

The Computerworld Smithsonian Awards  
125 Summer Street, Suite 1210  
Boston, Massachusetts  
USA

Subject: Nomination material, ser. no. 98341 The Swedish School Computer Network

Sirs,

It was a great honour for us to learn from Mr. Kent Åberg, Industry Sales Development Manager, Education and Research, at Sun Microsystems in Sweden, that the National Agency for Education's project "The Swedish School Computer Network" had been suggested by Mr. Scott McNealy, CEO of Sun Microsystems, to the Computerworld Smithsonian Awards Chairmen's Committee as an innovative use of information technology.

Through Mr. Åberg we have received the various forms and questionnaires connected to the nomination. We are happy to provide the Smithsonian Institution with the requested information about the Swedish School Computer Network.

We would here also like to comment on the relationship between the National Agency for Education and the Swedish Ministry of Education and Science.

The Swedish School Computer Network is a project run by the National Agency for Education on commission of the Swedish Ministry for Education and Science. The agency is a government body responsible for the Swedish preschools, K-12 schools and parts of the non-academic higher education. The Agency acts through active follow-up, evaluation, development, research and supervisory programmes.

Thus, the formal and political decision to create a School Computer Network was taken by the Ministry but the work to achieve the goals and aims of the project was carried out by the Agency.

Mr. Åberg, who has followed the project from its start, has, from an industrial perspective, provided us with valuable comments on the case study giving it increased width and depth.

Once again, we are honoured by the nomination and the interest thereby shown for the work carried out with the Swedish School Computer Network.

Sincerely yours

Johan Groth  
Ph.D., Senior Advisor

Benny Regnér  
Senior Advisor, Project Leader

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Johan Groth, Ph. D., Senior Advisor  
E-mail: [johan.groth@skolverket.se](mailto:johan.groth@skolverket.se)

Benny Regnér, Senior Advisor, Project Leader  
E-mail: [benny.regner@skolverket.se](mailto:benny.regner@skolverket.se)

National Agency for Education  
106 20 Stockholm  
SWEDEN

Phone: +46-8-723 32 00  
Fax: +46-8-24 44 20  
WWW: [www.skolverket.se/skolnet](http://www.skolverket.se/skolnet)

## Case study

### General Information

Serial number: 98341

Organization name: National Agency for Education

Project name: The Swedish School Computer Network

Category: Education & Academia

Organization address: National Agency for Education, S-106 20 Stockholm, SWEDEN

Visiting address: Kungsgatan 53, Stockholm, SWEDEN

Telephone number: +46 - (0)8 - 723 32 00

Fax number: +46 - (0)8 - 24 44 20

Organization's web address: <http://www.skolverket.se>

Project's web address: <http://www.skolverket.se/skolnet>

Person to contact: Johan Groth

Title: Ph.D., Senior Advisor

Address: National Agency for Education, S-106 20 Stockholm, SWEDEN

Telephone number: +46 - (0)8 - 723 33 96

Facsimile: +46 - (0)8 - 24 44 20

Electronic mail address: [johan.groth@skolverket.se](mailto:johan.groth@skolverket.se)

Public relations contact: Benny Regnér

Title: Senior Advisor, Project leader

Address: National Agency for Education, S-106 20 Stockholm, SWEDEN

Telephone number: +46 - (0)8 - 723 32 72

Facsimile: +46 - (0)8 - 24 44 20

Electronic mail address: [benny.regner@skolverket.se](mailto:benny.regner@skolverket.se)

### Short summary

Organization: The National Agency for Education

Project: The Swedish School Computer Network

Short summary: A national effort encouraging Swedish K12-schools to draw advantage of IT as a pedagogical tool. Activities, projects and information efforts on and off Internet create new network content that attracts new users among pupils, teachers, school leaders and parents.

### Long summary

Organization: The National Agency for Education

Project: The Swedish School Computer Network

Long summary: The Swedish School Computer Network is a national effort to encourage Swedish K12-schools to draw advantage of IT, and especially Internet, as a pedagogical tool. The project is run by the National Agency for Education on commission by the Ministry of Education and Science.

If one, quite arbitrarily, wants to specify a certain date when Internet was introduced in the Swedish educational system (except the universities who were connected much earlier) March 8, 1994 is a good choice. This day witnessed a meeting of the Nordic council in Stockholm. During the meeting the ministers of the Nordic countries, among them then Prime Minister Carl Bildt and Minister of Education Beatrice Ask, could use e-mail to communicate with a few schools in each of the Nordic countries. They could also view half a dozen web pages written by people at The Swedish University Network (SUNET) describing the Nordic countries and their educational systems. The pages included a couple of links to some of the few available Nordic web sites.

This was a first prototype of the Nordic School Net (ODIN), a joint project of the members of the Nordic Council (i.e. Denmark, Finland, Iceland, Norway, Sweden and the self-governing regions Greenland, the Åland Islands and the Faroe Islands). The countries had for a number of years collaborated in a number of data and telecommunication projects and in November 1993 had decided to further develop the ways of communicating and exchanging information between the Nordic schools.

The preparations and political decision-making process in connection with ODIN were nothing short of pioneering work. Both then and now, the fact that five countries were able to reach political agreement on a common infrastructure is quite unique. Technically speaking, the choice of the Internet and the World Wide Web (WWW), was also controversial. Since then, as we know, this technical solution has been chosen by various organisations on a national and international level.

In 1993 only a handful of schools in the Nordic countries (with the exception of Iceland where many schools were already connected) had access to the Internet and there were few, or no, Internet service providers (ISP) who directed their business towards other areas than academia or large companies.

After the meeting of the Nordic Council the Swedish government had to address the fact that there were very few teachers, school leaders and decision makers who knew what Internet was and how it could be used in an educational situation.

