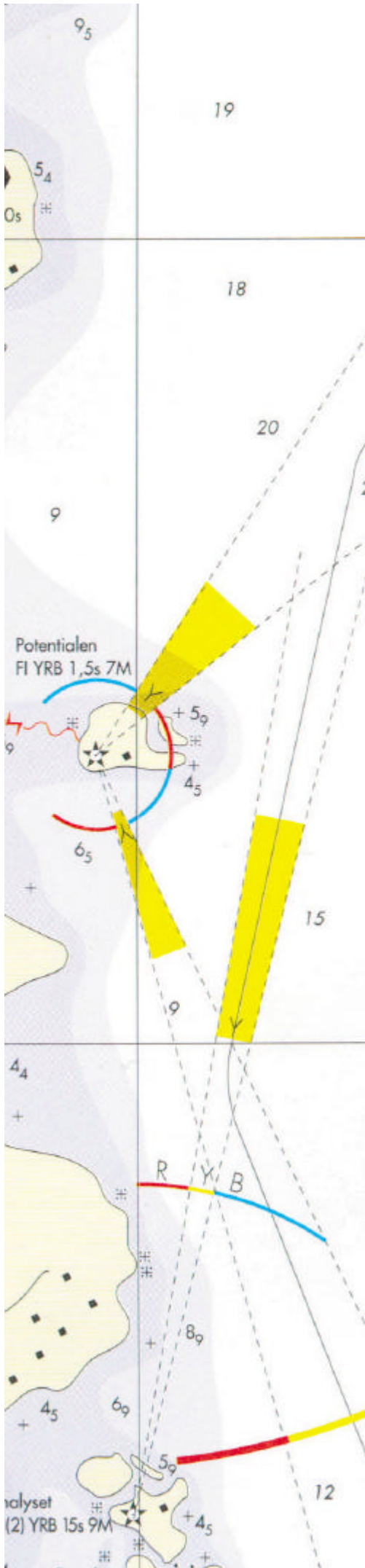


The IT cluster in Uppsala

A cluster study conducted by CMA
- February 2002 -

Short version



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1 Introduction

1.1 Background

In today's proactive business and industrial development, knowledge of the business cluster in the own region is key to success. This knowledge is necessary to be able to handle the activities in a professional manner, such as:

- Work out cluster strategies
- Attract foreign investments
- Create a forum for research-oriented businesses and venture capital
- Create science parks and cooperation with colleges and universities.

To create the knowledge base requires a deep insight into which companies and players compose the region's strong clusters today and in the future. The picture of the cluster must also be able to be communicated.

During the winter 2000-2001 a project group with regional representatives in Uppsala initiated an analysis of Uppsala's core competences and clusters, as a basis for continued work to develop regional business and industrial enterprises. The cluster study was conducted by CMA-Centrum för Marknadsanalys, and the study focused on the areas of Lice Science, Energy technology and Machine/tool manufacturing and engineering.

During the fall 2001 the group identified a need of analysis of the competence in the IT area. The group therefore contacted CMA-Centrum för Marknadsanalys, a spin-off from the University in Linköping, conducting market and cluster analyses for both the private and public sectors.

Examples of similar studies by CMA being used today include:

- A research report of world class competences in Linköping
- "Match Race – Linköping vs California" – a comparison of the strongest industrial clusters in Linköping with those equivalent in California.
- CMA's mapping of the Swedish regions Östergötland, Södermanland, Gästrikland and Västmanland.

This report is a shorter version of the complete cluster analysis presented in January 2001, and this report only covers the description of the companies in the IT cluster.

1.2 Purpose

The purpose of this study was to map the IT cluster in Uppsala County.

The current picture of the cluster identified and a visual presentation of its local networks is presented.

1.3 Concept

To be able to map the clusters and competences found in the difficult, diffuse perception of a network, the concept and terminology are important parts of the research. The following sections give a brief summary for the concepts used in the study.

1.3.1 Competence

The most important concepts for the mapping of competence are *cluster*, *players* and *networks*.

In this context, the term *cluster* refers to a concentration of actors within an industrial segment where the common denominator is that they draw from the same resources/competences. In this way, AssiDomän supplying paper for bag production is in the same Paper and Packaging cluster i Norrköping, as SCA Packaging with its packaging solutions. The common denominator is the production and problems of producing paper products even though the end products and the final market differ.

The cluster is made up of a number of core components that are compiled by the *players*. A player is a force acting within in a cluster. Players can be a department within a company, a business area, an entire company, a research group or a government authority. Businesses have been studied with a focus on their basic technical competence and their marketing ability defined as the success of the products on the world market. The academic research groups have been measured by judging their competence within the respective areas, their reputation and the connections to industry and the problems facing industry.

A local cluster can create a positive influence because it can offer:

- Experienced personnel
- A broad market with competent customers with the potential of becoming cooperating partners
- An attractive structure of suppliers who can also be potential cooperating partners.

A *network* in a cluster adds one more dimension because this shows the connections between the players and how they interact in the common environment. Perhaps the most natural network is that which is created between the suppliers and buyers.

1.4 Methodology

The following chapter includes an examination of the methods used followed by an introduction to the form for presentation of results.

1.4.1 Data collection using the snow ball sampling method

Choosing the subjects (respondents) to be interviewed when mapping a cluster is complicated because the entire appearance of the network is not known in advance. Therefore, the snowball sampling method was chosen¹. This method creates the sample

¹ Source: Churchill G.A. Jr, 1995, "Marketing research –Methodological foundations", 6th ed. The Dryden Press.

by asking every respondent to name one or more players who could contribute to the study. Thus, with every interview, more is learned about the system and:

“The target population is developed by utilizing the personal contacts among the units under investigation”²

The key issue is to identify a number of individuals that are assumed to be as representative as possible of the very diverse elements in the cluster. Finding the most diverse entrances into the cluster is key to ensuring the snowball picks up all of the elements in its path.³

CMA and the customer decided upon the sample together to make certain that as much experience and as many viewpoints as possible were represented.

1.4.2 Delimitations

The time allotted for the study was limited and the networks are widespread. Thus, delimitations were necessary. That all the representatives of a given cluster could not be interviewed was the most obvious limitation due to the time constraints. Thus, the sample was chosen using the snowball method. The study has tried to identify the representative competences, contributing in a positive sense. By this we mean that we have tried to identify the areas that are most interesting and compare favorably internationally whereas we have not tried to document those areas that do not meet the criteria. Thus, by definition, the study report is not static but represents a process that demands continual updating of the knowledge and competence of the business life in the area.

The study has encompassed the geographical areas of Uppsala County. Municipalities within in the County include Uppsala, Östhammar, Tierp, Älvkarleby, Enköping and Håbo. The identification of clusters has been confined to this geographical area, though possible connections to nearby regions that could be of interest have been described.

Delimitations of IT companies

Previous studies of the IT industry in Uppsala has stated that there are around 800 companies in the county. This figure has included a wide variety of companies, spreading from retailers of IT products to pure software applications developers.

In this study, there are some important delimitations concerning the companies' profile and size, and we have therefore excluded the following:

- Retailers and service/repair works
- Companies with 0,1 or 2 employees

This explains why the number of companies in this study are considerably less.

² Source: Lekvall P. & Wahlbin C., 1993, “Information för marknadsföringsbeslut”, IHN Förlag, Göteborg

³ Ibid

1.5 Project Organization

The customers in this study have been represented by the following group:

- Tönu Kerstell, Landstinget in Uppsala län
- Lars Strand, Uppsala County
- Peter Dahlström, Uppsala County
- Eva Sterte, Uppsala Municipality
- Bengt Rinde, Uppsala Municipality
- Anders Lundwall, The Chamber of Commerce for Uppsala County
- Kenneth Sundin, FR Uppsala
- Ingrid Anderbjörk, STUNS
- Krister Lundberg, ALMI Företagspartner
- Ewert Bengtsson, Uppsala University

At CMA, Oskar Ahnfelt has been the project manager and Johan Rapp and Joanna Romell the market analysts.

1.5.1 Interview guide

All of the interviews followed the same routine, with four main sections divided into the following subsections as follows:

Core competence in the organization

- Description of the company and its activities
- Number of employees

Network & cooperation

- Which players are the company cooperating with today?
- Is the company a part of any network?
- Who are the main suppliers to the company?

Recruitment

- From where do the company recruit new employees? What kind of education?
- Uppsala University? SLU? Other universities?

Strengths and weaknesses in the region

- Why is the company located in Uppsala county?
- What is missing here?
 - Competence?
 - Infrastructural issues?
 - Forums/networks?
 - Investors?
 - Types of companies?

Contacts

- What players (companies, organizations, research groups) must be included in a mapping of the IT cluster in Uppsala?
- Other people we should interview?
- Contact persons, telephone numbers etc?

Validation of the result

- How can the companies be categorized today?
- How would the IT area be illustrated/described (according to the tree analogy). Ideas for the trees?

We will point out that the interviews were tailored to the individuals questioned but the framework was given by the interview guide.

1.6 Presenting the results

The cluster is presented in a *competence tree model*.⁴ Figure 1 illustrates such a tree analogy. The roots represent the most important, basic competences in the cluster that contribute the “fertilizer” for the entire area. The trunk is the strength of the core competence that fosters branching out in different applications of the core competence. The players in the cluster can be identified with one or more of the application areas and these are the ones who create the intertwining branches of the tree.

A detailed description of every area in the competence tree accompanies the illustration.

