THE NORDIC TERMINAL PROJECT

A technological breakthrough in banking

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Abstract

At the end of the 1960s the united Nordic saving banks prepared a common procurement of computer based teller terminals for a total of 1500 saving banks. A contract was signed with Saab (Datasaab) covering development, delivery and maintenance. This business turned out to be the biggest teller terminal project in the world at that time, and it had a great influence on the further development of the savings banks as well as of Datasaab.

Introduction

On September 26 1969 Saab AB signed a contract/agreement with the united savings bank movement in Sweden, Denmark, Finland and subsequently in Norway, which for all parties presented an enormous challenge. This project was called "The Nordic Terminal Project" (NTP). For Saab it implied not only a delivery commitment within a given time, but also the start of a completely new business with an entirely new product line and new kinds of commitment.

For the banks this was another step into the world of data processing, which in turn would further stretch their existing operations.

The first agreement within the NTP included 2500 teller terminals at a value of 50 MSEK (which corresponds to 300 MSEK at 2004). The number of terminals was expected to triple in the next couple of years.

This was a business which Datasaab had won in competition with some 15 other suppliers.

The pilot installation was made in April 1972 (6 months late) and the production deliveries started in autumn of 1972.

During 1972 orders worth 125 MSEK (1972) were placed and by 1973 the NTP had ordered 6000 terminals with 2300 minicomputers of the type D5/20. Consequently the NTP became the largest teller terminal project in the world at that time with 1500 Nordic savings banks and 5200 offices in Denmark, Finland, Norway and Sweden.

The parties

The savings bank movement

The savings bank movement in the Nordic countries consists of a large number of very local banks of varying size. Such a local bank is managed by an elected board. Nationwide they are connected to (members of) what in Sweden is Svenska Sparbanksföreningen (Swedish Saving Banks Association) which runs a number of operations such as Sparbankernas Datacentraler AB (SPADAB). The corresponding organisation in Denmark is SDC (Sparekassernes Datacentral) and in Finland SCAB (Sparbankernas Central AB). At the end of the 1960s there were 300 banks in Sweden with a varied number of offices. The saving banks in Denmark, Finland and Norway had a similar organisation.

Datasaab

Datasaab evolved from the increasing electronics operations at the aircraft company of Saab (Svenska Aeroplan AB) This was in line with the evolution of the aircraft industry at the beginning of the 1950s, when systems technology with connection to electronics became a necessity for aircraft manufacturers. Thus what later became Datasaab grew from the military technology which became increasingly important for entering activities such as missile guidance and development of what was at that time an advanced computer for the Saab aircraft 37 Viggen.

Aircraft designers became aware of an increasing need for computers for heavy calculations. This gave birth to a Swedish designed computer named SARA (Saabs Räkneautomat), which was ready for use in 1957. Further development led to a prototype named D2 to test technology for future aircraft applications. Very soon it became obvious that this equipment could be used for other applications as well, and it evolved into the computer D21. This was one of the first completely transistorised computers in Europe, and a further development of D2 (D2+) with software competence added from SARA. (For further information see the first chapters in ref. 4). The computer operations had at that time more than 500 employees. During the 1960s around 100 D21 and its successor D22 were manufactured and delivered.

With the combined experience of commercial and military computers Datasaab developed a 'mini computer' D5 in 1969, and hereby a new era in the history of Datasaab began with computerised office terminals and large terminal systems. In 1976 there were 12000 terminals delivered or on order. The largest project was the NTP with more than 6000 terminals and 2300 mini computers.

In 1978 Datasaab became an independent company owned by Saab-Scania and the Swedish government. The company had at that time 3200 employees and operated in several countries with an invoicing of more than 700 MSEK (1978).

Facit AB

In the mid 1950s, the Swedish company Facit was a large producer of mechanical and electromechanical office machines, mainly calculating and adding machines and typewriters. Their business was worldwide with production concentrated in Sweden. In the late 1960s the competition on the international markets for office machines increased rapidly. At the same time the rapid development of technology led to 'the electronic revolution' which hit the market for office machines heavily. The whole industry underwent a radical structural transformation. The 'Facit crisis' developed almost at the same time as the NTP started and this directly caused problems for the project as Facit was a main partner to Datasaab. Facit later became a subcontractor to Datasaab who then assumed full responsibility towards the bank customers.

