



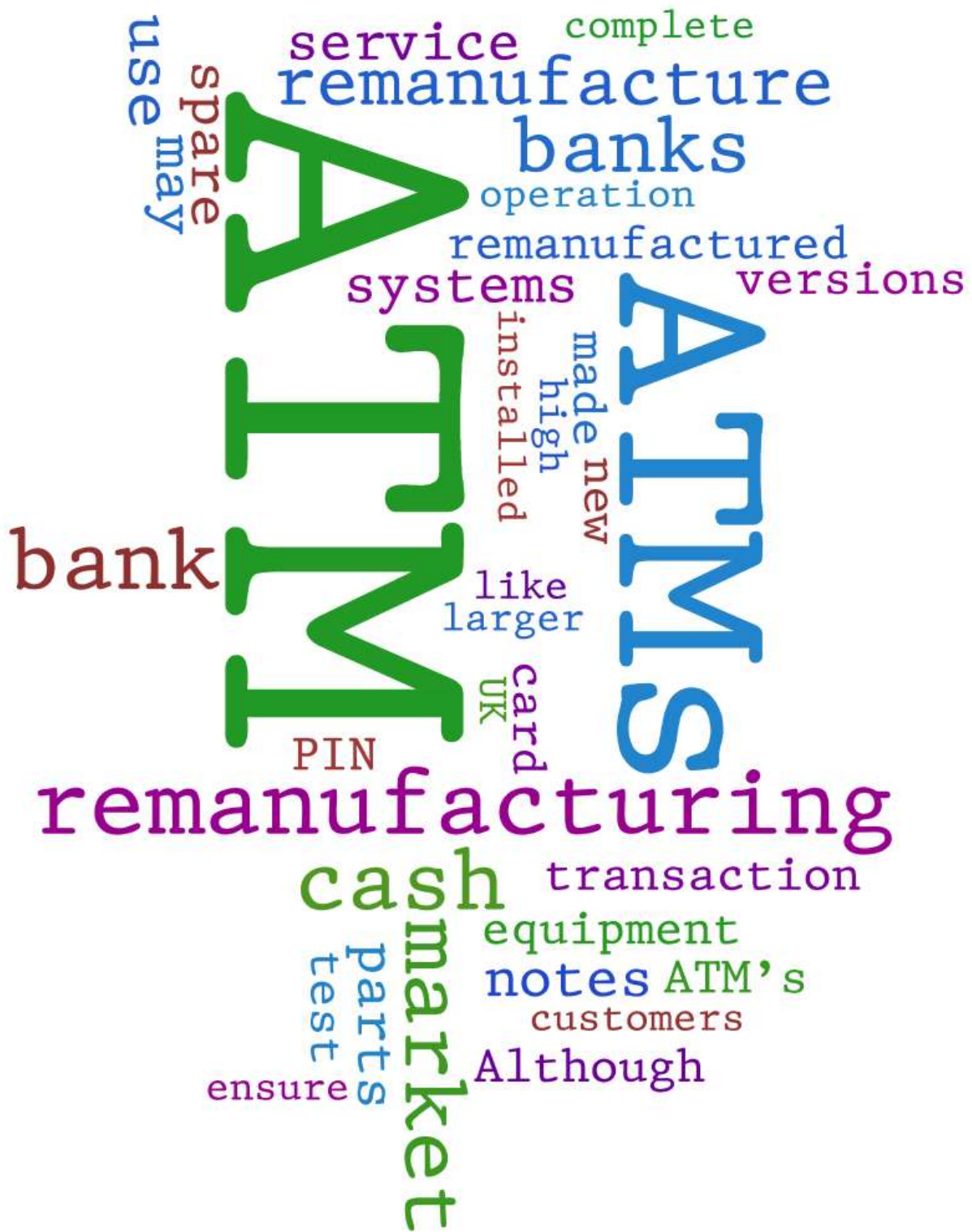
Product Group Report: ATMs

An assessment of the remanufacture of
automated telling machinery

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1 Overview

The first ATM was developed and installed in the City Bank New York in 1939 and was removed within six months due to lack of customer acceptance. The first of the modern ATMs was installed in Enfield, London in 1967 by Barclays bank and would only accept vouchers or tokens. It was the mid 1980s before the ATMs were widely used with the insertion of a plastic card and PIN (personal identification number).