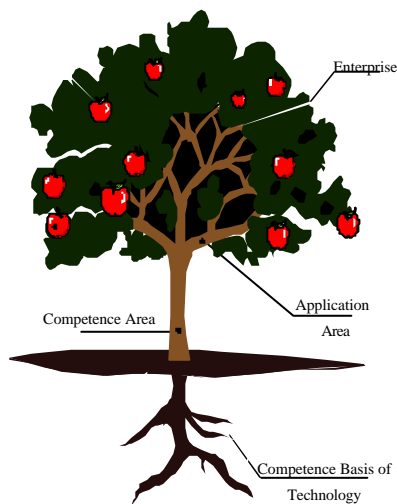


Figure 1: The competence tree model

⁴ The competence tree model is taken from Ahnfelt & Andersson, 1996

2 Research and companies

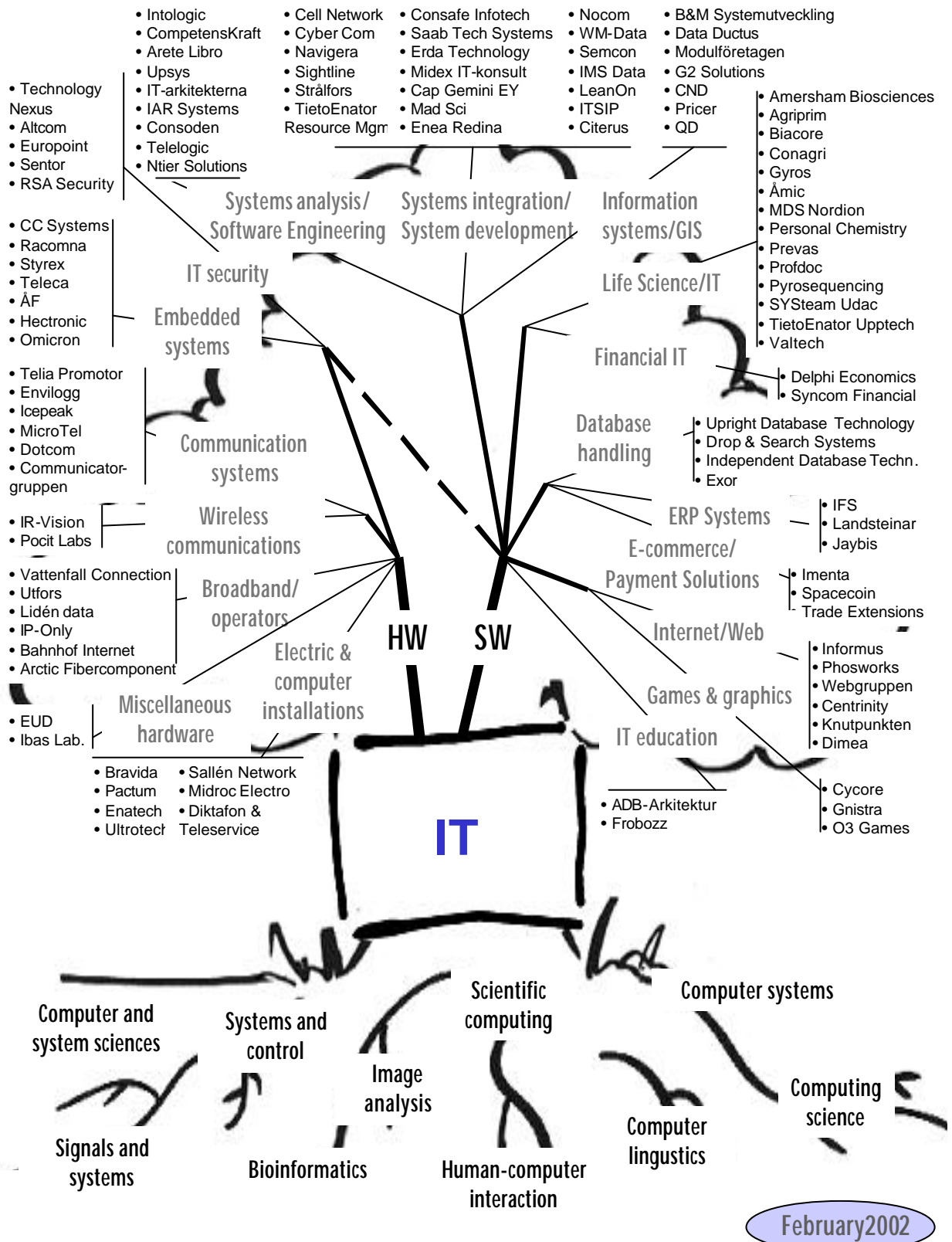


Figure 2: The Life Science tree

2.1 Introduction

The tree figure shows that a large number of companies are active in the IT area. We have divided the area up into two main types, namely, *Hardware related* (HW related) and *Software related* (SW related) areas. We have chosen to present all the research and all the companies on one and the same tree, which may make the picture somewhat difficult to understand. On the other hand, many of the various application areas (branches) are inter-related with each other. For example, the branches *Embedded Systems* and *IT Security* are examples of areas that are clearly a mixture of hardware and software related areas. It would be stupid or difficult to separate this group from any of the other categories. It is also difficult to divide up the roots of these branches into hardware or software oriented subjects.

It is also easy to see that the competence and subject of a number of the branches that we have reported on, are close to each other. We have illustrated this by allowing them to originate from one and the same "relatively thick" branch. For example, this applies to the following areas:

- *Systems analysis/Software Engineering, Systems integration/System development and Information systems/GIS* are all application areas containing companies with software development and system development as their core competence.
- *Life Science/IT* and *Financial IT* contain mainly companies that develop industry specific software for customers just in these segments. Of course, several other companies also supply software to these trades but they are often companies of a wider type compared to those in this category.
- *Communication systems* and *Wireless communications* are both branches in the communications area. Communication systems could in turn be divided up further, e.g. this branch contains several companies that supply CTI solutions to call-centre companies.

The branches and companies in the tree are described in more detail in chapter 2.3. A version of the tree without the companies is also enclosed, which makes it easier to see the application areas that we have identified. See Appendix C.

2.2 The roots

2.2.1 Introduction

Uppsala University has a very decentralised organisation. Most of the things that occur within the University happen out in the faculties and the departments. To prevent the risk of the general view and coordination suffering, the *Virtual IT Faculty* was established in 1998 and given the assignment of watching over IT issues in a general way on behalf of the University.

The main part of the research in the IT sector is divided between two large departments; the Department of Information Technology and the Department of Information Science.

The *Department of Information Technology* has a technical-scientific approach and includes research and education for scientific computing, computer systems, computing science, systems and control and image analysis. The Department of Information Technology within the faculty of Science and Technology comprises about 170 people

today and there are 18 ordinary professorships as well as a number of guest and adjunct professors.

Technicians and scientists and social scientists works together within the *Department of Information Science*. Here there are computer and system scientists, sociologists working with communications and media, as well as parts of the former Center for Human-Computer Studies (CMD) where the research subject was Human-Computer Interaction.

The Department of Information Science belongs to the Faculty of Social Sciences. It has 9 professorships. The number of employees is approx. 90 people.

IT-related research is also carried out in several other departments. The *Department of Linguistics* carries out research into computer linguistics. The Signals and Systems group at the Department of Materials Science has a hardware profile in their research (see section 2.2.9.)

Definition of IT

By IT we mean *all handling of information, irrespective of the application, with the help of digital technology*. This also includes data- and telecommunications, i.e. the definition includes what in recent years has been designated ICT (Information and Communication Technology).

IT-related programmes at Uppsala University

The University of Uppsala is one of the largest units for education in the IT-related area at university level in Sweden. The university offers four IT programmes in three faculties: the programmes for Computer sciences and Information technology in the Science and Technology faculty, the programme for Information systems analysis in the Social Sciences faculty, and a programme for language technology in the Faculty of Arts. One can also choose to specialise in IT within three other programmes; Engineering physics, sciences, and engineering programmes. Besides this, basic computer courses are offered to a large number of students working in other programs, mainly in the Science and Technology faculty.

During the past two years, two interdisciplinary M.Sc. Engineering courses have been started which combine skilled IT education with extensive knowledge from other areas of science. One of these is called *Systems in technology and society*. Its popular name is the Humanistic engineers. The other course is about Bioinformatics.

2.2.2 Computer Systems

Research in *Computer Systems* concerns the development of methods for the design of new computer systems and computer software. One studies how programs and the requirements for their functions can be described both mathematically and logically. With the help of this, one can automatically analyse for example how computers in networks interact and whether they fulfil the requirements stipulated.

Computer systems with very stringent requirements for predictable response times are of special interest because such systems are often used to control or supervise a process or a machine, for example, an aircraft or a telephone switchboard. Artificial neuron networks (computers with working methods similar to our brain) are also used to solve

problems in an efficient way, ones that conventional computers have difficulty in handling.

The department of Computer Systems is relatively large. Research in *computer architecture* is carried out here, lead by Erik Hagersten. The department has a close co-operation with Sun Microsystems in Silicon Valley. Bengt Johnsson and Yi Wang are researching into *formal methods and software technology*. Other important research areas in the field of computer systems are *hard real time systems, distributed systems and data communications, learning systems and computer science education*.

The department is connected to ARTES (A network for Real-Time research and graduate Education in Sweden) which is a national strategic research initiative in the field of real-time systems. ARTES is supported by the Swedish Foundation for Strategic Research (SSF).

Another competence centre to which the department is connected (together with the department of Computing Science, see below) is ASTEC (Advanced Software TEChnology). This competence centre also has connections with VINNOVA and its purpose is to develop and support industrial applicable technology for software specifications, design and development. The purpose is also to provide opportunities for research into industrial problems.

2.2.3 Computing Science

Computing Science concerns the general principles for computer based solutions, i.e. the theoretical, methodological and technological foundations for programming of computers and its applications. One can say that the subject is a link between computer systems and applications.

Computer equipment and hardware has gone through a fast positive development period as regards quality and economics, whereas the software has for some time been in some form of crisis – programs often include errors, they take too long a time to write, and are more costly than expected. Programming is still very much like craftsmanship and needs a scientific foundation to be able to develop into an engineering discipline. The purpose of the field of computing science is to build up such a foundation.

The core operation in computing science (which is a small department) is *Arne Andersson's* research into *simple and practical methods for sorting and searching* and *ASTEC*. Research is also carried out in *compiler construction* and *concurrency theory* in co-operation with *ASTEC*. This co-operation with *ASTEC* functions very well. *Bengt Johnsson and Roland Grönroos* are the leading lights from the department of computer systems in the research within *ASTEC*.

Other research areas in the root Computing Science are the *theory of computing and logic in computer science, databases* and *software engineering*.

2.2.4 Human-computer interaction

There are two departments at Uppsala University in the field of human-computer interaction, one in the Department of Information Technology and another in the Department of Information Science. The operations in both institutes are quite similar.

The research within human-computer interaction (MCI) concerns interaction between man and computers. Research is carried out from a technology perspective and based on

a sociology horizon and takes into consideration all relevant aspects, including computer technical, datalogical, psychological, ergonomic, sociological, and aesthetical.

An important part of the operations concerns developing methods and tools for discovering, measuring, eliminating and avoiding unnecessary and/or too high cognitive loads when working with computers. The design of optimal user interfaces is thus one of the main topics, bearing in mind the quickly increasing use of VR techniques (Virtual Reality).

The goal of research in the Department of Information Technology is to contribute to new knowledge about cognitive working environment problems and to the development of methods and techniques that will minimise such problems and create effective and user-friendly interfaces.

The department is quite small and includes many interdisciplinary types of work (technology students/psychologists). The department works a lot with large companies and organisations. The leading researcher is professor Bengt Sandblad.

Part of the operations carried out in the Department of Information Science is focused on the development of methods and tools for extending man's cognitive capabilities. The work is primarily focused on multimedia and VR-based decision support and working environments. Of special interest is thus different types of visualisation, the use of colour and multimodal interaction in combination with haptic (dependent on feeling by touch) interaction and visualisation. Interdisciplinary research is carried out in the fields of medicine, industrial systems and administration.

2.2.5 Systems and control

Research into systems and control is carried out in three operational fields at Uppsala University, namely: *automatic control, signal and systems modelling and system analysis*.

Automatic control

The theory of automatic control is a fundamental subject in the engineering sciences. In a similar way to other engineering sciences, automatic control searches for principles that make it possible to handle complex systems.

Examples of the applications of automatic control are the generation and transmission of energy, the automation of industrial processes and telecommunications. Control systems have been used for a long time in autopilots for aircraft and ships. Automatic control is also a prerequisite for space travel and is being used to an increasing extent in motorcars. Many buildings and vehicles have equipment for climatic control.

Signal and systems modelling

Signals and Systems Modelling (SSM) is a well-established research area that deals with general methodologies for obtaining mathematical models of signals and dynamic systems encountered in engineering, physics, ecology, medicine, economics etc. By its very nature SSM lies at the intersection and contributes to the cross-fertilization of several disciplines such as mathematical statistics, system identification and control, scientific computing, signal processing and image analysis. SSM makes use of tools developed in the aforementioned fields, as well as of its own tools, to develop mathematical models for the observed data (such as transfer functions, differential or

difference equations, state-space equations and so on) that are reliable descriptions of the reality despite the presence of noise, disturbances and modelling errors.

Torsten Söderström and *Petre Stoica* belong to the elite in the world in the field of theoretical *signal and systems modelling*. The department has an active co-operation with a number of major global companies.

Systems analysis

In the field of systems analysis, the research concerns biomechanics, i.e. analysis of human motion patterns and joint loads. The department of Systems and control together with Uppsala University Hospital, the Folke Bernadottehemmet and Karolinska Institutet, has investigated the forces in the knee joint. This knowledge can be used when manufacturing and evaluating artificial legs.

Håkan Lanshammar, who is today responsible for the whole of the *Institute of Information Technology*, comes from the *systems analysis part*. This subject area co-operates with smaller companies such as Qualisys and the local Sewage Works. Håkan Lanshammar's work is focused on the above mentioned research in the field of biomechanics.

2.2.6 Scientific computing

The Information Technology Department of Scientific computing is a methods institute that has close contacts with applications in industry and in the university world. Many of the students at the department come in touch with professional life through project and examination work.

The research in scientific computing is focused on the solution of partial differential equations (PDE), time-dependent and stationary cases, on complicated geometries, and with a resolution demanding high-performance computers. Many applications in science and industry lead to such problems. Examples are aircraft design, car design, meteorological and oceanographical studies.

