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Ambitious Educational Projects as a Driving Force for Software Development

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1 Introduction

In the pre-www era, dating back to 1987, schools required a communication system for collaboration. A requirements specification was established that focused on user friendliness, flexibility, distributed databases, and the transmission of formatted documents and pictures. During this era Transmission control protocol/Internet protocol TCP/IP communication was used, which is now known as the Internet.

Innovative ideas at the time were gradually embedded, and the whole package grew beyond the initial plans, gaining attention outside education as well. The combination of Windows and UNIX led to Winix, a product that was really breaking barriers at the time. The success appeared obvious. However, bureaucracy and politics terminated the adventure.

By bringing researchers from Scandinavia together to address educational and technical challenges of mutual interest, a national network and a Scandinavian network of educators and computer scientists were constructed. This fruitful collaborative work continued - even after the Winix project ended - in both national and international projects, with thousands of students in Norway and around the world.

2 Origins of the Project

The Minister of Education, Research and Church Affairs (KUF) wanted to build a close collaboration between some upper secondary schools in Northern Norway, comprises the Upper Secondary Schools in Hamarøy, Nordreisa and Honningsvåg. The project was named SPINN (School Project in Northern Norway). The distances between the schools were about one thousand kilometers. Moreover, some of the schools, such as North Cape Maritime College and Upper Secondary school in Honningsvåg (the northernmost town in the world) had several locations along the Coast of Finnmark County, spread over hundreds of kilometers.

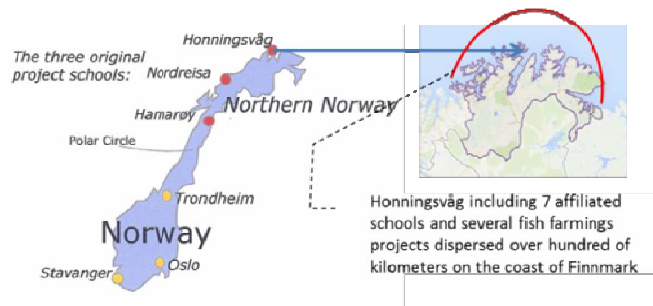


Fig. 1. Project Schools in SPINN - the School Project in Northern Norway

Several communication systems, such as Teleboks (Norwegian Telecom), PROCOMM, and Kermit, were tested. Computers using these communication systems had to be directly connected through modems and dial-up telephone lines, with one modem and dial-up line for each computer. These systems were very expensive for long-distance telephone connections and were inefficient for data-transmission. The high cost of dial-up telephone links also pressured the students to work quickly, thus sacrificing the user friendliness of data-communication. These systems did not have the desired features for use in teaching.

Because none of the systems offered satisfactory solutions for the educational needs in Norway, the development of a new system seemed necessary. The funding body was the National Plan of Action for Information Technology in Norway (Nasjonal handlingsplan for informasjonsteknologi).

We had developed the Grimstad-/Marked - model [1] and had experience used when designing the new system. User participation and prototyping were important right from the start. Subsequently, four subprojects were launched:

1. Competence building;
2. Development of system software, which eventually became Winix.
3. Educational projects.
4. Development of applications.

2.1 Competence Building

A prototype of the data communication had already been developed in 1987/88 to build skills in schools, especially in the experimental schools. The prototype system was deployed only on the local network without any connection to the outside world. In the summer of 1988 two courses in data communications were organized for 40 teachers and administrators from across the country. The courses were taught in Hamarøy Upper Secondary School, one of the experimental schools. Most participants came from the three experimental schools in SPINN. In addition to knowledge and

training in the use of data communications the participants were also trained in database searches.

Over the next few years, the simulation system for data communication and database searches was further developed. The plan was for schools to be able to acquire the system and train participants on data communications without the expense of dial-up lines.