However, there was experience and knowledge available to draw upon. First, SUNET who for many years had been the Internet provider for the Swedish universities. Second, Tele 2, a private telecommunications company who provided Sweden's first commercial IP-service. Third, a handful of teachers who had worked with Internet or other computer based communication and information systems.

One of these was one of the authors of this summary (Benny Regnér) who had been sending e-mail to USA via a simple BBS-system since about 1985. In 1990 the AT&T Learning Circle project included some Swedish schools which improved communication. Shortly thereafter Mr. Regnér was introduced to Internet by an American colleague in Santa Clara, California. Here, for the first time was a communications system that was simple, flexible, reliable and truly global. The experience gained was presented in a report to the National Agency for Education as a general solution to how computers could be used in international exchange programs for Swedish schools.

During late winter and early spring of 1994 Mr. Peter Karlberg and the other author of this summary (Johan Groth), both at that time Senior Administrative Officers at the Ministry of Education and Science, prepared a document describing how the schools should be introduced to the Internet. Two questions had to be addressed: who should do the work and how should it be done? Should the government commission SUNET to connect all schools? Should the government make a bid for computers for all schools? Should the whole process be left to the market forces?

In the end an "immaterial" or "content driven" approach was selected. This approach is characterized by no direct government involvement except when it comes to spreading information, enhancing awareness, stimulating new cooperations, presenting good examples and encouraging development and new ideas. The main role of the government is to increase the amount of, for schools, useful content on the Internet and thereby, indirectly, stimulate the use of new tools and media.

The reason for choosing the "content driven" approach lies in the experiences of earlier national efforts to introduce computer technology in Swedish schools. In the eighties a massive effort was made through subsidizing schools who bought "government approved" computers. The cost was high, around \$ 150 million, and the longterm effects negligible. The main reason for this was that the new hardware and software was not complemented with changes in pedagogical practices, administrative routines and organizational structures.

A commission was written according to these principles and given to the National Agency for Education.

A short word on the division of responsibility between the Ministry, the Agency, the local authorities and the schools might be of interest here. The ministries in Sweden are quite small (typically 100 persons or less) and have very few operative functions. These functions lie with agencies which are governmental bodies. The staff of the agencies are non-political civil servants with experience and competence to act in an operative way.

The National Agency for Education is responsible for the Swedish preschools, K-12 schools and parts of the non-academic higher education. The agency acts through active follow-up, evaluation, development, research and supervisory programmes. The responsibility for the day to day work in the schools lies with the headmaster of the school, while the funding of the schools is a matter for the local school boards. There is one school board in each municipality of which there are about 288. About 2 or 3 percent of the pupils go to private schools. These have their own school boards but receive their funding from the local authorities. The schools, both for private and public, are free to organize the work in any way they want, as long as the pupils reach the goals set up in the school law and the national curriculum.

When the Agency received the commission a project was set up, the Swedish School Computer Network (SSCN, <[www.skolverket.se/skolnet](http://www.skolverket.se/skolnet)>). The term network should here, in accordance with the "immaterial" approach, not be interpreted as a physical network connecting schools, organizations, national agencies etc. It should be understood as a base for systematic cooperation between teachers, students, administrators, teacher trainers, researchers and educational institutions, primarily in, but also outside, Sweden. The project's web site soon became a focus point and an easily available visualization of how the Internet can be used.

The appointed project leader of SSCN, Mr. Göran Isberg, assembled a group of persons representing various backgrounds within the educational field, among them Mr. Anders

Gillner from SUNET, Ms. Ann-Sofie Lönnqvist from the National Agency of Education Mr. Benny Regnér from Fredrika Bremer School and Dr. Johan Groth from the Ministry of Education.

In line with the content driven approach a number of, for schools, useful services were set up on the Internet. These included a database of Swedish schools with e-mail or web addresses, dedicated newsgroups under the group swnet, a list of carefully selected and annotated links, and a list of examples of good practices. These services were all available from the web site and have, since then been continuously updated.

The next step was to find a method to gain more knowledge about how the Internet could be used in schools. To this end 40 "pilot schools" were selected. This was done through an open process where schools were encouraged to take part. The interest was overwhelming and in the end a selection had to be made. The schools represented all different stages from grade 1 to 12, were situated from Kiruna in the north to Helsingborg in the south, and had varying degrees of knowledge of the Internet. Enthusiasm and a will to be part of the development work was what counted.

Contact was also made with the four, at that time, major Internet service providers (Tele2, France Teleom/Global One, Telia and Dialog). They were offered an opportunity to be part of the work which would offer a good opportunity to learn more about the schools and what type of services they needed. In return each company promised to provide about 10 schools with an Internet connection for a period of about 1,5 years. The schools were connected in various ways, from simple modem dial-up to 64 kB lines. Software and hardware companies like Sun Microsystems, ICL (now Fujitsu) and Microsoft also took part in the project on similar premises.

The pilot schools were to use Internet in 10 pedagogical projects of which the first was to make a home page on the Web for the school. The other projects all involved other partners, e.g. an author of children's books, the Historic Museum and the Swedish Military and Civil Defence. An interesting aspect of these projects were that the schools in a quite natural way collaborated with expertise outside the school house.

To ensure a continuous and strong exchange of experiences and knowledge the pilot schools and the industrial partners were gathered to meetings once per semester. The meetings contained both presentation of new services and techniques and work shops where the schools could discuss their problems and find appropriate solutions. This "coaching" of the pilot schools proved to be an effective way of helping them to start using the Internet.

Apart from the work with the pilot schools the project prepared general information material about Internet and the project that was distributed to all schools. The project members also spent many days traveling through Sweden talking to teachers, school leaders and decision makers. This part of the Agency's work, being "missionaries" and doing a lot of down to earth foot work, was very important in order to distribute knowledge and information on national, and yet personal, level.