The department of Scientific computing is one of the larger departments at the Department of Information Technology with 70-80 employees. This department at Uppsala University is a world leader in the field of technical scientific calculations. The senior researcher is *Bertil Gustafsson*. The competence center PSCI (The Parallel and Scientific Computing Institute) is also connected to the department. In the area of numerical methods and scientific calculations, the purpose of the competence center is to improve co-operation between the university and the industry. PSCI is an industrial consortium between VINNOVA, KTH and Uppsala University.

2.2.7 Image analysis

The *Centre for image analysis (CBA)* is a co-operation between Uppsala University and the Swedish Agricultural University (SLU). The purpose of the co-operation is to develop and reinforce the knowledge needed for an operative and sensible use of digital image analysis in society, particularly in the fields of environmental and medical science.

Research is carried out on both satellite remote sensing and medical image analysis. In most counties these two fields have developed separately. CBA tries to integrate the disciplines, seeking a balance between basic development of methods and algorithms

and direct work with applications. At the Centre about twentyfive researchers are working together in various projects with applications in such different fields as agriculture, forestry, water sciences, engineering, and medicine as well as more theoretical aspects of image analysis.

Today there are nine image analysis groups in Sweden. On initiative from the CBA, these groups co-operate within VISIT (VISual Information Technology) and receive funding from the Foundation for strategic research (SSF). The support is provided via a researcher educational program. The chairman of the research group is professor Ewert Bengtsson of Uppsala University.

The department of image analysis comprises 25 people and is actually not a part of but an annex to the Department of Information Technology because only half of the centre is connected to UU and the rest to SLU. The professor at Uppsala University is Ewert Bengtsson with research focused on digital image analysis.

Examples of spin-offs from medical image analysis are *AMI* (Applied Medical Imaging), *Diascan*, and the *CWA Institute* (Computer Wound Analysis Institute). *AMI* works with medical images and is still quite small and keeps a low profile. Possible application areas are in research around Alzheimer's disease and schizophrenia. *Diascan* develops software for general image analysis (the technology was developed from their experiences in the field of medicine). The company's operations are relatively small and today there are no employees. The *CWA Institute* at Västra Frölunda carries out computerised image analysis of wounds. This method measures the size and colour of a wound and gives indications about the progress of the wound healing process. They sell their services to pharmaceutical companies that wish to test their wound healing medicines. The company combines expertise in the fields of skin/wounds and image analysis.

Professor *Gunilla Borgfors* at SLU works with applications in agriculture, forestry, and medicine and co-operates with STORA and FOI, amongst others. The co-operation with FOI has resulted in a spin-off company at Boden.

Research areas in CBA are Medical applications, Applications in the external environment, and possibly a new one; Computer graphics and visualisation.

2.2.8 Computer and system sciences

The Computer science group at the Department of Information Science gives lessons in ADP, administrative data processing. The term has its roots in the 1960s and the definition has of course developed since then, but generally in ADP one develops and designs computer programs for administrative and economic applications, in contrast to technical. ADP covers a wide area, from user interaction to mathematical logic.

There are many similarities with the technical courses in the computer field, because irrespective of whether the applications are administrative or technical, the tools are the same. The same program language is used, e.g. C++ or Java, but they go in different directions. For computer scientists the emphasis is on developing programs in close contact with the users.

The computer science group is headed by professor Andreas Hamfelt, who is also the principal of the whole department.

An important addition to the department is Tore Risch who is researching in *distributed databases*. This group will however be transferred to the Department of Information Technology.

There are also a number of assignments for research in the department of computer science.

2.2.9 Signals and systems

The signals and systems group is a part of the Department of Materials Science. Research and teaching are carried out in the area of *Electrical Engineering*. The group has a broad competence both theoretical and experimental. The activities span the areas of *signal processing, communications, learning systems, non-destructive testing, microwave systems and control*.

The group comprises 70-80 persons and is headed by *Anders Ahlén*. The group has worked together with Ericsson concerning antenna techniques for radio base stations for mobile telephony. Last year some researchers in the department won the Venture Cup for their innovations concerning adapting the sound of hi-fi equipment to suit the room.

2.2.10 Computer linguistics

The Department of Linguistics carries out interdisciplinary teaching and research in the field of computer linguistics and its application area language technology.

Computer linguistics is focused on data processing of natural languages, e.g. Swedish and English. The basic research is focused on researching and modelling language utilisation and linguistic processes like understanding, production, and learning languages. This applies to both the written and spoken languages.

One important task is to identify the knowledge, linguistic as well as non-linguistic, on which language utilisation is based and to develop theories and methods for formalising it and making it available to computer programs. Most of the information that is transported on computer networks is expressed in natural language. Using computer linguistic research and development, tools can be created for handling such information and for navigating in the linguistic information streams.

Language technology comprises a strategic part of today's and the future information technology. Topical problem areas are machine translating and computer assisted translating, computerised writing support with grammatical checking, information searching in free text, man-computer interaction in natural languages, computer assisted language teaching, and speech technology.

The computer linguistics group is a smaller group with professor *Anna Sågval-Hein* and senior lecturer *Lars Borin*, among others. Their research areas focus on how to handle natural languages with a computer, i.e. how to get the computers to understand written text (for example, grammar check in Microsoft Word).

2.2.11 Bioinformatics

The Linnaeus centre for bioinformatics is a unit common to Uppsala University and SLU. Its assignment is to strengthen and coordinate research, education, and development work in bioinformatics as well as to contribute to spreading the utilisation of bioinformatics and its applications within the university and trade and industry. The

principal of the centre is professor Siv Andersson and research is carried out in the intersection of biology, medicine, computer science, mathematics and statistics. Bioethics and linguistics are important supporting disciplines.

2.3 The branches and fruits

2.3.1 IT education

ADB Architecture

ADB Architecture provides support for professional developers of distributed applications in Microsoft environments (.NET etc.) by training, design assistance, and advice.

ADB Architecture's task is to help and support professional developers to design and develop stable and scalable solutions in a Microsoft environment in the best possible way. The customer is a developer or a developing company, with few exceptions. The customer can be an end user only when an organisation needs help in the form of advice and technical information before selecting a technology. ADB Architecture has 7 employees and is not a product selling company but a service company. The main part of its operations is focused on developing and arranging courses and seminars, aimed at developers.

Frobozz

Frobozz was established in 1989 and has 14 employees today. The company has expertise in Java and Frobozz business idea is to offer competence in Java, object oriented, and related technologies. The technical people that work at Frobozz are leaders in the design of multi-layer information systems.

One of Frobozz main operational areas is training. The company has many years experience in the industry and at the university. All mentors at Frobozz are university graduates and certified java programmers.

2.3.2 Games & graphics

Cycore

Cycore was started in 1996 and has 45 employees of which 35 are based in Uppsala. It develops software for 3D graphics for the Internet that can be used for e-commerce applications. Their technology *Cult3D* can be used by product and service companies that want to visualise their products in 3D on the Internet and thus have a better possibility of marketing them. Using Cult3D one can twist, turn, and zoom in images from different angles. The product has been awarded a number of prizes.

Cycore also works with the development of 3D technology on the Internet and even with software for graphic special effects for films and television.

Gnistra

Gnistra is a consultant company that was established in 1999. It currently has 8 employees. The company's operations are two-fold. One part is consultant assignments for the telecom and biotech sectors, which involves system development, system

architecture and technical solutions. The other part is the development of multi-player games and platforms for such games. The company was one of the first in the world to develop a multi-player game for Java telephones.

03 Games

O3 Games is an Uppsala company that develops interactive digital entertainment. It was previously focused only on developing games for the PC and CD markets. Today it can offer production of a number of different game consoles on the international market. The company has 38 employees and has competence in programming and graphics. The employees originate from countries all over Europe, but a number of them are from the industry and the university in Uppsala.

2.3.3 Internet/ Web

Centrinity

Centrinity supplies intranet and extranet solutions to companies and organisations in the Nordic countries. The solutions give the customers the possibility of spreading, using, and developing knowledge better within the organisation. This can be done with the company's product; *FirstClass*. Centrinity has customers among compulsory schools, high schools, colleges and universities, municipalities, companies, and associations.

Centrinity is a wholly owned subsidiary company of Centrinity Inc, Canada, and has its head office in Uppsala with 30 employees. Centrinity has a consulting role and a support role. The competence in the company is focused on the development of interfaces with the Internet.

Informus

Informus works with the creation of industry adapted search systems for the Internet. Using these systems, the people that are searching for or supplying goods and services can find each other quickly and efficiently.

You can search for goods or a service by using the search function free of charge. The company that supplies the service pays for the registration of the information in the Informus database. One of the industries that the company is working with is the conference business. It is Informus' intention to develop similar search systems for other industries in the near future.

The company has its offices at Knivsta not far from Uppsala. The company was founded in 1995 and currently has 8 employees. It has competence in programming, web development, and databases, even if the everyday operations today are not focused on system development, but rather on marketing the service.

Knutpunkten

Knutpunkten has now been working for 4 years building Internet solutions for companies and organisations. Today there are 4 employees and the location is Knutby.

Knutpunkten develops project and communication system, amongst other things. It has also developed its own dynamic system for web publication – the Internet platform *Robinson* – which can be used for a wide range of things such as web pages, e commerce, intranet, documentation, presentation, and marketing. The company also

offers its customers the possibility of putting a whole database on the Internet or on an intranet developed by Knutpunkten, where Knutpunkten manages the operations, backup, etc.

Six months ago a subsidiary company was started in India for the purpose of supplying programming resources to Knutpunkten in Sweden.

Phosworks Interactive

Phosworks is a company from Uppsala that develops easy-to-use but advanced systems for dynamic media. Based on a technical platform, various applications are created for customers irrespective of whether the final result is to be published on the web, distributed on CD-ROM, or printed. The solutions cover a wide range of applications such as teaching, PR, speech support, etc.

There is a wide competence in the field of "new media", i.e. interactive media, with the Internet as a base. For example, this involves the design of user interfaces, the production of graphics and animation, and multimedia programming. The company has 11 employees.

Webgruppen

Webgruppen is a small company that employs 4 people. The operations are concentrated around web hotels, web page development, and consultancy in the fields of Internet strategies, security, and educational matters.

The company combines graphical knowledge with database knowledge in order to offer catalogues, both physical and electronic, to customers in a simple and flexible way. The application developed by Webgruppen offers fast and simple updating of catalogues from the web. It provides a simpler and more cost efficient solution for the customer.

Dimea

Dimea works with Internet based products and services. The company has 6 employees in Uppsala and the customers are also mainly in Uppsala. One of the company's products is EZINER, which was developed to meet the needs of companies and organisations wanting to create a network-based magazine, an "e-zine".

Among its other products are an order and booking system for graphic production.

2.3.4 E-commerce/Payment solutions

Imenta Sweden

Imenta Sweden is a small company with 5 employees that offers products and services for electronic commerce. Imenta helps companies to get started with trading on the Internet. They do this with products they have developed themselves in the business area *e-platforms*. In *e-services* the company offers web hotels and products from third parties. There is also a consultant side of the company that takes on assignments in program development and design or the design of home pages and intranet.

SpaceCoin

SpaceCoin is an Uppsala company with 12 employees and has developed a solution for taking payment for the contents and services on the Internet. SpaceCoin has developed a complete solution that looks after the whole process from registering the individual purchases to charging the end customer and then forwarding the money to the respective suppliers.

The development of the SpaceCoin system as an all-embracing payment solution for digital contents and services on the Internet, started in the autumn of 1999.

Trade Extensions

Trade Extensions has 11 employees and supplies software, services, and market places for e-commerce. The company offers software solutions for advanced auction applications and has a position for developing market places and algorithms.

