Chapter 7

Evaluation

7.1 Introduction

The implementation in detail was described in the previous chapter, with tools, technologies and algorithms with the help of various software design diagrams. This chapter presents crucial step of the whole research, the evaluation. In proving the objectives being achieved, this chapter describes evaluation methods, setup, results etc

7.2 Evaluation Strategy

Strategy for the evaluation is to test supplier or the seller side revenue in response to the dynamic changes in the market which are driven by the customers. It is assumed that, monopoly market doesn't exist because in such a market where suppliers control the market, there is no or less need to study revenue management. Hence supplier strategies are tested against un predictable and unseen customer behavior in earning greater revenue.

7.3 Experimental Setup

Setup of the experiment contains four cases against which test cases are run. Following are the cases

- Base Case – Statically priced inventory. In this case, suppliers price their inventory on a static markup and try to sell equal number of units every day.
- Adaptive Bargaining Case – In this case, agents start with Base Case mentioned above. But with the ongoing sales, agents tend to negotiate with customer agents on low priced bids to earn more revenue.
- Adaptive Autonomous Pricing Case – In addition to the previous case, in this case, agents perform adaptive price adjustments to the inventory listed prices based on current sales performance.

- Pricing with Forecasts Case – Including the previous case setups, in this case, agents use forecasting data also to adjust inventory allocation and pricing so that more revenue can be earned

Parameters to change in each cycle are number of bids generated and bid price. Varying those parameters, few cycles are run and overall revenue is recorded. Setup of the experiment is discussed in next section.

7.4 Choice of participants

Since the developed prototype is simulated, pervious setup is required. Following are the setup data.

- Seller Side (Supplier/Tour Operator)
    - Number of units to sell : 140
    - Number of days to sell above units : 14
    - Unit cost : 450.00
    - Standard Markup : 25%
    - Default list price : 562.50 (derived by 450 * (1 + 0.25)
    - Default number of units to sell at each day : 140/14 = 10
    - Default Demand for a unit for each day taken to be represented by the following curve
        - y = -10.0x + 660.0 [y=price, x=quantity] (Section 6.6.3)

  With different cases, seller will change markup, list price and units to sell each day, to achieve more revenue.

- Customer Side
    - Bid price
    - Number of bids to send

  Few levels were introduced to the above parameters to get more detailed output. Table 7.1 shows those levels.

Parameter	Level	Description
Bid Price	Increasing	Increase with from day 1 to 14

Bid Price	Decreasing	Decreases from day 1 to 14
Bid Price	Arbitrary	Arbitrarily vary from day 1 to 14
Number of Bids	Above Average	Varies, but above the supplier's default daily allocation, which is 10
Number of Bids	Marginal	Varies, but around the supplier's default daily allocation, which is 10
Number of Bids	Below Average	Varies, but around the supplier's default daily allocation, which is 10

Table 7.1: Customer side parameter table

The variations mentioned above needs to be generated during the simulation. Hence functions discussed in the implementation used and co efficient for those functions evaluated to be as follows in the Table 7.2.

Parameter	**Level**	**Function**
Bid Price	Increasing	$p= 23.21*d + 400$
Bid Price	Decreasing	$p= -23.21*d + 724.97$
Bid Price	Arbitrary	$p= -2.066(d - 12)^2+750$

Table 7.2: Functions for Bid Price Variation

Parameter	**Level**	**Function**	
		Increasing bid price	*Decreasing bid price*
Number of Bids	Above Average	$b= 0.2857*d + 10$	$b= -0.2857*d + 14$
Number of Bids	Marginal	$b= 0.2857*d + 8$	$b= -0.2857*d + 12$
Number of Bids	Below Average	$b= 0.2857*d + 6$	$b= -0.2857*d + 8$
Number of Bids	Arbitrary	$b= -0.09(d - 12)^2+15$	

Table 7.3: Functions for Number of bids calculation

The Table 7.3 shows two functions for first three rows, because, number of bids to place should follow the price variation. So, with increasing bid price, number of bids generated should also increase. So is, when bid price is decreasing. That will resemble the true nature of demand.

The values generated in Table 7.2 and Table 7.3 in each cycle is distributed by adding random values generated. That is done to hide the true nature of the customer demand fluctuation from the supplier while preserving some sense of the demand. So the bid price generated varied uniformly randomly between (-10.00) to 10.00 and number of bids to send between (-1.5) to (1.5) on top of the relevant values generated by the formulas for each bid.

