CHAPTER 8

Implementation issues relevant to the decision support model for cash replenishment

8.1 Introduction

The aim of Chapter 8 is to discuss various issues relevant to the implementation of an integrated inventory management system in a retail banking environment specifically aimed at improving the cash replenishment process. Figure 8.1 shows the relevance of this chapter with regard to the research project.

In addition to discussing general issues that need to be considered, the chapter will also address specific issues that need to be improved.

8.2 Inventory management across the supply chain in retail banking

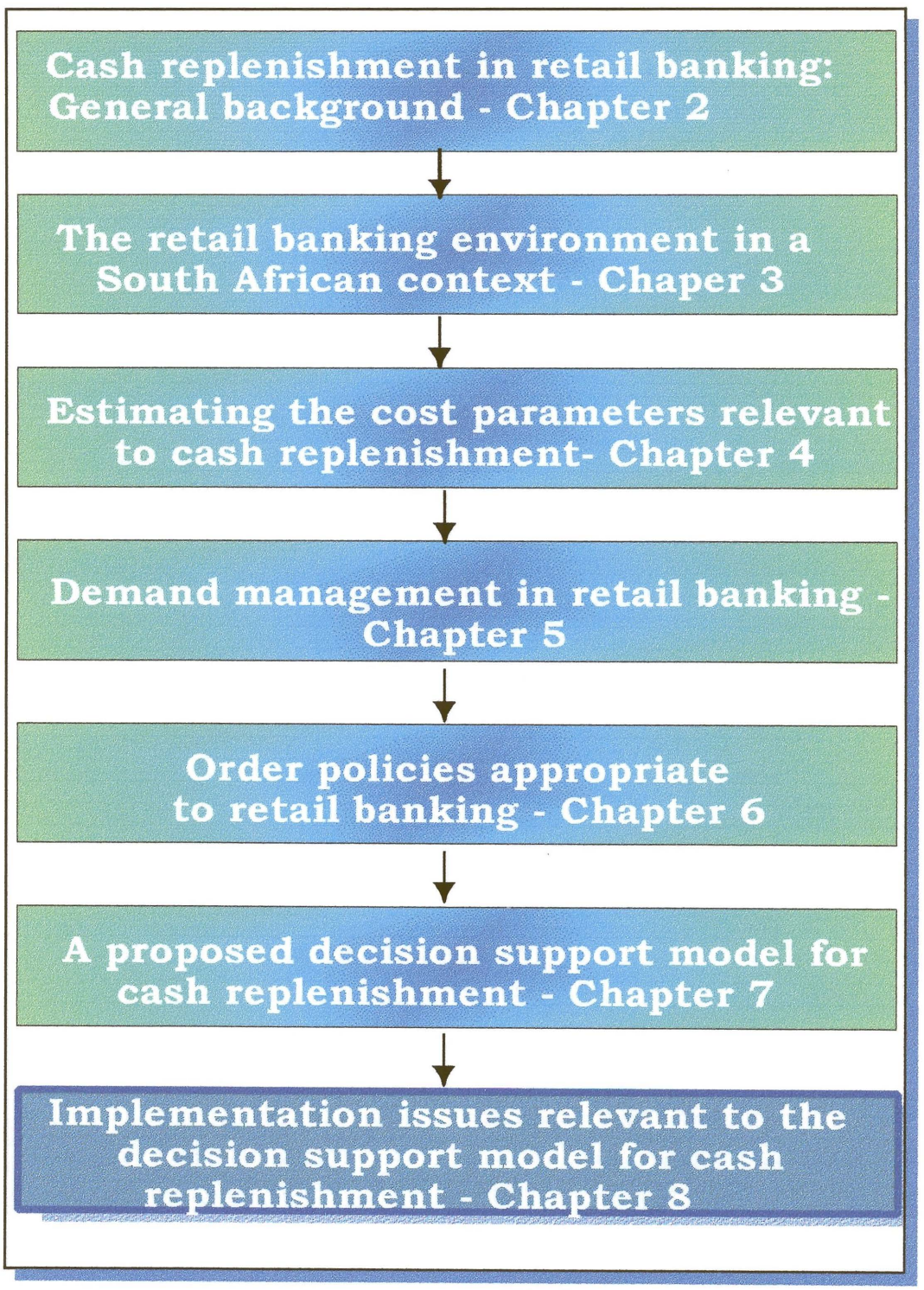
Handfield & Nichols (1999:8) discuss the changes that have come about in global markets resulting in an increasingly competitive environment. The impact of these changes is expressed as follows:

> *Managers throughout the supply chain are feeling the full effect of these changes. Cutbacks in staffing are forcing managers to handle a greater number of channels with fewer people, while cost pressures require that they do so with less inventory.*

From the above quote as well as the quote in paragraph 2.3.2.5, the critical importance of reducing inventories (cash or otherwise) is evident.

Figure 8.1

The structure of the report indicating the relevance of Chapter 8



Stevenson (1999:561) describes management as having two basic functions concerning inventory. The first is to establish a system of keeping track of items in inventory and the second is to take decisions on how much and when to order. The decision support model developed in this thesis sets out to facilitate this process at the branch level in retail banking, with the additional aim of reducing inventory levels without compromising the service level.

Stevenson (1999:561-567) expands on the requirements for effective inventory management as follows:

- A system to keep track of the inventory on hand and on order.
- A reliable forecast of demand that includes an indication of possible forecast error.
- Knowledge of lead times and lead time variability.
- Reasonable estimates of inventory holding costs, ordering costs and shortage costs.
- A classification system for inventory items.

With the exception of the last requirement, all others in the above list are relevant even when the inventory item concerns cash.

Pienaar (1999:3-7) states that optimum throughput through the supply chain should be achieved by design and not by accident and should *inter alia* include a careful plan of supply chain activities, close control of the execution of the planned supply chain activities and continuous reporting of the results of the supply chain activities. He continues that any business process is dependent on accurate data records, the best possible available demand information as well as the best possible supply information.

It is obvious from the discussion that the proposed model attempts to set up an effective system to support inventory management issues across the supply chain. However, some issues relevant to the successful implementation of the

model at branch level will have to be addressed to create an environment conducive to the use of such a model.

8.3 Implementation issues at branch level

The first step in implementing the proposed decision support model would be to investigate the factors influencing the cash replenishment problem . A distinction between generic factors (factors characteristic of South African retail banking) and branch-specific factors (those elements unique to a particular branch) will have to be made.

The second step concerns support issues necessary as enablers in this particular situation. These enablers include the necessary information systems as well as the training required by the branch operations manager and his/her support staff to use the model effectively.

Finally, an implementation plan at branch level is proposed as well as the steps required to maintain the decision support model post-implementation.

8.3.1 Generic versus branch-specific factors

As has been stated on a number of occasions in this thesis, specifically in Chapters 2 and 4, certain parameters relevant to the decision support model are of a generic nature. The supply cost, for example, is generic irrespective of the branch location. To determine the scope of these generic factors, it is proposed that a study similar to this, is carried out at an additional five to ten branches to verify that the factors described and quantified in Chapter 2 and 4 are indeed generic and have been quantified correctly. At present, the cost of holding cash inventories at the branch is not seen as something which should be managed at branch level. In fact, the branch does not even consider this as an issue which

if reduced, could result in a bottom line saving.

Other elements, particularly those discussed in Chapter 5, are branch-specific. It is obvious that each branch will have unique withdrawal and deposit patterns which have to be determined and tracked to ensure that changes are monitored and catered for.

Stevenson (1999:117) proposes monitoring forecast error by means of comparing forecast errors to predetermined values or action limits. Errors that fall within the limits are judged to be acceptable, whereas errors outside of either limit signal that corrective action is needed.

The control chart approach proposed by Stevenson (1999:118) involves setting upper and lower limits for individual values rather than cumulative errors (as is the case with a tracking signal). The limits are multiples of the square root of the mean square error.