The company is active in bartering, purchasing, and various types of sales auctions. Trade Extensions has specialised on the development of software and products for the flexible matching of bids in electronic auctions. One of the company's specialities is combinatorial trading. This means that the buyer and seller can stipulate terms or connections between their bids. For example, a supplier can offer a lower price if he can supply several types of goods, whereas a buyer can make an offer for a number of similar items on condition that he only intends to buy some of them.

2.3.5 ERP Systems

IFS

IFS develops and supplies component based business systems for middle-sized and large companies. The company's system *IFS Applications* is based on web and gateway technology with more than 60 components for the manufacturing and handling of the customers' value chains (SCM) and customer relationships (CRM), financials, development, maintenance, and human resources.

The office at Uppsala with 60 employees was started in 1995 and today there are two main themes; maintenance and human resources (HR). Among other things, they look after IFS salary support for customers in the whole of Sweden. The maintenance side is primarily addressed to heavy industry. IFS is a supplier to SCA and Volvo, amongst others.

Examples of customers in the county are the Uppsala Municipality, Pharmacia, and Erasteel at Söderfors.

Jaybis

Jaybis comprises two companies – one offers services and products for the development of sales and business processes as well as IT solutions, and the other is a consultant company. The companies have 21 and 40 employees respectively. Jaybis was founded in 1996 and is established in Uppsala. The company develops, produces, and implements whole or parts of business processes. The customers are mainly in the Pharmaceutical, Retailing, and Industrial sectors. The operations today are focused mainly on sales support/CRM.

Landsteinar

The operations are focused on selling and developing industry solutions based on the business system Navision Financials for the retailing industry and for distribution and wholesale companies. The company also offers products that are further developed by GroPro Landsteinar Development on the Notes/Domino platform such as CRM (system for handling customer relationships) and systems for the public sector.

Landsteinar is one of the largest dealers in Sweden for Navision Financials with offices in several places including Göteborg and Lund. There are 50 people working in the Uppsala offices.

2.3.6 Database handling

Drop & Search Systems

Drop & Search is an Uppsala company with 4 employees. It offers customised administrative systems. These are based on an own-developed system *dropshell*, which is a layer between the database tables and the special functionality that exists in a customer application. The company also offers a dynamic coupling between a www-server and the relational database 4th Dimension (4D). Further offerings include "database publishing", i.e. solutions in which material from a database is published in the form of a catalogue.

Exor

Exor is a small Uppsala company with 7 employees. The company was formed in 1984 and its operations then concerned mainly assembly and installations in the electronics and electrical fields. Today the operations are focused on database programming, i.e. the customised system development of databases and Internet solutions with integration between different Microsoft products.

Independent Database Technology

Independent is a small consultant company with 6 employees operating in Uppsala and Stockholm. The company focuses its operations around database technology. The business idea is to develop technically advanced solutions for handling data in areas such as telecommunications, real time systems, and high-availability computer servers.

The core competence includes relational and object oriented database handlers, program development with C/C++, Java and Visual Basic in Unix and Windows NT environments, as well as Internet technologies.

Upright Database Technology

Upright Database Technology in Uppsala employs 23 people and its operations are based on database development. There is considerable expertise for database handling within the company and many of the people have long experience of advanced relational database development. The consultant operations focus primarily on system development associated with databases. The company addresses mainly to customers that need a database to make its solution complete - both for volume business (VAR/OEM) and as support in its own business operations. Upright has developed a

relational database handler itself, Mimer SQL, which has been sold to several 10,000 installations all over the world.

2.3.7 Financial IT

Delphi Economics

Delphi Economics is a supplier of complete financial solutions in the fields of technology and information. The company has a total of 60 employees located at offices in Stockholm, Uppsala, Copenhagen, and Oslo.

The 30 employees at Uppsala work with financially related technologies such as the production of stock exchange pages, the operation of financial sites, and the development of software on assignment from customers. Furthermore there is about half of the analysis operations and quite a lot of work is done on "Investor Relations sites".

Syncom Financial Systems

Syncom Financial Systems was formed in 1997 and has 15 employees in Uppsala today. The company develops and sells software for the financial services market. Syncom offers ASP solutions to banks and stockbrokers for trading with financial instruments. The company supplies the technical infrastructure needed as well as the maintenance and operation of IT solutions.

Syncom offers the customers its solutions based on the *Syncom Financial Platform*, an open and flexible platform that can be developed when necessary. The company also connects up the front and back offices with a system called *Syncom Griffin*.

2.3.8 Life Science/IT

In this category we have chosen to present companies that are Life Science companies but also with a high degree of IT (e.g. Amersham and Biacore), and also companies that supply solutions (e.g. system developers) exclusively to Life Science companies.

Amersham Biosciences

Amersham Biosciences (formerly Amersham Pharmacia Biotech) is a world leading research based biotech supplier. The company has 4,500 employees in 30 countries. Uppsala is one of the company's five main plants, and here the company employs a total of about 850 people.

Amersham Biosciences develops, manufactures, and markets technology and products for bio-scientific research and the manufacture of biologically based pharmaceuticals. The customers are academic research centres and biotech, pharmaceutical, and diagnostics companies.

At Uppsala the company has a research centre that develops future chemical products, instruments, and software needed to analyse and purify proteins and other bio-molecules in laboratories and in industry. One department works with identification by mapping out the connections between illnesses and genes. This research has resulted in patents for more than 10,000 genes.

At Uppsala there is also Amersham's largest plant for the manufacture of chemical products, where 300 people work mainly with the manufacture of separation media for

industrial and laboratory use as well as ready-packed chromatographic systems and columns, but also electrophoresis reagents, bio-chemicals, and dextran products.

Biacore

Biacore develops, manufactures, and markets analysis instruments for studying and measuring bio-molecular interactions. The method is called surface plasmon resonance (SPR) based biosensor technology. The customers are primarily research labs in the pharmaceutical and biotech industries, universities, colleges, and research institutes. The company is listed on the Stockholm Stock Exchange's O-list and on the technology stock exchange Nasdaq in New York. Research, development, and production within Biacore is located to Uppsala where the company has 180 employees.

Agriprim

Agriprim was formed in the spring of 2000, and at the same time it moved into the Uppsala Innovation Centre's Ultuna branch. The operations can be divided up into two major branches:

- Development and operation of information services for companies that work professionally in agriculture. This is done through the web site www.agriprim.com.
- Consultant operations for companies in the agricultural sector, that want to be better at utilising new techniques, mainly for conveying information and market contacts via the Internet. The focus is on project management, marketing strategy, and definite help in building up web sites.

The company has 3 full-time employees in Uppsala.

Conagri

Conagri has an operations idea to be a full-service supplier with the possibility of being able to supply customer-unique solutions in the whole spectrum of information processing. The company is owned by Swedish Meats and Svenska Lantmännen, and there Conagri has a total responsibility for inter alia the operations and development of networks and hardware.

The company also has a close co-operation with Intentia, because several of Conagri's customers use Movex as an ERP system. This has resulted in a partnership agreement between Conagri and Intentia with focus on Food and Beverages.

Conagri has a total of 65 employees and its head office is in Malmö. About 20 people work at the office in Enköping where the company's computer operations are located.

Gyros

Gyros was founded in 2000 as the result of 10 years of research in Amersham Pharmacia Biotech. Gyros develops and markets micro-laboratory systems in CD-format for fast and cost effective DNA analysis. The company is based in Uppsala and has today about 85 employees.

Gyros offers companies in the pharmaceutical, biotech, and diagnostics businesses, a platform that means that laboratory processes can be miniaturised and integrated on to customised CD discs. Thousands of analyses can be done in parallel in each such one-off

micro-laboratory. Using this technology, the customers can make large savings as regards efficiency, profitability, and information contents.

The system has been developed in close co-operation with Åmic, who are responsible for the development and manufacture of the CD discs used.

MDS Nordion

MDS Nordion has become specialised on radio isotopes, radiation treatment, and other related technologies for diagnosing, preventing, and treating illnesses. MDS Nordion is a part of the MDS Group, which is a Canada based international group of companies in the field of health services and health care. MDS Nordion has operations at Uppsala in cancer treatment and medical technologies. The company has approx. 1,100 employees in total of which 47 people work in Uppsala.

During recent years MDS Nordion has acquired a number of European companies and among the latest acquisitions in Scandinavia are the Uppsala companies Helax and Precitron. These companies develop and market information systems and various accessories for planning, simulating, and controlling the radiation treatment of cancer. Helax and Precitron's products are found in leading cancer clinics all over the world.

One of MDS products is TMS (Treatment Management System), which is a computerised information and planning system for the radiation treatment of cancer patients. The system handles information about the cancer patient's anatomy, the course of the illness, and the extent of the tumour and its location in the body. Based on this information and together with the images stored in the computer, the system can simulate radiation treatment and study the effects on the tumour and on the healthy tissue.

Personal Chemistry

Personal Chemistry develops, manufactures, and markets Coherent Synthesis technology, for the purpose of improving the efficiency of pharmaceutical manufacturing processes. The company has approx. 65 employees at its head office in Uppsala and a further 30 people in subsidiary companies in the USA, England, and Germany.

Coherent Synthesis is based on research at the Karolinska Hospital from the beginning of the 1990s. The idea is based on microwave technology and automated procedures from planning to documentation for the development of active substances for pharmaceuticals. The customers are international pharmaceutical companies and some examples of these in the region are Pharmacia and Melacure.

Personal Chemistry has a close co-operation with the University of Uppsala, primarily in method development with the department of organic pharmaceutical chemistry at the Institute of Pharmaceutical Chemistry at BMC.

Prevas

Prevas is a project oriented technical IT consultant company with 45 employees in Uppsala. The company operates in three areas:

- Prevas Bioinformatics
- Prevas Industry

- **Prevas Telecom**

Prevas Bioinformatics is the leading operation in Uppsala. Since 1993, Prevas has been deeply involved as a supplier of advanced IT solutions to the most important technology companies in the biotech field. Two examples are Amersham-Pharmacia Biotech and Pyrosequencing AB. Therefore, in January 2000 a new business area was formed, Prevas Bioinformatics, which is focusing on the specific needs of this customer category. The business area is looking for customers in Sweden that are operational in the biotech field and pharmaceutical research, biotech technology, and medical technology.

Profdoc

Profdoc is Sweden's largest supplier of journal systems for primary health care, school health services, and the private health care sector. Since its start in 1989, the head office has been in Uppsala but a branch office was opened in the south of Sweden in the autumn of 2001.

The Profdoc Group is the largest supplier of journal handling systems in the out-patient care sector in Scandinavia. The Profdoc Group has offices in Sweden, Norway, and Denmark and all together has more than 25,000 users spread over 3,600 installations. In Sweden there are about 12,000 users.

Profdoc AB has 35 employees in Uppsala. Profdoc Link is also a part of the Group. This is a communication company that sells communication solutions for IT software.

Pyrosequencing

Pyrosequencing is an Uppsala company that develops, produces, and markets analysis instruments, reagents, and methods for automated DNA sequencing and sequence based analysis. The products are intended for researchers in medicine, pharmaceutical development, biology, and agriculture and forestry. The company is listed on the O-list of the Stockholm Stock Exchange and has 77 employees.

SYSteam Udac

SYSteam Udac is a supplier of IT solutions for health services and health care as well as for personnel administration. The company also offers services for web, network, operation, and training.

SYSteam Udac is a part of the SYSteam Group which has approx. 900 employees at 40 places in northern Europe. SYSteam Udac was founded and has its seat in Uppsala, with local offices in Luleå, Stockholm, Linköping, and Lund. About 100 people work in the Uppsala offices.

Larger customers on the health services and health care side are the Landstingen (County Councils) in Uppsala, Östergötland, and formerly Södra Älvsborg, Bohuslän, as well as NU Health care, together with a further 30 hospitals. The company range comprises both products and services. The products include comprehensive solutions such as software for more specific application areas, e.g. operation planning and "care weight" measurement.