7.5 Obtaining Responses

The experimental setup mentioned above is run on the simulated prototype for 4 cycles for each of the cases mentioned in the evaluation strategy. Total revenue, displayed on the user interface is recorded for each cycle.

7.6 Results

Output data collected by running the tests attached to the Appendix C, Table C.1. Following are chart presentation of the collected results.

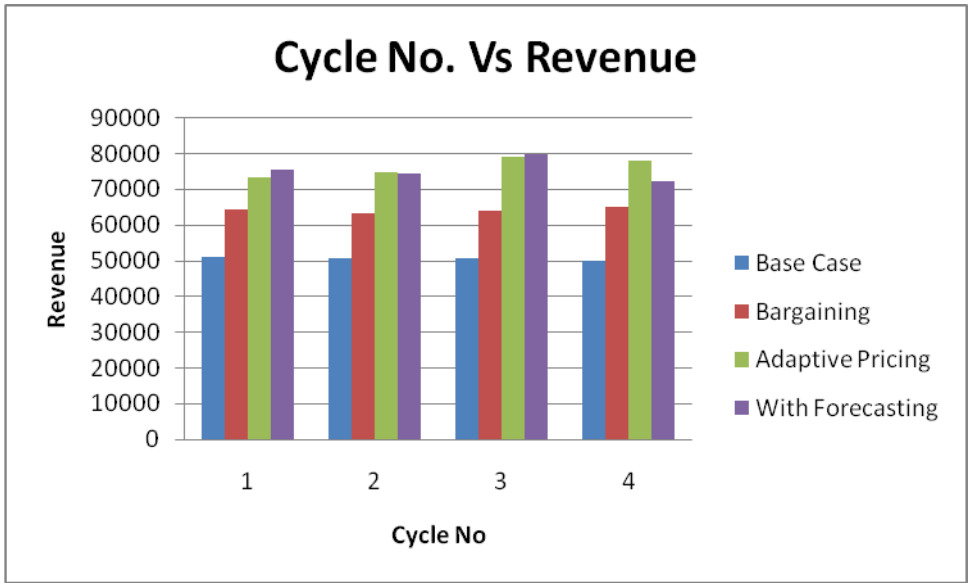

Figure 7.1: Revenue per cycle with increasing Bid price and above average Bid count

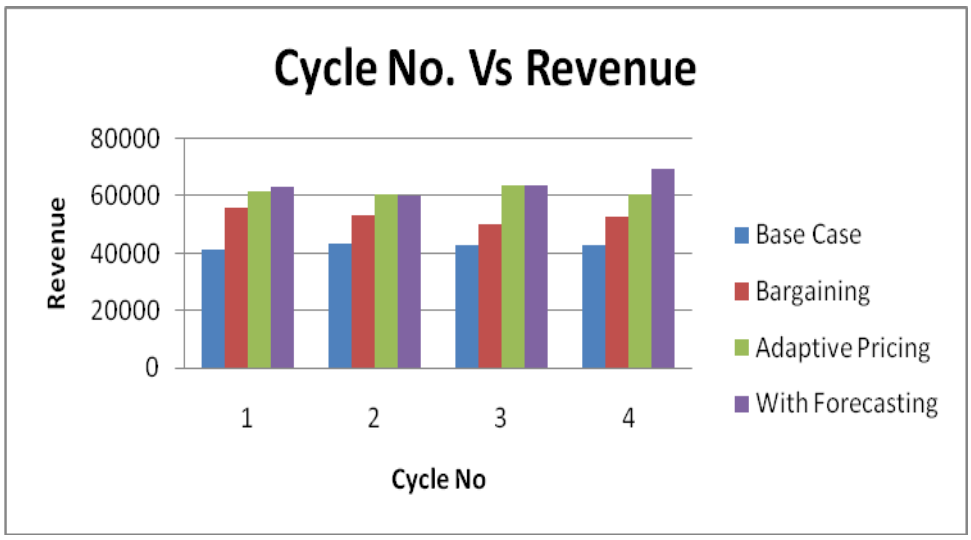

Figure 7.2: Revenue per cycle when Bid price is increasing and Bid count is marginal