At present, no forecasting is done at the branch level as was described in earlier chapters. Obviously, if withdrawal and deposit patterns are not monitored on a continuous basis, the branch will not be alert to changes (gradual level changes or even cyclical behaviour). As was shown in Chapter 7, by combining forecasting methods with a more flexible approach to replenishing cash, a significant reduction in the average amount of cash held at the branch was achieved.

8.3.2 Support factors

From the discussion in paragraph 8.3.1 it is obvious that the branch operations manager will need to have accurate information continuously to take the "best" possible decisions regarding the supply chain activities at the branch. At present there is no transparency with regard to the amount of cash held at the branch

throughout the day. The branch operations manager is able to judge the amount of cash present in the branch at any time by physically going to the safe and observing the amount on hand. There is a limit to the number of times it would be possible for that person to physically perform that function. It is proposed that an information system is developed for the branch which will provide the branch operations manager with on-line information as to the amount of cash in the branch at any time during the day. In addition, it is proposed that deposit and withdrawal totals are monitored throughout the day, creating the necessary visibility if for example withdrawals are unexpectedly higher than forecast.

From the above it is clear that certain changes will be required from a systems point of view. However, the effect will be that although, as in the case of the branch investigated, cash inventory levels may be significantly reduced, the service level will not be impaired. By redesigning the information system, the branch operations manager will be in a position to manage and control cash inventory levels much better. Obviously this could then become a key performance area for the operations manager which should be evaluated on a continuous basis.

It will be crucial to provide the branch operations manager as well as his/her support staff with the necessary training regarding the decision support model. Issues relevant to the decision support model will include some basic inventory management theory and forecasting theory as well as training on how to use the redesigned information system.

8.3.3 A proposed implementation plan

The proposed decision support model was developed for a particular branch of a retail bank. Should the model be used for other branches, the following implementation plan is proposed:

Step 1

Test the validity of the cost parameters determined in Chapters 2 and 4 of the report for the branch where the model is being implemented. If the parameters are not valid, establish the scope of the cost parameter relevant to that branch.

Step 2

Establish historical withdrawal and deposit patterns for the branch as demonstrated in Chapter 5 of the report.

Step 3

Based on judgement, decide how much of the historical data patterns are representative of the situation and consider changes to the branch location, size, number of agencies, opening/closure of new branches/agencies, level of competition in the trading area (refer to paragraph 2.2.3) and so forth that in the near future may have a bearing on the data patterns at the branch.

Step 4

Investigate various forecasting models suited to the data patterns at the branch. As illustrated in Chapter 5, select a suitable method subject to the requirements of simplicity and ease of use from the perspective of the branch operations manager and his/her support staff.

Step 5

Use the forecasting model combined with various order policies to find the "best" policy for that branch as illustrated in Chapter 7.

Step 6

Monitor the forecast by means of the control chart approach described earlier. Take action should the monitoring of the forecast error indicate the necessity. This would include revisiting the "best" order policy since the data patterns have changed, *i.e.* return to Step 5.

Step 7

Monitor changes that have an impact on the cost parameters determined in earlier Step 1. Should changes occur, return to Step 5.

The proposed seven step plan will not only lead to successful implementation, but will guarantee post-implementation maintenance of the decision support model ensuring that accurate information populates the model.

Implementation at branch level will require the involvement of the branch operations manager and his/her support staff from the very inception of the project, and will require assistance from specialists who are familiar with inventory and forecasting theory. A task team comprising branch staff members and specialists should take joint responsibility for the implementation. Post-implementation, support should still be available from the specialist staff, but the responsibility and accountability for maintaining the model should be that of the branch operations manager. A suitable performance measure should be put in place to monitor the use of the model by the branch operations manager.

8.4 Conclusion

As quoted earlier in this chapter, supply chain activities should not occur by accident but by design. The system in use at the branch at present is very much an experience-based random effort with absolutely no theoretical foundation with regard to optimising the cash replenishment process. No performance measures are in place highlighting exceptional performance or even investigating the cost involved in providing this particular service element of branch operations. The proposed decision support model goes a long way to providing a means whereby supply chain activities will occur by design rather than by accident - a situation every manager irrespective of the environment in which he/she finds themselves, should feel exceedingly comfortable about.