A last, but not least important task, was to create more content on the Internet suitable for Swedish schools. This was done in two ways: contact was made with various "content providers" and new content was created directly by the project group.

The content providers were found among organizations, government bodies, companies etc. In some cases (like newspaper archives) the providers possessed plenty of "contents" but were unaware of what the schools needed or wanted and/or of the development of Internet. In

many of these cases a meeting and a demonstration started a process that led to that more material was made available on the Internet. In other cases the content provider was involved in a collaborative project where schools were encouraged to take part. An example of this was the work with the Historic Museum in Stockholm who, together with the pilot schools, made a web based multimedia teaching material based on the physical exhibition The Swedish History.

In yet other cases content had to be "created". Two rather simple, but highly popular, examples are the two Internet based courses developed by the Agency together with Mr. Mikael Eriksson, Linköping University, and Mr. Pär Lannerö, student at the Royal Institute of Technology. Mr. Eriksson created a web based course on how to write HTML. This course was used by many schools as an introduction on how to present information on the Internet.

Even more popular was the web course "Ett smultronställe för Internetblåbär" (smultronställe = place where wild strawberries grow, i.e. a very pleasant place, blåbär = blueberry, i.e. a person with limited knowledge about a subject). This course was developed by Mr. Lannerö as an introduction to Internet for those who had no previous experience or knowledge. The course was an immediate success and was used extensively, not only by teachers. The course has received a number of "Best site awards" in Sweden.

During the fall of 1997 Mr. Lannerö adopted one of Sun Microsystems Java courses to the needs of those working in the Swedish schools. The course, "Java for Curious", was presented as one of many activities during Netd@ys Sweden 1997.

A fourth service, actually the most popular service, was the digital dictionary. The Agency owns the copyright to several dictionaries. The content of the English-Swedish one was entered into a database and given a web interface. This very simple application was a very useful example on how old functions could be done in a new way.

Two more extensive examples is Musiknet and IKON. Here the goal was to create two completely new pedagogical resources, one concerning Internet in connection with music and one Internet in connection with art. Musiknet is a collaboration between the Agency, the Royal University College of Music, Tele2, Sun Microsystems and Fujitsu. Musiknet is a separate foundation focusing on teacher training, distance education, new techniques for media transmission etc. Three important activities within Musiknet are Klavinet, Ljudo and IMP. Klavinet offers piano lessons over the Internet using MIDI-files. This means that anyone who has a MIDI synthesizer and an Internet connection can communicate with and learn from an last year student at the Royal University College of Music. Ljudo is a free database of sounds collected by professionals and pupils. This will be a very useful resource for those teachers that are beginning to make their own multimedia teaching materials. In IMP high school pupils not only make their own media productions but also build their own virtual media production companies in collaboration with experts in the field.

IKON is a collaboration between the Agency, The Museum of Modern Arts in Stockholm, The University College of Arts, Crafts and Design, The Royal University College of Fine Arts and the ArtNode Foundation. Both projects create new contents, initiate new projects, and collaborate with schools in different activities. They have their own funding etc. but remain in close contact with the Agency and the SSCN.

In parallell with the work carried out by the Agency schools, organizations, companies and many other started using the Internet. Thus, many processes were in action at the same time inspiring each other. The development of useful tools and services on the Internet, for

schools, was thus a decentralized process with, in many cases, a very clear bottom-up approach.

Today the SSCN is an integrated part of the Agency's work with school development. It is run by the IT-unit at the Agency which is headed by Mr. Lage Åström. Today the project leader is Mrs. Christina Szekely. The SSCN comprises several different activities all aiming at increasing the knowledge about and interest for information technology as a pedagogical tool. The SSCN has a, not only within the school system, well known and popular site. The project members give lectures and courses, provide inspiration and serve as initial project coordinators in various projects. The SSCN continuously spreads information about the use of IT in schools through the magazine Klassrum direkt.

The results have been quite remarkable. Today around 1400 of Swedens approximately 6000 schools have their own webservices. Preliminary statistics (full report in the spring of 1998) shows that nearly all secondary schools are connected as well as a majority of the primary schools. Since only a handful of schools were connected in 1995 this is indeed promising. Even though many factors serve to explain this development it is our belief that a national "content driven" initiative is the best way of inspiring schools to begin drawing advantage of the Internet as a pedagogical tool.

The Swedish School Computer Network will continue to develop, keeping the Swedish schools informed about the development of the Internet and its use in a school context.

The work with Swedish School Computer Network has also taken a European dimension in that Sweden has proposed the construction of a European Schoolnet (<[www.eun.org](http://www.eun.org)>) modeled on the SSCN. The Schoolnet will involve all EU-members plus Iceland and Norway. During its initial phase (ending around summer 1998) the project is headed by Sweden. Chairman of the Steering Committee is Mr. Ulf W. Lundin and the project office consists of Mr. Stellan Ranebo, who in the early 1990's worked at the Nordic Council and had an important role in the planning of the Nordic School Net, Mr. Benny Regnér and Dr. Johan Groth. Hopefully the experience and knowledge gathered in the Nordic and Swedish projects can contribute in making Internet a common tool in European schools.

## Questions

### Benefits

Q: Has your project helped those it was designed to help? In your opinion, how has it affected them? What new advantage or opportunity does your project provide to people?

Has your project fundamentally changed how tasks are performed? In your opinion, have you developed a technology that may lead to new ways of communicating or processing information? How might that change unfold?

A: The goal of the Swedish School Computer Network is to illustrate the possible advantages of using Internet for communication and information processing. Through the project Swedish schools will be able to learn more about and evaluate the possible benefits of using Internet. From this point of view the project has indeed helped those it was designed to help.

