shah, Switzerland	Amorphous and microcrystalline silicon photovoltaic cells and modules.
EPFL, M. Grätzel, Switzerland	Development of flexible, dye based solar cells, photovoltaic cells with white light conversion efficiency of over 10%.
ETH Zürich, A. Tiwari, Switzerland	Thin film solar cells on flexible solar cells based on (Cu(Ga, In)Se <sub>2</sub> )
Solaronix, Switzerland	Production of dye solar cells, transparent conductive coatings and electrochromic elements
VHF-Technologies, Switzerland	Flexible solar modules based on 'Flexcell technology' for plastic substrate applications

Table 4: Overview of research institutes and companies in the field of solar energy conversion

#### Fuel Cells

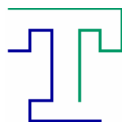
##### 1. PEFC (Polymer Electrolyte FC)

The development of PEFC is strongly pushed, since it has the largest application potential of all fuel cell technologies in the mobile sector. In addition, applications in decentralized power supply systems and as an alternative to batteries in small systems are pursued. The required technology is closely related to that required for the DMFC.

##### 2. SOFC (Solid Oxide FC)

Due to the high efficiency and the direct usage of hydrocarbons, the SOFC has a high application potential. Materials problems are the current research focus.

##### 3. DMFC (Direct Methanol FC)



Best suited for applications in the automotive sector, since a rather abundant energy source is used as the fuel. Currently for used for small, portable applications.

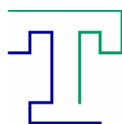
In addition to stationary (industry and private household) and automotive applications, the potential of fuel cells for portable applications is emerging. Several major companies are currently working on fuel cell powered versions of portable appliances such as lap top computers, personal digital assistants (PDAs), mobile telephones, etc.. The major advantage of the micro fuel cell technology is that power delivery is up to 50 times longer and recharging can be reduced to less than a minute. Mid range fuel cell technology has potential applications for cordless appliances, power tools, wheelchairs, bicycles, boats, home energy systems and portable computers.

<b>Institute / Company</b>	<b>Projects / Products</b>
<b>EPFL, A. Rufer, Switzerland</b>	Research on PEFC systems, modeling, control, power electricity
<b>PSI, G. Scherer, F. Büchi, O. Haas, P. Dietrich, Switzerland</b>	Research on PEFC materials, membranes, catalysts, in-situ diagnostics, PEFC-stacks, -systems.
<b>ETHZ, M. Meier, Switzerland</b>	Research on PEFC bipolar plates, -stacks, -systems and Power Pac.
<b>UAS Biel, Walther, Switzerland</b>	Research on PEFC mini systems
<b>EPFL, M. Rappaz, M. Grätzel, D. Favrat, Switzerland</b>	Research on $\mu$ -SOFC, thin film electrolyte materials, SOFC stacks
<b>ETHZ, L. Gauckler, Switzerland</b>	Research on $\mu$ -SOFC, nano materials, membrane electrode assemblies (MEA)
<b>EMPA Dübendorf, T. Graule, Switzerland</b>	Research on SOFC , anode materials, MEA nano materials
<b>MesDea, Switzerland</b>	Production of air-cooled PEFC system
<b>FUCCELLCO AG, Switzerland</b>	Production of SOFC cell and stacks
<b>Htceramix, Switzerland</b>	Production of SOFC stacks. Proprietary technology based on a ceramic gas diffusion and current collection layer with plastic properties.
<b>Sulzer Innotec, Switzerland</b>	Production of SOFCs, - stacks, components development

Table 5: Overview of research institutes and companies in the field of fuel cell energy technology

### **Thermoelectricity**

Thermoelectric generators that convert heat (e.g. body heat) into electrical power exhibit a great potential to meet the demand for energy source for autonomous micro systems that are used in applications such as wearable electronics or ubiquitous computing. For instance, the TE technology provides opportunities for medical electronics since the link up of patients via cables can be eliminated, if sensors and power supplies are embedded in textile band aids. New thermoelectric materials, reduced power consumption of the



chips and lower production costs are currently the focus of a wide range of research activities.

<b>Institute / Company</b>	<b>Projects / Products</b>
<b>ETHZ, Hierold, Switzerland</b>	Research on miniaturized and integrated TE devices.

Table 6: Overview of research institutes in the field of thermoelectricity

### Rechargeable batteries

Rechargeable batteries or accumulators that have significantly penetrated the market are based on NiCd, Nickel-metal-hydride (NiMH), Li-ion or Li-polymer materials. Lithium batteries exhibited outstanding performance and contribute significantly to worldwide sales in portable batteries. The portable electronics market (mobile telephones, hand-held computers, GPS systems, monitoring sensing devices etc. ) is still dominated by NiCd batteries as power source. Sony is the biggest player in this market, followed by Emerson Electric and Samsung.

Focus in research is put on improvement of power density, lifetime and charge/discharge rates in Li-based and metal hydrides batteries by using nanocrystalline materials and nanotubes.

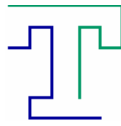
<b>Institute / Company</b>	<b>Projects / Products</b>
<b>PSI Villigen, Novak, Switzerland</b>	Research on Li-ion batteries, development and optimisation of new materials for both anode and cathode
<b>EPFL, Grätzel, Switzerland</b>	Research on Li-ion batteries, new anode materials
<b>Bar Ilan University, Isreal, D. Auerbach</b>	NanoBatt project: new materials, new synthetic routes for Li-batteries
<b>NTERA (XOLIOX), Swiss subsidiary</b>	Nanocrystalline metal oxide batteries for 100 times faster charge and discharge rates compared to commercially available Li-batteries.

Table 7: Overview of research institutes and companies in the field of rechargeable batteries

### Supercapacitors

Supercapacitors offer an unique combination of high power and high-energy performance parameters. The energy density of supercapacitors are 100 times higher than in dielectric foil capacitors and the power density is 10 times higher than in normal batteries. Supercapacitors are an emerging technology for portable products and other sectors. Small, space-saving solutions are already being developed.

<b>Institute / Company</b>	<b>Projects / Products</b>
<b>PSI Villigen, Switzerland</b>	Research on high power EDLC using glassy carbon and aqueous electrolytes and high energy EDLC using



	activated carbon and organic electrolytes.
<b>Montena components, Switzerland</b>	Technological world leader in the domain of supercapacitors with an energy density of 4.3 Wh/kg and a power density of 4 kW/kg.

Table 8: Overview of research institutes and companies in the field of supercapacitors

### Kinetic energy powered systems

Human kinetic energy is an attractive energy source for low power wearable systems. It is less dependent on the placement of the energy converter than solar or thermal energy. Currently the feasibility of wearable systems powered by human kinetic energy is investigated.

Institute / Company	Projects / Products
<b>ETH Zürich, G. Tröster, Switzerland</b>	Research on the energy harvesting efficiency of a micro power converter and the appropriate sensor systems that can be powered.
<b>ASULAB, Switzerland</b>	Development of a generator in the heel of a normal shoe which produces about 0.3 Joule per step. The generator consists of a metal frame, plus a compression spring. The weight of the body compresses the spring which drives the generator via a rack and pinion arrangement, when it is released.

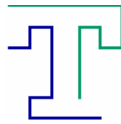
Table 9: Overview of research institutes and companies in the field of kinetic energy powered systems

### Contactless energy transmission

Systems in movement, equipped with electric drives, must be supplied in energy, generally by moving cables, collector rings or catenaries. Among the applications of rotating tables, the X-Y table, electric vehicles, etc. can be quoted. Such a contactless energy transmission may be realized by the mean of an air gap transformer, rotating or linear. Such systems were modeled for rotating, linear, with and without iron alternatives. Four studies and developments were undertaken at the Integrated Actuators Laboratory at EPFL, Switzerland:

- rotating transformers with ferrite structure;
- a systematic study of an ironless linear transformer for a power of 6 MW for Swissmetro (cf.: <http://laiwww.epfl.ch/projetsMJ/swissmetro/index.html>);
- a complete new realization of a power supply for the electric motor vehicle Serpentine (<http://laiwww.epfl.ch/projetsMJ/serpentine/index.html>);
- development of a demonstrator associated to a linear motor for machine tools.