CHAPTER 9

Conclusion

9.1 Research objectives revisited

As stated in Chapter 1, the main objective of the research was 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 was divided into a number of subproblems, each having its own objective. The subproblems were as follows:

- To determine the cost parameters describing the nature of the problem of cash provision in a South African context - this was reported on in Chapters 2 and 4 of the research report.
- To investigate the characteristics unique to the South African retail banking environment - this was reported on in Chapter 3 of the research report.
- To determine the nature of the demand distribution (a function of deposits and withdrawals) for a cash point - the investigation was reported on in Chapter 5 .
- To develop a forecasting method appropriate for the retail banking environment in South Africa - also reported on in Chapter 5, although it was clearly stated that the methods used were specific to the branch under investigation.
- To investigate 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 represented by typical branch of a South African retail bank.

As a result of the investigation into these subproblems, a generic decision model was developed which may be used to improve the cash replenishment process at branch level for retail banks in South Africa. Finally, some suggestions were made regarding the implementation and maintenance of the decision support model.

9.2 Research methodology

To investigate the cash replenishment problem the cooperation of one of the leading retail banks in South Africa was obtained. A typical branch was selected. The total withdrawal and deposit patterns as well as the ATM withdrawal patterns for a three month period during 1998 were investigated. The cost parameters relevant to the cash replenishment process were quantified. The approach followed was based on the classical inventory theory where the total cost of carrying inventory comprised three cost categories, *i.e.* storage cost, supply cost and shortage cost. Since the banks do not quantify the shortage cost, various assumptions regarding the scope of the shortage cost had to be made.

The next step was to determine the cost of the existing order policy followed by the branch. This figure was used as a benchmark once alternate policies were investigated. The investigation resulted in alternate policies which significantly reduced the daily cost involved in carrying inventory as well as reduced the average amount of cash carried at the branch. By reducing the average cash inventory level, the risk factor related to bank robberies was significantly reduced.

It was also shown, that the branch should consider using an appropriate forecasting method, since once forecasting was combined with an appropriate order policy, it was possible to reduce the cost of carrying cash inventories even further.

In conclusion, the research report suggested an implementation plan to be followed at branch level pointing out that certain changes to information systems were required. In addition, training needs were identified to enable the branch operations manager together with his/her support staff to successfully use the decision support model.

9.3 Results achieved

Table 7.4 compared the existing approach followed at the branch (which is mainly experience-based and largely of a random nature) to the proposed method based on the research at that particular branch. It was shown that the daily cost of carrying cash inventory could be reduced from R2 729 per day to R2 371 per day. This represented a 13 per cent bottom line cost reduction at the branch or R358 per day. As mentioned in Chapter 7, if this result is extrapolated for similar branches within the portfolio of this particular retail bank, the potential annual saving exceeds R8 000 000. Figure 7.3 showed the reduction in average inventory achieved following the proposed method as compared to the existing approach followed at the branch.

It was pointed out in Chapter 8 that some elements of the research would apply at any branch of this bank and for that matter, probably at any retail bank branch in South Africa. However, those elements that are branch-specific were also pointed out.

9.4 Contribution to the knowledge base

As pointed out in Chapter 1, the research was limited to a particular branch of a South African retail bank, 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.

9.5 Future research

It would be prudent at this point to indicate possible further research opportunities emanating from the research. It is quite clear that more work needs to be done to distinguish between branch-specific and generic factors impacting on the cash replenishment problem. In addition some elements which were varied on an *ad hoc* basis in this instance may be quantified in a scientific way. Examples that come to mind include safety stock levels, service levels, the determination of the trading area and many more. This was but a first attempt to show the advantages of approaching the problem in a more scientific way than is at present the case.

Finally, the role of industrial engineering in the service environment may no longer be challenged and the particular role in the retail banking environment should be a *fait accompli*.