CHAPTER 1

The scope of the research

1.1   General background to the problem

1.1.1 The scope of the problem

Retail financial services have been evolving at a great pace in the recent past. Issues that have had to be addressed include (KPMG *s.a.*:6):

- Declining margins;
- consolidation;
- increasing shareholder demands;
- new regulatory pressures;
- growing complexities and costs of technology;
- new market entrants; and
- higher customer expectations.

In this changing global financial services market, the role of retail banks is continuously being redefined, specifically with reference to the provision of cash to a global society, which despite the move towards a cashless world, continues to prefer cash as a method of payment in concluding transactions. It is claimed that 50% of all payments world-wide are made with notes and coin. The question of cash remains central to how banks perceive their roles and strategies as well as how they are perceived by their customers. (De La Rue *s.a.*:2)

Given the fact that retail banks have to provide for the needs of their customers with regard to cash, the following illustrates the scope of the problem:

- Retail banks have to carry certain amounts of cash at branches, agencies and in automated teller machines (ATM's), but in doing so incur certain costs.

- The nature of the cost of providing cash facilities, has to a certain extent, been obscured due to a reluctance to regard cash as an inventory item. This unwillingness is most probably the legacy of accounting practice, which must be appreciated.

- The cost elements involved in providing cash facilities *inter alia* include holding cost, insurance cost, transportation cost, processing cost and shortage cost.

- Various other factors exacerbate the cash replenishment problem, for example, unpredictability in demand patterns and unreliability in supply lead time.

The result of the above is that retail banks tend to hold excessive cash at their various cash points (be it a branch, agency or ATM). If a holistic view of the problem is taken, identifying the true nature of all of the costs involved, without overemphasizing a single element, it would lead to a reduction in the amount of cash held at a cash point and it would minimise the unnecessary movement of cash, an activity that hardly adds value from the customer's perspective. It is claimed that *"cash frustrates bankers because the customer is reluctant or unwilling to pay for cash services"* (De La Rue *s.a.*:9).

Although the problem of providing cash in the correct quantities, and denominations, and at the right time, is common world-wide, a number of factors specific to the Republic of South Africa contribute to the extent and scope of the problem locally. Oosthuysen (1995:3) states that South African banks in general are faced with a number of challenges such as increased local and international competition, an increase in fraud and money laundering activities, bank robberies, customer resistance to excessive price increases as well as aggressive and innovative marketing initiatives. The specifics of the South African situation are discussed further in Chapter 3.

1.1.2 Quantifying the need for a solution

During an interview with representatives of De La Rue Cash Systems, UK, the following claims were made to illustrate the ignorance which exists globally with regard to the problem of optimising cash provision:

- 20% of all retail banks world-wide are aware of the problem of optimising cash provision and are attempting to address it.
- 30% of all retail banks world-wide are considering addressing the problem, but are not yet doing it.
- 50% of all retail banks are not even aware of the problem or of the benefits that may accrue if the problem is addressed.

1.1.3 Sources of profit in retail banking

The increasingly competitive and complex environment of retail financial services has compounded the focus on key profit drivers and has led to fundamental questions about the management and exploitation of distribution channels (KPMG *s.a.*:6). It is important to note the two major sources of profit for retail financial service institutions. The first source of revenue is loan activities, *i.e.* the difference between income on funds lent and the cost of deposits. The second source is commission and the fees recovered for financial services rendered (Falkena *et al.* 1995:68). From the above, it is obvious that the cost of deposits detracts from the first source of income. Therefore if anything can be done to reduce the cost of deposits, it will lead to an increase in profit.

In a thesis submitted to the Department of Applied Accountancy, UNISA, in 1995, Oosthuysen investigates the problems with current management information reporting in South African banks, which is not timeous and lacking in reliability. He states, *inter alia*, that information regarding the cost of a product and the profitability of a product is not readily available. The provision of cash is but one of the products (or services) provided by retail banks. As

stated by De La Rue (s.a.:2): *"As banks attempt to unbundle costs to identify cross-subsidy across product lines, the cost of cash has come in for increasing scrutiny"*. Therefore any investigation into the cost of providing this service will be to the advantage of the industry.