There are two types of ATM:

- Mono-function devices: This has only one type of function such as cash dispensing or statement printing.
- Multi-functional devices: These will, in addition to cash dispensing and giving statements, accept deposits, pays bills etc.

Both types are manufactured for indoor or outdoor use and can be located in any situation from service stations on the motorway to supermarkets, as well as banks.

Most ATMs are connected to all the bank networks to enable their customers to access their personal bank account even if their bank has not got a branch in their location. To enable this, a communications standard, ISO8583, is adopted worldwide.

Underwriters Laboratories (UL), an independent product safety laboratory organisation, has a test standard for ATMs called UL291. For ATMs that store cash only during business hours the ATM has to be designed to withstand a physical attack for more than five minutes, enough time for someone to call the police. ATMs outside bank premises that hold cash 24 hours a day conform to a higher UL test certifying that they can withstand physical attack for more than 30 minutes.

There are no hard figures for the number of ATMs worldwide, but estimates by ATMIA place the number of ATMs in use to be over 1.5 million in August 2006. Just for interest the most southerly of these is installed ATM is in McMurdo Station, Antarctica and most northerly at Grise Fiord, Nunavut, Canada. The market is growing, with USA, Canada, Europe and Japan having the highest number in relationship to the population, with high demand for new ATMs in the Asia/Pacific area as well as Latin America.

Prices of ATM have come down by more than half since the boom sales that began in 1996. The entry level for ATMs has changed with shops and commercial premises being able to enter with the newer versions that are leased by companies that charge for each transaction. The cost of these is around £3,000 per ATM. This is expanding the ATM sites in the UK dramatically as we see them being installed in high street shops as well as the bigger stores and supermarkets. Currently 62% of UK ATM's are located outside bank premises.



The ATM versions in bank are considerable more expensive at approximately £20,000 each that is due to the extra security and larger capacity.

The move towards the cashless society will not mean the demise of the ATM, conversely the numbers will grow the need for automatic customer handling for services like topping up debt cards and mobile phone cards. The system could be expanded to include getting cinema and theatre tickets, hotel reservations, repeat prescriptions and others services that can be included to speed up services in a world that is getting increasingly busy. With organisations wanting to reduce their costs, ATM's are less expensive than having staff.

The latest innovation is the combined Pay phone booth and ATM. As pay phones are in locations where there is high numbers of people this makes them ideal for ATM's.

2 ATM design

An ATM is typically made up of the following components:

Hardware:

- CPU - (Calculation and communication to central hub) This is the main computer to control the ATM.
- Magnetic reader - (card or card and chip) To read the credit cards issues by the banks.
- PIN pad - (to enter the PIN and amounts required).
- Display – (for the customer to see the transaction) Was the CRT type but with the smaller versions this is changing over to LCD flat screens.
- Function Buttons – (located near the PIN buttons for operation selection)
- Record Printer – (for the customer to have a record of the transaction)
- Transaction printer – (recording each transaction locally in the ATM). Not seen by the customers; used to track the ATM operation and as back up if the ATM fails.
- Vault – (to store the machinery and money securely).
- Housing – (to hold everything together and aesthetics).
- There is also a crypto-processor held within the secure area that is the device that ensures secure transactions by encoding the communications with the banks.

