Exploiting Simulation for Product Returns in SMEs

Muhammad Ejaz Ahmed and Muhammad Latif

Abstract - For retail small to medium enterprises (SMEs) product returns have often been seen as an irritant, a cost centre and an area of potential customer dissatisfaction. The paper reports that product returns in retail SMEs can no longer be ignored in the current economic climate. Fierce competition coupled with small profit margins means that retailers find it increasingly difficult to ignore lost revenue from product returns. The paper introduces and details product return procedures normally used in retail SMEs. A focussed look at two similar retail SMEs (Alpha and Beta) in the consumer electronics market reveals very similar product return practices that under close scrutiny appear to be inefficient. Previous research reveals little or no work has been done to model and simulate product return procedures in retail SMEs. The research study uses discrete event simulation (DES) to model and simulate the effects of product returns in SMEs and explore strategies to reduce their affect on the supply chain. Witness simulation software has been used to develop a base model representing product return procedures from which inefficiencies were identified and reduced to produce an efficient simulation model. The results of this study have been well received with collaborating SMEs Alpha and Beta.

Keywords; Product Return Procedures, Discrete Event Simulation, Reverse Supply Chain

1. Introduction

In the new global economy, competition has become so fierce coupled with small profit margins that retail Small to Medium Enterprises (SMEs) find it increasingly difficult to ignore revenue lost from product returns. Often product returns are a hidden activity and its effect are not realised until they become unmanageable. Product returns are now of major concern to many retail businesses as this directly affects their profits [1].

Traditional product return practices have been unable to respond to the changing and challenging needs of global businesses that have ventured into very volatile and competitive markets, based on instant and impulse purchases i.e. on-line. Managers are finding that traditional methods are "too late, too aggregated and too distorted" [2] to support a good returns policy. Some work has been done in the field of reverse supply chain to improve product returns policies and it's planning [3]. Analysis of previous research shows that this has mainly been based in the manufacturing industry [4], where the merchandise is directly returned to the manufacturers. Researchers have tried to improve methods in the return of merchandise to manufacturers, providing suggestions as to how returned goods can be resold after remanufacturing. Business Process Re-engineering (BPR) is used to define remanufacturing in simulations [5]. The whole process that covers the entire scenario is called reverses logistic in supply chain management [6]. Many researchers have identified the issue of unsold merchandise, remaining in depots due to different reasons, for example incompatible system, undesirable look, old fashioned, new inventions and fraud [7]. Researchers have tried to improve the co-ordination and cooperation between vendors and distributors regarding the restock of merchandise to some extent. However, due to the wider implications it is considered necessary to improve cooperation between customer, supplier, retailer and manufacturer [8].

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Product Returns

A product return is essentially a process of a reverse supply chain; it can also be called reverse logistics. If it is not managed properly then it can have the ability to de-stabilise an established SME. A system for product returns essentially interacts with:

- Customer
- Retailer
- Supplier (Manufacturer)

What is a product return

A product is returned to the retailer (vendor) because of various reasons, e.g. quality imperfection, incompatibility, expired, failed delivery, side effects when in use on human body or under distance selling regulation (DSR), [9]. Product returns have often been viewed by customers as a necessary evil, a painful process and, usually, unavoidable. For retail SMEs product returns have often been seen as an irritant, a cost centre and an area of potential customer dissatisfaction. Usually product returns are accepted during a set time frame after sale. There are many reasons for product returns, however they usually occur when customer is not satisfied with product, customer refused to take the product or the product does not fulfil their requirements e.g. product was faulty after purchase, distance selling, unclear view, not compatible with their demand, wrong description on web, missing accessories. Although there are reasons for these returns, they are unavoidable, however if the customer's

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response is due to poor services provided by the retail SME they may be controlled [10].

1.1 Types of products returns

Product returns are categorised into two classes.

Controllable Product returns: Controllable returns are the returns, which can be eliminated or minimised by some positive actions taken by the retail SME. For example this type of return usually occurs because of bad management, errors in publication on web, non standardized shipping, damage goods, wrong item and poor customer services [10].