The interest of the energy transmission technology by induction is certain and should develop in the medium term. Application to the Serpentine vehicle and a machine tool is realized and is in phase of industrialization.



Institute / Company	Projects / Products
<b>EPFL, M. Jufer, Integrated Actuators Laboratory (LAI), Switzerland</b>	Research on electric drives, from small watch motors up to 100 kW motors, including drivers, control, sensors and transmissions. Special developments are also undertaken in advanced transportation systems and in piezo-electric technologies.

Table 10: Overview of research institutes and companies in the field of kinetic energy powered systems

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## Human machine interface

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### Research competencies

#### **ETH Zurich**

#### **Man-Machine Interaction Research Group,**

Institute of Hygiene and Applied Physiology

[www.mmi.ethz.ch](http://www.mmi.ethz.ch)

The Man-Machine Interaction group is an interdisciplinary group consisting of computer scientists, psychologists, ergonomists and engineers working in close cooperation. MMI conducts empirical research and applied studies ranging from usability studies to hardware and software development. Interaction research is the main focus of the MMI group.

#### **CSEM Centre Suisse d'Electronique et de Microtechnique SA**

<http://www.csem.ch/fs/interface.htm>

Research topics:

- Recognizing voice
- Denoising acoustic or visual signal
- Recognizing writing
- Recognizing human emotion
- Human activity recognition and categorization
- Movement recognition

#### **ETH Zürich**

#### **Prof. Friedemann Mattern**

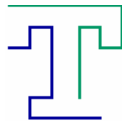
Department of Computer Science

Institute of Pervasive Computing

Distributed Systems Group

<http://www.vs.inf.ethz.ch/res/>

Research topics:



### **Smart Cooperative Objects**

- This research topic concerns the creation, installation, management, and interaction with smart objects. Of particular interest to us are also security and dependability issues, context-aware collaboration, as well as infrastructure support.

### **Sensor Networks**

- Sensor networks consist of large numbers of tiny autonomous computing devices, each equipped with sensors, a wireless radio, a processor, and a power source. Their close integration with the physical world imposes a number of novel and challenging research problems.

### **Privacy**

- The massive deployment of smart cooperating objects with fine-grained sensing and large-scale communication capabilities has potentially large consequences for our personal privacy. We are investigating how future ubiquitous computing systems can support a sufficient level of privacy awareness.

### **Social Implications**

- Privacy is but one aspect of our everyday that might substantially be altered by the deployment of ubiquitous computing environments. In order to better understand the non-technical requirements of such systems, we are investigating the social, economic, and ethical implications of ubiquitous computing.

### **CUI University of Geneva**

**Prof. Nadia Magnenat-Thalmann**

MIRALab

[http://www.miralab.unige.ch//3research/research\\_projects.cfm](http://www.miralab.unige.ch//3research/research_projects.cfm)

Research topics:

Virtual humans (avatars) simulation and virtual worlds

Participation in the European Project HUMAINE, which aims to lay the foundations for European development of systems that can register, model and/or influence human emotional and emotion-related states and processes - 'emotion-oriented systems'

### **EPFL Lausanne**

**Prof. Afzal Ballim**

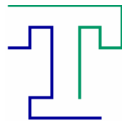
LITH: Computer Science Theory Laboratory

Media Research Group

<http://media.epfl.ch/>

<http://lithwww.epfl.ch/~ballim/>

- Natural Language Processing
- User Modeling
- Localisation
- Human Computer Interaction



- Groupware
- Computer Supported Collaborative Work

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## Communication

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### Research competencies

#### University of Zurich

##### Prof. Reinhard Riedl

Department of Information Technology

Distributed Systems Group

<http://www.ifi.unizh.ch/egov/>

[http://www.ifi.unizh.ch/~riedl/pa\\_activities.html](http://www.ifi.unizh.ch/~riedl/pa_activities.html)

Research topic:

Trustworthy systems

#### ETH Zürich

##### Prof. Armin Wittneben

Department of Information Technology and Electrical Engineering,

<http://www.nari.ee.ethz.ch/wireless/background/background.html>

Research topics:

Hierarchical communication systems in Pervasive Wireless Access Networks

The vision of the Wireless Communication Group is to develop enabling core technology for pervasive wireless access and fuel the interdisciplinary effort, which is required to make pervasive wireless access and the applications a reality. Current focus of our work is on designs, which explicitly exploit physical layer, medium access control layer and data link layer cooperation among nodes. Our early results indicate that this approach achieves a quantum leap in the performance/cost trade off, which is at the heart of pervasive wireless access. As an example we have been able to relieve a fundamental problem of wireless MIMO technology: the requirement of a channel with rich scattering. Pervasive wireless access networks challenge many "proven" approaches to wireless network design (cross layer designs, heterogeneous nodes, cooperation, decentralized organization, energy awareness, etc.).

#### ETH Zürich

##### Prof. Dr. Gustavo Alonso

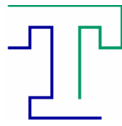
Information and Communication Systems Research Group

Department of Computer Science

<http://www.iks.inf.ethz.ch/>

Research topics:

PROSE is a modified Java Virtual Machine that supports dynamic Aspect Oriented Programming. We use PROSE to explore the problem of software adaptation in a number of applications including Web servers, J2EE containers, robots, and mobile computing.



Jadabs is a platform for dynamic acquisition and removal of applications and/or code extensions. Jadbabs uses a light weight event based middleware that makes it very suitable for small devices.

JOpera is a visual composition engine for Web services. It supports the design and enactment of complex business protocols and conversations.

ASAP: QoS in multi-hop wireless networks

PANAMA is a multimedia framework to support user-oriented multimedia applications. By organizing various user devices (Laptop, PDA, Handy and etc) as a single entity, PANAMA enables pervasive multimedia streaming which is tracking the user through different devices or interfaces.

The Wireless Laboratory is a test lab for different projects: Jadabs, Panama, ASAP. We apply our systems in real live scenarios whereof we have developed prototypes for a robot and multihoming infrastructure

### **EPFL Lausanne**

#### **Prof. Jean Pierre Hubaux**

Laboratory for computer communications and applications

<http://icawww.epfl.ch/>

Research topics:

#### **Project Terminode**

The Terminode project is a 10-year-long research program (2000-2010) that follows a system approach to investigate wide area, large, totally wireless networks that is called mobile ad-hoc wide area networks. In the Terminode project, a radically distributed approach is pursued, in which all networking functions are embedded in the terminals themselves. Because they act as nodes and terminals at the same time, these devices are called terminodes. A network of terminodes is an autonomous, self-organized network, completely independent of any infrastructure or other equipment.

### **EPFL Lausanne**

#### **Prof. Touradj Ebrahimi**

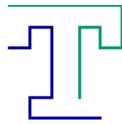
Laboratory for Signal Processing (ITS)

<http://ltswww.epfl.ch/>

Research topics:

The expertise of the ITS ranges from digital signal processing to integrated systems design and contributes to both theoretical and practical research efforts. The main topics investigated within ITS include (but are not restricted to):

- Biomedical signal/image processing
- Computer vision
- Data compression
- Media delivery



- Visual information representation and processing
- Integrated system design

The IST significantly contributes to the development of parts of the MPEG standard now used in audio CDs and digital TV.

### **ETH Zürich**

#### **Prof. Ueli Maurer**

Institute of theoretical computer science

Information security and cryptographic research group

<http://www.crypto.ethz.ch/>

This research group has built up an outstanding reputation for excellence in security theory.

### **CSEM Centre Suisse d'Electronique et de Microtechnique SA**

<http://www.csem.ch/fs/telecom.htm>

#### Telecom Applications of MOEMS

Application areas are:

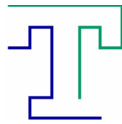
- Wavelength management: wavelength monitors (this promises to be a important as cheap DWDM system proliferate), wavelength multiplexers/demultiplexers (but these will have to reduce in size from present concepts), wavelength switches (programmable add/drop multiplexers), equalization (present method of ensuring that the power in all wavelengths is equal are rather cumbersome).
- Dispersion management: tunable chromatic dispersion compensation (important as bandwidth and distances increase) , polarization mode dispersion (important for 40 Gb/s systems).
- Power management: The ability to vary power levels independently of laser drive current or amplifier pump power.
- Assembly: Self-alignment systems, including replicated alignment elements, plus micro-machines, and automated packaging

### **Industry**

**Crypto AG** has been the specialist for information security at the highest cryptological and technical level. More than 130 countries have chosen Crypto AG as their trusted partner.