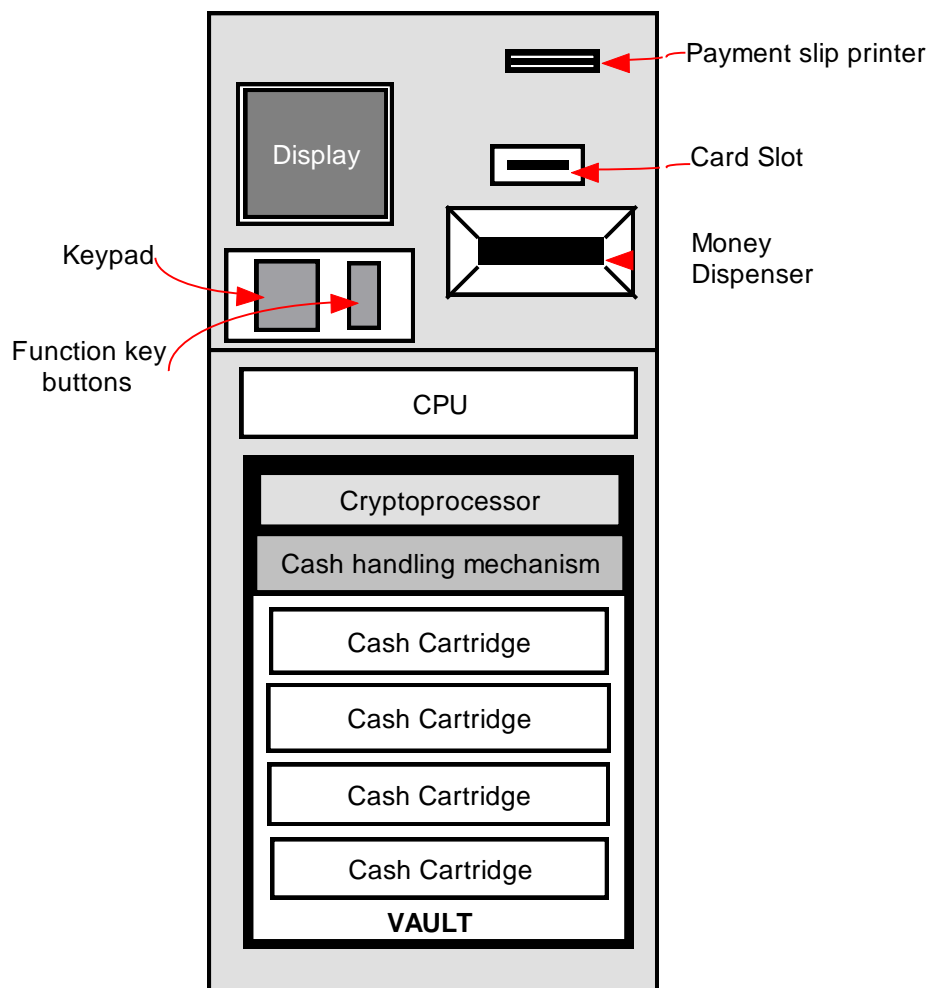


Software

- There are several platforms used Microsoft Windows operational systems e.g. 98, NT or XP and also Sun Microsystems's Java.

Fig. 1 shows the approximate layout of an ATM. Security is paramount and an ATM is effectively a safe with a dispensing mechanism. It is vital that systems with information are kept safe and the ATM operator's cash is not lost.

Figure 1: Typical ATM layout



Although the basic operation is simple, to dispense the right amount of cash when required to the right person, it requires a complex electromechanical system to move the cash from the right cash tray, count it and verify. Every time a customer puts a card into an ATM, the card reader decodes the unique ID details from the magnetic strip on the back, and asks for the PIN. The ATM links with the relevant bank and checks the PIN and card are correct and passes a message back to the ATM to allow the transaction.

The ATM uses several methods to ensure it does not give out the wrong amount requested. As well as counting the notes it will use light transmission to ensure there is only one note being issued and then measure the total thickness of all the notes requested against a known figure. Any worn or thin notes are rejected, before dispensing, into a separate area to be checked when the ATM is filled with cash.

There have been very few instances whereby an ATM has given out the wrong amount. The main reason for incorrect transactions has been human error where the notes were put into the wrong tray e.g. £20 notes in £10 note tray. Although this is now been made almost impossible to do in the later versions it does happen, but with the transaction data held within the ATM the customers benefiting from the error can be traced and the monies recovered.

Reliability has to be excellent and the ATM has to work correctly dispensing the right amounts of cash and work 24 hours a day. This requires the back up computer system linking all the banks and ATM's to be working 24 hours a day throughout the world so that the customers can use the ATM to obtain cash wherever and whenever they need to in every time zone.

3 Remanufacturing issues

There is a vibrant market for remanufacturing the larger ATMs of the type found in banks and the trading of ATM spares across the world. The major banks are taking the lead working with their service companies to offer a worldwide service. These major banks and the six biggest UK manufacturers like control most of the complete ATM remanufacture. This has arisen for security and commercial reasons, but acts as a barrier to other remanufacturing organisations by controlling the spare parts provision to other companies trying to work on their products.