Uncontrollable Product returns: Uncontrollable returns are the returns which cannot be eliminated or stopped by any actions taken by the retail SME. For example these returns can't be stopped because of distance selling regulation, faulty goods, change of mind and customer behaviour.

1.2 Effects of product returns on SME

The frequency of product returns can have a negative effect on business and become a painful process for managers to deal with the returns goods, but a well thought out procedure for product returns can ensure an effective way of dealing with product returns with minimum inconvenience between customer and supplier. In serious cases it can become unproductive for example when product lines have returns greater than 25% [11]. "Indeed, product returns cost U.S. manufacturers and retailers approximately $100 billion annually in lost sales and reverse logistics, reducing profits by 3.8% on average per retailer or manufacturer" [12]. The effect of product returns is much more prominent when the world economy is facing a financial recession resulting in a "credit crunch". All markets in an economy are feeling the effects of a credit crunch especially retail SME operating in consumer products. Many retail SMEs have lost their buying power due to the credit crunch [13]. In these circumstances it is very hard to operate retail SMEs without scrutinising product returns.

1.3 Effect of product returns on customers behaviour

Usually a customer shows negative behaviour against product returns because this is a waste of time, resources and sometimes money. However if they are facilitated by the company, satisfaction with the returns procedure and speed of response can have a positive effect on the customers perspective of the company and can develop confidence and loyalty. This is a good sign of a relationship between customer and retail SME. Customers with a good returns experience are far more likely to be loyal and make further purchases from the SME in the future [14].

1.4 Handling of product returns

After receiving a large number of returns the main focus of SMEs is how to manage them and how to decrease the percentage of product returns. This situation could be much worse if product returns rates are over 20% which then become costly if not managed properly [9]. Management of SMEs often try many experiments to handle the rate of returns. The experiment conditions are often very dependent on the frequency of products returns. If the return rates of products are controllable then a company can deal with it on a temporary basis but if the return rates of products are uncontrollable or "between" 10% to 20% then this needs to be dealt with on a permanent basis.

It is very difficult to understand and appreciate the dynamics of a product returns procedure within a retail SME using purely analytical techniques due to the operational and mathematical complexities involved. Solving the problem by using computer based process simulation would minimise the risks associated with any operational change and lead to an improvement in the overall effective efficiency (OEE). The aim of this study was to investigate product return procedures in retail SMEs and exploit discrete event simulation to improve the practices.

2. Process Simulation

It is known that computer simulation enables business processes to be modelled, better understood and has the potential to make improvements without incurring the traditional risks. Simulation is a process which defines the strategies in terms of business activity and captures behaviour which can provide the better understanding and practice for managers to apply on business process. Simulations are helpful for managers to understand their working environment for solving the complexity of system, documentation and obtaining quick reports. The process of interest is usually called a system with elements of logic, flow and a set of assumptions that describes the systems. These elements are a combination of mathematically or logical derived relationships. To verify a system in process we need to compose a model. If the model is simple enough then mathematical methods can be used to obtain exact result. On the other hand most real-world systems are far too complex model exactly using rigorous mathematics. In these cases, simulation is a useful technique that enables complex models of real systems to be built realistically and results estimated. Eventually a computer is used to assess the numerical data and characteristics of a simulation model [15]. Process simulation provides solutions to real and imaginary system's complex problems and gives the accurate representations of real world situations. It is very hard to obtain correct solution without simulation otherwise it would be time consuming, costly and have no benefits. There is a rising demand in engineering, military, biology, power energy, aeronautical technology and business process to conduct more research into the use of simulation to improve output in these fields. Simulations are of a benefit to businesses, helping them to achieve targets with the lowest possible outgoings and help to implement cost saving strategies to enable long term business survival. The problems for the organisations that they can't implement change without a clear understanding of results and what impacts of the changes will be to business profit. Therefore managers require tools to develop understanding and to observe business process modifications, examining the impact changes in processes would have in the modification of the overall business.