TietoEnator Upptech

Almost a year ago, TietoEnator Upptech became a separate subsidiary company of the TietoEnator Group. The company works with system development and the target group is biotech and medicine technology companies. The company works primarily with everything from prestudies to analysis & design, implementation, testing and project management. It also carries out risk analysis and one of its specialities is to introduce wireless solutions in the customers' products. The company has 22 employees in Uppsala.

Valtech

Valtech is an international consultant company that supplies overall solutions in e business, from strategy, architecture, and project management to creative design, system development, and quality assurance. The company has three business areas:

- Biotech & Pharma
- Financial
- Industrial

Valtech has 900 employees spread over 16 offices in Europe, the USA, and Asia. In Sweden there are offices in Stockholm and Uppsala with a total of 100 employees. About 20 people work in Uppsala where the main theme concerns the business area Biotech & Pharma. The company addresses here biotech companies and amongst other things has developed a web based system for designing so-called sequential primers, which is unique for each analysis situation at Pyrosequencing's customers. Valtech also contributes with architecture consultants in various strategic platform projects at Pyrosequencing.

Åmic

Åmic develops and manufactures replicated micro-systems with requirements for high precision in large quantities, on assignment from companies in for example Life Science, mobile telephony, and optics. The company is based in Uppsala and has 20 employees. Among the company's customers are Gyros and Pyrosequencing.

Åmic develops the CD discs used in the Gyros system, for example. The discs can be used when analysing liquids and in optics. The company also works with dispensing of reagents, with inter alia Pyrosequencing as a customer.

Uppsala University is an important base for Åmic. The company has a co-operation with the research centre for surface and microstructure techniques, SUMMIT, at the Ångström laboratory. Furthermore, the company has recruited staff from the university and hires premises in the Ångström laboratory clean rooms.

2.3.9 Information systems/GIS

B&M Systemutveckling

B&M Systemutveckling is an Uppsala company founded in 1991 by Per Bergström and Lars Mauritzson. Today it employs 13 people. The company's operations involve the development of complete program systems both with its own products and as consultants.

The company developed one of the world's first land-based positioning systems for tracking vehicles. Since then the company has supplied many positioning systems to customers in a number of different fields.

CND Gruppen

The business idea of the CND Gruppen is to investigate, develop, and implement projects in digital document handling and using its own products, to solve customer specific needs in digital drawing handling. The concept is based on CAD and the handling of CAD drawings in a common digital drawing archive together with screen drawings and other file formats. The company has chosen CaraDoc as a platform for developing trade specific applications. *CND-DOC Architect & Consultant 2.1* and *CND-DOC ScanningArchive 2.1* are two document handling products developed by the company. The company has 10 employees in Uppsala.

Data Ductus

Data Ductus is a company with a total of 30 employees located at its offices in Uppsala (16) and Stockholm (14). The company offers services on a consultant basis that relate to the more efficient handling of information. Areas in which Data Ductus is working are information handling (visualising, virtual reality, document handling, and web development), the operation of large networks and applications, and the development of advanced software systems.

G2 Solutions

G2 is an IT consultant company with relatively small operations in Uppsala. Three employees work in Uppsala with methods and well-known tools on market leading platforms. The products, tools and knowledge deal with traditional operations and e-commerce. The operations are focused on business and system development and solutions for customer handling, data storage, and decision support. One of the company's cutting edge areas is CRM – Customer Relationship Management – that is offered through the *OTOSYS* system which the company has developed itself. The company also offers its customers *HitsIntoLeads* which is software for detecting and grading prospects and new business opportunities by analysing and profiling the behaviour of people making searches on the web.

Modulföretagen

Modulföretagen is a small company with 5 employees in Uppsala that sells financial systems. *MicroMore* is a own-developped system and was launched in its first version in 1984. *MicroMore* is a DOS-based system that can be adapted to suit and integrated into the customer's operations.

Pricer

Pricer has developed a pricing system for communication in shops. The system comprises application software installed on a server, base stations, receivers, and electronic "price tags". The company has its location in Uppsala and currently has 46 employees. Pricer sells its products to the convenience goods trade all over the world and the majority of its customers are abroad. Today the larger part of its software

development is outsourced to India and hardware development to Canada. Despite this, there is still an extensive development department in Uppsala.

QD

QD is an IT service company that works with the Internet and information handling. QD operates in the Mälardalen region (middle of Sweden) with just more than 80 employees, of which about 55 are in Uppsala.

QD has five operational areas. In *vocational training* QD offers advanced vocational training for longer periods of time. The training can be in programming and development, for example. The area *company training* involves customised training courses for employees in organisations with the help of knowledge tests and interactive and teacher-supported training methods in the office package, for example.

QD also develops customised IT solutions. This means information handling, knowledge management solutions, and digital information systems based on the Internet/intranet, databases and e-commerce with emphasis on Microsoft platforms. The company offers complete solutions as well as renting individual competence. This is in the area of *information services*. In *technical services* typical work is designing technical systems, carrying out installation work, and operations and maintenance. The final area is *IT services*, which involves furnishing the customers with various forms of hardware, servers, and software licenses.

2.3.10 System development/Systems integration

Cap Gemini Ernst & Young

Cap Gemini Ernst & Young is a world-wide consultant company in the fields of management and IT. The Group offers services at a global level in areas such as strategy, systems integration, system development, design, and outsourcing.

At Uppsala it develops customised systems solutions based on the customer's system requirements. Cap Gemini & Ernst & Young has 25 employees in Uppsala where the customers are primarily in the Life Science and pharmaceutical fields.

The company has competence primarily for system development, but also in areas such as project management, investigations, and specific knowledge in the pharmaceutical industry.

Cell Network

Cell Network is a consultant company with operations all over the world. The main areas are *IT/Internet*, *Telecom* and *Media/Communication*. It supplies everything from specialist competence to business critical solutions with complete responsibility for strategy, technology, design, and content.

In Uppsala there are 16 consultants who work with creating integrated solutions and the development of business solutions. Holistic thinking involves everything from prestudies and requirement specifications via project management and system development to the introduction of quality analysis.

Citerus

Citerus was founded almost 2 years ago and today has 10 employees. Located in Uppsala, the company is today mainly involved in systems integration. Sometimes it works as an expert in other company's projects, sometimes it takes on a complete assignment - from idea to design. The customers are found in a number of different businesses, but an important target group in Uppsala is the small biotech companies.

Consafe Infotech

Consafe Infotech is an IT consultant company with three business areas; *Communication solutions*, *Business solutions* and *Embedded solutions*. At Uppsala, the main business is in Business Solutions and Consafe Infotech has approx. 30 employees there. The company develops primarily business support systems for its customers, but is also occupied with project management, investigations, and tender issues. The technical development is in middleware and thin client systems. The company has many of its customers in Stockholm.

Cyber Com

Cyber Com Consulting Group started in Sweden in 1995 and was listed on the stock exchange in 1999. Today it has a total of more than 300 employees in Stockholm, Uppsala, Göteborg, Sundsvall, Malmö, and Copenhagen. The company has concentrated its operations around two business areas, e-Business and Telecom & Services.

The company has existed in Uppsala since 1997 with 16 employees. Operations are mainly concentrated on the business area eBusiness. In this area it creates system solutions partly by developing new parts for the customers and partly by integrating them with investments already made. The company has knowledge and competence in areas such as system architecture, system development, and system integration, but also in project management and operational analysis.

The customers are in the fields of banking, finance & insurance, and trade & industry. In Uppsala some of the customers are in the biotech/medicine spheres.

Enea Redina

Enea Redina with 45 employees offers consultant services in the area of information handling. Together with the customer, it develops information systems that support the customer's core operations. In this work is included drawing up information strategies, implementing operational analysis, and the design of tailor-made applications.

Knowledge is available in the organisation in areas such as databases, software development, and interface user friendliness. Customers are, for example, the Swedish Medical Products Agency, and other medical related companies.

Erda Technology

Erda Technology with 15 employees is a consultant company with a peak competence in technical system development. The company offers services in four areas of operation: *Embedded* (development of software in embedded systems), *Application* (application development of technical systems), *Communication* (solutions in telecom, datacom, and

mobile communications), and *Media* (technical solutions in home communications and interactive media).

The services include the whole chain within technical system development from an idea to the realisation of a system where the company answers for project management, design, and development. The customers are mainly in the fields of Biotech and Telecom.

IMS Data

IMS Data was founded in 1985 and has a total of 400 employees at 16 places in Sweden, from Malmö in the south to Skellefteå in the north. At Uppsala there are 23 employees.

IMS Data has a business idea to develop and make business processes more efficient with the help of modern information technology. The operations are carried on in the business areas *System development, Technology & Infrastructure, Operations & ASP, IT products* and *Communication*.

IMS Data is a system integrator of IT infrastructure, which involves investigations, prestudies, design, project management, and implementation. It also has a large number of operational services where it takes responsibility for a part or the whole of the customer's IT environment. This can involve, for example, the complete operation and ASP services.

ITSIP

ITSIP has 25 employees and sells to middle-sized and larger companies that have requirements for reliability and performance in their Internet solutions. The customers are offered business development and system development in five operational areas; *e-business, e-services, security, payment systems, and broadband services*. These offerings are focused on areas such as broadband, telecom, Internet, media, and entertainment.

LeanOn

Since it was started in Uppsala in April 1998, LeanOn has mainly been working with IT consultant operations in the banking and financial sectors. In addition to consultant activities, LeanOn develops and sells a web based system for time reporting; *TeamPlanet*.

The company has 13 employees and offers business critical solutions, i.e. the development of systems with stringent requirements for performance, security, and availability. This also sometimes involves integration with existing systems with connections to both internal and external systems. LeanOn is also engaged to some extent on assignments concerning securities and stockbroking via the Internet.

Mad Sci

Mad Sci was started in the summer of 2000 and the company works with the development of systems for so-called Multi-channel publishing.

The company's first product, Line-In-Server, is an application that makes it possible for radio stations, concerts, and music festivals, that normally generate an analogue sound output, to publish sound on the Internet.

The company has 7 employees in Uppsala.

Midex IT Consultant

Midex IT Consultant is an Uppsala company with 12 employees. The operations are focused primarily on the integration of large existing, operation-critical systems with new modern environments, e.g. with different types of middleware and Internet interfaces.

The company offers specialist resources in server based development as well as complete undertakings of various system development projects, from planning and design to implementation and delivery.

Navigera

Navigera Business Consulting focuses on business development based on Navision Financials/Attain – a business system for middle-sized companies. The company has six offices in Sweden, from Umeå in the north to Helsingborg in the south, with 70 experienced operational consultants and system developers. In Uppsala there are 15 employees.

From the Uppsala office, Navigera is active in the Mälardalen region and offers tailor-made solutions based on the business system Navision Financials/Attain. This means order/stores handling systems, economic systems, material planning systems, and e-commerce solutions.

Nocom

Nocom was formed in 1985 and is today listed on the O-list of the Stockholm Stock Exchange. The company has approx. 200 employees in Uppsala, of which the majority (about 130 people) are employed in the subsidiary company Nocom Svenska, which is the core operation. The company is a partner to several software developers in the world and has agencies for a number of these. The company was Netscape's first co-operation partner outside the USA.

Nocom is focused on *Content Management* and *integration (EAI)*. Some examples of companies for which Nocom is a dealer are Vignette (that offers the product Storyserver, within *Content*), and Tibco (within *Integration*).

Nocom's market is primarily in the Nordic countries, where the company has a strong position in a number of fields, including industry, telecom, banking, and finance.

Saab Tech Systems

The Saab Tech Systems office in Uppsala develops distributed real time systems and command systems for military applications. The largest customer is the Swedish Defence Forces, but there are also some customers abroad.

The office has 55 employees and has a very advanced and specialised knowledge in developing systems for just command systems. Development is done using programming languages such as Ada and C++. The system is Windows NT or Unix based.

The company describes itself as a system administrator, and it is certified in a number of Microsoft products, communication products such as TSIP and management products. Technical solutions are offered to local companies such as Pharmacia, Amersham, Munters, and Gyros.

