

AUTOMATIC TELLER MACHINES

A DataSaab Project During 1970-1985

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Abstract: Provides a description of the development of an automatic teller machine. This product from Ericsson and Omron featured high capacity and significant improvement in security and customer interface. Swedish and Finnish banks used a large number of units for almost a decade.

Key words: ATM, Datasaab, Ericsson, Omron

1. INTRODUCTION

The automatic teller machine (ATM), or uttagsautomat, or Minuten, or Bankomat, is a customer-activated terminal. Probably it is unnecessary to give that information since this type of machine is regularly used by a majority of the population in the Nordic countries and in most western societies. Behind the front panel (Figure 1) however, is a complicated system of electronic and mechanical components together with computers and computer software. Because the machine handles cash and has constant exposure to the public, it must meet great demands on reliability, security, and availability. In addition, it must withstand various degrees of vandalism without hurting the vandals themselves. In 1995, the Swedish savings banks recorded 133 million transactions on 1007 ATMs, which means an average load of 11000 transactions per ATM per month. The corresponding cash flow was the fabulous sum of 133 billion Swedish kronor.



Figure 1. The Ericsson/Omron ATM

This paper describes how the Swedish company Ericsson and the Japanese company Omron designed, produced and maintained ATMs and how this product dominated the Swedish and Finnish market for almost a decade.

2. BACKGROUND

In the 1960s, banks in many countries started to introduce self-service terminals, primarily for cash withdrawal. The long-term goal was to provide better service to the customers and lower the banks cost. In Sweden, Sparfrämjandet contacted TetraPak, later Meteor to develop an ATM, and at the same time, Handelsbanken introduced the name "Bankomat" which today is the common Swedish name for an ATM in general.

The savings banks in Sweden took a major step forward in the second half of the 1970s by installing 600 Docutel ATMs. The Datasaab service organization had the task of installing and maintaining these machines. In the meantime, the Swedish commercial banks had formed a common organization called Bankomatcentralen.

In the middle of the 1970s, Datasaab started to market an ATM family developed jointly by Datasaab and the Finnish company Valmet with a cash dispenser from Inter Innovation. This product did not, however, become a commercial success in Sweden but a couple of hundred were sold in Finland, Norway, Austria, France, and Spain. In 1981, Datasaab had accumulated considerable experience in designing, marketing, and maintaining ATMs, but unfortunately, losses had also accumulated. Ericsson took over Datasaab the same year, and it was indeed doubtful if Ericsson would be willing to continue such an unprofitable business.

However, the steady increase in the number of transactions soon made it necessary for the banks to install more and better ATMs. The Swedish saving banks, represented by the commonly owned company Spadab, worked out a specification for a new ATM with greatly increased note capacity and a very high degree of security to replace the Docutel machines. Banks were very important customers to Ericsson and they could not ignore such a major challenge from the saving banks. The ATM group in Linköping (former Datasaab) assumed the task of working out a plan of how to meet the requirements and if possible convince Spadab. However conditions were tough and it was a case of either winning or disappearing. Furthermore, the number one and only alternative was to find an external supplier and keep Ericsson's own costs to a minimum. However, Ericsson got the subsequent order in the beginning of 1984, and the result was a product that turned out to become the dominating ATM in Sweden and Finland for almost a decade.

3. HOW TO FIND A PARTNER

In 1982, the ATM group in Linköping started a worldwide search for a partner. It soon became apparent that no available standard product met Spadab's specification. Therefore a partner must be willing to undertake a development effort at their own risk, which narrowed the search considerably. Finally, they selected Omron Tateisi Electronics in Japan for further technical discussions and negotiations. Omron had a high reputation as a supplier of banking equipment, including ATMs, and they already had a number of usable components, especially the vital cash dispenser. Gradually a working concept evolved where a complete ATM was constructed with components from both companies as shown below. Ericsson/Omron specified the necessary safe which Spadab purchased directly from an external supplier.

Ericsson	Omron
Responsible for the entire system	Mechanical design
Main computer	Note dispenser
System software	Magnetic card reader/writer
Application software	Visual display unit
Communication software	Printers
Security	Customer detector
Overall design	Operator panel
Ergonomics	Power supply

The above concept generated intense discussion within Ericsson. Why favour Omron rather than Swedish and European suppliers? Could co-operation with Omron really work, having in mind cultural differences and geographical distance? Finally, the ATM group received approval to present the concept to Spadab, where it was met by outright mistrust. This slowly changed to scepticism and finally to approval.

4. HOW TO ORGANIZE THE PROJECT

In theory, the prospects for a successful project looked very good. Both companies were highly competent and most components were well proven in other products. However, one vital thing remained. This was the establishment of an organization between the companies which could function effectively. The ATM group (about ten persons) in Linköping, reinforced with a senior member from the purchasing department worked on the project. Omron established a similar group. Both groups had support from the main line organizations. The Ericsson group split up at the end of the project due to a major reorganization and a separate Ericsson department did the development of the application software. However, the original group handled the contacts between the companies throughout the project. Several of the Ericsson people had worked with foreign companies before, but none had been in Japan. Personal relations, common sense, and humour overcame cultural differences.