In 1994 very few people outside the universities knew anything about Internet. The SSCN not only increased the knowledge among persons within the educational system but also, as one of the first and at that time largest Internet projects in the country, served as a source of knowledge about Internet for companies, organizations, libraries, museums, newspapers, etc.

The introduction of Internet into the school system, and the example of the Swedish School Computer Network, have in many ways affected the schools. It is clear from many visits and discussions that the computer has, at last, become a natural tool in the schools. The reason for this is that Internet brought advantages that appealed to new groups of teachers, e.g. language and social science teachers. Before Internet it was rather difficult to see any real use for computers (other than perhaps as a word processor) in, say, history. Also, Internet and the SSCN have in many cases served as a catalyst for other changes that, in principal, might very well have taken place even without computers. Many schools today work with projects, with problem based learning, with individual study plans etc. All these changes were possible before but did not gain momentum until Internet was introduced. Why is hard to say, but it appears that the very "material" changes connected to the introduction of Internet (new hardware, changes in how rooms are used etc) inspired to "immaterial" changes. In a time of change all changes got a chance.

For schools in Sweden it is today possible to use many new information sources. Some of these were not available at all earlier (e.g. sound archives), some have been made cheaper and easier to use (e.g. newspaper archives) and some have become easier to access (e.g. library catalogues and public reports from various governmental and non-governmental bodies). The access to all these sources gives enormous possibilities and is an opportunity for pupils and teachers alike.

The SSCN has been a fore-runner in pointing to new ways of carrying out different tasks. Some of the first web interfaces to large databases were developed within the project. This completely changed the way of interacting, no longer was there need for courses in complex search languages, now a sought after news paper article was only a couple of clicks away. Very early the SSCN started distributing information via Internet. Today administrators, teachers and pupils in a majority of the schools can be reached by e-mail etc. In a technical sense this may not be revolutionizing or impressive but through the example of the SSCN the schools saw that it could be done and that there were gains to be made.

Another example is the project The Writers Den where 600 pupils in grades 4-6 under the guidance of an author wrote a book together. The author had for many years been working with school children. By using the Internet he could interact with more pupils over a longer period of time. This made it possible to work with more advanced projects making it more interesting for the pupils. Today there are more than 20 authors who have adopted this way of working with children.

It may be argued that we have not fundamentally changed how tasks are performed, the changes described would have come anyway, perhaps later, but still. This might be true but we believe that the fact that a governmental agency started using Internet and showed that it works had an instrumental influence on when and how Internet was introduced into the schools. Internet is today a widely available tool used for many different tasks by all groups (pupils, teachers, administrators etc.) in the schools. It could have become a tool reserved for certain groups (e.g. high school teachers) and/or certain tasks (e.g. transferring data between the schools and the local authorities) but it did not. Here the SSCN has its main importance.

The SSCN has not developed any new technologies. It has created new services, applications and resources on the Internet. Many of these have been developed in close collaboration with content providers of various kinds. A close collaboration with companies within software, hardware and telecommunication have also been important. The fact that the National Agency for Education have had a leading role has ensured that the new resources have been suitable

for the educational system. In this sense the project have influenced the development of new technologies and new services.

We believe that we will see even more profound changes of the educational system. With all the world's information in your home computer, with the possibility to attend courses with the world's best teachers from your living room, why should anyone go to school (i.e. to the physical house) at all? In a situation where every pupil can interact with the world's foremost experts in every field of knowledge what is the role of the teachers? The school as we know it today may very well have disappeared within a decade or two.

Two projects connected to SSCN that point in this direction is a joint project between the Royal Institute of Technology (KTH) and Fredrika Bremer School. The school is situated in a municipality where rather few persons have a university degree. To show the pupils that there is nothing strange with studying at a university they are offered a course in environmental sciences at KTH. The students all have their own portable computers, attend classes at KTH and at Fredrika Bremer, use Internet for information retrieval, dedicated discussion groups etc. The interest for this new type of course has been large.

The second project concerns Rågsved, a part of Stockholm where many immigrants live. The project proposes to connect the schools with the homes of the pupils. An important role is played by those teachers who work with the children in their native tongue and who now will have a new way of communicating with the families. Perhaps it will also be possible to break the isolation into which many immigrants may fall, not least due to the language problem.

### **The importance of information technology**

Q: How did information technology contribute to this project? Describe any new technologies used and/or cite innovative uses of existing technology. For example, did you find new ways to use existing technology to create new benefits for society? Or, did you define a problem and develop new technology to solve it?

How quickly has your targeted audience of users embraced your innovation? Or, how rapidly do you predict they will? Does your work define new challenges for society? If so, please describe what you believe they may be.

A: Information technology is at the core of the Swedish School Computer Network project. The project is all about how Swedish schools may benefit from using IT and especially Internet. In keeping with our goal to be an inspiration and at the same time gather experiences and knowledge that could then be disseminated to the schools we have tried to be at the front line of new technologies. From start in 1994 we have used web, ftp, news, mail and mailing lists. As new technologies were developed they were used and tested in the project (e.g. streaming audio and CU-SeeMe). The use of interactive video has been very useful and popular in the lower grades where the writing skills are not yet fully developed. During the fall of 1997 the interest in the Java programming language has increased.

The use of Internet as a pedagogical tool has soared in the last years. In 1994 almost no one even knew what Internet was, in 1998 nearly all secondary schools and a majority of the primary schools have Internet access. Around 1400 of Sweden's approximately 6000 schools have their own homepage on the Web. The picture is one of rapid growth. This would not have happened in a time of cut backs in public spending, both on national and local level, had not pupils, teachers and school leaders embraced this new pedagogical tool. The pace has been surprising even for those involved. No signs show that the interest is diminishing.

