University of Stellenbosch

Graduate School of Business

Operational Research

Group Assignment

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from: Group 5

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Declaration

Hereby We, Group 5 of the Fulltime MBA Class, declare that this group work is our own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university in order to obtain an academic qualification.

Bellville, 2002-06-11

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Executive Summary

Woolworth's Financial Services owned by Woolworth's Holdings (Pty) was established during September 1993 with the launch of the Woolworth's in-store card. The Woolworth's Financial Services mission is to provide a unique customer services experience and has expanded its product range to personal loans, unit trusts, in-store cards and credit cards. The credit card section's policy is to send credit card offers to pre-approved credit worthy customers. When the customer accepts the offer an inbound call is made to the credit card call centre. The call centre is currently experiencing staff scheduling problems in the achievement of efficient service levels.

Problem Statement

The problem statement in this study is the maximisation of quality customer service, with minimum staff requirements per hour while maintaining a 90/20 service level ratio. The quality service level specifies that 90

Optimal Staff Service Model

The queuing MM1 model has been chosen, as inbound calls form a queue and the availability of call centre agents determines the waiting time and length of the queue. A solver table has been applied to resolve the optimal level of staff requirements. Historical data supplied by the call centre included the number of calls per hour, number of employees, average duration of calls and the service level ratio. This data was modified and applied to the MM1 model.

Result

The results depicted a difference in current staff requirements between Woolworth's and the predicted MM1 model. Inappropriate scheduling of staff experienced by Woolworth's could be the result of overstaffing during busy periods and understaffing at more quiet times.

Conclusion

The result obtained from the predicted MM1 model indicates optimal staff requirements at specific levels of inbound calls. Woolworth's Financial Services call centre will be able to schedule staff for optimum service level more efficiently by using the MM1 model combined with their forecasted information.

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1 Introduction

Woolworth's Holdings Limited is a South African based blue chip retailer, which operates internationally through two subsidiaries namely Woolworth's (Proprietary) Limited and Country Road Limited. The group currently employs 11 742 employees. Woolworth's offers a selection of apparel, footwear, toiletries, cosmetics, home wear, food and financial services of excellent quality and outstanding value under its own brand name.

The Woolworth's group vision is: "We aspire to being the most trusted and respected African retail brand. We will achieve this by nurturing and building lifetime relationships with our customers. These relationships will be earned by us by making the Woolies difference."

Woolworth's Financial Services (Pty) Ltd. is owned by Woolworth's Holdings (Pty) Ltd. The Financial services section was established during September 1993 together with the launch of the Woolworth's in-store card. The business has developed rapidly over the past few years and now has more than a million in-store customers. They also offer other financial options such as personal loans, unit trusts and Visa credit cards. The Financial service section employs over 400 people and services their customers through a

call centre. Most of the customers of the more than 100 Woolworth's stores are serviced from this central call centre.

2 Woolworths Financial Services

Woolworth's Financial Services is an integral part of the broader Woolworth's offering and is built on the Woolworth's brand values, reflecting trust, superior customer service, quality and value for money. The Woolworth's Financial Services mission is to provide a unique customer service experience through solutions that will make the difference to customers.

Woolworth's Financial Services focus on the needs of Woolworth's in-store card customers and cash shoppers and will expand its product range substantially over the next two years.

The personal loans, unit trusts, in-store card and credit card customers are currently all serviced through a central call centre. In the call centre environment, the financial products are individually ring fenced including all service and support functions. Service functions are divided between inbound and outbound calls, and support functions include all administration activities. A bridge supervisor coordinates the queuing of all calls, as well as the service levels of individuals in the ring fenced areas.

The credit card section's policy is to send credit card offers to pre approved credit

worthy customers with personal details extracted from an existing Financial Service client database. When the customer accepts the credit card offer, an inbound call has to be made to the credit card call centre to accept the offer and confirm details resulting in card activation. The credit card offers (mailers) are posted according to the monthly marketing strategy programme. It has been established that after three days from the date of mailing, the credit card call centre start receiving inbound enquiries.

The manager of the Woolies credit card call centre, Mrs Martie Myburgh is currently experiencing staff scheduling problems with the current system. We, group 5, offered to assist her by building a staff scheduling model. She provided us with all the necessary inbound call centre information.

3 Problem Statement

"To maximise quality customer service, with minimum staff needed per hour and maintaining a 90/20 ratio service level. The quality service level specifies that 90% of all inbound calls should be answered within 20 seconds."

In order to construct the staff scheduling model, the following assumptions have to be taken into account. The customers interested in accepting credit card offers constitute 25% of inbound calls, with average call durations of 600 seconds. The balance of inbound calls constitutes from standard enquiries and has average call durations of 60 seconds. The model should allocate a five minute relieve break per hour per staff member.

3.1 Optimal Staff Service Model

The Queuing MM1 model was decided upon as: The inbound calls form a queue and the availability of the call centre agents determine the waiting time and the length of the queue. Since no macro input like in the MMS Model is required, the MM1 can be used with the premium solver. The purpose of the model is to provide quality and efficient customer service by minimising the waiting time and length of the queue, while main-

taining a minimum amount of staff. The queuing MM1 model and the premium solver provide the necessary tools to determine the optimal level of calls and staff availability.

