

CASE STUDY – System Proposal

On a request from the Chief Warden of the student hostel, a study was initiated to find out how the operation of the hostel could be improved by implementing better information system. After lengthy discussion with various personnel in the hostel, it was concluded that the problem which had to be tackled on a high priority basis was a better information system for billing, accounting, inventory control and stores issues in the students' mess. The deficiencies identified in the current system are as given below.

1. Missing functions.
 - 1.1 Forecasting of stores requirements not done.
 - 1.2 Purchases not consolidated.
 - 1.3 Daily rate calculation not updated frequently.
 - 1.4 Menu not planned for balanced nutrition and low cost.
2. Unsatisfactory performance.
 - 2.1 Billing not accurate and prompt.
 - 2.2 Student bills not itemized.
 - 2.3 Stores issues to cooks not systematic.
 - 2.4 Payments to vendors not prompt.
 - 2.5 Large variations in mess bills every month.
3. Excessive cost of operations due to the following:
 - 3.1 Unpaid long outstanding bills from students.
 - 3.2 Extras and rebates not reflected in stores issues.
 - 3.3 Frequent unplanned visits to city to buy out-of-stock items.
 - 3.4 High transport cost (small purchases at high cost) due to not consolidating stores requirements.

These deficiencies are to be removed in the proposed information system.

Goals of the proposed system. The main quantified goals and the sub-goals of the proposed system are as given below:

Main goal

M1 Send the bills to students within 5 days of the end of the month.

Sub-goals

S1.1 Itemize bills indicating extras and rebates with dates.

S1.2 Ensure less than 5% variation of bills from month to month.

S1.3 Bring to the attention of the Chief Warden the bills which are not paid within 10 days of issue.

S1.4 Update daily rate. Calculate bills every day.

The main goals and sub-goals to remove deficiencies 1.1, 1.2, 2.3, 2.4 and 3.2-3.4 (mentioned above) are given below:

Main goal

M2 Control inventory of items and issues to cooks so as to bring down mess bill by 10%.

Sub-goals

S2.1 Ensure payment to vendors within five days of supply of items.

S2.2 Make sure that at most four trips per month are made to the town for purchase and consequently transport cost is less than 1% of item cost.

S2.3 See that inventory levels are not more than 10% of monthly requirements.

S2.4 Make sure that cooks do not get more than 5% of calculated requirements.

Goals to add function 1.4.

Main Goals

M3.1 Balanced menu to meet nutritional requirements.

M3.2 Cost of food not to exceed current cost.

Sub-goal

S3.1 Randomize menu.

Alternative solutions examined. Three alternative solutions were examined. These are given below:

Solution A: Improve the current manual system by improving procedures.

Solution B: Use a single PC in the hostel office

Solution C: Use three small client computers in the mess, stores and accounts office and connect to a server in the hostel office.

Comparison of Solutions:

Solution A is feasible but is not scalable. In other words if the number of students increase the system will be difficult to implement. It requires meticulous attention to details by clerks. It is thus rejected.

Solution C is very expensive as it needs four computers. It does provide on-line updates but this is not necessary in this problem.

Selected solution. Solution B is selected as it is technically and operationally feasible.

The cost/benefit of Solution B to assess economic feasibility is given below:

Consider Solution B of the hostel mess management problem. The direct costs are:

1. Cost of PC, printer, uninterrupted power supply and system software (Windows XP Office 2000, anti virus and Turbo C) = Rs.70,000.
2. Cost of space (nil). No extra space allocated.