An explanation for this could be as follows. To achieve its goals (i.e. to increase the knowledge of the pupils and improve their skills in various fields) a K12-school typically carries out activities that can be grouped into the following five categories: communication, presentation, information retrieval, use of tools and training. The Internet provides a powerful infrastructure for working within communication (e.g. e-mail and chat), presentation (e.g. web) and information retrieval (e.g. web and ftp). What the SSCN does is to add useful content to these categories.

The work of introducing Internet into the educational system will define new challenges for society. Some have been touched upon above and concern the role of teachers and schools. Other challenges are how teachers are to keep up with the rapid development of technology and new ways of communicating and processing information? How are the schools to solve the task of running large networks with many computers (the problems are both technological and economic)? How is society and the schools to cope with the questions that arise when information of literally all kinds are available to children? New thinking is required in regards to teacher education, how schools are built and used (is it reasonable to let the schools stand empty and unused except between 8 AM and 4 PM during 40 weeks per year?) etc.

### **Originality**

**Q:** What are the exceptional aspects of your project? Is it original? How? Is it the first, the only, the best or most effective application of its kind? How did your application evolve? What is its background?

**A:** The Swedish School Computer Network is a national initiative run by a government body and covering a whole country. The exceptional aspect of it is that it does not force the schools in any way or in any sense. It does not make recommendations or put up guide lines to be followed. It does not make national bids for computers, Internet access or anything else.

The project works by creating new services intended for schools on the Internet, it works by spreading information and showing examples. Thus it works by creating an interest among pupils, teachers, school leaders and decision makers. This interest in combination with the specific conditions, interests, priorities and wishes of a certain school then, in a local process, results in decisions about how to connect, what services to use etc. For each school a different solution adopted to the specific local needs will be found.

The method of producing examples instead of giving orders is well in line with the decentralized and goal oriented organization of the Swedish school system. In many other countries similar national initiatives have had a more top-down approach where e.g. the ministry buys computers for all schools. The risk with such a system is that the differences between the schools are not taken into account leading to less useful solutions at a local level.

If the Swedish way of introducing Internet in schools is the best or the most effective way is hard to say. What we can say is that in a short span of years many Swedish schools have connected to the Internet, in many cases with high band width. Many interesting and pedagogical projects have been carried out and many schools and teachers have with great creativity used IT to create better education.

However, we do think that the fact that the use of Internet in Swedish schools in most cases has originated in the needs, interests and knowledge of individual teachers or groups of teachers is important. This method of "organic growth" is in many ways in parallel with the structure of Internet itself.

## Success

Q: Has your application achieved or exceeded its goals? Is it fully operational? How many people benefit from it? If possible, include an example of how the project has benefited a specific individual, enterprise or organization. Please include personal quotes from individuals who have directly benefited from your work. Describe future plans for the project.

A: The Swedish School Computer Network of today consists of many activities on and off the Internet. It is fully operational and an important part not only of the introduction of Internet into schools but also as a forum for developing other aspects of the future school system. It is available to everyone with an Internet access.

The number of schools on the Internet (see above), the number of users of the project web site per day, the number of new services that have been made available and the many subprojects which have addressed various pedagogical questions indicate the success of the project.

As a simple indicator of success it can be noted that the SSCN web site has, in January 1998, about 35.000 "readings" per day which approximately equals the number of "readings" on the web sites of the major Swedish news papers.

An example of a successful subproject is The Learning Bridge. The main idea of the project is to let high school pupils communicate with and learn from children in the same age in other countries. Internet is a vital tool in this work. First the Swedish pupils try to find schools and pupils in the other country and then work together with them around different questions, e.g. youth unemployment, traditions, how families live and work etc. This in turn often means that contacts must be made with companies, organizations, governmental bodies etc. At the end of the year the Swedish group visits the other country and the schools and institutions with whom they have communicated and worked. Each year a group of about 60 pupils together with their teachers have travelled to USA. The round trip has lasted between two and three weeks. The project has been an important example within the Swedish School Computer Network of how Internet can be used.

Two pupils who attended the course at Fredrika Bremer school south of Stockholm in the fall of 1994 and the spring of 1995, Anna Mattson and Linda Schmidt chose HIV/Aids as their field of work. The goal was to examine, compare and analyze the attitudes toward HIV/Aids in USA and Sweden.

"The big difference between the information found on the Internet and in the library was that on the Internet the information was more up to date. We found maps showing the spreading of HIV/Aids on the Internet. They were of great help in our work", says Linda Schmidt.

Anna Mattson comments: "There is a big difference between being given 30 pages about Aids and being told to read them till tomorrow and the way we work with Internet. I learn more using the Internet since I don't only have to read the information but also find and evaluate it. It is important to be able to take initiatives and think for yourself, but this only makes you more interested."

In the project The Writers Den Lasse Ekholm, a well-known author of childrens books, uses Internet and the Swedish School Computer Network to work with writing and reading in a new way. Pupils and their teachers interact with Lasse Ekholm via web and e-mail, fetching exercise and drawing from his experience. The children then write their own essays which are discussed over the Internet and presented on the web. The main advantages with this way of working is that the schools can work with an expert for a longer period of time and still keep costs down. Also, a problem in school is to have a subject all day for several days which is

somewhat of a necessity if the expert has travelled to the school. With the Internet an initial meeting to discuss the framework of the project can be followed by a longer period of "low impact" interaction which gives the pupils more time to think, reflect and in their own tempo work with the project.

Pernilla Larsson, teacher at Apalby school, says: "The important thing is not the computer in itself but the fact that the pupils can have direct contact with an author who helps them."