Semcon

Semcon has 3 consultants in Uppsala that work with inter alia system development, programming (java, C++), project management, and computer support. This often involves IT solutions in the form of system development for information systems in IT and electronics. Semcon in Uppsala is focused on the customer segment, small biotech companies.

Sightline

Sightline is a consultant company in system development and programming, with focus on Internet tools. An example is the project control program *ProSight*, which is a scalable intranet solution that surveys and controls meetings and time schedules in project controlled operations.

The company has its head office in Stockholm, but there are also 4 employees at Uppsala.

Strålfors

Strålfors offers complete solutions when it comes to business critical communication and information solutions. Strålfors has its head office in Ljungby and is an extensive Group of companies with 2,000 employees in 11 countries. In Uppsala there are about 25-30 employees.

The unit in Uppsala is involved in personalising account cards, telephone cards, etc. The competence is in java programming and is used to develop and program the chips that are then mounted in the cards. The complete product is then packaged and supplied to the end customer within 24 hours. Strålfors also deals with the invoicing.

TietoEnator Resource Management

TietoEnator is represented in Uppsala mainly by the companies, TietoEnator Resource Management and TietoEnator Upptech (see Life Science/IT).

TietoEnator Resource Management offers software applications and support services for customers both in the private and public sectors. The business area applications cover economics and personnel handling, key account management, and document and information handling. About 80 people work at Uppsala.

WM-Data

WM-Data is a consultant company with a wide range of IT-related services. In Uppsala there is approx. 70 employees.

Operations started in Uppsala in connection with the purchase of Owell. Today there are customers in Biotech and public authorities. The company offers solutions in areas such as network solutions, system solutions, but there is also competence in project management and in Internet-related services for increasing customer benefits. Here software development is an important contribution.

2.3.11 Systems analysis/Software Engineering

Arete Libro

Arete Libro is an Uppsala based company with 40 employees. It furnishes IT knowledge in the value chain from operational analysis over modelling, IT architecture, and project management, to realisation in modern development environments in the form of consultant services and project undertakings. It has competence in java programming, databases, project management, and IT architecture.

Arete offers consultant services and project undertakings to customers in the private and public sectors. Examples of customers are the County Administrative Board, the City of Uppsala, and Pharmacia.

Competenskraft

Competenskraft is a Group of five subsidiary companies with a total of 80 employees at a number of places in Sweden. 35 of these work in Bålsta. Competenskraft is an IT consultant company with three operational areas. In the area *System consulting* it works with systems analysis, project management, investigations, handling payment reminders, verification and validation. In *Information and data security* it offers risk and vulnerability analysis, operational analysis, and requirement specifying – all based on an IT security perspective. In the area of *System development* it offers development of program products, systems integration and maintenance.

Consoden

Consoden is a small Uppsala based company with five employees that offers consultant services in technical software development. The focus is on reliable systems, real time systems, and wireless technology. Furthermore, there is competence for project management and the application of development processes such as RUP (Rational Unified Process). The company also develops complex systems mainly together with companies in the defence and telecom industries.

IAR Systems

IAR Systems is one of the world-leading companies in C/C++ compilers. The company develops and markets C/C++ compilers, debuggers, and assemblers. IAR Systems develops tools that facilitate the programming of microprocessors. The objective is to make it simpler and quicker for the customer to program.

The customers are in telecommunications, vehicles, and the home electronics field. Most of the sales are from export markets where the most important markets are in Europe and the USA. IAR Systems has approx. 160 employees of which 100 are in Uppsala.

Intologic

Intologic is a research company that was spun off from Uppsala University in 1998 to commercialise the results of more than 10 years research and industrial projects in the fields of knowledge handling and knowledge technology.

Intologic works with the consultation and development of IT systems and models for knowledge handling, decision support, resource planning, administration, and IT platforms. The company has 6 employees in Uppsala.

IT-arkitekterna

IT-arkitekterna has about 50 employees at its offices in Uppsala and Stockholm. There are currently 4 people at the Uppsala office. The company was founded in 1996.

The company offers a complete concept from product idea to a satisfied end customer. IT-arkitekterna offers consultant services and customised training in the following areas: operational and system development methodology based on Rational Unified Process (RUP), IT Architecture, customer relationship process (CRM), issue and document handling (workflow), project management, and test management. Work is done mostly in Java, Microsoft, Oracle and IBM's development platforms. Emphasis is on operational investigations, system investigations, and methodology development.

The customers are mainly in finance, insurance, telecommunications, pharmaceuticals and biotech. The latter group is especially focused by the Uppsala office.

Ntier Solutions

Ntier Solutions was founded in 1998 and has today 16 employees at its offices in Stockholm and Uppsala. 10 of these are in Uppsala. Since the start the company has supplied consultants with specialist knowledge principally in multi-layer architecture, database design, data communications, and soft real time systems.

In its assignments the company is involved in one or more steps of the development process. This includes everything from pre-studies of various design alternatives to the integration and acceptance testing of systems. Emphasis is on the design, development and testing.

The company's customers are found among IT suppliers and companies mainly in telecom, pharmaceuticals, media, and finance.

Upsys

Upsys (Upsala Systemkonsult) offers technical consultant services in system development and system integration in open systems. This means that they participate in development projects, investigate network solutions, analyse security matters, manage projects, etc. There is also a long experience of UNIX-based systems.

The company's main operations are to supply advanced consultant services in the IT field where the customers are mainly to be regarded as system suppliers. Experience is available in communications and integration in open system environments, methods and tools for system development, security in operating systems, networks and databases, as well as standards in open systems. The company has 13 employees at the office in Uppsala.

Telelogic

Telelogic is a supplier of solutions that facilitate and support software development. The company has focused its operations on three areas. *Telelogic DOORS/ERS* is a system that facilitates the inspection of whether a system complies with the requirement

specification. *Telelogic Tau* is a visual development environment for analysis, design, and testing of advanced software. Telelogic Tau uses a visual programming language that leads to shorter development times. The last area, *Telelogic Synergy*, is a configuration and version program that keeps track of changes and used versions in a project.

Telelogic has offices at a number of places in Sweden. The Uppsala office has 15 employees and is primarily focused on the Telelogic Tau area.

2.3.12 IT Security

Altcom

Altcom was started in 1997 as a subsidiary company to Mapsit AB for the purpose of making use of and further developing system solutions for unemployment benefit funds (societies) and their members. Today the company has 10 employees in Uppsala. The company became independent in 1998 and operations were widened to include Internet solutions and technical consultant operations for authorities and companies. Today Altcom's operations are mainly divided up into two business areas – *Information services* and *Security*.

Operations in the business area *Information services* include product development, administration, operations, project management, and investigation assignments. An *e-benefit fund card* has been developed in this field. This is a web-based system for the declaration of benefit fund cards for the unemployed. Besides the e-benefit fund card, a *Form guide* has been developed. This provides support when filling in forms, with information for the user about the contents of the form and about the information requested.

Altcom's consultants in system development have a well-documented expert knowledge of *Security issues* for Internet/intranet and application development for electronic trading, such as payment systems and web shops. The company has competence in Public Key Infrastructure (PKI) which is used for electronic identification, transaction security, and digital signatures.

Europoint Networking

Europoint Networking is a small consultant company with three employees that supplies specialist competence around IP-based services. The company has many years experience of the Internet and intranet. It designs and implements Internet services for ISPs and large and small internal company networks. The operations are focused on the design and implementation of IP networks, technical security in IP networks, including firewalls and VPN, network services such as email, catalogues and web, web services with connections to various types of systems, and server systems based on different variants of Unix and Windows.

Technology Nexus

Technology Nexus (Nexus) supplies solutions for its customers' operations as well as developing and managing the customers' products. Both these solutions are often used in mobile networks, the Internet, intranet, radio networks, digital television, and other open communication channels.

About 20 people work at the office in Uppsala today and most of them work with security solutions. The others work with system development and with administration. In the Security group, Nexus deals with security in communications (routers etc.), firewalls, access solutions for operating systems and authentication.

The Uppsala office has its customers in a number of different fields, locally but mainly in the Stockholm area.

RSA Security

RSA Security is an American IT Security company that is behind the so-called RSA algorithm for encryption.

The company is listed on the Nasdaq list and has 40 employees at Uppsala working with product development. The Uppsala unit develops customised products, and products of a more general character that are sold all over the world.

The focus at Uppsala is on the business area *SecureID*, which means advanced solutions for safe authentication. This involves primarily software development to ensure that unauthorised people cannot get access to email, web servers, intranet, extranet, etc. Examples of product areas that solve the authentication problem are time synchronous tokens and smart cards. A part of the development work today is focused on solving authentication in mobile telephones.

Sentor

Sentor is a company that offers specialist competence in Internet security and IT. The company was established in 1998 and offers solutions with focus on security.

Sentor can be involved in a project all the way, from the design phase and to delivery, and afterwards can be responsible for the operation and maintenance of the system during the actual administration phase.

The company, that has 10 employees and the majority of its customers in the Stockholm area, can also offer secure auditing and secure hosting. The latter part is in co-operation with IP-Only.

2.3.13 Embedded systems

CC Systems

CC Systems develops complex control systems for mobile applications in "difficult" environments. The company has 40 employees in Uppsala and works for many different trades. The common theme is demanding environments where the requirements for availability and security are very stringent. One example is forestry machinery.

CC Systems is established in Alfta, Uppsala, and Västerås. Software development and electronics design is carried out at Alfta and Västerås, whereas the focus at the Uppsala office is on software development.

Examples of products developed in the organisation:

- *Cross Country Pilot* is a product family of vehicle computers characterized by high performance and functionality as well as a high degree of environmental resistance.

- *Cross FIRE* is a product family of powerful IO modules for use in difficult environments.
- *Silvi*A* is software developed for forestry, a complete and very modern administrative program for adaptation computers.

Hectronic

Hectronic is an Uppsala company with 12 employees. It develops both software and hardware for use in embedded systems. The company's customers are mainly large Swedish industrial groups such as Volvo, Saab, and Atlas Copco. Besides offering consultant services, the company has a building block that it has developed itself with a base in both software and hardware. Hectronic has many years of competence in industrial PC design.

Omicron

Omicron at Uppsala was started in 1998 and has today 6 development engineers employed. The company develops parts of and complete systems in areas such as for example embedded systems, instrument software and electronics, application software, data presentations and analysis systems, as well as software for payment terminals.

Racomna

Racomna is located in Uppsala with 16 graduate engineers working with technical physics, of which several have taken a doctor's degree. The company works principally in three business areas – *mobile telecommunications*, *biotech*, and *defence technology* – and is specialised on RF and microwave technology, signal processing, and real time systems.

The company works with complete undertakings, in which they deliver a result and take responsibility for manpower, premises, and training. The result is delivered in the form of investigations, simulation studies, documentation, software, designs for verifying theoretical and simulated performance (proof of principles) as well as prototypes.

Since May 2001, Racomna has a co-operation with Uppsala University in order to be able to offer assignment research.

Styrex

Styrex is a consultant company with 16 employees and its business idea is with peak competence in electronics, programmable logic and hardware programming, to offer advanced technical consultant services for the development of embedded electronics and computer systems.

All the employees are university educated engineers in the fields of electro-physics or computer technology. The company covers a wide area in electronics and programming technology.

The customers are research and industrial companies in the areas of biotech, defence technology, machinery technology, and telecommunications, where there are stringent requirements for the system's performance, reliability, and quality, and where a holistic view and a new way of thinking determines the results.

The list of principals includes ABB, Amersham, Ericsson, FMV/FOI, IAR Systems, Micronic Laser Systems, and the Swedish Space Corporation.

Teleca System Design

Teleca System Design has existed in Uppsala for almost two years and currently has 8 employees. The company is a supplier in the development of software for advanced systems, electronic equipment, and applications. Competence is available in hardware-near programming, real time systems, embedded system databases, and information handling. The offerings to the customers are a complete undertaking. The Uppsala office's customers are mainly in the biotech sphere.