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3. Problem background

Retail SMEs are struggling to continue their business during these difficult times. Inefficient product return procedures make the matter much worse. This has resulted in the need to conduct a study on product returns and explore improvements to the return procedures.

Previous studies have shown that there are no comprehensive product return procedures for SMEs. SMEs require an organized system which deals with supplier, distributor, retailers, and customers, and processes for handling returns. Research is necessary to devise a system that can meet the needs of SMEs product returns.

For this study to be of benefit it was necessary to work with retail SMEs that had experienced some problems with product returns from customers. To this affect two independent retail SMEs referred to as Alpha and Beta, operating in the consumer electronics industry, based in the North West region of UK had agreed to participate in the study. The selection of these companies is based upon their good business standing, credibility, and reputation. However, both SMEs are facing business difficulties during the credit crunch. The same methodology can be applied to both SMEs because they have similar problems regarding product returns. Cooperation with management of Alpha and Beta will enable strategies that best suit the company to be devised, developed and hopefully implemented. Using process simulation software it was envisaged that an optimum strategy can be demonstrated.

4. Product Return Procedure

Reviewing operational procedures from SMEs Alpha and Beta, the process of product returns starts from the allocation of a return merchandise authorisation (RMA) number. The customer is given the RMA number to allow the item to be traced when it is received in the return department. After receiving the item, the item is booked in and allocated to the appropriate individual for processing. The item is checked for physical damage, if damage is present which is due to the customer, the item is moved to the customer return department, if the item is undamaged it is sent to the technician for checking. If no fault is found the item is returned to the customer, it a fault is found by the technician the item goes for further processing. The paperwork for the faulty items is initially checked; if the item has been returned within 28 days then a new replacement item is sent to the customer and the faulty item sent to the supplier. If the fault is found after 28 days, the warranty on the item is initially checked, if it is within the warranty period then the item is sent directly to the supplier. If there is a replacement item available with the supplier then the customer will be sent a replacement, if not the retail SME receives credit which it passes onto the customer. If the item is returned within 7 working days without being used then credit or money is given back to the customer. If the item is not correctly delivered then the customer is also credited. Figure 1 illustrates the early stages of the product return procedure.

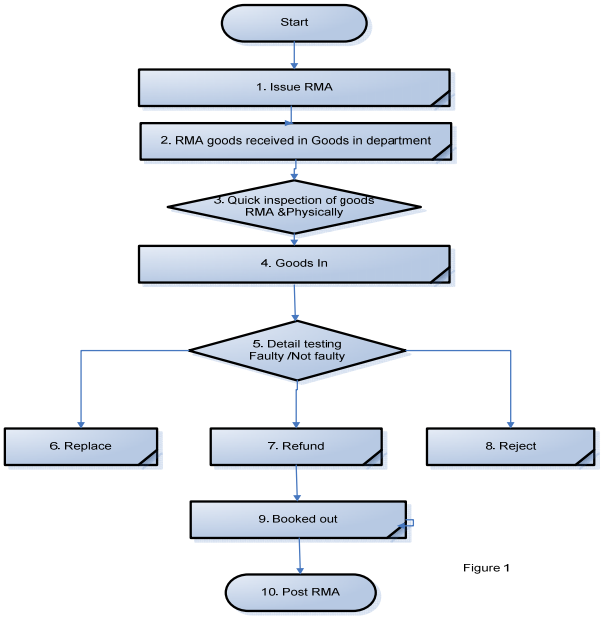

Figure 1: Early stages of the Product Return Procedure

Figure 1 is interpreted as follows:

1. Issue RMA number (generated by the RMA return manager)
2. Merchandise received in goods in department with RMA number
3. Quick inspection of received faulty merchandise (RMA & physically)
4. Booking in of received goods in the system
5. Detail testing (faulty/not faulty) make decision on the circumstances
6. Replace the faulty merchandise with new item.
7. Refund the money back to customer in some cases like under DSR, less than seven days, or failed delivery.
8. Reject due unsatisfactory explanations by customer or contravenes the regulations
9. Booked out
10. Post RMA in system

5. Witness Model Building

To model the product return procedure as described in the earlier section it appeared logical to use the stages depicted in figure 1.