4.1 Meetings

Project meetings occurred about four times a year by turns in Linköping and Kusatsu. These meetings were thoroughly prepared in advance and all decisions were fully documented. They could bring up all kinds of problems, from contract issues to technical details. The Spadab requirements were sometimes somewhat vague and changing; nevertheless, they had to evolve into a crystal clear specification between Omron and Ericsson. In addition these meetings had a social function and also helped to establish good personal relations. It was of vital importance to create a spirit of trust and honesty in the groups. Then it was much easier to solve inevitable conflicts.

Spadab representatives often visited Kusatsu at the same time as the project meetings. Sometimes these visits resembled balancing on a knife edge, and even the Japanese hosts had some difficulty to keep a straight face. When project meetings extended to night hours, the hosts served noodle soup as refreshment. Perhaps "noodle" had a double meaning.

4.2 Communication

This was pre-internet time so high quality faxes were used for daily communication. Even detailed drawings would transfer immediately. The time difference between the countries was an advantage rather than a drawback. In the morning, the Linköping people picked up the night's fax from Kusatsu, and in the evening the answers were sent back to Japan. Thus, the project could proceed round the clock.

4.3 Working together

Technicians and designers from both companies worked together without intermediaries. This created a spirit of objectivity and they would solve technical problems together, without prestige considerations. It seems that the Japanese people pay much attention to even the smallest problems and it turned out that Swedes had the same attitude. At least that was true twenty years ago.

5. SOME TECHNICAL ASPECTS

It is not the intention of this paper to describe the ATM technology in detail since it is not of general interest today. However, two aspects are worth mentioning. These are logistics and security.

5.1 Logistics

It is a well-known principle in all production to keep the value of inventory as low as possible. The Japanese shipped the majority of the Omron equipment by sea and that activity required careful planning. One had to know the installation schedule well in advance and not be subject to major changes. To lower the inventory value it was decided as part of the design process that ATMs would not be assembled and fully tested before shipment to the customer. Instead, all ATM components met for the first time at the customer's site and installers assembled them without any major problem.

5.2 Security

The Ericsson/Omron ATM had a cash capacity of 10000 notes and consequently physical and logical security was a major concern. The individual customer's card number and pin code were processed in an Ericsson security module located at the keyboard. Data to and from the bank's central computer were encrypted. The transaction was either approved or refused and the security module sent an encrypted command to the cash dispenser located in the safe. By this arrangement, it was impossible to empty the cash dispenser by manipulating the signals to this unit.

The safe in an ATM has a fundamental weakness in the narrow slit through which the notes are fed to the customer. It is much easier to blow up a safe from inside than from outside and an attempt to put even small quantities of explosives into the safe must be stopped. If for some reason an ATM alarm was triggered, a shutter immediately closed the safe slit.

6. MAINTENANCE AND RELIABILITY

The first Ericsson/Omron ATM became operative at Växjö Sparbank in 1985. More than 900 machines were delivered to Swedish saving banks. In addition, 400 machines went to Bankomatcentralen, Nordbanken, and Automatia Pankiautomaatit OY in Finland. The Ericsson service organization was responsible for maintenance in Sweden.

Spadab originally specified 6000 transactions per month per ATM. In reality, the average load became twice as many. This reflects the way the attitude towards ATMs by Scandinavian people changed from suspicion to general acceptance.

In 1995, the banks recorded an average of 12 errors per year per ATM. However, only a few errors caused the ATM to shut down and the availability was between 94% and 95%. All attempts to steal money from the ATMs by brute force have failed.

7. THEN WHAT HAPPENED?

Since the ATMs sustained a high load and had a long life, the Swedish market was saturated for several years. When replacement started in the second half of the 1990s, Datasaab and Ericsson Information Systems had vanished long ago. As far as the author knows, Ericsson today has no interest in ATMs. At the end of the century, products that are more modern had replaced all Ericsson/Omron ATMs. The saving bank in Linköping donated one ATM to the Linköping University and it is now part of the small computer museum.

8. SOME CLOSING REMARKS

“The aim of the HiNC-1 conference is to re-examine our past and to extract experience and knowledge which we may use in order to make wiser decisions about future endeavours in development and in the use of information technology in the Nordic countries.” It is the author’s opinion that the ATM project has some elements which are well worth retaining for the future. The technology had good quality but was not spectacular. No invention occurred and no patent was granted. Simply, standard components from both companies were combined in a clever way; the result was a very powerful system meeting the customer’s specification.

Today’s spectacular communication facilities have made it possible to form alliances all over the world without geographical limitations. What we must keep in mind, however, is that communication is not enough. The Ericsson/Omron ATM project emphasized a number of other conditions for success:

- Both parties must have strong incentives to fulfil the project, and this must be re-examined during the project since conditions may have changed.
- The project manager must have sufficient authority and integrity to fend off attacks against the project. Such attacks could be lower overall priority, reorganization of the company, or even political considerations.
- Good personal relations and a spirit of trust between those directly involved in the project must be developed. Then it is easier to sort out unpleasant situations.
- Try to identify critical technical issues and keep them to a minimum. Otherwise, the schedule tends to get out of hand.
- Technical people from both parties must be given the opportunity to work together.
- Project managers must learn “to smell a rat” when vague problems are conveyed from people who are not verbally gifted or unwilling to admit a mistake.

To develop a good project climate takes time — and time is a rare commodity nowadays.

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NOTE

Saab Aircraft Co in Linköping owned Dataaab until 1978 when it became a separate company, Dataaab AB together with Stansaab AB in Stockholm. In 1981, Ericsson Information Systems AB acquired Dataaab AB followed by Nokia in 1987.