Issues:

- The larger ATMs are large and heavy and will need specialist-lifting equipment to transport them into a workshop and on to another location.
- Larger items of equipment require specialist workshop equipment to ensure safe working practices while remanufactured.
- Obtaining spares for the larger ATMs, typically installed in bank premises, is difficult as the main banks control them and their main suppliers, and supply to other remanufactures is limited.
- Testing the computer and communication with the central banking systems will have to be set up.

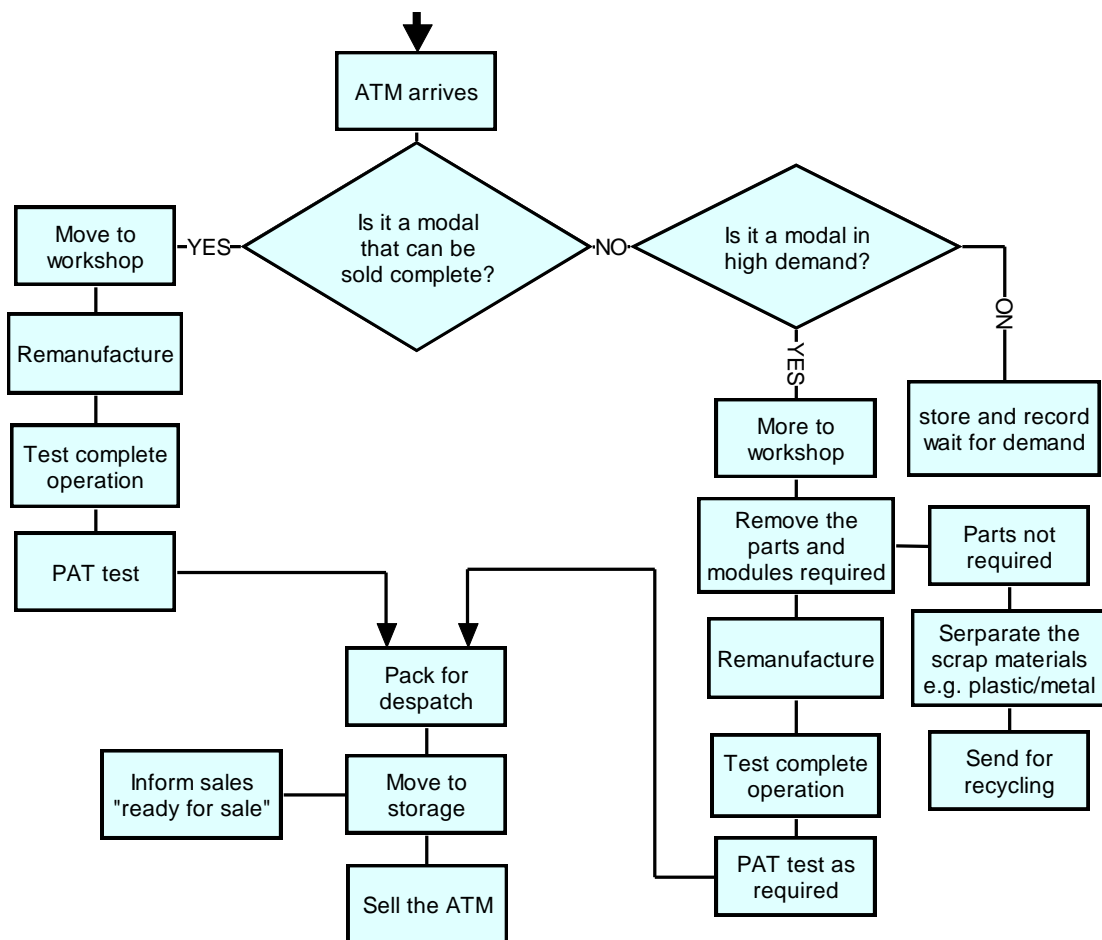


- To test the operation of the ATM the remanufacturer will have to purchase test money from the notes producers like De La Rue that are made from the same paper stock as real money but printed as test notes. These get worn out regularly and require replacing.
- All completed ATMs and spare parts (if they are in the form of modules) will have to be PAT tested to ensure electrical safety.

The typical remanufacture operation is shown in Figure 2 below and is based on the ability to find markets for complete ATMs or for selling the spare parts.

As with all remanufacturing businesses any equipment discarded during the remanufacturing process will be recycled with minimum landfill.

Figure 2: ATM remanufacturing sequence



The banks have systems in place to monitor the usage of their ATMs and will exchange their higher use ATMs and move them to a quieter location after remanufacturing to prolong life.