1.2   Definitions

According to Falkena *et al.* (1995:68) a commercial bank is defined as *"... an institution carrying on a business of which a substantial part consists of the acceptance of deposits of money withdrawable by cheque, draft or order"*. This definition covers the most important activities carried out by commercial banks, although a wide variety of other functions are performed by these institutions. Most commercial banks are mainly involved in retail services, *i.e.* aimed at the individual client, although the emphasis is shifting to corporate or wholesale services. Due to the emphasis on individual banking services, this type of institution is often referred to as a retail bank. As various "non-banks" enter the financial services market (refer to paragraph 3.5.3 for further elucidation in this regard), it is perhaps cash handling that distinguishes and defines the retail bank (De La Rue s.a.:2).

1.3   Objectives of the research

1.3.1 Formulation of objectives

The main objective of the research is to establish a scientifically-based decision-making procedure for optimising the amount of cash to be held at a cash point (be it branch, agency or ATM) at any time without compromising the customer service level or incurring undue cost. In reaching the objective, the problem has been divided into a number of subproblems, each having its own objective. The subproblems are as follows:

- Determining the cost parameters describing the nature of the problem of cash provision in a South African context.

- Investigating the characteristics unique to the South African retail banking environment.

- Determining the nature of the demand distribution (a function of deposits and withdrawals) for a cash point.

- Developing a forecasting method appropriate for the retail banking environment in South Africa.

- Investigating the existing order policies used by retail banks, as well as alternative order policies, with the aim of improving the process of cash replenishment.

As a result of the investigation into these subproblems, a generic decision model is developed which may be used to optimise the cash replenishment process for retail banks. The decision model is used to evaluate the impact of changes in the nature of the cost parameters, changes in the demand distribution, as well as the impact of other factors, for example unpredictable lead time.

1.3.2 The use of management science in banking

Miller & Orr (1967:133) commented as follows on the use of operations research in the field of finance:

> *One stream of current research in finance involves the extension to the field of finance of the methods and approaches that have come to be called 'operations research' or 'management science'. Researchers working along these lines try to develop mathematical representations or 'models' of typical decision making problems in finance and, where they are given the opportunity to do so, to test and apply these models in actual decision settings.*

They continue to comment that this research is a mere trickle if compared to work done in other fields, but is expected to grow as the computer technology develops.

In 1978, Kalman (1978:16) commented as follows on the use of Management Science in the field of finance:

> *Recent advances in the development of quantitative models for finance and banking, along with the increasing utilization of electronic computers, have made it feasible to adopt a management science framework in approaching many types of financial problems.*

Concurrent with the previous comment, Fabozzi & Trovato (1978:24-29) reported on a study that was carried out, to establish the use of quantitative techniques (such as linear programming, queueing theory, simulation, game theory, statistical sampling and so forth) by commercial banks. The study included 92 banks, of which 13 were non-users of quantitative techniques. A correlation was established between the size of the bank (in terms of deposits) and the use of the techniques - smaller banks did not make use of the techniques. When asked why the techniques were not used, the main reason was a lack of understanding of these techniques, rather than the expected answer of high cost. The report on the study concluded by predicting that the use of these techniques would definitely increase especially as top management realised that such models do not replace decision makers, but assist them in making improved decisions.

Eilon & Fowkes (1972:1-24) provide a good overview on the use of Management Science in banking and finance, whereas Brunsen (1976:1-6) specifically provides an overview of the use of linear programming as a bank management tool.