Each processing stage was mapped directly into the discrete elements available within the Witness simulation software [16]. The basic elements enabled entities (product returns) to the flow through the retailers warehouse facility using activities, buffers, resources, and transporting elements etc. Figure 2 represents the data flow diagram (DFD) for the RMA process which was modelled using Witness.

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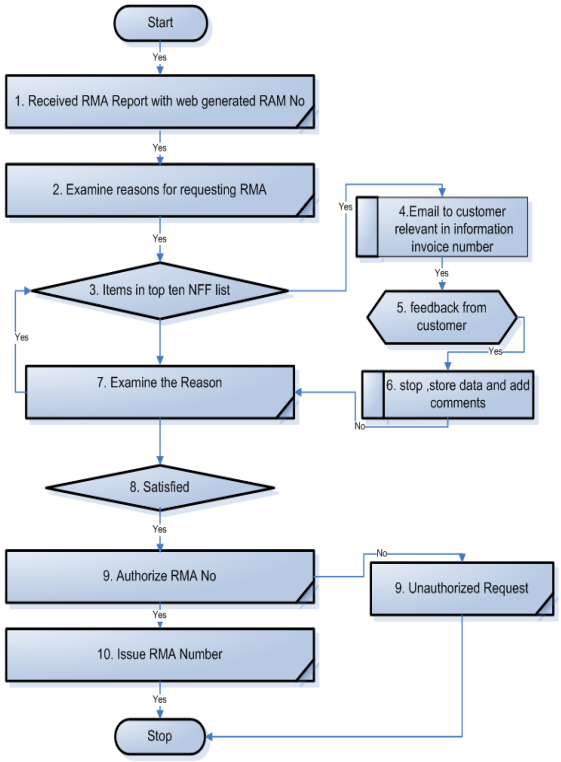

Figure 2: DFD representing the RMA simulation model

Following on from the RMA process the model constructed included replacement of the faulty product to the customer which is illustrated in figure 3.