ÅF

ÅF (Ångpanneföreningen) is an IT consultant with a wide operational area. Four companies in the Group are represented in Uppsala, namely; Electrical technology, Heating ventilation and sanitation engineering projects, Industrial technology, and System design. In total there are 30 employees in Uppsala, but the IT-related areas Electrical technology and System design have together 10 employees. This number is expected to increase during the coming years because the company is growing in these areas. The target group is primarily biotech companies.

Solutions are offered in a wide spread of areas such as broadband networks, hardware development in the form of, for example, platforms and software development in databases, document handling, Internet-related solutions, and various system solutions.

2.3.14 Communication systems

Communicator Group

Communicator helps Swedish companies and authorities in the procurement or development of information and communication systems. Of the company's 110 employees, there are 15 people in Uppsala and 6 in Enköping at the subsidiary company Teleplan. The Communicator Group also includes a subsidiary company Communicator Systems with 10 employees at Uppsala. The company has its head office in Solna.

Teleplan has five operational areas: plant technology in fixed and mobile environments, network systems, power supplies for telecom and datacom, interactive systems, and telecom and data communications. Teleplan works with the planning and projecting of telecom, datacom, and radio systems, and uses tools developed by itself for projecting and documentation, TEKDOK. Communicator Systems is specialized on system design, mobile systems, and radio technology.

Dotcom Solutions

Dotcom Solutions has 600 employees and offices at 30 places in Sweden. There are 9 people working at the Uppsala office. Dotcom Solutions supplies complete communication platforms for speech, data, imaging, and network services. The company offers consultant services, system integration, installation, training, service, and support.

The company co-operates with world-leading system product suppliers such as Cisco, Nortel, Extreme, Alcatel, Ericsson, and Sony, as well as the leading operators of

network services. One of Dotcom Solutions main areas is application development for contact centres, i.e. development of CTI solutions.

Envilogg

Envilogg was started in 1988 as a consultant company in telephony and data technology. Since 1995, Envilogg is a product company with focus on CTI in general and telephony, contact management, and contact centres in particular.

The majority of Envilogg's products are software and systems for so-called Contact Management. This means that the company develops, markets, and supplies referral systems, software for telephone switchboard operators and agents in call and contact centres, complete telecom systems for call/contact centres, catalogue systems, text conveying and video systems for people with impaired hearing, and support systems for debiting, statistics, operations, maintenance, and integration with other programs for contact handling such as Lotus Notes, Outlook, and Groupwise. Envilogg has an office in Uppsala with 26 employees and its most well-known customer is Telia's directory inquiries 118 118.

Icepeak

Icepeak has an office in Uppsala with 6 employees and has a long practical experience of developing voice-controlled services. In their previous employments the co-workers have been involved in developing and leading work on several of the large voice-controlled systems that are in use on the Swedish market today, e.g. Swedish Rail's voice controlled train timetable information service, the National Road Administration's voice answering service, the voice controlled Tele-fund card of the Swedish Municipal Workers' Union, etc. Furthermore, the company has many years experience of research in areas such as speech translation, speech recognition, speech synthesis, and speech coding. In addition, it has long experience of development and project management in the fields of telephony and traditional system development.

MicroTel Technology

MicroTel is an Uppsala company with 12 employees. Its niche is CRM (Customer Relationship Management) and CTI solutions (Computer Telephony Integration). MicroTel is a developer of products and systems for the analog and digital telecom markets as well as being dealers for value-adding computer accessories. The company develops its own products and has knowledge in both software and hardware development.

Telia Promotor

Telia Promotor is an IT consultant with 150 employees in Uppsala. The operations are quite broad and focused on customer handling and customer communications. Telia Promotor works with *Contact Centers* where many different issues are handled. Both existing Contact Centers or those that are being started from scratch. The concept includes consultant services, solutions based on different platforms for part or whole solutions, as well as various forms of operations and support services.

A Contact Center can have its point of origin in a telephone based customer service or in a company portal and is often a central part of a company's CRM effort. Telia has experience and knowledge about CRM systems.

Another area where Telia Promotor is active is in *e-contacts*, in which secure and efficient customer handling is implemented via web solutions. Furthermore, it offers project management and a strategic advisory service regarding company communication services.

2.3.15 Wireless communications

IR-vision

IR-vision was founded in 1999 and based on the premise that today's and tomorrow's society is in need of faster and simpler access to local offerings of information and services. This will function additional to today's mobile Internet developments. The idea for the concept comes from Jerry Pettersson, who together with the seven other people in the company, develops today software and hardware at Uppsala for the "local stations" that will function as infrastructure and make access to the local information possible. The company has developed demo products and is now ready to take the step into the market.

Pocit Labs

Pocit Labs is an Uppsala company with 11 employees. The company develops software for communications, partly wireless. The company has been active for almost two years and will soon be ready to launch its first product versions on the market. Its customers are exclusively overseas.

The company's market will include the "ad hoc wireless networks" through which the company hopes that many products will have wireless communication in the future. By implementing intelligent portable clients, Pocit labs can with its product *BlueTalk* make communication through these ad hoc wireless networks possible. These networks can arise between different users or between users and neighbouring electronic services.

2.3.16 Broadband/Operators

Arctic Fibercomponent

Arctic Fibercomponent is a manufacturer of fibre-optic cabling. The production is local and the company employs 40 people in Uppsala. The customers are also local but the majority of them are spread over the rest of the country.

Bahnhof Internet

Bahnhof Internet is a privately owned IT Group with nationwide coverage that was started in 1994. Bahnhof Internet is Sweden's oldest independent Internet supplier. The company offers its customers (primarily companies but also private persons and organisations) web hotel services, called and fixed Internet connections, broadband connections via fibre, radio, and copper, as well as a number of other Internet services. These include, for example, email services and server hosting in modern server rooms.

Since June 1999 the Group's operations also include technical operations, development and marketing of the global top domain register for the country code domain ".st". There are 25 people at the Uppsala offices.

IP-Only

IP-Only Telecommunication is an Internet operator that addresses companies aiming at a high level of operational safety for their computer equipment and/or would like to have access to the latest technology for the Internet. IP-Only has three service areas; Colocation, Internet Access, and Traffic analysis.

The company has 15 employees at the offices in Uppsala.

Lidén Data Gruppen

Lidén Data Gruppen is a company stationed in Enköping with approx. 15 employees. The company comprises four subsidiaries - Lidén Data System integration AB, Lidén Data Product AB, Lidén Data Affärssystem AB, and Lidén Data Internetwork AB. Some of its operational areas are sales of computers and accessories, town network design, sales of fixed connections, LAN design, and consulting.

The most active part of the company is the subsidiary Lidén Data Internetwork. In Enköping this part of the company offers broadband solutions, Internet, and communication services, based on an own city network.

Utfors

Utfors business idea is to supply the most cost-efficient high-speed services on the market based on the next generation of IP technology to companies in the Nordic countries as well as to private persons. The infrastructure is being built today in all the Nordic countries.

As Utfors owns the network, it can also sell pipes and black fibres to other operators and thus finance large parts of the extensions being built in the network. With 60-70 employees in Uppsala, the company offers IP-based services such as telephony and telefax on the Internet, Internet connections for private customers, fixed access to the Internet, LAN-LAN on the Internet, called VPN (Virtual Private Networks) to companies, as well as fixed VPN on the Internet to companies.

Vattenfall Connection

Vattenfall Connection builds infrastructure for broadband in Sweden by digging and burying fast and secure fibre optic networks. Amongst other things, Vattenfall Connection has built the infrastructure for broadband in Uppsala. Today the company offers powerful broadband solutions to the various players on the market. This is done by renting out data capacity directly to companies or to Internet operators. The company has 8 employees in Uppsala.

2.3.17 Electrical and computer installations

Bravida

Bravida's business idea is to be the leading installation and service company that develops and supplies complete solutions in the Nordic countries. The company is the

first technical total supplier of installation services in the Nordic countries. The company's technical competence includes telecom, datacom, power supplies, ventilation, heating and sanitation, security, and intelligent solutions as well as geographic information technology.

Bravida has split up its operations into the following technical areas: *Telecom and datacom networks, information and communication technology, ventilation, heating and sanitary, and electrical*. In Uppsala there are 60 employees of which the majority are installation technicians in the electrical field. This means that a large part of the local operations is focused on the installation of cables in building.

Diktafon & Teleservice

Diktafon & Teleservice started in 1985 as a service company. The operations comprised from the start only service and installation of telecom equipment, telephone answering services, dictation machines, automatic telephone diallers, pagers, etc. Today the company also has a sales organisation with tailor-made solutions for their customers. The company, with 12 employees, has its own installation department and service department.

Since 1994 the company has had an agreement with Telia which allows it to sell Telia's telephone switchboards and thus be a complete supplier with the possibility of taking care of all orders for telephone lines, etc. Telia Finans is a co-operation partner. This means that the customers can have a rental agreement with all their telephone and datacom costs gathered on one invoice. Today the company also has agreements with Panasonic and Siemens, and the telephone switchboards from these companies are also included in the product range.

Enatech

Enatech has 10 employees and since the start in 1993 has been working with PC computers in networks, communications, AutoCAD, AutoCAD LT, and many other of the standard programs that are in use on the market today. The company projects, installs, and administers networks for datacom and telecommunications. It also works as a pure consultant both before, during, and after the installations.

Enatech also helps its customers with their Internet efforts, which can involve anything from simple e-mail solutions to advanced shops.

Midroc Electro

Midroc is an electro-technology company with consultant, contracting, and service operations in the areas of electrical installations, industrial automation, power supplies, cooling, data communications, security, and telephony.

Midroc has 900 employees in Sweden and is represented at 26 places from Malmö in the south to Ljusdal in the north. At Uppsala the emphasis in the operations is on installations and service for power supplies, lighting, telecom, and datacom. Similar activities also take place at Tierp and Gimo. Together, these three offices have 43 employees.

Pactum

Pactum is a small company with 7 employees with focus on Auto-CAD systems. Pactum is an Auto-CAD dealer and offers hardware, software, and support. The company also works with consulting and offers training, customising, and application development as well as datacom and network advisory services in relation to Auto-CAD systems. A part of the operations is focused on the installation and maintenance of networks.

Sallén Network

Sallén Network carries out the installation of cable systems for datacom and telecommunication. The company offers complete solutions that include network installation of cable systems as well as active components, for example, switches and routers. Sallén Network can carry out anything from simple installations in the form of additional wall sockets in an existing system to larger and more complex fibre installations.

Ultrotech

Ultrotech was started in 1989 and the operations comprised initially cable television installations and programming services. Today the company offers work with 3G projects, broadband, and network installations as a total contractor or as a subcontractor. Furthermore, the company can offer intranet and smart home solutions. Ultrotech is located in Bålsta and operates today in the larger Stockholm region with 10 employees.

2.3.18 Miscellaneous hardware

EUD

EUD Teknik was founded in 1993 and currently employs 28 people in Knivsta. The business idea is to develop and manufacture computer equipment and PCs for professional use and adapt them to suit the respective customer's requirements.

The range has successively been extended with peripheral equipment from manufacturers such as Mitsubishi, AMD, Samsung, NEC, Acer, HP, Intel, etc. In 1998 the company was awarded the agency for Mitsubishi's EVS range.

Ibas Laboratories

Ibas was established in 1978 with operations in the areas of computer redesign, data erasing, and data investigations. The head office is located at Kongsvinger in Norway.

Ibas develops its own hardware and software to ensure that the customers get the best possible results. Amongst other things, the Patan technology has been developed. This allows the analog reading of individual disks in a hard drive and the conversion of the data back to digital readable files.

In Uppsala there are 6 employees primarily concerned with sales.