[http://www.crypto.ch/pages/htm/crypto/about\\_us.htm](http://www.crypto.ch/pages/htm/crypto/about_us.htm)

### **Cablecom**



Cablecom is one of the principal providers of telecommunications services in Switzerland, offering a comprehensive range of services to domestic and business customers.  
<http://www.cablecom.ch>

### **Switch**

Switch promotes modern methods of data transmission, sets up and runs the academic and research network in Switzerland.  
<http://www.switch.ch>

### **Symetria**

Symetria AG offers tailor-made solutions and specific services in the area of Multimedia communications over an intranet, the internet and ISDN such as : Videoconferencing, data conferencing and streaming (multicasting and video on demand).  
<http://www.symetria.com>

### **Tellware**

Tellware is a firm developing intuitive collaborative planning tools. Their specific field of activity concern development of interactive hardware and software.  
<http://www.tellware.com/>

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## **Software, web & network technologies**

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### **Research competencies**

#### **ETHZ Zürich**

**Dr. Paul (Pawel) Lukowicz**

<http://www.ife.ee.ethz.ch/cag/>

Research topics:

- Opto-Electronic Interconnections in Computer Systems
- Reconfigurable Computing
- Parallel Computing
- Low Power Computer Architecture

#### **ETHZ Zürich**

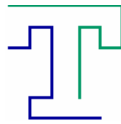
**Prof. Bertrand Meyer**

Chair of software engineering

<http://se.inf.ethz.ch/>

Research topics:

- Trusted components: components equipped with specified and guaranteed quality properties.
- Component certification.
- [SCOOP: general, easy to use programming mechanism for concurrent, multi-threaded, distributed, Web service applications.](#)



- [Proving the correctness of reusable components](#)
- Eiffel and object technology
- Seamless persistence for object-oriented programming
- [From patterns to components](#)
- [Contract-based testing](#)

### **EPFL Lausanne**

#### **Prof. Karl Aberer**

Distributed Information Systems Laboratory

<http://lsirwww.epfl.ch/lsir-people.htm>

Research topics:

- P2P systems: addressing the problem of efficiently searching for resources in a decentralized architecture
- P2P web retrieval
- Distributed workflows

## **2.2 Potential fields of application and societal demand**

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### **Gerontotechnics**

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#### **Foundations**

#### **FST Foundations suisse pour le teletheses**

#### **Project Quo Vadis**

The project aims at the technical support by means of automatic door opening for people that suffer the Alzheimer's disease.

<http://www.fst.ch/FST2/al/default.php?CAT=3&SNAV=2&CONT=8>

[http://www.fst.ch/FST2/al/IMAGES\\_LANGUES/produits/Brochure\\_QuoVadis1\\_D.pdf](http://www.fst.ch/FST2/al/IMAGES_LANGUES/produits/Brochure_QuoVadis1_D.pdf)

Products to enhance the quality of life of elderly people: Holistic studies of the environment (rooms, home, buildings) and the required infrastructure for remote control of windows, doors, elevators, emergency call, etc..

<http://www.fst.ch/FST2/al/default.php?CAT=3&SNAV=2&CONT=5>

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### **Health care/wellness**

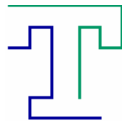
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#### **Research competencies**

#### **ETH Zürich**

#### **Prof. Gerhard Tröster**

Department of Information Technology and Electrical Engineering



Electronics Laboratory

<http://www.ife.ee.ethz.ch/showcase/groups/sensor/>

Research topics:

Active wireless Electrodes for Bio-Potentials (EEG and ECG)

**Electronics Laboratory**

Wearable Computing Lab

<http://www.wearable.ethz.ch/mac000.0.html>

Research topic:

Motion aware clothing

**CSEM Centre Suisse d'Electronique et de  
Microtechnique SA**

<http://www.csem.ch/fs/telemonitoring.htm>

CSEM designed a system which addresses the following aspects:

- Automatic fall detection considered by professional as a major risk for elderly and disabled people
- Medical monitoring of vital physiological parameters
- Medication compliance, which is a major reason for hospitalization, fall, etc.
- Communication of physiological parameters and vocal communication between the user and relatives, physician doctor, medico-social institution and monitoring center

**Industry**

**Telealarm group companies**

Teletronic SA, La Chaux-de-Fonds

[www.telealarm.com](http://www.telealarm.com)

**Telecare (Ascom)**

[http://www.ascom.com/solutions\\_ws/products\\_ws/nurse\\_call\\_ws/telecare\\_m\\_ws.htm](http://www.ascom.com/solutions_ws/products_ws/nurse_call_ws/telecare_m_ws.htm)

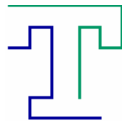
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**Services**

**Research competencies**

Please refer to the section health/care wellness. A research competence in this field is Prof. G. Tröster and his wearable computing lab.

**Industry**



## **Bones GmbH**

<http://www.bones.ch/>

Products: Personal assistance for visually impaired (handicapped) people. A portable user device with a matching counterpart (environment infra structure) enabling the user's communication and interaction)

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## **Smart home**

### **Research competencies**

## **CSEM Centre Suisse d'Electronique et de Microtechnique SA**

[http://www.csem.ch/fs/home\\_auto.htm](http://www.csem.ch/fs/home_auto.htm)

- Intelligent Appliances,
- Security systems (including intrusion sensing),
- Home Health monitoring systems,
- Home Robots, and
- Aggregation of all of the above through single and transparent control

The best comfort control solutions, developed by CSEM, will save your facility money, improve the comfort of the building occupants and respects environment-friendly aspects. CSEM has a proven and sound experience in the development of intelligent HVAC systems, ranging from wireless valve controllers over self-commissioned heating controllers to advanced building control systems.

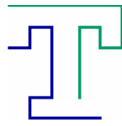
The last few years have seen the emergence of numerous new wireless technologies, some of which (for example IEEE 802.11b, Bluetooth, etc...) have reached the market recently. While the general trend is to offer higher and higher data rates, there are many existing and new applications that do not require such a high bandwidth, but would strongly benefit from a wireless communication link. Examples of such applications are wireless sensor networks. In this perspective, the Microelectronics Division has launched a project called WiseNET™. Its main objective is to develop a low-power wireless ad-hoc network made of many distributed microsensors that are energetically autonomous (usually battery operated) and able to communicate amongst them and with the external world. WiseNET™ will enable the monitoring and the control of physical and environmental parameters for a variety of applications spanning the home, the office, the clinic, the factory, in vehicle, over metropolitan area, and the global environment. For example, WiseNET™ will monitor security and safety in the future homes and offices.

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## **Smart textiles**

### **Research competencies**

## **ETH Zürich**



**Prof. Gerhard Tröster**

Department of Information Technology and Electrical Engineering

Electronics Laboratory

<http://www.wearable.ethz.ch/qbic.0.html>

The QBIC (QBIC Belt Integrated Computer) is a tiny wearable computer with enough computational power to support a wide range of applications. The current model is batch produced at the Swiss Federal Institute of Technology in Zurich as a research platform to collect and compute sensory data for medical monitoring and context recognition projects. However many other applications may be supported e.g.:

- To monitor medical parameters of critical patients 24 hours a day
- To collect and analyse data on user movement for rehabilitation
- To collect and analyse data on user movement for dance projects.
- As a computer for reality games
- As a guide to tourists or travellers

**EMPA St. Gallen**

**Dr. M. Ruedi**

Laboratory for Physiology and Protection

**Medical textiles**

The research activities are concentrated on the development of non- or minimally-invasive materials and products for health maintenance and treatment. Our primary effort is in gerontotechnology to maintain the quality of life of elderly people, with a focus on products and devices for disease prevention, pain relief and the control of bodily functions.