The Ministry of Education, Research and Church Affairs and The Ministry of Labour and Social Affairs released in 1991 their own textbook "Electronic information resources, information capture and distance learning." As early as 1990, there were 4615 searchable (like today in WWW) databases available in the world, delivered by 2500 database producers with 654 database hosts. In Scandinavia there were 433 registered databases [2].

2.2 Development Strategy

The development of Winix applied the same model as that of Arpanet/Internet, but naturally on a far smaller scale. The leader of the project was well acquainted with the organization of Arpanet. Shortly after the first International Conference on Computer Communications (ICCC) in October 1972, he became familiar with Arpanet/Internet at the Norwegian Technology University (NTH). Subsequently, he continued to follow the development of the nets.

A central office, the Advanced Research Project Agency (ARPA)/ Information Processing Techniques Office (IPTO) under the Department of Defense (DoD), led the development of Arpanet. Executing units were environments related to universities and other centers of competence, such as MIT, Harvard, Rand Corporation and BBN (Bolt, Beranek and Newman). BBN had the primary responsibility for the development, but the project also involved a dozen other development agencies with specific tasks.

The original plan for Arpanet was to engage only one center for development to obtain the maximum effect of ARPA's investments on technical equipment. Gradually, however, the dimensions of the project increased, particularly after observing that ARPA could also meet other challenges through Arpanet. ARPA used, for example, grant funds for the development of ALOHA net¹, which became the origin of packet-switching over microwave networks, and for the development of Packed Radio Net (PRNET) for mobile communication and Satellite Net (SATNET), with a station in Norway, for the transmission of seismic data for defense purposes. Gradually the Internet came into being as we now know it, developed jointly by professionals in Great Britain, France and Norway.

The original idea for using Winix was to connect only secondary schools for closer collaboration, especially within the SPINN project, with more than 30 different sub-projects. During the project, new projects and products emerged, creating far more interest and possibilities beyond the original plans. The Winix Network was primarily

¹ ALOHA, a pioneering computer networking system developed at the University of Hawaii.

developed for The Ministry of Education, Research and Church Affairs, by the following centers of competence:

3S AB (Scandinavian System Support AB), Sweden, was a high technology company that developed IT-systems in the environment at the University of Linköping. For the Winix project, it functioned much like the BBN did for Arpanet/Internet.

TISIP was a Foundation for Project Oriented Information Technology Research at Trondheim University College of Engineering. Tisip wrote much of the requirement specifications, and they were also the leader of Winix Support Services (WSS). Winix Support Services were organized in a network and were available to users 24 hours a day. Winix International had organized an educational system consisting of the Winix Main Education Service (WMES) and several local educational services (WES).

Numerica Ltd was the company, which developed the Winix Application Development Toolkit. It provided Winix Network or stand-alone users with a robust application creation environment for developing personal computer-based applications under Microsoft Windows. Through its intuitive WYSIWYG (“what you see is what you get”) design interface, the Winix Application Development Toolkit allowed both non-programmers and application experts to quickly and easily create, and interactively test, sophisticated applications incorporating object-oriented techniques. The Winix Application Development Toolkit fully supported the Microsoft family of compilers, providing a rich programming environment for new application development and facilitating the porting of existing code bases.

ModellData Ltd, was the company, which developed the Winix Simulation Development Toolkit (WINSIM). This toolkit gave the user a state-of-the-art Windows-based development environment that allowed personal computer users with little or no programming experience to develop simulation applications, similar to the Winix Application Development Toolkit. The simulation toolkit, now named Powersim [3], still exists and has been further developed by Modelldata, which received the Rosing Award for Powersim in 1994 and the European Academic Software Award '94. Powersim was the only Scandinavian software product authorized as a SAP² Software Partner.

Mikrosys Ltd, a company based near the University of Tromsø, Norway. They developed the Winix Name Service (WNS) and were active in WSS.