There is a large global market for remanufactured spare parts with over 200,000 sites on the Internet. ATMs are built modularly and these modules are remanufactured and stored to enable quick delivery to maintain the ATM systems.

The newer designed ATM that are positioned in locations like motorway service stations and shops are not manufactured as robustly as the large bank versions and are seen to have less opportunity for remanufacturing. Although their lower price (and hence remanufacturing value differential) makes them less commercially attractive to both the remanufacturer and the prospective customers, this product is no different to other types of electromechanical equipment. Smaller businesses that are extremely cost-driven may therefore fuel a rising market in these smaller ATMs.

4 Markets

Currently the UK market for remanufactured complete ATMs largely comprises the banking industry and the leading manufacturers who, with their partners, engage in new build and remanufacturing. Cooperation allows them to manage the deployment, exchanging the high use ATMs to low use areas to ensure maximum life while controlling the security. Absolute growth in this area is likely to be low (in the UK, but perhaps not in developing countries).

Since there is a faster growing market for smaller ATMs, there is a larger opportunity to grow remanufacturing business here. However, it will still be hard for new remanufacturers to break into the complete ATM remanufacturing market as the original manufacturers are comfortable with these practices. On the other hand, there is a thriving market for remanufactured spares and modules for use to maintain the fast-growing global ATM inventory, which may form an alternative entry point.

A good example is SPC International, which has been in the business for fifteen years. It has developed a market for the supply of spare parts and modules to other service companies throughout the world at a price that is very attractive when compared to new. It is important to bear in mind that price may not be a dominant issue here; like aircraft, an ATM out of service is major failure of service, so speed of repair to maintain operational status is critical. Any organisation that can support a keen price with excellent logistics should have an edge.



5 Environmental

The transportation of the very heavy ATMs around the world for remanufacture has an obvious environmental impact. However, these costs must be balanced against substantial materials and energy saving made over manufacturing a new ATM.

Should ATMs have to be recycled, the majority of the material is steel (85%) with the balance being made up by rubber, plastics and Printed Circuit Boards (PCB's). Although there is a small amount of hazardous material in the PCBs there is very little in the ATM to pollute the environment. Although large, it is unlikely that this entire volume would ever go to landfill, for example. Greater issues exist around the uncontrolled export of unusable components – possibly hazardous – to developing countries for so-called reprocessing.

6 Conclusions

6.1 Opportunities

Although ATM's have been widely used in banks since the 1960s the smaller commercial versions are relatively new; these models are being sold to a diversity of organisations with varying needs. This market offers a potential for selective growth in remanufacturing services.

With increases in card-based and automated services, the role of the ATM is evolving. Extracting maximum value from the upgrade of old devices also offers potential for remanufacture. Similarly, the development of ATMs integrated with traditionally separate systems, such as telephone booths, may require specialist rebuild capabilities.

For the current stock, this report has identified two markets:

- Complete ATM remanufacture. This may be largely restricted to the smaller, cheaper ATMs now typical of shops, stores and retail outlets.
- Spare part or module remanufacture. Certainly remanufactures not aligned with a bank or one of the major manufacturers would find the spare part market easier to enter, selling via the Internet. Alternatively, sophisticated operators who can offer high quality, fast response turnaround and logistics may have an advantage.



6.1 Barriers

For complete unit remanufacture there are significant barriers:

- The need for heavy lifting equipment.
- Extreme issues of security, confidentiality and systems auditing or verification.
- The need to be validated and approved for access to test money.
- Agreements with ATM manufacturer to get access to spare parts.

It is therefore highly unlikely that anyone who does not already have one or more of these capabilities, either by already being in the industry, or in a related high-security sector such as military, will be able to enter.

6.2 Enablers

The enablers in this sector are of more assistance to the component or sub-assembly dealers:

- ATM technology is electro-mechanical and the majority of parts that will be faulty or require replacing during remanufacture will be mechanical. The electronics is based on known technology from the computer industry. This allows the ATM's to be remanufactured by workshop personnel who are not so qualified, working on the cleaning up and resetting of the mechanism. They will have to be supervised and the final checks made by a qualified engineer.
- New legislation such as WEEE and ROHS directives may assist in opening design standards or specifications to non OEMs to enable reuse.