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**Robotics**

**Research competencies**

**ETH Zürich**

**Prof. Brad Nelson**

Institute of Robotics and Intelligent Systems

Research topic:

Wireless magnetoelastic sensing for biomedical and microrobotic applications

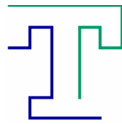
<http://www.iris.ethz.ch/research/magneto.php>

**EPFL Lausanne**

**Prof. Terrence Fong**

VRAI-group, virtual reality and active interfaces group

Research topics:



### Collaborative Control

In collaborative control, a human and a robot collaborate to perform tasks and to achieve common goals. Instead of a supervisor dictating to a subordinate, the human and the robot engage in dialogue to exchange information, to ask questions, and to resolve differences. Instead of serving the human as a mere tool, the robot can operate more like a partner. With this approach, the robot has more freedom in execution and is more likely to find good solutions when there are problems

<http://vrai-group.epfl.ch/projects/collaborative.control/>

### Vehicle Teleoperation

Efficient, robust vehicle teleoperation through easy-to-use interfaces

<http://vrai-group.epfl.ch/projects/ati/>

**Dalle Molle Institute for Artificial Intelligence** (University of Lugano and SUPSI  
(University of applied science in Swiss Italy)

**Prof. J. Schmidhuber**

Learning Robots

<http://www.idsia.ch/projects?kind=current>

### **EPFL Lausanne**

**Prof. A. Billard**

Autonomous Systems Lab

Research topics:

- Artificial Neural Networks,
- Robotics,
- Neural Modeling,
- Computational Neuroscience,
- Programming Through Demonstration,
- Imitation Learning,
- Language Acquisition

<http://asl.epfl.ch/>

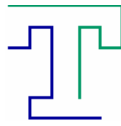
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### **Sociology**

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With respect to research on improving quality of life of elderly people in their own home please refer to the section 'Smart home' and the activities of the CSEM, that specifically address these issues.

With respect to face-to face communication and the development of communication networks, please refer to research of the CUI University of Geneva and the man-machine interaction group at the ETH Zurich.



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## **Re-use, sustainability**

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### **Research competencies**

#### **ETH Zurich**

##### **Prof. P. Schönsleben**

Department for management and production sciences

[pschoensleben@ethz.ch](mailto:pschoensleben@ethz.ch)

Project: LicoPro: Lifecycle Design for Global Collaborative Production(EU-IST-2001-37603, IMS-2001-00009)

The capability to systematically adapt to changes in market demand requires new approaches for design, operation & control of production systems. LicoPro aims at their integrated design on in-plant and transcorporate level, that are changeable with reduced lifecycle consumption of resources.

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## **Compatibility, modules**

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### **Research competencies**

#### **ETH Zurich**

##### **Prof. W. Fichtner**

Integrated Systems Laboratory

[fichtner@iis.ee.ethz.ch](mailto:fichtner@iis.ee.ethz.ch)

Project: Computational electromagnetics

Electromagnetic effects in electronic devices in the past often have been neglected or approximated with very simple principles. The future standards for electromagnetic compatibility of electronic systems will be harder to meet due to increased complexity, higher operating frequencies and lower operating power.

The Integrated Systems Laboratory is developing a simulation environment which allows to take into account electromagnetic effects during the design process.

#### **ETH Zurich**

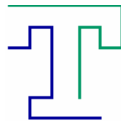
##### **Prof. H. Melchior**

Institute for quantum electronics

[hans.melchior@phys.ethz.ch](mailto:hans.melchior@phys.ethz.ch)

Project: Low Cost Packaging of Semiconductor Laser Arrays Modules for Data Communication Applications

The packaging of optoelectronic devices for optical telecommunication and parallel interconnects largely dominates the costs of these modules. This is mainly due to the incompatibility with electronic packaging and the high geometrical precision requirements at the fiber-chip interface. Self-alignment techniques help to reduce packaging time and costs drastically.



### 3 National Programs

#### 3.1 National programs already funding areas related to AAL

The only promotion organisation for the funding of application oriented research and development in Switzerland is the Commission of Innovation and Technology (CTI) (cf. chapter 4). There are no programs in Switzerland currently running, which are dedicated to the funding of AAL-related projects. However, two of four promotion areas in the CTI cover technological topics, which shall be addressed AAL as there are: Enabling Sciences and Micro- /Nano (cf. chapter 4)

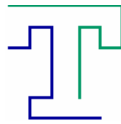
Since the beginning of 2004, a transdisciplinary promotion campaign called 'Innovation for successful ageing' (ISA, 10) is running. It targets national research and development projects that both lead to innovative solutions in the market and take the specific needs of older people into account. This includes new technologies, products and services. Funding of such projects originates from budgets of the four promotion areas of the commission of technology and innovation (CTI) (cf. chapter 4). Therefore, the application for funding shall be directed to one of these areas, which topic suits with the project content.

#### 3.2 What kinds of instruments do exist for this purpose?

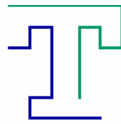
In the following table, the promotion campaign ISA is described. Details about the contents of the individual promotion areas of the CTI are given in chapter 4.

Title of measure	CTI-ISA (Innovation for successful ageing)
Initiator/sponsor	Commission of Technology and Innovation (CTI) Head: Prof. O. Gassmann, University of St. Gallen
Format	Transdisciplinary promotion campaign
Duration/time frame	2004-2006
Main objectives	<ul style="list-style-type: none"><li>- Raise of awareness among business, research and public organizations in Switzerland regarding innovations that target the special needs of older people</li><li>- Promotion of innovation and economic growth through the stimulation of innovative projects for active ageing</li><li>- General encouragement and subsidization of the transfer from science to market</li></ul>
Technological focus	ISA addresses the four promotion areas of the CTI that comprise the funding of individual projects as there are: <ul style="list-style-type: none"><li>- Life Sciences (MedTech and BioTech)</li></ul>

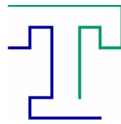
	<ul style="list-style-type: none"> <li>- Engineering Sciences</li> <li>- Enabling Sciences</li> <li>- Micro- and Nanotechnologies</li> </ul> <p>Remark: Please refer to chapter 4 for a detailed description of these promotion areas.</p>
<p>Fields of application and fields of technology/drivers:</p> <p>The following drawing illustrates the application fields located at the interface between needs and technologies, which may be addressed by research and technology projects, which shall be promoted by the ISA initiative.</p>	
<p>Phases along the value chain</p>	<p>The funding of CTI projects is primarily focused on projects that aim at the development of competitive technologies as well as products and processes, which have a mid-term impact on the market. The funding is allocated to industry driven projects according to the funding guidelines of the CTI, which are described in detail in chapter 4.</p>
<p>Target groups of the funding</p>	<p>Companies, large, small and medium-sized enterprises incl. start-up companies. Universities / Universities for applied science / Public or non-profit-making research organisations</p>
<p>Funding instruments and frameworks, criteria for eligibility</p>	<p>Co-operation of at least of one enterprise and one non-profit research institute. The Swiss CTI</p>



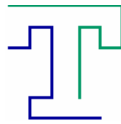
	<p>funding rules are based on a 50/50 participation between industry and non-profit research institutes. Only the non-profit research institute will receive funds form CTI.</p>
<p>Accompanying measures</p>	<p>1. Conferences and presentations:</p> <ul style="list-style-type: none"> <li>a. 1. KTI-ISA Konferenz in St. Gallen, 26.5.2004; 180 participants from research and economy</li> <li>b. Viva50+ Ceremony, 20.4.2004; 300 guests from economy, politics and research</li> <li>c. KTI-ISA Infolunch FH Lugano, 06/2004; 30 participants</li> <li>d. Technologiemanagement foundation council, 18.6.2004; 25 executives from industry</li> <li>e. Zukunft Alter Kick-off, 19.8.2004 280 participants from economy, research and non-profit organisations</li> <li>f. 2. KTI-ISA conference in Lausanne, 5.11.2004; 100 participants</li> </ul> <p>2. Workshops:</p> <p>RFID potential and ISA, St. Gallen 22.9.04: what are the potentials for RFID technologies for an ageing society?</p> <p>3. Publications:</p> <p>Various articles in Swiss newspapers and technical journals about innovation potentials of products and processes for an active ageing population and universal design.</p>
<p>International cooperation</p>	<p>No dedicated international cooperation envisaged, only learning from best practices examples in the USA and the Netherlands. Planned is the participation in the conceptual outline of an 'Age-friendly-label' in cooperation with the WHO according to the standards of 'Ageing and Life Course'. The label aims at the certification of senior-people-equitable products and therefore facilitates the promotion of such developments.</p>
<p>Exploitation schemes</p>	<p>The CTI-ISA initiative will be exploited by the University of St. Gallen in terms of</p> <ul style="list-style-type: none"> <li>a. Publications to universal design, technology and innovation management with</li> </ul>