Hektor Data AB, Linköping, was the company which developed the Winix Database file handling system and relational database manager. It was a complete multi-user system that permitted mixed processing of local and remote Windows and UNIX files and included many of the functions found in advanced relational database management systems on mainframes. It could handle fields of variable length, and it could process text, graphical information, lists, and so on, not only binary numerical data and strings.

² SAP (Systems, Applications & Products in Data Processing) is a European multinational software corporation, headquartered in Walldorf, Baden-Württemberg, Germany

Hi-Q International Inc. was the company which developed the Winix Terminal Emulator. A Winix LAN could be interconnected to other Winix LANs in a wide network area (WAN). Through the powerful integrated Winix Emulator on a Winix Network, the users could directly access local or remote mainframes, databases and networks. The Winix Terminal Emulator could be used either as a stand-alone product on a MS-DOS host or as an integrated component of a Winix Network.

Winix Network. The overall goal for the development of the Winix Network was to gain pedagogical, technological and organizational experiences with tele-education and distributed work situations. We envisaged that a typical installation at the schools in the future would be a LAN connected global network. Therefore, we required seamless integration between LANs composed of workstations. Independent of educational projects or requirements in Norway, we were aware of some international standards that had to be considered, especially TCP and IP (TCP/IP) protocols, and protocols for mail system and for conferences.

Internet. During the 1980s, the number of local nets using TCP/IP - and also the number of TCP/IP vendors - was growing very rapidly. The dominant model for an internet work was Arpanet/Internet with the emergence of a worldwide data communication system. In 1987, Arpanet/Internet was estimated to have several hundred thousand computers connected – and perhaps as many as one million users. The Arpanet/Internet was free for use in non-profit research and education. The OSI³ model was irrelevant, not only economically but also technically, because it had major limitations with its strong limited addressing range - "...it completely ignored connectionless services and connectionless protocols, even though that is how most local networks work" [4]. In the next edition of Tanenbaums computer network textbook, he reinforced the statement and argued that the OSI-model was "Bad technology, bad implementation, bad timing and bad politics" [5].

UNIX. Organizations at the time were moving towards distributed models of network computing. Years of research and development had given UNIX a powerful and sociable identity, with its greatest power in distributed, heterogeneous networks. As a result, UNIX addressed the networking issues faced by network managers in a variety of corporate settings. (TCP/IP) protocols were the standards of the Internet, which was dominated by UNIX servers.

Trends in network management, many of which were focused on the special difficulties presented by decentralized networks, shed additional light on the direction, that UNIX was taking, and the advances that network managers could expect in the future. Because of its flexibility and expandability, UNIX was gaining popularity among corporate users, faced with the challenges of managing diversified and complex computing environments. UNIX was promising for communication flexibility, multiple hardware options, distributed applications, network management capabilities. It could connect dissimilar computers, run applications across multiple

³ Open Systems Interconnection Model. Is a Reference Model based on a proposal developed by International Standards Organization (ISO).

platforms, integrate diverse business functions, and it was an alternative to limited PC technologies.

MS-Windows. Most computers in the schools were running MS-DOS. A few were using the Apple Macintosh with its graphical interface. The introduction of MS-Windows changed the interface of PCs for non-professionals, and the system developed rapidly - with Windows 2.0 and Windows/386 in 1987, Windows 3.0 in May 1990, and Windows 3.1 in April 1992.

MS-Windows was quickly gaining popularity among PC users. In a few years Microsoft had sold more than 10 million copies of Windows. Windows was developed for simple tasks, and it lacked a powerful networking environment.

Integration of Windows and UNIX. In short, UNIX was promising as the “glue” that integrated diversified Windows desktops with departmental and corporate computing environments, while providing functionality for the next generation of “open systems”.

Unfortunately, the UNIX server functionality was normally limited to file and print services and some lower level of limited gateway access to the corporate environments. Integration between the UNIX server and desktop computers was at best crude, often relying heavily on the character-oriented command structure of UNIX. Current UNIX server/local LAN integration products demand that the end-user become familiar with the complexities of the UNIX environment in addition to the command structure of their own PC.