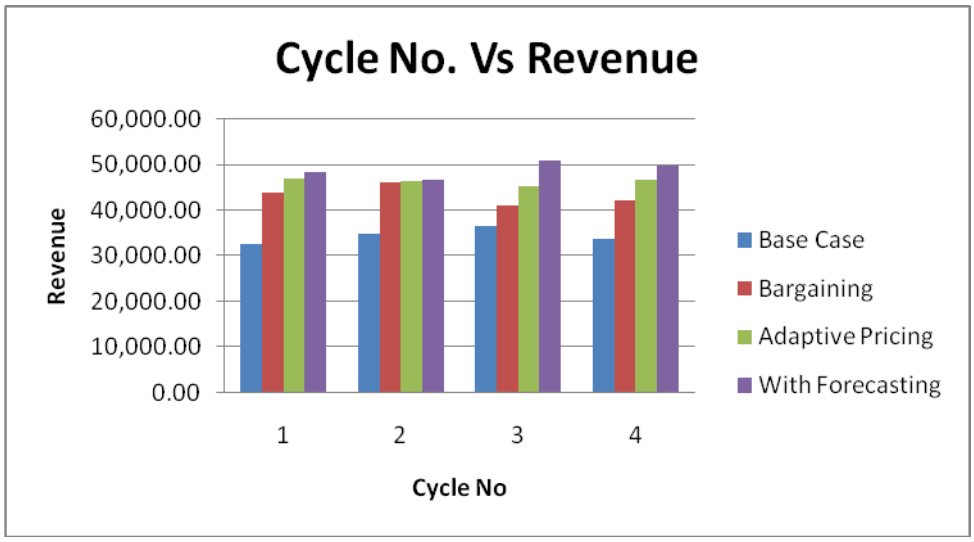

Figure 7.3: Revenue per cycle when Bid price is increasing and Bid count is below average

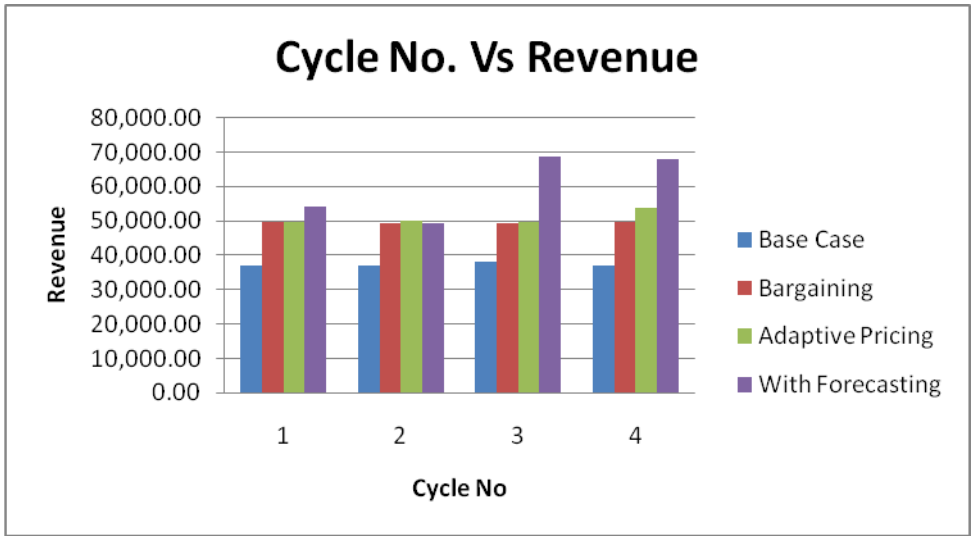

Figure 7.4: Revenue per cycle when Bid price is decreasing and Bid count is above average