THE PROJECT

The Nordic Terminal Project

In 1968 the above-mentioned Savings Bank organizations created a joint committee for specification and purchasing. The goal was to make a common acquisition of equipment and systems for the bank offices for local processing of transactions and connection to central computer systems via a storage medium or online communication via tele lines. The name of the project was NTP, Nordic Terminal Project. Very soon Norway joined the project and then it covered almost all saving banks in the four countries. The idea was that purchasing of large volumes should stimulate the suppliers and give more advantageous prices. In Sweden Svenska Sparbanksföreningen describes the detailed ambitions in a document "Specification for a Teller Machine for the 1970s", published in 1968 (ref.1).

The Specification

The specification that was created during 1968 to be the basis for a request for quotation had the following highlights:

1. The specification should cover all technical and economic demands for the banks. An important parameter of course was the cost and therefore it was even more important from that point of view that a single terminal could meet the full requirement.
2. The terminal should be modular in design so as to meet the variable requirements for teller terminals, data collection, data registration and communication with a central computer system.
3. The terminal should be computer guided to maximise the flexibility through variations in the software. The idea was that 0.5 kbyte would be enough for the computer memory. At least the memory requirement should not exceed 1 kbyte!
4. The specification had detailed descriptions for the different terminal modules. Different types of keyboards, different types of media for storage and transferring (OCR-strip, punched tape and magnetic stripe), indicators, monitors and other displays and how to make a teleline connection. There were also security demands such as journals for backup.
5. Other demands dealt with service and maintenance to get highest possible availability.
6. The timetable asked for a prototype in the middle of 1970, pilot installations in October 1971 and production and deliveries from beginning of 1972.

Request for quotation

The request was sent out during 1968 to around 20 prospective suppliers from around the world and from whom 15 replies were received. All bids did not of course cover the whole project and some quoted a separate price for the development which showed that this was not an off-the-shelf product.

As soon as the content of the NTP specification was available at Datasaab intensive activities were started to find out what could be done. Datasaab personnel had earlier taken part in the specification of a European teller terminal. This was now advantageous for Datasaab as a possible supplier despite their lack of real experience and appropriate products.

An early decision was taken to include Facit AB in the Datasaab operations. Facit was at this time a worldwide office equipment supplier. They already had at least the basics for the required terminal modules such as keyboards, printers, indicators, etc. Datasaab was therefore able to concentrate on other parts of the project.

In December 1968 Saab presented a quotation which was followed by 10 months of tough negotiations during which the economic margins shrank more and more. As this meant large economic undertakings, the top executives at Saab took an active part in the negotiations. Initially Datasaab had to convince the Saab executives that this was a project and a business area worth continuing with. However the minicomputer idea had been presented earlier as a complement to the D20 line.

Remaining to the end of the bidding was the large Italian office equipment supplier Olivetti with products and system solutions to which the savings banks apparently gave serious consideration.

Contract signed

In September 1969 a contract was signed for 2500 terminals at a value of 50 MSEK in the monetary value at that time.

Pilot installations began in April 1972 and serial deliveries during autumn the same year.

During 1973 6000 terminals and 2300 mini computers of the type D5/20 had been ordered.

Technology and modules

Teller terminals

The only feasible way to perform data processing at the beginning of the 1960s was to use large mainframe computers. Collecting and recording transactions was a big problem. It was time consuming, errors were frequent, and several days could pass before a transaction appeared in the central system. It was vital to meet the customer's demands for fast and reliable information, and a number of methods had been tested without success. So with earlier experience in mind the banking world started to figure out how a future teller terminal would look.

It is easy to imagine the numerous and lengthy discussions about the many disparate requirements and wishes within such a complex organization as NTP. In addition the savings bank organisations in the Nordic countries differed considerably.

Terminal computer D5

Now a new concept had to be defined which could form a platform for further development in the future. The idea to use a minicomputer to control a terminal was not especially revolutionary at this time, but nevertheless was somewhat daring.