With the introduction of Windows by the Microsoft Corporation, especially after introduction of Windows 3.0, and after its broad market acceptance as a new, easy to use graphical user interface standard for personal computer interaction, users were becoming less willing and, in some cases, less able to cope with the current level of LAN/server integration. Users were demanding server integration with their LANs, that preserved their Windows environment while delivering the power and the flexibility of UNIX.

The ambitious goal for the development of the Winix Network product family was to make a seamless integration of UNIX, the MS-Windows environment and the Internet a practical reality.

2.3 WINIX MANAGER

Winix Manager was the graphic environment launch pad for the features and services provided by Winix. Using its icons or its menu bar and pull-downs, you could start the mail system, the conference system, the Winix Emulator, the text editor, or the program library service using MS-Windows techniques.



Fig. 2. Winix Manager (if you replace the figures with squares, the interface is very much like the interface of Windows 8.1 today)

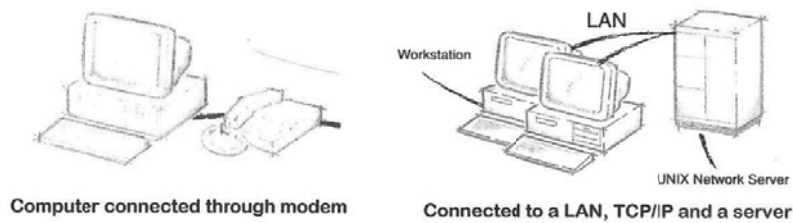


Fig. 3. Winix for single user and small organizations (pictures from Winix brochure)

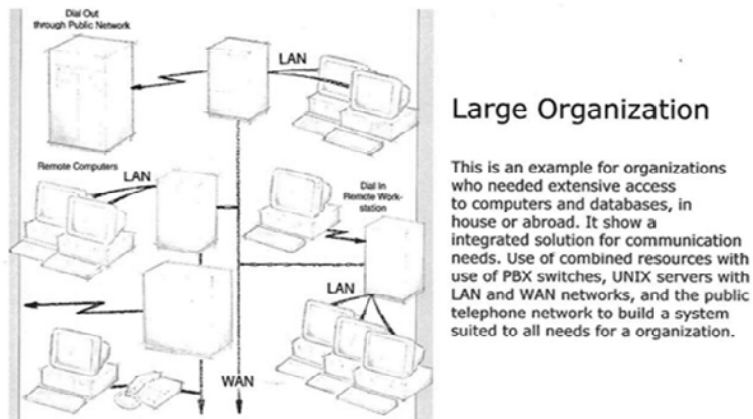


Fig. 4. Winix for large organizations (picture from Winix brochure)

3 Winix in Norway Europe and North America

As early as in 1989, the Ministry signed a business contract with Telia AB, Sweden, which warranted a minimum sale. However, in the fall of 1990, a few months before the Winix for Windows 3.0 standard was placed on the market, Telia AB required changes in the contract. Telia AB wanted to take over the development of the product, and thus take over the ownership of Winix step-by-step. After having sought advice with the Attorney General, among others, the Ministry rejected the request. The contract was subsequently terminated.

In 1991, the Ministry signed a business contract with an American company, which after extensive testing in US approved Winix version 1.0 in May 1991 [6]. The company immediately initiated a broad marketing campaign to realize the market potential for Winix in the North American market. These activities included presence at industry trade events such as COMDEX-Spring, COMDEX-Fall, Micro Vision and TELECOM'91 in GENEVE, October 1991. These activities led to a high level of awareness of and interest in the Winix product family, both domestically in the US and internationally.

There were thousands of inquiries from potential customers and distribution partners. Serious interest in the product was expressed by some of the largest information technology users in the United States as well as by leading vendors in the market, e.g., International Business Machines, AT&T, NCR, Sun Microsystems, Digital Equipment Corporation, Unisys Corporation, Motorola and Sequent Computer. Experts suggested that it was exceptional for a new product to receive so much interest from the industry giants.