	<p>respect to the demographic change as well as economical impact of the demographic change</p> <p>b. Integration of ISA topics in lectures to technology management</p> <p>The individual projects initiated by ISA and funded by the CTI are exploited by the project participants themselves, i.e. in the form of scientific publications, patents, spin-offs, etc.</p>
<p>Links to other European programs</p>	<p>The CTI-ISA promotion campaign has no links to other European programs</p>
<p>Budget allocated</p>	<p>The CTI-ISA initiative is a top-down activity of the CTI in order to create awareness for the need for application-oriented R&amp;D within the scope of the development of innovative products that especially address the requirements of elderly people. The CTI funding amount for this activity is 129'000 sFr (83'000 Euros) in order to finance the expenses for the accompanying measures such as conferences, seminars and workshops. For the individual projects that will be undertaken in the context of ISA and funded by the CTI, there is a free competition over the 467 Mio sFr, which are allocated to the four funding areas of the CTI (cf. chapter 4).</p>
<p>Project portfolio/targeted actions</p>	<p>There is no project portfolio within this initiative. Targeted actions are conferences, seminars and workshops described above.</p> <p>In the fourth quarter of 2004 the following projects have been submitted to the CTI that fit into the context of ISA:</p> <ol style="list-style-type: none"> <li>1. S. Balemi, SUPSI (Scuola Universitaria Professionale della Svizzera Italiana, (university of applied sciences in the Italian part of Switzerland)): Interface for elderly and visually impaired people-part 1</li> <li>2. M. Ruedi, EMPA (Eidgenössische Materialprüfungsanstalt St. Gallen): (1) Atmungsaktive Wäsche für Langzeitpatienten (Breathable clothes for long-time patients), (2) Health Monitoring in integrierten Textilien (Health monitoring in integrated textiles)</li> <li>3. S. Engel, university of applied sciences Aargau: Help desk for ageing travellers</li> <li>4. J. Graf, university of applied sciences St. Gallen: next generation offroad wheel-</li> </ol>



	<p>chair</p> <ol style="list-style-type: none"> <li>5. M. Zölch, university of applied sciences Solothurn: project Prime Time, ageing in enterprises</li> <li>6. B. Ludewig (hospital of the canton St. Gallen) and M. Loher (university of applied sciences St. Gallen): Process optimised development of virus vector-based vaccines against tumor diseases</li> </ol>
<p>Evaluation of the measures</p>	<p>The measures of the CTI-ISA initiative will be evaluated according to the following measurands:</p> <ol style="list-style-type: none"> <li>1. Number of CTI-ISA conferences</li> <li>2. Identification of experts and opinion leaders</li> <li>3. Number of contacted enterprises with respect to creation of awareness</li> <li>4. Number of elaborated best practice examples, case studies and potentials of universal design</li> <li>5. Number of publications within the scope of ISA and universal design</li> <li>6. Number of interviews and workshops conducted with enterprises</li> <li>7. Number of submitted projects within the scope of ISA</li> </ol>
<p>Agency/intermediary in charge</p>	<p>CTI</p>
<p>Actors involved (research, development, production, application, retail, users/customers, qualification/training, intermediary organisations etc.)</p>	<p>With respect to the promotion campaign ISA itself, the following actors are involved:</p> <ol style="list-style-type: none"> <li>1. ProSenectute : societal support of ISA</li> <li>2. Schweizer Seniorenrat (Swiss senior citizens advisory board): societal support of ISA</li> <li>3. Zukunft Alter: alignment of industry aiming at CTI projects</li> <li>4. NFS-Forschung: Wealth and Ageing</li> <li>5. Viva50+: world ageing congress in 10/2005</li> <li>6. Within the scope of the campaign, industries as well as SMEs of eleven different branches of industry (goods manufacturer, energy and water supply, trade and repair services, restaurants and hotels, banks and insurances, real estate, health and social services, public and personal services) were interviewed with respect to their strategic alignment of their products and proc-</li> </ol>



	<p>esses towards the requirements of elderly people.</p> <p>Within the scope of CTI-funded projects the actors involved are project specific.</p>
Co-operation platforms/networks	<p>The CTI is the major platform for cooperation. In addition to that, CTI-ISA interfaces with important organizations that represent the requirements of elderly people in Switzerland (described above).</p>
Driving factors/innovation barriers	<p>Since CTI strongly promotes the bottom-up approach of application oriented R&amp;D projects (cf. chapter 4), the major driving force is the industry and thus the market demand. The demographic change is a big challenge but also a great opportunity for innovation. The objectives of the CTI to foster the transfer to market and thus the impact on economy is a driving factor.</p>

Table 11: Details about the CTI-ISA promotion campaign

## 4 Structure of National Public Funding

### 4.1 What is needed for the implementation of a national AAL program in your country?

An implementation of a national AAL-related research program in Switzerland requires a corresponding orientation of the general federal research strategy and thus the allocation of respective subsidies for both fundamental and application oriented research. Both the orientation of the federal research strategy as well as the allocation of subsidies towards the realization and funding of a specific AAL related program is impossible in the current (2004 – 2007) legislative period. Considering the next legislative period starting in 2008, the chances are currently rather low for three reasons:

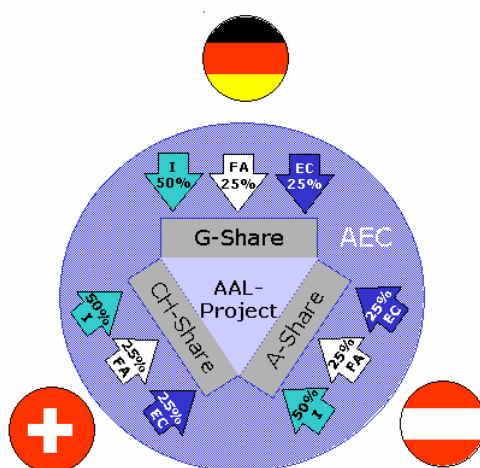
- a. It would require an extreme effort in lobbying in the highest decision organs in the responsible federal departments (OPET, DEA, Swiss federal council) and in the Swiss parliament. The time required to enhance the probability of success is out of scope within this specific support action.
- b. AAL is an umbrella for transdisciplinary research and development in the fields of enabling sciences such as micro system techniques, nano technologies as well as information and communication technologies. Each of these disciplines is of high importance for the excellence in research and development and thus for the economy in Switzerland and are therefore promoted correspondingly (especially in the legislative period from 2004 – 2007). A promotion of AAL in the form of an interdisciplinary campaign with the aim to establish corresponding national and transnational

projects in these disciplines would definitely contribute to the realization of the vision of AAL on a national and European level. The effort for realization is comparatively justifiable and the chances for success relatively high.

- c. Currently, a transdisciplinary promotion campaign under the supervision of the CTI is running called ISA, Innovation for Successful Ageing, which is described in chapter 3. The awareness for this specific topic is raised by this promotional campaign and can be regarded as a very valuable forerunner for the Swiss participation within transnational AAL-projects in the seventh European framework programme.

In this respect, the following model for transnational cooperation between the European member states is suggested. The model is principally based on the established EUREKA model and takes into account the current boundaries imposed by the Swiss legislative processes.

The following Figure 1 schematically illustrates a transnational AAL-project with participation of three member states, e.g. Germany, Austria and Switzerland, which are treated as project partners. Each project partner is a consortium of at least one research institution and one company.