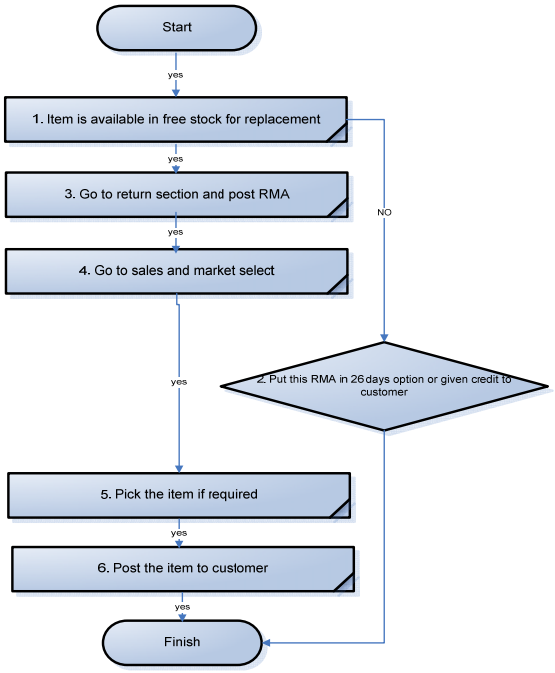

Figure 3: DFD of sourcing a replacement product

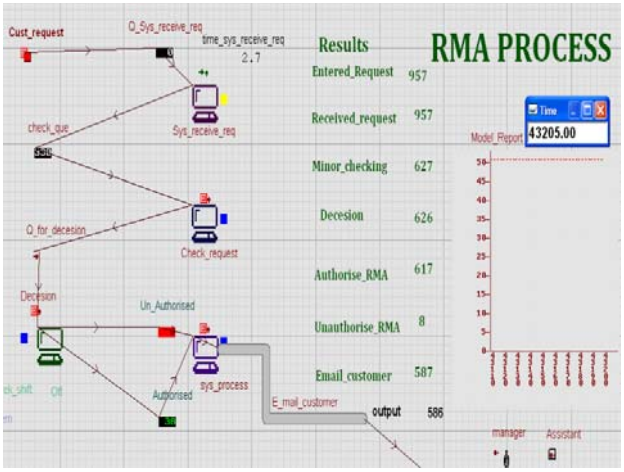

Figure 4: Partial view of the simulation model

The model construction details and the data used for experimentation is the subject of a separate research publication. In conjunction with companies Alpha and Beta it was deemed appropriate to consider product returns for a specific month that would give the worst conditions. The simulation test runs were limited to one month of operations.

The latter stages of the modelling activity required considerable input and interaction from companies Alpha and Beta for model verification and validation. The base model constructed, as shown in figure 4, required considerable effort and iterations resulting in the model eventually producing comparable baseline results.

6. Simulation Model Results

To perform experimentation the scenario manager within Witness was utilised. The scenario manager was able to execute slightly different scenarios of the developed simulation model. The random elements of the distributions used within the model were fully tested. It was determined through experimentation that five replications provided a clear view of the results with good confidence.
One aspect of the RMA procedure was to consider staffing levels. Table 1 illustrates partial results for the three models constructed, after a single month of simulation. The base model results indicate a staffing level of three would enable 62% of the RMA requests to be fulfilled.

Table 1: Partial results after one month of simulation after five replications

Model	RMA requests Received	RMA requests Generated	Staff levels
Base	944	585	3
Model 1	942	934	2
Model 2	943	935	1

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The current system of generating an RMA number was inefficient. It RMA procedure produced large delays due to checking procedures that are not required. Most of the checks are not necessary, and don't benefit the retail SME. It was concluded that the only required check is to make sure that the RMA number is issued in the correct category, and is not issued to items that should be directly returned to the manufacturer such as software. Resulting from these findings there is no need for staff to perform the following three tasks:

1. Staff to check the RMA request
2. Forward the checked request to manager
3. Manager approves or disapproves the RMA

The current system (base model) confirms three members of staff are required to maintain the RMA system. However, observations based at Alpha and Beta appears to show staff are not working to their full capacity. This is also confirmed in the results obtained from the simulation.

Based on observations, the base model was modified with the above three checks removed and associated operations. The modified model was labelled as model 1 which resulted in only two staff required to operate the RMA process. Model 1 is significantly more efficient in terms of output i.e. 99% of the RMA requests have being generated within the month. These changes can be integrated into the working practices at Alpha and Beta which will the OEE of the RMA process. The unnecessary checking stages throughout the process have been removed. A single operator has the right to issue the RMA number, the decision does not need to be taken by the manager, who already has a high work load and is often the main cause of delay in the system. This change enables an RMA number to be generated in the quickest possible time. Further cost and efficiency gains can be obtained by considering that one of the two staff from model 1 does not have to be based in the RMA department at all times. Clearly when there are no RMA numbers to be generated the individual can move to the product returns department, reducing the number of staff required and further reducing costs. Model 2 assumes a single multi-skilled operator with delegated authority can perform all the tasks needed to process the RMA requests and email to customer. In this way staffing costs can be substantially reduced. The simulation results for model 2 in table 1 demonstrate that this option is feasible.

7. Conclusions

Product returns can have negative effects on businesses, decreasing profits and sometimes leaving them with goods that they struggle to sell. When a customer returns an item the retail SME has to have the procedures to deal with the items effectively, to prevent customer complaints and unnecessary delays. If retail SMEs do not have a logistics system for handling product returns then it becomes very hard and unmanageable. An up to date return handling system is an only way to protect SMEs business. Computer simulation using Witness has been used to model the returns department at SMEs Alpha and Beta. This study has helped to manage the flow of product returns, allowing an item to be quickly traced and its place in the process to be determined. With the help of simulation software, management at Alpha and Beta were able to understand their business processes at a working level never like before. Simulation was able to show the SMEs internal work flow dynamically with reports on inventory levels that simply was not possible before. This study has enabled managers at Alpha and Beta to clearly see exactly where the problem is. Once the problem areas were identified, the base model constructed in Witness was utilised as a test bed for alterations.