1.3.3 The suitability of inventory models in approaching the problem

As early as 1952, Baumol published an article in the Quarterly Journal of Economics titled *The transactions demand for cash: An inventory theoretic approach* (Homonoff & Mullins 1975:3). In this model the transaction demand decisions were formulated as a deterministic inventory control problem. At the Graduate School of Business Stanford Finance Conference held in June 1966, Miller & Orr presented a paper on *An application of control-limit models to the management of corporate cash balances* (Miller & Orr 1967:133-151). Homonoff & Mullins (1975) expanded on the Miller-Orr model in a book titled *Cash Management: An inventory control limit approach.* None of these publications specifically investigated the position of a retail bank relating to cash management. However, the research certainly points to the suitability of the underlying theory to solve this class of problem.
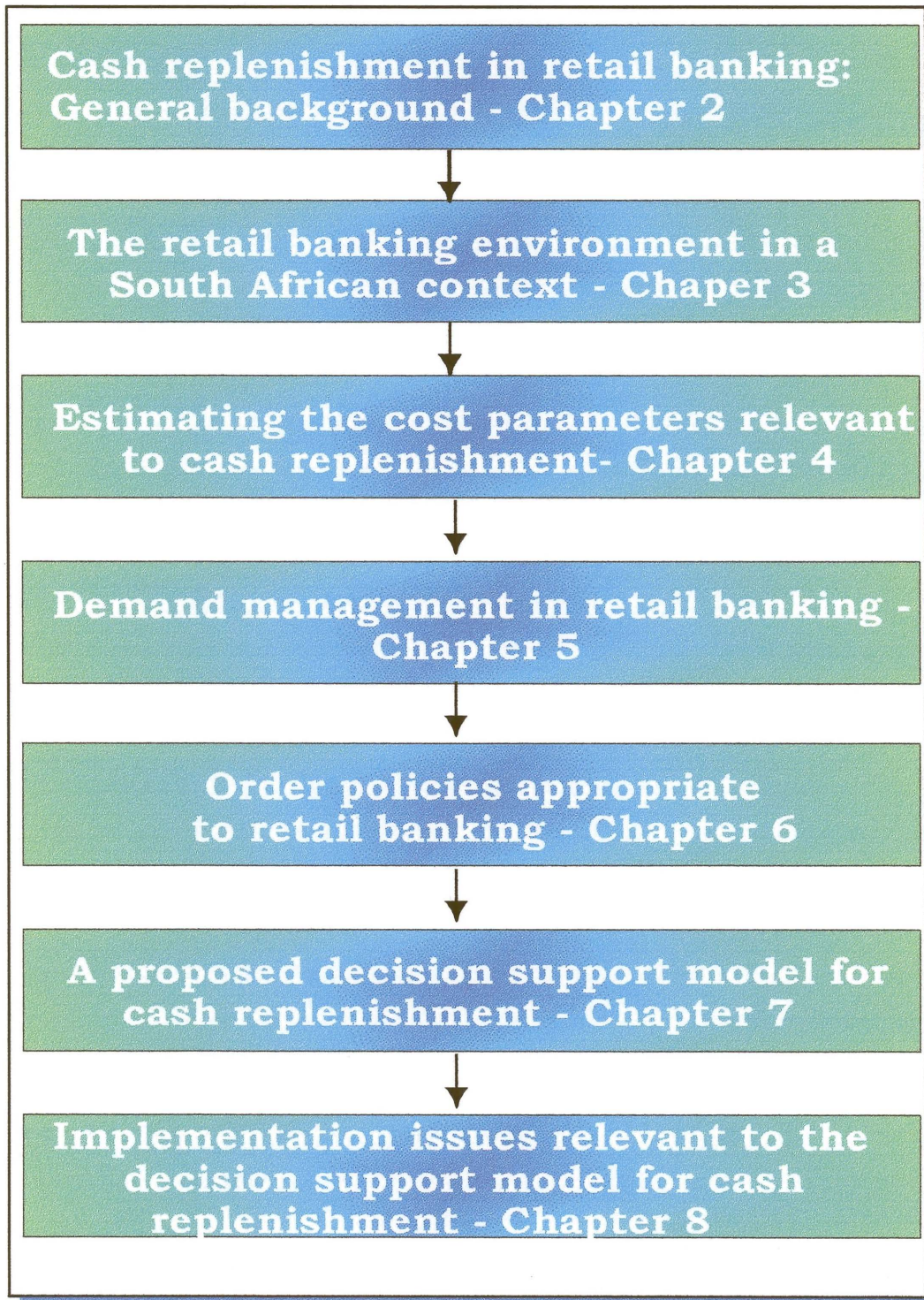
1.4 Research methodology