#### Explanations

**AAL-project:** Transnational RTD-AAL-project between Germany, Switzerland and Austria (example)

**CH-Share:** Individual national share of the project costs (A: Austria, CH: Switzerland, G: Germany)

**FA:** Financial contribution of the national Funding Agency

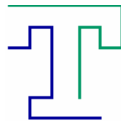
**I:** Financial contribution of the Industry  
**EC:** Financial contribution of the European Community

**AEC:** Central Administration of the European Community for AAL-projects

Figure 1: Example of a transnational AAL-project based on the Swiss proposal for the definition of an AAL169 program

In this model, each state funds the project participation of his project members with financial capital of the national funding with 25% of the national share. Industry partners contribute with 50% to the national share of the project costs. The European Community contributes with 25% of the project costs of the individual member states. The AEC is responsible for administration of the transnational AAL-related projects. This management body is financed by disposal of 7% of the funding contribution of the FA.

Switzerland promotes this proposal for funding transnational AAL-related projects, i.e. each participating member state funds its own part of the project. Switzerland is willing to fund the Swiss part of transnational AAL-related projects up to a funding volume of



2.6 Million Euros/a in the frame of national application oriented research project funding. The funding originates from a global budget, which is allocated to the funding of national application oriented research projects managed by the CTI. The funding is managed according to the guidelines of the commission for technology and innovation (CTI), which are explained in the subsequent chapters. Switzerland will submit a written commitment for the funding of the Swiss part of transnational AAL-related projects within the frame of FP7.

This model has the clear advantage, that it profits from existing and well established structures, without requiring intensive and thus expensive administration.

## **4.2 Actors**

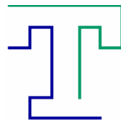
In the field of application oriented research and development and specifically for the implementation and promotion of AAL-related fields, the commission for technology and innovation (CTI) is the funding agency of the Swiss federal government that promotes the collaboration between non-profit oriented research institutes (Swiss Federal Institutes (ETH, EPFL, EMPA, PSI), universities and universities of applied sciences) and the economy thus supporting the innovation process in the economy. The core of the activities is the bottom-up principle, i.e. the project partners, especially the partners from industry, determine the content of the R&D collaboration.

### **4.2.1 Decision makers**

The CTI is the official agency of the Swiss federal government for the promotion of applied, closely related to economy research and development on a national or international level. The CTI is a permanent, non-parliamentary commission of the Federal Department of Economic Affairs (DEA) and consists of 27 members. On the average, 60% of the members work in leading positions of private economy and 40% are internationally renowned university researchers with economic experience. Furthermore, 23 persons from economy work on a mandatory basis as permanent experts in the teams of the individual areas of promotion and programmes for the evaluation of applications of projects. All members work part-time for the CTI. They provide their experience to the CTI and are no stakeholders. This ensures great independency for the commission with respect to their decisions. Special emphasis in the appointment of experts is the strict separation of 'players and referees', i.e. members of the CTI are not allowed to decide upon projects and be simultaneously the applicant of the project.

### **4.2.2 Sponsors**

The promotional activities of the CTI are financed by global credits, which are approved by the confederate parliament for four years according to the ERT-message (education, research and technology) of the Swiss federal council. In this message, the specific aims and the thematic focal points of the promotional activities in the respective legislative period are defined. The 2004-2007 period has the following foci:



- Increased promotion of start-ups and entrepreneurial culture; extension of the CTI Start-up initiative
- Major fields of activity
  - Life Sciences
  - Nanotechnology and Microsystems Technology
  - Information and Communication Technologies
- Consolidating competencies relative to applied R&D in the UAS
- Promoting risk capital ventures, also called “Discovery Projects”, with high market potential
- Encouraging interest of the young in science and technology

The CTI will receive 467 million Swiss francs for the 2004-2007 period for the implementation of these tasks.

#### **4.2.3 Owners/Hosts**

Figure 2 depicts the position of the CTI within the OPET (Federal Office for Professional Education and Technology), which itself is a subdivision of the Federal Department of Economic Affairs (DEA). The OPET is the federal government’s competence center for professional education, Universities of Applied Sciences and innovation policy. The most important instrument of the OPET with respect to the encouragement of transfer of know-how and technology between science and industry and thus to speed up the integration of research findings into successful products or services is the CTI. The president of the commission is the director of the OPET. The general secretary of the CTI as well as the administrative work required for the promotional activities are performed by the CTI innovation promotion department. The definite decision competence is in the hands of the director of the OPET up to a funding volume of 1 million Swiss Francs, the principal of the OPET is responsible for amounts between 1 and 3 million Swiss francs, and the federal council for amounts larger than 3 million Swiss francs.

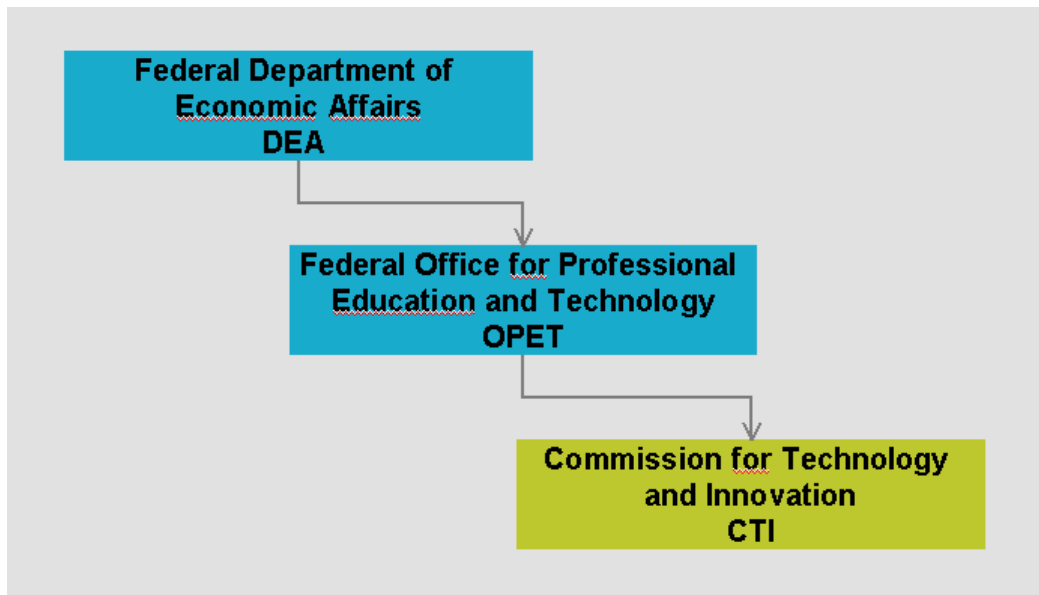
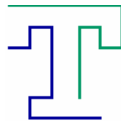


Figure 2: The positioning of the CTI within the OPET and DEA

### 4.3 Structures

#### 4.3.1 Format of funding (programs, projects) (11)

The following Figure 3 shows the four disciplines of support, which are addressed by the CTI through promotion and promotional activities.

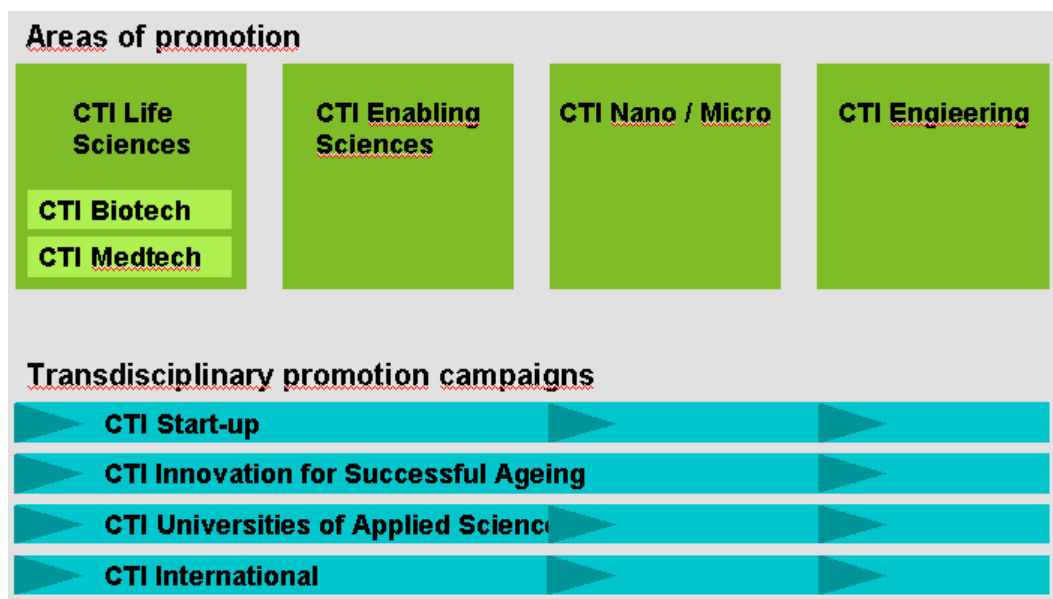
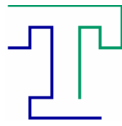