It turned out that the savings banks had a great number of offices with only one teller terminal. An important part of the computer design process at Saab was to make it attractive for these offices to invest in a minicomputer, which in reality was designed to handle six or more teller terminals. A big effort was put in to define a sufficiently simple computer for 1-2 teller terminals only. Several solutions were proposed, e.g. to use a word length of four bits ("nibbles") only, but a sufficiently large cost reduction could not be obtained. In the end only one computer version, called D5/20, was launched. It was designed for 1-6 teller terminals, and a higher production volume and unified software motivated a lower price for small offices.

It was a tricky task to define a set of instructions for the computer. On one hand the amount of electronic circuitry must be minimized, but on the other hand software memory must be kept as small as possible. The result was some 20 instructions and a word length of 16 bits. The computer did not have an interrupt function, which in fact turned out to give some advantages.

The need for more memory was a constant headache as for everyone else in the business at that time. In this case the requirement for a small memory was extreme. (The memory was a ferrite core matrix with the ability to keep the information when the computer was turned off.) The limited instruction list of D5/20 made it even more difficult to meet the memory requirement.

Instruction list:

STORE	ENTER SUBROUTINE
LOAD	CHAR SHIFT (2)
ADD	SHIFT (2)
SUBTRACT	OUTPUT
STORE CHAR	IO ADDRESS
LOAD CHAR	INPUT
JUMP	IO SENSE
COND. JUMPS (6)	END OF IO
AND	AND OUTPUT COMMAND.

The D5 cabinet measured 480 (19") x 220 mm and weighed 25 kg. The computer with a memory of 16 kb needed 285 W of power. The electronic circuitry was built on double sided printed circuit boards with plated through holes.

A total of more than 6000 minicomputers D5/20 were built.

DIL5, an interpretative language.

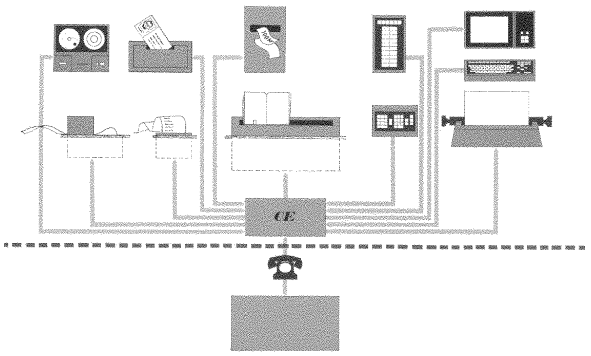
The invention of a new programming language solved the memory dilemma. It was called DIL5 (Datasaab Interpretative Language for D5) and emphasized low memory requirement. This language handled time-sharing in an elegant way without an interrupt function. Since the terminal was frequently idle and waiting for e.g. a keystroke, there was plenty of time for other tasks.

As a programming language, DIL can be characterised as problem oriented (at the lower end of the scale). The instructions were often character oriented—one character at a time was read from the keyboard, and then processed etc. As a DIL programmer you didn't have to worry about addresses. All references to data areas, programs and peripherals were assigned alphanumeric names. Each terminal had a data area of its own, and all terminals together shared a common data area. Translation and assembling were done in a Datasaab mainframe computer D22.

The NTP application including communication software could then be implemented in 8kb, which, however, soon increased to 12kb. Even so it was a remarkable achievement. The DIL language with its smart architecture was further developed over a period of almost 20 years including many variants for special purposes.

Terminal modules

The terminal modules were supplied by Facit (as a subcontractor) and consisted of a selection of the following units:



Key Unit

Administrative lock ON/OFF including storage of accumulators and account balance.
Operative lock, standby and changing of operating mode.

Keyboards

Transaction and numeric keyboard (same unit)
Functional keyboard and alfanumeric keyboard.

Indicator panel

Six segments with alphanumeric text
Numeric indicator

Printers

Numeric Strip Printer
Numeric tabulating printer for receipt on voucher or in passbook 16 characters, 10 characters/inch
Matrix serial printer 10 char/inch, 6 rows/inch , 40 characters per row, capital letters and digits
Matrix Strip Printer

Alphanumeric Monitor Display

8 inch 5 rows with 40 characters (digital and special)

Magnetic Cassette Storage Unit

Type: ”Philips Cassette”

Printing had to be done on control journal and OCR journal. Receipt was printed on voucher and in passbook, list or form.

Printer 5808

Of all these units the passbook printer turned out to be a continuous problem. Admittedly it was a big challenge to design a printer able to print in all types of passbooks. These were very heterogeneous with thick covers, thin covers, and portrait or landscape format. In addition print must be equally good on the first and the last page.