This study has resulted in the construction of three RMA simulation models. The first simulation model represents the existing system operating at 62% efficiency; this is described as the base model. The second model is an enhancement to the base model with efficiency of 99%. The final model is the preferred systems as it maintains the same efficiency but reduces the staff levels and costs. The study has demonstrated that simulation can directly benefit retail SMEs in their product return procedures. These recommendation have will enable the participating SMEs (Alpha and Beta) to increase their OEE in the Product returns department and improve customer satisfaction as their requests for return a product is dealt with in a quick and timely manner.

This is yet another example of how simulation enables SMEs to change their business processes/practices using a computer environment, without risking costly setbacks of real world trial and errors. Another aspect that has contributed to the increasing usage of the business modelling method is the increasing pace of change in business. Due to competition SMEs do not have enough time to try out new changes in reality, and correcting mistakes, once they have occurred, is often extremely costly and in some cases to irreversible.

References

1. Hokey M., Chang S., and Hyun J. (2006), The Spatial and Temporal Consolidation of Returned Products In A Closed-Loop Supply Chain Network, Computers & Industrial Engineering. 51(2), pp 309-320.
2. Necati A., Deniz A., and Ayse G., (2008), Locating collection centres for incentive-dependent returns under a pick-up policy with capacitated vehicles, European Journal of Operational Research, 198(3), pp790-799
3. Lee, C. H. and Rhee, B.D., (2007), Channel coordination using product returns for a supply chain with stochastic salvage capacity. European Journal of Operational Research, 177 (1) pp. 214-238.
4. Zikopoulos, C. and Tagaras, G., (2007), Impact of uncertainty in the quality of returns on the profitability of a single-period refurbishing operation. European Journal of Operational Research, 182(1) pp. 205-225.
5. Bertoni, M., et al., (2009), PLM paradigm: How to lead BPR within the Product Development field. Computers in Industry, 60(7) pp. 476-484.
6. Hy Sonya, H., et al., (2009). Understanding the reverse logistics operations of a retailer: a pilot study. Industrial Management & Data Systems, 109(4) pp. 515-531.
7. Amato-McCoy, D. M., (2009), The `Sole' of Returns Fraud. Chain Store Age, 85(7) pp 45.
8. Ding, D. and Chen, J., (2008), Coordinating a three level supply chain with flexible return policies. Omega, 36(5) pp. 865-876
9. Quak. H.J. and de Koster M.B.M., (2005) Report Series Research in management, Erasmus Research Institute of Management (ERIM) RSM Erasmus University / Erasmus School of Economics Erasmus UFniversiteit Rotterdam, ERS-2005-066-LIS, November 2005.

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10. Fornell C. and Birger W. (1987), Defensive Marketing Strategy by Customer Complaint Management: A Theoretical Analysis," Journal of Marketing Research, 24(4), pp.337–46.
11. Mayhew Glenn E. (1997), Modelling Merchandise Returns in Direct Marketing, Journal of Direct Marketing, 11(2), pp.20–35.
12. Blanchard, David (2007), Supply Chains Also Work in Reverse, Industry Week, May 2007.
13. Brunnermeier M. K., (2009). Deciphering the Liquidity and Credit Crunch 2007–2008, Journal of Economic Perspectives, 23(1) pp. 77–100
14. Peterson, J. A. and Kumar, V., (2009). Are Product Returns a Necessary Evil? Antecedents and Consequences. Journal of Marketing, 73(3) pp.35-51.
15. Law A.M.,(2007), Simulation and Modeling Analysis,4th ed., McGraw Hill, Boston USA, pp.3. ISBN: 0070667330.
16. Witness Simulation software, (2010), the Lanner Group, Redditch, UK (www.Lanner.com)

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