Figure 3: Areas of promotion and promotion campaigns of the CTI

In the following the specific fields of the four main disciplines, which are supported by the CTI are explained in detail



### **CTI Life Sciences:**

The discipline CTI 'Life Science' includes two special support initiatives CTI Bio-Tech and CTI MDTech. Within this discipline, the following fields are supported:

- Chemistry
- Biochemistry
- Pharmacology
- Biotechnology
- Medicine
- Dietetics
- Food technology
- Agricultur
- Medical technology

### **CTI Enabling Sciences:**

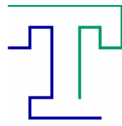
Within this discipline, the following fields are supported:

- Company management and financing
  - Management and strategy, resources, market, corporate governance, sustainability, controlling, reporting, communications, financing instruments and risk management
- Public administration and tourism
  - Public management, e-government, spatial planning, landscape development, tourism
- Design and architecture
  - Communication design, film, multimedia, visualizations; industrial, product, furniture/fitings design; fashion and textile design; interior design; restoration; construction; restoration/preservation of historic monuments, town planning, landscape architecture
- Economics and social sciences
  - Macroeconomic conditions, social trends, healthcare manegement, etc.
- IT and communication technology
  - Business IT, telematics, e-business, knowledge management, e-learning
- Integrated production and logistics
  - Industrial manufacturing in integrated processes, lifecycle management, service integration, virtual factory

### **CTI Nanotechnologies and Microsystem Technology:**

Within this discipline, the following fields are supported:

- Nanotechnologies



- Microsystems technology
- Systems engineering
- Robotics
- Electronic engineering
- Optoelectronics
- Sensorics
- Telecommunication engineering

### **CTI Engineering:**

Within this discipline, the following fields are supported:

- Production technologies
- Material technologies
- Mechanical and thermal engineering
- Civil engineering
- Chemical engineering
- Environmental technology
- Ecology

Furthermore the CTI especially support interdisciplinary support initiatives in the fields of

- Start-ups
- Innovation and successful ageing
- Universities of applied sciences
- International

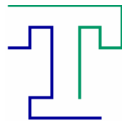
in order to ensure that projects in applied R&D are increasingly carried out on a bottom-up basis in strategically significant market and business segments. Therefore, the aims of such projects are in coincidence with the aim of the specific support initiative, but must be allocated to one of the four promotion areas for the application of the funding. In detail, the four interdisciplinary campaigns comprise the following fields:

### **CTI Start-Up:**

- Support for prospective entrepreneurs in setting up their own company
- Coaching for technology oriented start-ups
- Entrepreneurial courses and training for the high-tech sector

### **CTI Innovation for Successful Ageing:**

- New possibilities for innovation: the ageing population
- Increasing demand for products and services geared to the needs of older people in order to support an active ageing process



### **CTI Universities of Applied Sciences:**

- Building competencies for applied R&D
- Creating and developing the National Networks of Excellence of the UAS, such as timber industry, microelectronics, telecommunications, integrated production and logistics and biotechnology

### **CTI International:**

- Awarding of the EUREKA label
- Support for projects within the global intelligent Manufacturing Systems (IMS) research program
- Bilateral cooperation and representation on the EU Technical Committees
- Joint projects with China

### **A successful CTI support requires the following prerequisites:**

- A collaboration of at least one company and at least one non-profit oriented research institution or high school (Federal institute of Technology, university, UAS) in a CTI project
- Only non profit oriented research institutions or high schools will receive a financial contribution of the CTI for financing the salaries of the personnel
- The business partner assumes at least 50% of the project expenses
- A cash contribution of the business partner to the research institution or high school (around 10% of the project expenses assumed) in order to finance travel or consumable material
- The project partners decide on the subject themselves, thus the bottom up principle is promoted
- The focus is on innovation and must follow the following criteria:
  - Economic and scientific/technical significance
  - Market potential
  - Contribution to promoting sustainable development
  - Clear work schedule and financing plan (verifiable milestones)
- Utilization of the results must first be settled with respect to patent law
- The projects must envisage a rapid time to market
- Regular reviews by CTI experts help keep the project on schedule and allow for any changes in direction in good time
- Each project culminates in a plan outlining how the solution is to be implemented

The evaluation of the applications, the consulting of the applicants, the accompaniment of running projects and the conduction of reviews and evaluation of the project results are performed by teams of five to ten persons that are recruited from the expert commission of the CTI. The following figures illustrate the processing of a CTI application (Figure 4) and the project controlling (Figure 5).

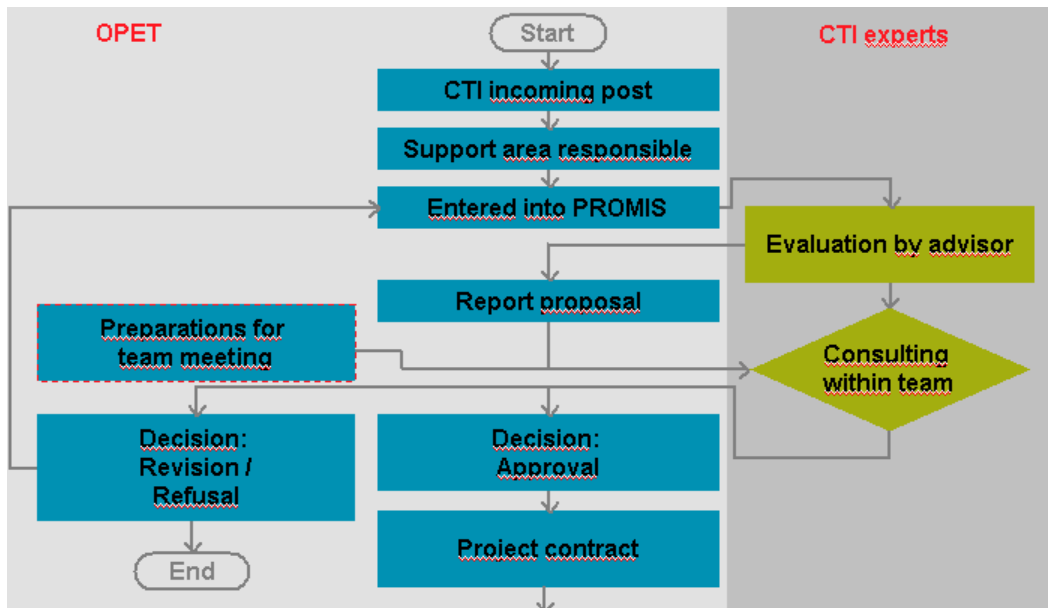


Figure 4: Processing of a CTI application. Remark: PROMIS is the project database of the CTI