Appendix A. References

Face-to-face interviews

Name	Company/Organization	Date
Ewert Bengtsson	Uppsala University	2001-11-27
Peter Dahlström	Uppsala county	2001-11-27
Werner Schneider	Uppsala University	2001-12-11
Bengt Starke	Cycore	2001-12-11
Jerry Pettersson	IR-vison	2001-12-11
Olle Landström	IAR Systems	2001-12-11
Stefan Ström	Nocom	2001-12-18

Telephone interviews

Name	Company/Organization	Date
Erik Hagersten	Uppsala University	2001-12-27
Karl Åke Lindblad	Älvkarleby Municipality	2001-12-10
Arne Wålstedt	Enköping Municipality	2001-12-10
Erik Sondén	Håbo Municipality	2001-12-10
Maj Sundblad	ADB Arkitektur	2002-01-14
Stefan Ljungdahl	Agriprim	2002-01-10
Jonas Larsson	Altcom	2002-01-09
Irene Lindgren	Arctic Fibercomponent	2002-01-23
Lennart Ward	Arete Libro	2002-01-10
Lars Mauritzon	B&M Systemutveckling	2002-01-16
Monica Lundström	Bahnhof Internet	2002-01-17
Anders Tallén	Bravida	2002-01-23
Torbjörn Berglund	Cap Gemini Ernst & Young	2001-02-09
Claes Ulvefeldt	CC-Systems	2002-01-14
Ann Andersson	Cell Network	2002-01-17
Kajsa Aura	Centrinity	2002-01-07
Magnus Gulliksson	Citerus	2002-01-09
Rainer Korhonen	Communicatorgruppen	2002-01-18
Morgan Eriksson	CompetensKraft	2001-12-10

Mats Idberg	CompetensKraft	2002-01-08
Ulrika Hedberg	Conagri	2002-01-10
Steven Lefevre	Consafe Infotech	2002-01-10
Mats Östlund	Consoden	2002-01-21
Åke Wideqvist	Cyber Com Consulting	2002-01-11
Bengt Starke	Cycore	2001-12-11/19
Lars Frisk	Data Ductus	2002-01-11
Anette Smith	Delphi Economics	2001-12-20
-	Diktafon & Teleservice	2002-01-23
Staffan Douhan	Dotcom Solutions	2002-01-11
Per Sjöstrand	Drop&Search Systems	2002-01-21
-	Enatech	2002-01-23
Ylva Melin	Enea Redina	2002-01-11
Kennet Burvall	Envilogg Datateknik	2002-01-10
Olle Frimansson	Erda Technology	2002-01-11
Staffan Svensson	EUD	2002-01-23
Jan Wünsche	Europoint Networking	2002-01-17
Jörgen Enström	Exor	2002-01-21
Arne Kjellberg	Flexicon	2002-01-10
Johan Grundin	Formab Data	2002-01-17
Torhald Eriksson	Frobozz	2002-01-11
Ulf Dellborg	G2 Solutions	2002-01-21
Tomas Alm	Gate.se	2001-12-20
Jacob Friman	Gnistra	2001-12-19
-	Gyros	2002-01-23
Heike Brunberg	Hectronic	2002-01-11
Olle Landström	IAR Systems	2001-12-11
-	Ibas laboratories	2002-01-17
Rehan Mirza	Icepeak	2002-01-10
Christoffer Ekström	Imenta Sweden	-
Lennart Hammarstedt	IFS	2001-12-19
Niklas Hedenskog	IMS Data	2001-12-19

Johan Sintorn	Independent Database Technology	2002-01-21
Mikael Bengtsson	Informus	2002-01-07
Jerry Pettersson	IR-vision	2002-01-10
Mikael Orman	IT-arkitekterna	2002-01-17
Mattias	ITSIP	2002-01-09
Pia Andersson	Jaybis	2001-12-19
David	Knutpunkten	2002-01-17
Nina Larsson	Landsteinar Svenska	2002-01-10
Klas Svensson	Lean On	2001-12-19
Ulf Ihrsén	Lidén Data Gruppen	2002-01-11
Adam Johansson	Mad Sci	2002-02-06
Kristina Lundqvist	MDS Nordion	2002-01-10
Håkan Lundblad	Microcomp	2002-01-18
Paul Padoan	MicroTel Technology	2002-01-11
Claes	Midex IT Konsult	2002-01-15
Sven Erik Löfgren	Midroc Electro	2002-01-23
Anna-Lena Hamnestrand	Modulföretagen	2002-01-16
Bo Brask	Navigera	2002-01-22
Niko Letho	Ntier Solutions	2002-01-17
Daniel Benitaz	O3 Games	2001-12-19
Peter Ohlén	Omicron	2002-01-23
Kennet Hjelm	Pactum	2002-01-23
Kristina Andersson	Phosworks Interactive	2002-01-08
Peter Sigendröi	Pocit Labs	2002-01-10
Tomas Lundin	Prevas	2002-01-14
Tomas Lundgren	Pricer	2002-01-11
Linus Fred	Profdoc	2002-01-10
Mats Ottosson	QD Systems	2002-01-16
Anna Karlsson	Racomna Research	2002-01-14
Staffan Marklund	RSA Security	2002-01-22
Håkan Waltersson	Saab Tech Systems	2002-01-14
Kristoffer Sallén	Sallén Network	2002-01-23

Mats RG Andersson	Semcon	2002-01-16
Martin Zetterlund	Sentor	2002-01-10
Lotti Brantström	SpaceCoin	2001-12-19
Svante Brinkhagen	Strålfors Svenska	2001-12-19
Mikael Hannberg	Styrex	2002-01-15
Ingrid Sellenius	Syncom Financial	2001-12-20
Sören Richardson	SYSteam Udac	2002-01-10
Stefan Lagerholm	Technology Nexus	2002-01-10
Anders Jakobsson	Teleca System Design	2002-01-14
Mikael Wedin	Telelogic	2002-01-14
Göran Olsson	Telia Promotor	2002-01-10
Birgitta Larsson	TietoEnator	2002-01-09
Roger Björnstedt	Trade Extensions	2001-12-19
Lena Lexén	Ultrotech	2002-01-23
Marie Louis Lindberg	Upright Database Tech	2002-01-16
Marcus Boberg	Utfors Bredband	2002-01-16
Joel Sunnehall	Valtech	2002-01-10
Lars Dahlquist	Vattenfall Connection	2002-01-15
Tommy Gustafsson	Webgruppen	2002-01-15
Anna Persson	WM Data	2002-01-09
Jonas Larsson	Ångpanneföreningen	2002-01-14

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Home pages

Name	Company/Organization
ADB Arkitektur	www.adbark.se
Agriprim	www.agriprim.com
Altcom	www.altcom.se
Amersham Biosciences	www.apbiotech.com/sweden/
Arctic Fibercomponent	www.arcticfiber.se
Arete Libro	www.libro.se
B&M Systemutveckling	www.bmsystem.se
Bahnhof Internet	www.bahnhof.se
Biacore	www.biacore.se
Bravida	www.bravida.se
Cap Gemini Ernst & Young	www.capgemini.se
CC-Systems	www.cc-systems.se
Cell Network	www.cellnetwork.se
Centrinity	www.centrinity.se
Citerus	www.citerus.se
CND Gruppen	www.cndgruppen.se
Communicatorgruppen	www.communicator.se
CompetensKraft	www.systemkraft.se
Conagri	www.conagri.se
Consafe Infotech	www.consafeinfotech.com
Consoden	www.consoden.se

Cyber Com	www.cybercom.se
Cycore	www.cycore.com
Data Ductus	www.dataductus.se
Delphi Economics	www.delphi.se
Diktafon & Teleservice	www.ditt.se
Dimea	www.dimea.se
Dotcom Solutions	www.dotcom.com
Drop&Search Systems	www.drop.se
Enatech	www-enatech.se
Enea Redina	www.redina.se
Envilogg Datateknik	www.envilogg.se
Erda Technology	www.erda.se
EUD	www.eud.se
Europoint Networking	www.europoint.se
Exor	www.exor.se
Frobozz	www.frobozz.se
G2 Solutions	www.g2solutions.se
Gnistra	www.gnistra.se
Gyros	www.gyros.se
Hectronic	www.hectronic.se
IAR Systems	www.iar.com
Ibas laboratories	www.ibas.se
Icepeak	www.icepeak.se
IFS	www.ifs.se
Imenta Sweden	www.imenta.com
IMS Data	www.ims.se
Independent Database Technology	www.independent.se
Informus	www.informus.se
Intologic	www.intologic.com
IP-Only	www.ip-only.net
IR-Vision	www.ir-vision.com
IT-arkitekterna	www.it-arkitekterna.se

ITSIP	www.itsip.se
Jaybis	www.jaybis.com
Knutpunkten	www.knutpunkten.se
Landsteinar Svenska	www.landsteinar.se
Lean On	www.leanon.se
Lidén Data Gruppen	www.lidendata.com
Mad Sci	www.madscilab.com
MDS Nordion	www.mds.nordion.com
MicroTel Technology	www.microtel.com
Midex IT Konsult	www.midex.se
Midroc Electro	www.midroc.se
Modulföretagen	www.modulforetagen.se
Navigera	www.navigera.com
Nocom	www.nocom.se
Ntier Solutions	www.ntier.se
O3 Games	www.o3games.com
Omicron	www.omicron.se
Pactum	www.pactum.se
Personal Chemistry	www.personalchemistry.se
Phosworks Interactive	www.phosworks.se
Pocit Labs	www.pocit.com
Prevas	www.prevas.se
Pricer	www.pricer.se
Profdoc	www.profdoc.se
Pyrosequencing	www.pyrosequencing.se
QD Systems	www.qd.se
Racomna	www.racomna.se
RSA Security	www.rsasecurity.com
Saab Tech Systems	www.saab.se/saabtechsystems
Sallén Network	www.sallen.se
Semcon	www.semcon.se
Sentor	www.sentor.se

Sightline	www.sightline.se
SpaceCoin	www.spacecoin.se
Strålfors Svenska	www.stralfors.se
Styrex	www.styrex.se
Syncom Financial	www.syncom.se
SYSteam Udac	www.udac.se
Technology Nexus	www.nexus.se
Teleca System Design	www.teleca.se
Telelogic	www.telelogic.se
Telia Promotor	www.promotor.telia.se
TietoEnator	www.tietoenator.se
Trade Extensions	www.tradeextensions.se
Ultrotech	www.ultrotech.se
Upright Database Tech	www.mimer.se
UPSYS	www.upsys.se
Utfors Bredband	www.utfors.se
Valtech	www.valtech.se
Vattenfall Connection	www.vattenfallconnection.se
Webgruppen	www.webgruppen.se
WM Data	www.wmdata.se
Åmic	www.amic.se
Ångpanneföreningen	www.af.se

Other home pages:

The home pages of the municipalities

The Swedish University of Agricultural Sciences (www.slu.se)

Uppsala University (www.uu.se)

Appendix B. Professors within the IT field at Uppsala University

This list contains the names of the professors within the IT-related fields at Uppsala University. (Source: Ewert Bengtsson, Uppsala University)

Department of Information Technology

Computing science

- Arne Andersson
- Faron Moller
- Alexander Shen (gäst)
- Sten-Åke Tärnlund

Computer systems

- Parosh Abdulla
- Per Gunningberg
- Erik Hagersten
- Joachim Parrow
- Yi Wang
- Hans Hansson (gäst)

Human-computer Interaction

- Bengt Sandblad

Systems and control

- Bengt Carlsson
- Håkan Lanshammar
- Alexander Medvedev
- Petre Stoica
- Torsten Söderström
- Torbjörn Wigren (adj. prof.)

Scientific computing

- Bengt Fornberg (gäst)
- Bertil Gustafsson
- Per Lötstedt
- Michael Thuné

Image analysis

- Ewert Bengtsson

Department of Materials Science

Signals and systems

- Anders Ahlén
- Anders Rydberg
- Mikael Sternad

Department of Information Science

Computer and systems sciences

- Andreas Hamfelt
- Åke Hansson
- Larry Lucardie (adj. prof.)
- Tore Risch

Media and communication

- Lowe Hedman

Human-computer interaction

- Werner Schneider

Department of Linguistics

- Anna Sågvall-Hein

Appendix C. Tree without companies