Many magazines also showed great interest [7]. For instance, the German magazine PC Professional Neus von der Comdex, August 1991, "Das für heterogene Systeme Interessanteste Produkt Winix". [8] PC NETZE "Schule im Netzwerk"; [9] Personal Computer "Groupware und Netzwerk", a three page article; [10] "Integration von Unix, Dos und Windows unter einem Dach", a four page article; [11] and Byte "Winix Joins Windows and Unix in a Common GUI".¹

¹ What some others were saying about Winix:

"*Revolutionary Workgroup Power*", three page article, R. R. Ackerman, Jr., Infoshare Inc.

"*We are very impressed with the power and flexibility of the Winix Network, and believe that it will become a major force in the network industry. I think you have a real winner here, something that the industry desperately needs, and customers have been clamoring for.*", Pete Rourke, Product Marketing Director, Computer Centers Inc ,Tempe, AZ.

"*The availability of Winix America products on our UNIX platform further demonstrates Tandem's commitment to open cooperative computing and our dedication to providing lasting value to our customers.*", Chip Pardini, Tandem Computers Inc.

"*Winix has great possibilities. The time is right for it. It has the windows front end, which makes it easy to get to the power and possibilities of the growing UNIX world. We have customers out there who could benefit from this*", Lisa Lindgren, Science Applications International Corporation, San Diego

Høybakk committee [12]. In September 1991 the Ministry's committee for Winix delivered recommendations for creating a new company with at least 100 employees for the US market alone. The development of Winix was to continue unabated.

Special analysis by IDC [13]. The Ministry contacted the International Data Corporation (IDC), a leading company in market analysis. They performed a special analysis and concluded that "The enormous potential for growth that occurs for Winix arises from a very lucky combination. One has found the right software solution tailored to the right hardware for computer systems of the 1990-ies." Further on, it states "And one has come far enough in development of the product to participate in the expansion. The product side is in other words OK, the marketing will now decide if Winix will be part of the expected growth."

Furthermore, IDC stresses how important it is for early success of new products in the market. "Experiences indicate that it is too late to develop a product when the market for this kind of product takes off. One has to have a reasonably developed product available from the start. We therefore believe that Winix is very well positioned to benefit from being in the particular software market that is likely to have the largest expansion in the 1990-ies."

Special analysis by Marked Share [14]. A special analysis by Marked Share concluded that "The Winix concept and products are exciting and represent a new and fresh mindset within Norwegian IT. Marked Share is impressed with the strong will and determination that the steering group demonstrates. The work that we have seen up until now is professional and poses a unique opportunity for a Norwegian/Swedish product to achieve wide international sales and distribution."

3.1 American Business Group

The American business group had approved the software product in May 1991, and they placed their first order in the summer of 1991; however, the Ministry was not able to deliver complete packages due to production problems with some plastic ringbinders designed and custom-made by a manufacturer. In a meeting at the Ministry of Education, initiated by the Winix project leader, the Minister approved of contact with the American group to discuss a possible sale of Winix. A direct background for this action was a budgetary authorization by the Ministry of Finance to cover development costs through sales income. This had to be accounted for before the end of the year (1991). The Minister was kept informed.

In November 1991, the American Business Group went to Oslo with the intention of buying the Winix family of products for approximately 40 million NOK, offering a royalty of 6% and free Winix-software in the future for the Norwegian school system. The development would remain in Scandinavia. The financial leader was an attorney; he had specialized in representing early stage and emerging growth companies such as NIKE and Lattice Semiconductor. However, the Ministry, as the owner of the product, turned down the offer. The Ministry, in understanding with several other ministries, wanted to pursue its own business. Possible economic problems in the Ministry should

be of minor importance. The Winix project leader recommended sale [15].