Lasse Ekholm says: "For many years I have travelled around Sweden giving courses in reading and writing in different schools. My method has four steps. The children start by describing a person, then a place and, third, an event. Fourth, they have a person in a place where something happens, i.e. a short story. The Writers Den is organized in the same way. I see two main advantages with working via Internet. One is that when we put the pupils writings on the web they really feel that the text is available for a broad audience. Having a real audience (not only your parents and teacher) is very stimulating. The other is that travels can be minimized which saves time and money, for me and the schools. The resources can be focused on writing and the learning process. However, it is important to remember that meetings face to face can never be totally excluded. They give all participants a personal relationship to each other and the project"

In the future it is important for the Swedish School Computer Network to keep up the work of being an example, a place where schools can find information about how to use IT. With the development of the European School Net (a member state initiative within the EU that builds heavily on Swedish and Nordic experiences) it will be natural to increase the number of activities and projects that have an international profile. This will mean new opportunities, not least for teachers within the fields of language and social sciences.

Another indication of the project's success is the visits of prominent persons. The foremost of these is when Their Majestys King Carl XVI Gustaf and Queen Silvia visited Haninge municipality south of Stockholm in 1995. There was an explicit wish to visit Fredrika Bremer School, one of the pilot schools in the project, to learn more about how they had integrated Internet in the classroom work. The demonstration was done by Mr. Benny Regnér, part time teacher at the school, and Dr. Johan Groth.

Other visits include Mme. Edith Cresson, Commissioner of the European Union and responsible for among other things the use of IT in schools. Microsoft's founder Bill Gates also included a visit at the National Agency for Education when he visited Sweden in 1996. Mr. Gates paid special attention to the work being done within the subproject Musiknet about how to use the Internet for education in media and music.

A reason for the obvious success of the project is, as we see it, that we never let technological limitations limit the vision on how the Internet could be used as a pedagogical tool. It has also proved to be true that what one wants to do today is technologically realizable tomorrow, or even this afternoon.

Another reason is that the project conscientiously worked by creating meetings where different persons and organizations met and new knowledge and ideas were produced. Examples are IKON and Musiknet mentioned above.

### **Difficulty**

Q: What were the most important obstacles that had to be overcome in order for your work to be successful? Technical problems? Resources? Expertise? Organizational problems?

Often the most innovative projects encounter the greatest resistance when they are originally proposed. If you had to fight for funding, it would be useful to include a summary of the objections you faced and how you overcame them.

A: The obstacles facing the Swedish School Computer Network project at the outset were of three different types. The first were real, and often technical, problems. For example, there were very few Internet providers in Sweden in the summer of 1994, no web hotels, and only a limited number of companies who knew how to connect LAN:s to Internet, put up servers, routers etc. In many schools the computers were placed in an impractical way in special computer rooms instead of being a natural tool in each classroom or they were altogether missing. All these problems were always solved faster and simpler than we could have imagined. This is an interesting and, we believe, general experience from working with Internet.

The second type was related to the experience and knowledge among teachers, school leaders, local politicians etc. How do you present a new, hopefully useful, pedagogical tool to a group of teachers who don't understand the words you are using ("the web is a global distributed source of knowledge"), how do you get school leaders to reallocate resources within the school for something that is completely new but said to be of great importance in developing the school and, last, how do you get local politicians to allocate the necessary money for huge investments in networks, computers, software, teacher training etc. when budget cuts are the word of the day?

The third type had to do with visions. Many were those who for example said "I know about Internet and I see its potential for school use, but it won't work. The access is too expensive and the band width will never suffice when all schools start using Internet". All such pessimism has, so far, turned out to be unnecessary. Hardware and software have become more user friendly and cheaper. The band width has always increased with the demand. Even our prediction, first expressed at a meeting with the board of one of Sweden's major hardware companies, that hardware will cost nothing in the future appears to be coming true.

The answers turned out to be content, content and content. The most effective way of creating interest in a specific group was to show that there were gains to be made for that group. Teachers wanted various information resources and curriculum material, school leaders ways of simplifying communication both within the school and outside etc.

An important factor in the success of the project was the fact that the government had given a national agency a commission. This gave the project a sort of formal credibility which was very useful in our contacts with commercial partners, museums, universities, local politicians, school leaders and teachers. Even if you are very sceptic it is hard to completely neglect someone on a government mission. Of course this formal background had to be complemented with real knowledge and competence.

## References

### Reference 1

Name: Stig Hagström

Title: Professor, Chancellor of the Swedish Universities, Chairman of the Board National Agency for Higher Education

Company: National Agency for Higher Education

Address: Birger Jarlgatan 43, Box 7851, S-103 99 Stockholm, SWEDEN

Telephone: +46 - (0)8 - 453 70 60

Facsimile: +46 - (0)8 - 453 70 45

E-mail: stig.hagstrom@hsv.se

## **Reference 2**

Name: Carl Bildt

Title: Member of the Swedish Parliament, Party Leader, Former Prime Minister

Company: The Swedish Parliament

Address: Riksdagen, S-100 12 Stockholm, SWEDEN

Telephone: +46 - (0)8 - 786 53 90

Facsimile: -

E-mail: carl.bildt@riksdagen.se

## **On-line resources**

Below follows a list of on-line resources that are related to or in other ways illustrate the work with the Swedish School Computer Network.