3.2 Methodology

Input required in the MM1 Model consists of arrival and service rate. The objective is to find the minimum amount of staff in order to achieve the 90/20 ratio. This will automatically minimise cost through reduced wages and therefore cost has not been included in the model. Historical data supplied by the call centre only included the number of calls per hour, number of employees, average duration of calls and the service level ratio. This data had to be modified in order to apply it to the MM1 Model.

4 The Problem

The MM1 model only accepts a service rate and an arrival rate as an input. The given data consists only of calls per hour and a ratio to be achieved. The calls per hour can be used as an arrival rate, whereas the service rate has to be calculated. Since the target is to minimise staff, the ratio has to be utilised to measure the achievement.

4.1 Transferring the Ratio

Assumptions were made in order to transfer the 90/20 ratio into a usable format for application in the MM1 Model. Calls can spend from zero to an infinite time in the queue, suggesting an exponential distribution. This makes even more sense considering the fact that most calls are answered rather sooner than later. Only 90% of the calls should be taken into consideration as per required level of service and therefore 10% of calls are negated. Hence the probability of rejection for the exponential distribution is 10%. The given data specifies a certain point on the exponential distribution marking the 20 second constraint of the service level ratio. In the MM1 Model an expected time in the queue is calculated and the assumption is that this would be the 50% point in

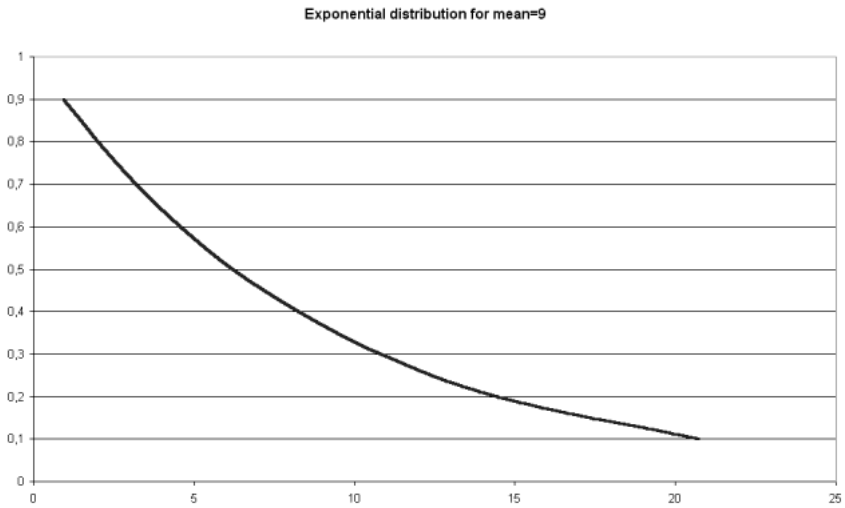

Figure 4.1: Exponential distribution

the exponential distribution. By using the following formula

$$x = -\text{mean} \cdot \ln(P)$$

it can be changed into

$$\text{mean} = \frac{-x}{\ln(P)}$$

and therefore the given mean can be calculated for the matching 90/20 ratio. This makes it possible to transfer the ratio and compare it to the average time that a customer spends in the queue given by the MM1 model.

4.2 Calculating the Service Rate

The service rate can not be derived directly from the given figures. A five minute break is allocated per employee per hour. By taking average call durations, calculated from the given statistics, it is possible to calculate the amount of processed calls in an hour

by calculating the number of employees multiplied with their available time per hour. This figure has to be divided by the average call duration in minutes.

$$\text{Service rate} = \frac{\text{No. of employees} \cdot \text{Working time in minutes per hour}}{\text{Average call duration in minutes}}$$

5 The Solution

The calculated service rate as well as the arrival rate can now be imported in the MM1 model. No optimisation has been done up to this point. In order to reach an optimal solution, the premium solver was applied. This is where the 90/20 ratio becomes important. The MM1 calculates an average time spend in the queue by dividing the expected number of customers in the queue by the arrival rate. Since the target is to pick up 90 % of the calls within 20 seconds, the mean of this distribution should be expressed. It is possible to calculate the mean as illustrated in section 4.1 on page 7. The calculated figure has to be greater or equal than the average time spent in the queue and was therefore be imported as a constraint in the solver. A queuing model only makes sense if the service rate is greater than the arrival rate to prevent infinite queues. Hence this constraint was also imported into the solver.

The changing cell reflects the number of employees and represents the figure that should be minimised.