In December 1991, the American Business Group returned, now asking for a license contract with exclusive rights to the sale of the Winix Products within the USA and Canada [16]. The licensee would warrant a minimum of royalty. Additionally, the business plan for the following years suggested sales & marketing expenses for 1993 - US\$ 10.8 million, and for 1994 - US\$ 15.4 million. The licensee's forecast for 1993 was 130,000 licenses i.e., approximately US\$ 190 million, and for 1994, 266,000 licenses, amounting to approximately US\$ 390 million. The Royalty was 30% up to US\$ 5 million, 20% US\$ 5 – 7.5 million and 15% over US\$ 7.5 million. The Ministry still wanted to pursue its own business and therefore rejected the offer.

In March/April 1992, a Swedish company and a German company both wanted to enter into a license agreement with non-exclusive rights for the sale of Winix products, excluding the USA, Canada, the United Kingdom and Australia, with sales and marketing guarantees.

4 The End

In beginning of January 1992, the Ministry of Education started its own company, Winix Ltd. The shareholding company received a 5 million NOK founding capital, which was far from the 100 million that was recommended by experts, and the number of employees was one – 1 -- and far from the 100 employees that Høybakk committee considered a minimum. The first task of the board should be, according to the recommendation by the funding agency, to engage an executive director. The project manager for Winix was asked to enter Winix Ltd, and the fund company that the Ministry used as an adviser recommended hiring him as a research/technical director. He was rejected because of health problems – he was worn-out; therefore, he was never employed by the company.

To make a tragic story short, Winix Ltd never got up and running. The Board had its first meeting in July 1992, approximately seven months after the start of the company, and in reality, after the end of the development history of Winix. The company still had no managing director, and there was still only one person employed. It was far from 100 employees that experts and advisers for the Ministry considered a minimum, as mentioned earlier. Previous attempts to call a board meeting had failed.

With this mixture of politics and business, mostly politics, the development and support of Winix ended after a few months – in the summer of 1992 - due to the inability to act. The developers were not allowed to develop the Winix Network any further.

4.1 Social Issues

Through the Winix project, a great number of people developed high competence, and today they are owners or staff members of cutting edge companies for the

development of new technology, or they are using the technology in new ways. A number of them are internationally active. This collaborative work was very fruitful, and after the Winix project ended, several of them continued close cooperation with each other both in national projects and international projects. In the years that followed, thousands of students all over the world have been educated via Winix, despite no further development and maintenance of the product - it was running and running. Central Winix actors have been active coordinators and/or partners of ten to fifteen EU projects.

5 Conclusion

The main background for starting Winix in the 1980s was the need for a flexible and user-friendly communication system between Norwegian schools and the fact that no existing system at the time met the defined requirements for educational purposes. Along the road, due to new ideas and desires from the teachers and school authorities, extra modules were added to cover a wider range of services, e.g., tools for the development of applications and tools for designing and implementing simulation software. As the functionality increased and the total package became more multi-purpose and user friendly, complexity and costs naturally also grew.

On the other hand, this multi-purpose and flexible software system appeared to be just-in-time for needs and interests far beyond the Norwegian school system. It caught attention, was evaluated and positively described at large software shows, in magazines and news media around the world, thus inviting unexpected attention and indicating economic potential. The negatives were those in Norway who were against government actions and those who fought for OSI model; the Internet would never be a standard. Winix was now gradually taking on dimensions that were not quite suitable for a government body such as the Ministry of Education.

How could this golden egg be taken care of without losing control of the product that should meet the original goals for Winix development? This turned out to be particularly difficult when Winix was ready to go commercial. The question was: Should the Ministry sell out, or should it continue spending public money to develop a product that schools needed and that, at the same time, could be a source of economic benefit? When the decision was finally taken to create an organizational structure that could handle both the development and the marketing of Winix, the Ministry seemed unable to act. Instead of quick actions and business-like behavior, one observed delays and lack of action.

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