\* The Swedish School Computer Network, <http://www.skolverket.se/skolnet> (the project itself)

\* IKON, Interactive Art in School, <http://www.ikonart.org> (a project about art and how Internet can be used in art education that has grown out of the Swedish School Computer Network project)

\* Musiknet, <http://www.musiknet.se> (a collection of projects concerning about music, multimedia, pedagogy and Internet that has grown out of the Swedish School Computer Network)

\* National Agency for Education, <http://www.skolverket.se> (general information about the Swedish school system. The Agency is responsible for the Swedish School Computer Network)

\* ODIN, The Nordic School Net, <http://www.odin.dk> (a similar project on Nordic level)

\* EUN, The European School Net, <http://www.eun.org> (a European project that to a large extent is based on experiences from the work with the Swedish School Computer Network)

\* The Foundation for Knowledge and Competence, <http://www.kks.se> (a semi-government foundation that funds information technology projects within the Swedish educational system)

\* SUNET, Swedish University Network, <http://www.sunet.se> (general information about the development of Internet in Sweden)

\* ISOC-SE, the Swedish Chapter of the Internet Society, <http://www.isoc-se.com> (general information about Internet in Sweden)

## **Description of included digital images**

\* bridge.gif

A picture of two students and their teacher, Mr. D. Svoboda, in the computer room at Fredrika Bremer School. Mr. Svoboda is responsible for the project The Learning Bridge. Spring 1995.

\* girls.gif

Two girls in grade 4 working working with art on the computer. The work is part of an virtual art exhibition. Spring 1995.

\* homeeng.gif

The homepage of the Swedish School Computer Network, English version. January 1998.

\* homeswe.gif

The homepage of the Swedish School Computer Network, Swedish version. January 1998.

\* writers.gif

A group of pupils working with the project The Writers Den and the projectleader author Lasse Ekholm. Spring 1995.

## Time Capsule Questions

Please address any issues and/or problems that you have been unable to resolve after your project was introduced to your targeted audience or to the general public.

Q: Is our society prepared for this application?

A: When the project was started in 1994 there were nearly no schools in Sweden with experience of using the Internet. There were only four companies who sold Internet access and they had all rather limited experience of schools as customers. For example, the providers held the view that the connection between the router and the local network was the responsibility of the customer whereas the schools saw it as a task for the provider. During the first two years of the project many new companies appeared covering different combinations of services from the access itself all the way to the schools' computers. In 1998 expertise is available for anyone who wants to connect to the Internet.

Another, and perhaps more interesting, question is how the introduction of information technology and especially the Internet into the educational system has served as a catalyst for other changes. Sometimes in parallel with and sometimes in the wake of this great changes take place in such areas as teachers salaries, content of work for teachers, pedagogical practices, how schools are built etc. Organizational and administrative routines in schools, municipal school boards and national educational bodies are also affected. Which comes first, the technological change or the other changes, is hard to say. Sometimes it seems that other reforms are carried through "disguised" as "IT in schools". This might imply that these other reforms may now be implemented with less discussion and preparation than would have been the case at other times. On the other hand, it might imply that long wanted changes that for a reason or another have been hard to execute may now be carried out.

Last, it is quite clear that Internet has many profound social effects. How distance learning (i.e. learning "without" teachers, schools and class mates), global communication (where you may know more about someone on the other side of the earth than about your neighbor), the increase of "virtual experiences" at the expense of "real experiences" etc. will affect the human mind is impossible to say.

In conclusion, society was not prepared at all in 1994. Today, in 1998, it has solved most practical or "material" questions connected to the use of Internet in schools. The "immaterial" questions, i.e. those of social and cultural nature, are first now being made visible. The effects and how to prepare still remains an open question.

Q: Is it affordable?

A: When the project started the use of Internet was still very expensive in Sweden, especially when compared to the services available in Swedish or for a Swedish audience. Prices around a couple of thousand crowns per month (around 15 or 20 percent of an ordinary teacher salary) for a simple dial-up connection of 14400 bits per second were mentioned. However, within only a year or so dozens of Internet providers appeared and prices were down to around a hundred crowns per month for a dial-up connection of 28800 bits per second. In 1998 anyone who wants can get access to the Internet and all the services available there.

The same development has taken place for content on the Internet. In 1994 there was very little content at all suitable for Swedish schools and even less was written in Swedish. Much of the content that was suitable and in Swedish was extremely expensive to access, e.g. news paper databases. The Swedish Computer Network worked to increase the amount of suitable

content not only by creating content itself and inspiring others but also by making agreements with important providers. The National Agency for Education could for example offer to pay the provider a certain amount and in return demand special school rates. The interesting thing is that in many cases the providers have retained their special rates even when the Agency's contribution seized. In some cases the "special school rates" even became the new general rate.

The decrease in prices and the increase in school oriented services and applications have made the Internet into a much used and readily available pedagogical tool.

Q: Was it well-represented to the public?

A: The Swedish School Computer Network project was initiated at a time when Internet rapidly became a matter of great interest in almost all parts of the Swedish society. Since it was one of the first and largest projects directed to a Swedish audience and written in Swedish it attracted much attention, not only from the educational sector. Those involved in the project spent much time giving lectures in schools, organizations, companies etc. Much was also written in newspapers, magazines and journals. An important part of the project was to disseminate knowledge and spread information. The web site was thus complemented with conferences, presentations as well as various brochures, reports and other printed material, distributed to all approximately 6000 Swedish schools. Thus, it was hard for the prime target groups (i.e. pupils, teachers and school leaders) to avoid knowledge about the project.

Q: Will it be appealing only to a small subset of our society or are its benefits wide-spread?

A: The Swedish School Computer Network prime target groups are pupils, teachers and school leaders in Swedens K12-schools. The secondary target groups are parents, policy makers and others interested in educational matters. Thus, the project aims at a large, and important, part of Swedish society.

## Description of supplementary materials

Material included in the Time Capsule. Most material is in Swedish but will be briefly commented upon here.

\* Regeringsbeslut U94:957/US (1994)

The formal decision by the Swedish government to commission the National Agency for Education to develop and manage a Swedish School Computer Network. The commission is signed by the Minister of Education Mrs. Beatrice Ask and Mr. Peter Karlberg, Senior Administrative Officer.