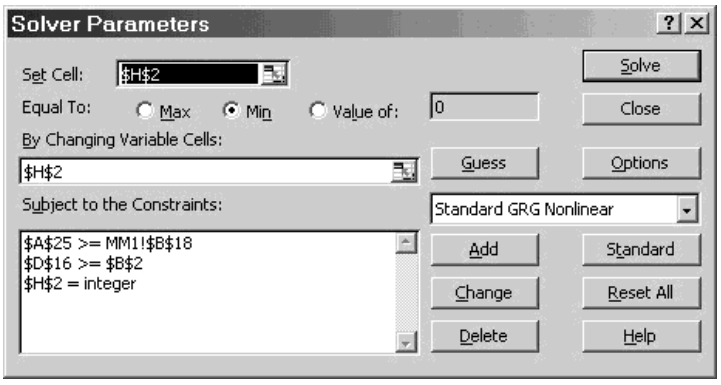

Figure 5.1: Premium Solver settings

6 The Result

Ratio	5	10	15	20	25	30	35	40
60	27	21	19	17	16	16	15	15
65	28	22	19	18	17	16	16	15
70	30	23	20	19	18	17	16	16
75	31	24	21	19	18	17	17	16
80	33	26	22	20	19	18	17	17
85	36	27	24	21	20	19	18	17
90	39	29	**25**	23	21	20	19	18
95	43	32	28	25	23	22	21	20

Table 6.1: Changing Ratio for 180 Calls per hour

Should the service level ratio be increased to 90/15 the number of employees per hour would only increase by two as indicated in the solver table. This can have a dramatic impact on customer service levels and customer satisfaction with only a small increase in staff.

The graph in picture 6.1 on page 13 clearly illustrates the figures given in table 6.2 on page 14, and therefore the number of calls per hour and the matching scheduled staff from the existing call centre Model as well as the new developed staff scheduling model. Existing company profile indicates less staff required for less than 190 inbound calls per

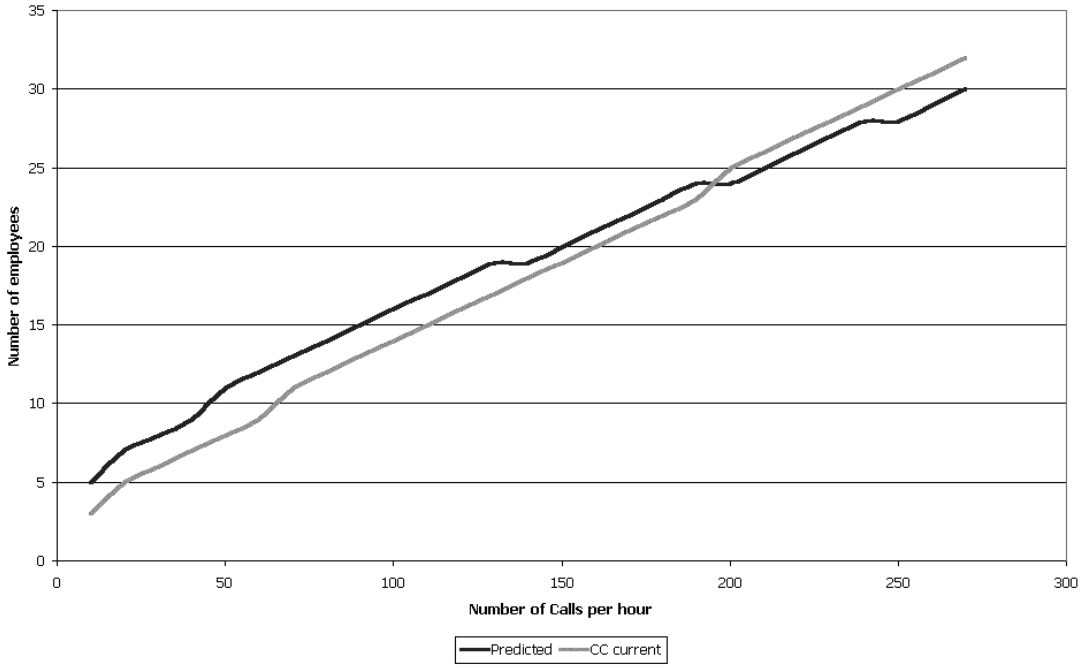

Figure 6.1: Graph for comparison between model and current figures

hour compared to the recommended profile. The company has indicated a problem with inappropriate scheduling of staff. This can be as a result of overstaffing for periods where inbound calls exceeds 190 per hour and understaffing when calls were less than 190 per hour. The predicted number of employees by the model supports this assumption.

	Model —	Current
Calls/hr	Employees	
10	5	3
20	7	5
30	8	6
40	9	7
50	11	8
60	12	9
70	13	11
80	14	12
90	15	13
100	16	14
110	17	15
120	18	16
130	19	17
140	19	18
150	20	19
160	21	20
170	22	21
180	23	22
190	24	23
200	24	25
210	25	26
220	26	27
230	27	28
240	28	29
250	28	30
260	29	31
270	30	32

Table 6.2: Comparison between model and current for different call levels

7 Conclusion

The result obtained from the predicted model indicates optimal staff requirements at specific levels of inbound calls. The model, combined with forecasted information, will provide Woolworth's Financial Services Call Centre with a scientific method in staff scheduling for optimum service level achievement. It is recommended that information should be captured on the amount and duration of dropped calls. This will give an indication of the correct service level ratio to be maintained. Further investigation should be conducted to measure total inbound calls and their duration, since accurate measurement in this field can have dramatic impact an the model output.

List of Sources

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