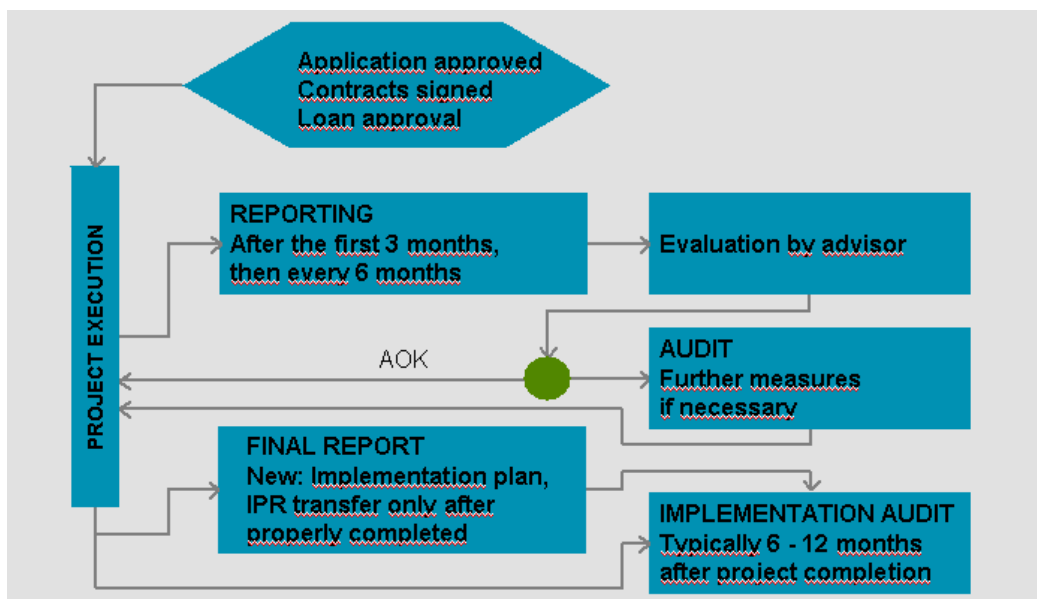
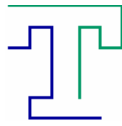


Figure 5: CTI Project controlling

#### 4.4 Legislation Processes, Balance of Power

As described in chapter 4.1, the adoption of a national AAL-related program is out of scope both with respect to the boundaries of the Swiss legislative processes and to the orientation of the general federal research strategy for fundamental and application oriented research. Therefore, the vision of AAL in Switzerland has to be realized within existing structures that comprise a corresponding European orientation towards transdisciplinary application oriented research and development.



#### **4.5 Federal, Central Regional Considerations and Requirements**

Since the CTI is the only relevant commission for the implementation of promotional activities towards financing application oriented research, only the general funding rules of the CTI, which are described in the previous chapters, are applied to the funding of the individual projects. No regional or comparable issues (cantonal) have to be considered for the funding.

#### **4.6 What is the Benefit of going European?**

In this respect, the following points may be considered as benefits for Switzerland:

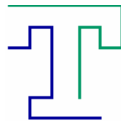
- Creation of awareness for the importance of the project in order to meet the challenges of the demographic change. A mutual, transnational European effort would be very useful.
- A valuable attempt to focus and streamline the multitude of European activities towards assisted living that are individually undertaken in the various European countries for more than ten years now. The final goal to establish a common European competence for the benefit of both science and economy.
- On a scientific level to achieve the critical mass for focused application oriented research and development, with the aim to develop the required technologies and processes for the realization of the AAL vision preferably on a mid-term level.
- Exploration of new markets and thus new jobs for small and medium enterprises that intend to focus their product strategy towards fulfillment of the needs of the ageing population
- Creation of technologies, products and services with an international orientation

#### **4.7 Time Frame for National Budgetary Planning Processes**

The national budgetary planning process comprises a four year time span. At the beginning of each quadrennial legislative period, the budgets for research education and technology are distributed among the involved stakeholders according to the ERT message described in chapter 4.4.

#### **4.8 Estimated Share of National Budgets Likely to be agreed upon**

The project funding managed by CTI does not comprise a fixed allocation of the global share of the granted 467 million Swiss francs for programs, which is granted to the CTI for promotional activities within the legislative period from 2004-2007. There is a free competition around the budget per individual project. A fixed allocation of existing or new subsidies within a household title that corresponds to a definitive obligation secured by juristic means is out of scope for Switzerland. With respect to the model discussed in chapter 4.1, Switzerland is willing to fund the Swiss part of transnational AAL-related projects up to a funding volume of 2.6 Million €/a in the frame of national application oriented research project funding



## 4.9 Requirements of Formal and Informal Lobbying

For the implementation of a national AAL-related program that fosters the transnational cooperation between the European member states, representatives of the following offices/agencies/departments have to be informed or convinced respectively:

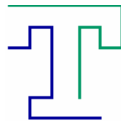
1. Head of Section CTI International
2. Director of the CTI
3. Director of the OPET
4. Director of the DEA
5. The federal council of Switzerland

The consequence would be an extreme and long lasting process, which is out of scope for the current proposal. Better alternatives, such as this described in chapter 4.1, have to be sought and defined in order to achieve the overall goal.

## 5 Cross Border Activities

The following table gives an overview about Major EC-funded projects with Swiss organisation participation.

Acronym	Title	Project type	High school
WINDECT	Wireless local area network with integration of professional-quality DECT telephony	STREP	n.a.
DAIDALOS	Designing advanced interfaces for the delivery and administration of location independent optimised personal services	IP	ETHZ
ECRYPT	European network of excellence in cryptology	NoE	Uni GE
COGNIRON	The cognitive robot companion	IP	EPFL
GOODFOOD	Food safety and quality monitoring with microsystems	IP	EPFL
SHIFT	Smart high-integration flex technologies	IP	n.a.
POLYAMPHI	Self-organized nanostructures of amphiphilic copolymers	Marie-Curie	Uni BS
SIMILAR	The European research taskforce creating human-machine interfaces similar to humans	NoE	Uni GE
HARDECOAT	Development of new hard decorative coatings based on transition metal oxynitrides	STREP	FH-west
MAESTRO	Mobile applications & services based on satellite & terrestrial interworking	IP	n.a.
SENSATION	Advanced sensor development for attention, stress, vigilance & sleep/wakefulness monitoring	IP	Uni BS
POLYAPPLY	The application of polymer electronics towards ambient intelligence	IP	n.a.
AGENTLINK III	Co-ordination network for agent-based computing	CA	n.a.
DIADEM FIREWALL	Distributed adaptive security by programmable firewall	STREP	n.a.
NAPA	Emerging nanopatterning methods	IP	EPFL
PULSERS	Pervasive ultra-wideband low spectral energy radio systems	IP	ETHZ
SINANO	Silicon-based nanodevices	NoE	ETHZ



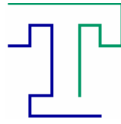
MIMOSA	Microsystem platform for mobile services and applications	IP	EPFL
MIMOSA	Microsystem platform for mobile services and applications	IP	n.a.
INTELLIDRUG	Intelligent intraoral medicine delivery micro-system to treat addiction and chronic diseases	STREP	n.a.
HUMAINE	Human-machine interaction network on emotion	NoE	Uni GE/EPFL
PLASMO-NANO-DEVICES	Surface plasmon nanodevices - Towards sub-wavelength miniaturization of optical interconnects and photonic components	NoE	EPFL
HEALTHY AIMS	Nano scale materials and sensors and microsystems for medical implants improving health and quality of life	IP	EPFL
MONCERAT	Broadening the application field of ceramic components by joint and interactive research on EDM machining technology, novel ceramic materials based on nano-powders	STREP	n.a.
KNOWLEDGE WEB	Realizing the semantic web	NoE	EPFL
ASSEMIC	Advanced methods and tools for handling and assembly in microtechnology	Marie-Curie	n.a.
TAI-CHI	Tangible acoustic interfaces for computer-human interaction	STREP	UAS-west
ULTRASMooth TH	Ultrasmooth magnetic layers for advanced devices	Marie-Curie	n.a.
RTNNANO	Fundamentals of nanoelectronics	Marie-Curie	Uni GE
PIPS	Personalized information platform for life and health services	IP	n.a.
AMICOM	Advanced MEMS for RF and millimeter wave communications	NoE	EPFL
VISNET	Networked audiovisual media technologies	NoE	EPFL
WCAM	Wireless cameras and audio-visual seamless networking	STREP	EPFL
EURO NGI	Design and engineering of the next generation internet towards convergent multi-service networks	NoE	EPFL

Table 12: Overview about AAL related EC-projects with Swiss participation (12), n.a.=no data available

## 6 Sources and Links

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**Links:**

All links to online sources are listed in the text.