\* Skoldatanätet i Sverige - hur skall det realiseras? (1994)

A report written by Mr. Mats Brunell, Royal Institute of Technology, Mr. Anders Gillner, Swedish University Network and Mr. Benny Regnér, Fredrika Bremer School describing how a Swedish School Computer Network might be realized.

\* Ett svenskt Skoldatanät - information om utvecklingsarbetet, juni 1994

Report from the National Agency for Education describing the Agency's view on how the government commission to build and run a Swedish School Computer Network is to be executed. Also contains a brief description of what Internet is and what services that are available on Internet.

\* Det svenska Skoldatanätet - information om utvecklingsarbetet, januari 1995

Report from the National Agency for Education describing the development work this far. Description of the developed services (database of Swedish schools with e-mail and/or web pages, special news groups for the Swedish educational system, information services, e.g. the Agency's web site and various databases, and a list of good examples on how to use Internet in school). Also contains an updated version of what is the Internet, how does it work and who provides Internet access in Sweden.

\* Det svenska skoldatanätet öppnar möjligheten! (1995)

General information material from the National Agency for Education about the project.

\* Det svenska Skoldatanätet - teknisk dokumentation (1995)

Report from the National Agency for Education describing how the 40 "test schools" had connected themselves to the Internet, what hardware and software they were using, how they had addressed issues such as safety, ethical questions etc. Not intended as a recommendation but as a collection of examples for other schools to be inspired by.

\* Det svenska Skoldatanätet - en värld av kunskap (1995)

Report from the National Agency for Education describing the various services, projects and pedagogical activities carried out in the project. The services include school catalogues, hotlists, dictionaries, virtual school libraries, interactive courses on how to use the Internet and how to make web pages, and an electronic billboard. The projects include collaborative projects about the environment, the Swedish civil and military defence, how it is to be a teenager in Sweden and in USA, and a writing project where 600 pupils in 11 schools wrote essays and a book together over the Internet (The Writers Den).

\* Internet och skolan - etiken, ansvaret och hjälpmedlen (1996)

Report from the National Agency for Education discussing and analyzing the ethical questions that may arise when introducing Internet in a school. Also touches upon questions such as viruses, firewalls etc.

\* Det svenska Skoldatanätet - dokumentation av några användningsprojekt (1996)

Internal report from the National Agency for Education describing the work with and results of the pedagogical projects carried out by the 40 pilot schools.

\* Skoldatanätet - en presentation and The Swedish School Computer Network - an introduction (1996)

General information material from the National Agency for Education about the project (in Swedish and English).

\* Idolens hemlighet (1996)

A book written by 600 pupils in 11 schools using e-mail and web as tools for collaborative work. The book is a result of the project The Writers Den.

\* Musiknet, IKON and Länkskafferiet (1997)

Three brochures describing projects and services that were initiated by the Swedish School Computer Network project and partly funded by the National Agency for Education. In 1998 they are all important resources in their own right but they still collaborate closely with the Swedish School Computer Network project.

\* Klassrum Direkt (3 issues) (1997)

This magazine is a direct source of information about IT and how to use it. It is published by the National Agency for Education.

\* Internetboken (1997)

A printed version of the two on-line courses developed in the Swedish School Computer Network project. One course is an introduction to Internet and the other is a course on how to write HTML.

\* Netd@ys Europe 1997

An information page describing the Swedish approach to Net@ays 1997. The week was divided into 192 slots (one for each hour) and each slot led to a new activity taking place on the Internet during that hour. Many activities during Netd@ys were carried out by schools who only three years earlier had made their first experiences of using the Internet.

\* Clippings concerning the Swedish School Computer Network (9 clippings)

The sample clippings describe the work in the project between 1994 and 1996. The clippings are taken from Affärsdatas newspaper database. Computer Sweden and Datateknik are the two major computer magazines in Sweden, DN is Swedens largest daily news paper and TT is Swedens leading news agency.

\* Skolans datorer (1993)

A report from the National Agency for Education describing the quantity and quality of computer hardware in Swedish schools.

\* Skolans datorer 1995

A report from the National Agency for Education describing the quantity and quality of computer hardware in Swedish schools. When comparisons are made with the previous report a rather remarkable development can be seen, e.g. in 1993 there was one computer per 38 pupils in compulsory school (grades 1-9), in 1995 the number of computers had increased giving a ratio of one computer per 19 pupils. A third report of the same kind will be released in spring 1998.

\* Datorsatsning och Sedan ... (1995)

A report from the National Agency for Education describing the long term results of a large scale national effort (the DOS-project) carried out between 1988 and 1991 to introduce computers in school. The approach was more "material" than "content driven".

\* Välkommen till ODIN - det nordiska skoldatanätet (1996)

A brochure from the Nordic Council describing the work with the Nordic School Net

## Answers to personal questions

### **Johan Groth**

Q: Your first memorable experience with a computer?

A: The first computer I met at the Royal Institute of Technology and in life had no screen but was directly connected to a line printer, i.e. all computer output was printed on paper. Even small errors generated vast amounts of paper during compilation!

Q: Your most important teacher?

A: My high school math teacher who with complete disrespect for the national curriculum and the existing text books showed us pupils what mathematics really is about.

Q: What does becoming a part of the Smithsonian's Archive mean to you?

A: A great honour and also a strange but not unpleasant feeling of leaving a small foot note in the annals of history.

Q: The one question you would like answered?

A: As a former researcher in fluid dynamics it is simple: how does turbulence really work?

### **Benny Regnér**

Q: Your first memorable experience with a computer?

A: An Esselte 100 computer that I found in a forgotten box in a school in the beginning of the 1980's and the almost hostile attitude of the other teachers towards the "useless thing". Not from this, but from my next computer I sent my first e-mails to the USA.

Q: The one question you would like answered?

A: How are we to build a school where the potential of every child is developed and each child is given an equal opportunity in life?