Saab received increasing complaints from the savings banks and Facit, facing severe problems of their own, hesitated to tackle the printer problems. So with a crisis coming up, Saab decided to develop a printer themselves. Requirements from other potential customers supported this decision. But it is understandable that Saab was very hesitant in entering this new market.

The outcome was the printer 5808, followed by PR366 a couple of years later. It used a needle print head with 7-9 needles, originally a German design but further developed by Saab. The printer had an ink ribbon and a flexible resistant plate to accommodate different types of media.

33000 printers were manufactured between 1974 and 1984.

Ergonomics

Furniture designers were called in to make the teller terminal attractive and comfortable to the cashier. A new concept had made its entrance: Ergonomics.

Data communication

After the local equipment had been defined, it was time to tackle the next problem. How should all the bank offices be connected to the central computer in a cost effective way? Up to now data communication had been point-to-point connections or multipoint. Now Saab had to find an efficient, reliable, and inexpensive way to connect the offices.

An idea to be tested was to connect several offices in loops with traffic in one direction only. The loop traffic was transmitted to the central computer through a regional communication computer. A drawback was that an interrupt in a loop caused all offices in that loop to be disconnected. This method is still used today in local LAN, Local Area Networks. In Sweden the task was to connect 877 offices with a response time of six seconds for a simple transaction, including two seconds in the central computer. This should be met in 95% of all cases, a condition that required statistical methods to prove.

DELIVERIES

Production

For the production people the change to volume production from handmade small numbers of units was a real challenge.From being a handicraft, the task now became the handling of large volumes. This demanded a brand new workshop layout, modern assembly equipment, completely changed organisation and training of the personnel.

In 1976 there were 500 employees who made 2000 minicomputers a year. Some 40000 components passed the incoming inspection every day. Automatic test equipment was installed.

In addition to the manufacturing of printed circuit boards to be mounted in chassis with a power supply, came the new and large task of assembling the printer 5808 (above) which contained 5000 mechanical details.

Installation and maintenance

When the new bank equipment began to be installed, completely new demands arose compared to earlier experiences. Bank security and the image of the bank in relation to their customers required that the installations were made when the bank was closed i.e. evenings and nights. The installation had to be made in the period from closing of the bank in the late afternoon to opening next morning and by then the equipment had to be in full operation and the bank personnel educated and trained.

The logistic flow for the whole project was complicated, and demanded very accurate planning as the different components in an installation came from different directions. Everything had to fit and no omissions could be accepted.

With regard to maintenance, the plan from the beginning was that Facit AB should take responsibility as they already had an established and distributed organisation. For several reasons this could not be accomplished, so Datasaab had to build up a totally new organisation and a new maintenance philosophy at considerable cost. The demands were that attendance of service personnel should be within two hours at any location and half an hour to take measures. At the beginning, of course, this caused large financial losses.

With the further bank business which was achieved there were at the beginning of the 1980s some 25000 teller terminals installed in 11 countries plus 220 ATMs.

At its highest the terminal population rose to around 32000.

An example of the savings bank's teller terminal

EPILOGUE

At the end of the 1980s there were still 4200 teller terminals and 1100 D5s in service.

Among the reasons why Datasaab, despite tough competition, managed to get this large order was that the computer and data competence was available at the aircraft company together with advanced technology. The lack of an existing finished product allowed the possibility to develop more or less exactly what the customer wanted and finally there was a strong economic resource in the background.

The Nordic Terminal Project changed the whole Datasaab business from being a supplier of mainframe computers to the provision of computer based bank terminal systems.

These terminals with the computer D5/20 were installed in Spain, USA, France, Great Britain, Austria, Belgium and Holland, totalling around 15000 terminals 1972-1978.

The mainframe computers were transferred to a new company in cooperation with Sperry Univac. But that is another story.

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3. Bits & Bytes ur Datasaabs historia. TEMA BANK. Datasaab 1996
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5. According to the Central Statistical Bureau in Sweden the basic reference amount was 6400 SEK in 1970 and 39300 SEK in 2004. Thus the amounts given in the paper must be multiplied by approximately 6 to get today's monetary value.

(References 1-4 are available in Swedish language only)