Figure 1.1 provides a graphic overview of the chapters of the research report.

The methodology used to investigate the use of inventory theory to model the cash management problem experienced by retail banks, was the following:

- The general problem was investigated as determined by the features of the specific situation in retail banking, culminating in the development of a conceptual mathematical model of the total cost of handling cash - reported on in Chapter 2 of the thesis.
- The features of the problem specific to the South African retail banking environment were investigated - reported on in Chapter 3 of the thesis.
- The cost parameters, as included in the conceptual model of the total cost of handling cash, were empirically determined by means of a case study - reported on in Chapter 4 of the thesis.

Figure 1.1

**An overview of the research into the cash replenishment problem
in retail banking**

Cash replenishment in retail banking: General background - Chapter 2
The retail banking environment in a South African context - Chaper 3
Estimating the cost parameters relevant to cash replenishment- Chapter 4
Demand management in retail banking - Chapter 5
Order policies appropriate to retail banking - Chapter 6
A proposed decision support model for cash replenishment - Chapter 7
Implementation issues relevant to the decision support model for cash replenishment - Chapter 8

- Chapter 5 investigates the nature of demand and withdrawal patterns for the case study presented in Chapter 4. Since no formal demand forecasting takes place at this particular branch, various methods are proposed to forecast the demand.

- In Chapter 6, the existing order policy of the branch described in Chapter 4 is investigated so as to obtain clarity regarding the impact of the various parameters on the problem. Alternative policies are investigated and evaluated.

- Chapter 7 proposes the structure for a decision tool for use in a retail bank.

- Chapter 8 addresses implementation issues relevant to the successful use of the decision tool in cases other than the one under review.

1.5   Limitations of the study

The study was limited to an investigation at one particular branch of a leading South African retail bank. The figures used to describe cash movements at the branch obviously were of an extremely sensitive nature and were fairly difficult to obtain due to the way in which transactions are reported. The accuracy of the data provided by the branch could not be verified, but had to be accepted at face value. Although a particular case was investigated, a concerted effort was made to point out how the methodology may be used in the generic situation.

During the period under review, the branch relocated to an office complex across the street from its previous location in probably one of the busiest shopping malls in the city. This had a direct impact on the ATM withdrawal patterns at the two ATM's located at the branch. As the branch operations manager stated at the time, it took the customers almost a month "to find us again", before the withdrawal patterns started to normalise, although at a level much lower than before due to the lack of passing traffic. In addition, soon after the research was carried out, a number of other branches of the same retail bank were

consolidated into this one particular branch. This would impact on the validity of the branch specific factors determined as part of the research.

In addition changes at SBV, the sole supplier in this particular case, as regards ownership may have a bearing on the supply cost structure. Rumours of a management buy-out or a take-over by the South African Reserve Bank in contrast to the current ownership may impact directly on how the cash is supplied. Some of the constraints adhered to by the branches at present, for example a single delivery per week is preferred, may then be challenged.

1.6   Contribution to knowledge base

Although limited to a particular branch, the study proved the applicability of industrial engineering principles in a service environment, where the added value of having the optimum cash amount available when required would impact directly on the bottom line of the bank and thereby achieve a cost reduction which can only enhance share-holder value. In the changing environment confronting retail banks in South Africa, enhanced share-holder value is of the utmost importance to increase competitiveness and long-term survival.