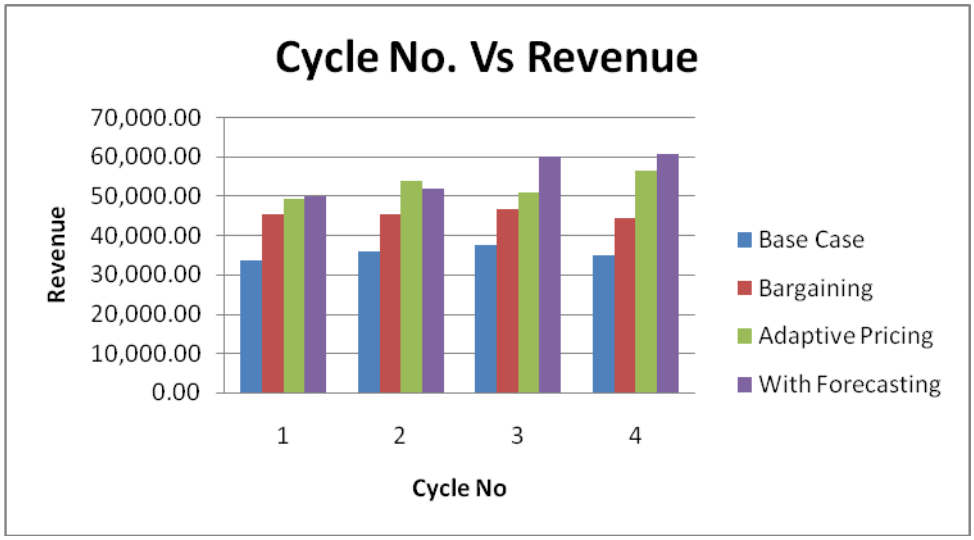

Figure 7.5: Revenue per cycle with decreasing Bid price and marginal Bid count

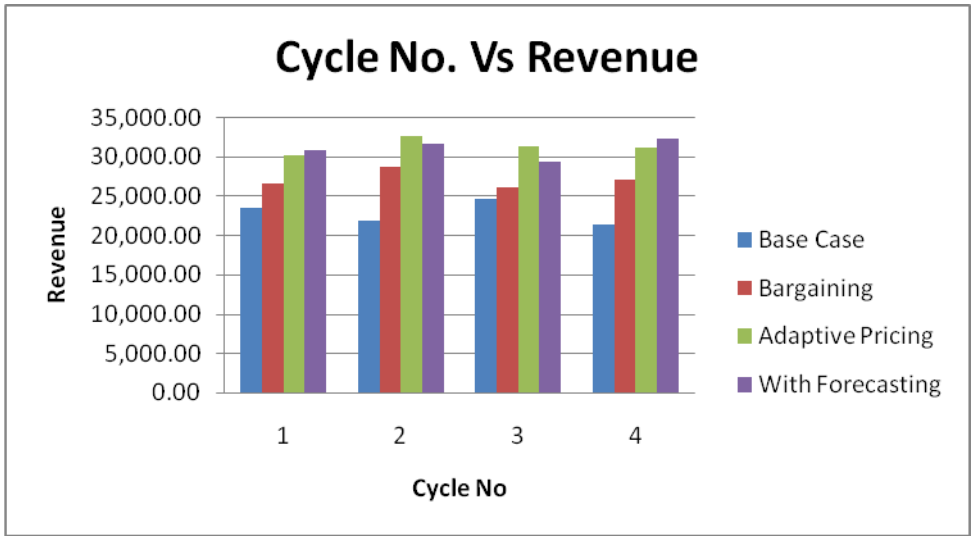

Figure 7.6: Revenue per cycle when Bid price is decreasing and Bid count is below average

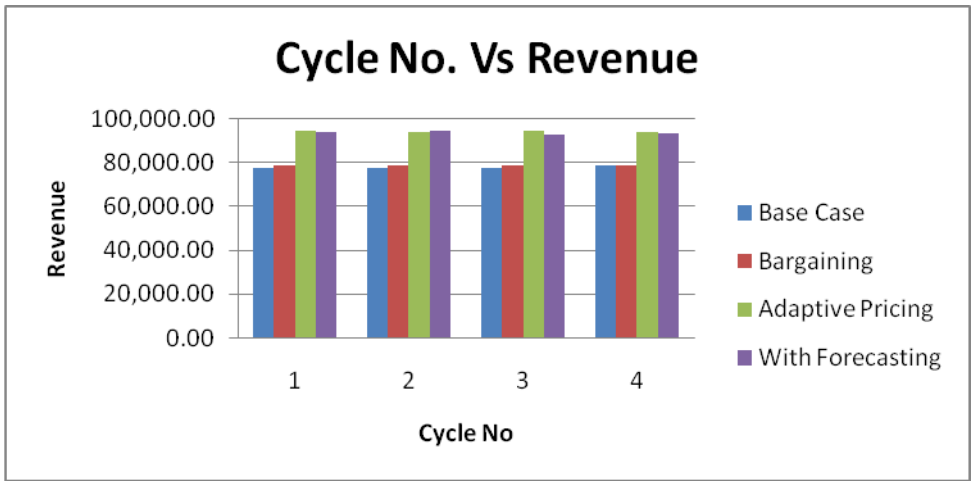

Figure 7.7: Revenue per cycle with arbitrary Bid price and arbitrary Bid count

7.7 Summary

Starting from the strategy for evaluation, this chapter presented details of the evaluation. Experimental setup, where 4 main cases defined to carry on the evaluation was explained. Then, parameter selection was presented. Customer driven demand introduced and the response from the supplier or the tour operator side is observed. Based on the results, number of charts produced. Next chapter presents a conclusion and future work while discussing the results obtained in this chapter.