3. Cost of systems analysts/Programmers/Consultants for 3 months = Rs.60,000/-
4. Recurring costs:: Stationery cost, floppy cost, Maintenance/Electricity =
Rs.2000/- per month).
5. One time cost = Rs.1,30,000/-

Benefits (Direct savings)

1. Savings per month due to inventory reduction and wastage
= 5% of mess bill of 400 students
= $2.25 * 400 * 30$
= Rs.27,000/-

(Assume Rs.45 bill per day per student. Savings per day is 2.25 per student. 30 days in a month).
2. Savings in transport cost (estimate) Rs.800 per month.
3. Savings due to early payment to vendors
= 1.2% of total billing to vendors
= $37.5 * 400 * 30 * 0.012$
= Rs.5400/- per month

(Rs.37.50 per day is assumed to be material cost in mess bill)
4. Savings due to better collection (40 defaulting students, 1% interest per month)
= $40 * 1350 * 0.01$
= Rs.540 per month

Intangible benefits

1. Student satisfaction due to itemized bills and less variation.

2. Better menu planning

Total benefits = Rs.33740 per month

Recurring cost = Rs.2000 per month

Net benefit per month = Rs.31,740

Total capital cost = Rs.1,30,000/-

New equipment to be installed. PC and printer with the following features:

Hardware

IBM compatible PC

256 MB main memory

1.2MB floppy drive

40 GB hard disk

15" colour monitor

132 character 80 cps dot printer

Software

Windows XP Operating System

MS Office 2000

antivirus software

Turbo C

Infrastructure

500 VA, Uninterrupted Power Supply

Need a dust-free room to locate PC

Benefits expected. (These were as given earlier)

Cost of the system. As calculated earlier, the cost of the new system will be

Capital cost hardware system software = Rs. 70,000

System analysis/design cost = Rs.60,000

Recurring cost = Rs. 2000 per month

New procedures to be implemented. Using simple pay back method and assuming 1% interest per month we obtain the Table 4.1

Table 4.1 Cost-benefit –Present value method

<i>Month</i>	<i>Cost</i>	<i>Net Benefit</i>	<i>Present Value of benefit</i>	<i>Cumulative Present Value</i>
0	1,30,000	-	-	-
1		31740	31426	31426
2		31740	31115	62541
3		31740	30806	93347
4		31740	30502	123849
5		31740	30200	154049

We see that the cumulative benefit exceeds cost of the system by the fifth month.

Thus we conclude that the proposed system is economically beneficial.

The subsystems involved in this solution are now described.

- (i) *Billing subsystem.* An extras/rebates register will be maintained in the mess for students to enter the requests. One page per student is assigned. The register entries are codified for the use of computer processing. The register pages are printed on the computer each month and stapled together and kept in the mess for entries by students. Entries in the register are keyed into the PC each day by the mess clerk. A program will check whether sufficient notice has been given for rebates, whether number of days rebate asked is as per rules. The data entered is used by a program to create a summary statement giving expected number of meals to be prepared 48 hours from now. This is passed on to the mess manager to control issues. This program also updates each students' record with details of extras and dates of absence.

(ii) *Subsystems in billing system.* Subsystem for finding meals to be cooked.

INPUT: Extras/rebate requests of each student each day.

PROCEDURE

- Check each input record to see if rebate is admissible and extras are correct.
- Enter admissible rebates and extras in student billing file.
- Find number of meals to be cooked two days from now. Print note to mess manger.

OUTPUT: Note to mess manager giving number of members and meals to be cooked 48 hours from now. (This subsystem runs daily on the PC)

(iii) *Subsystem for mess bill calculation.*

INPUT: Items issued each day (perishable and non-perishable)

PROCEDURE:

- From items issued each day find total expenses each day.
- Accumulate daily expense and add fixed overhead (salaries etc.)
- Using number of members calculate up-to-date daily rate.
- Using student billing information file an expense file, calculate the itemized bill for each student at the end of the month.
- Enter in student billing file.

OUTPUT: Itemized bills to students.

(Updating daily rate is run each day whereas student billing system is run once a month).

(iv) *Subsystem for unpaid bills*

INPUT: Payments information.

PROCEDURE

- Enter all payments in student billing file.
- Five days after last date for payment, examine this file and create a list of students with unpaid bills.

OUTPUT: List of overdue bills sent to Chief Warden

(This system runs once a month)

The billing system described above satisfies main goal M1 and sub-goals S1.1 and S1.3. To satisfy sub-goal S1.2, the mess secretary who gets an updated daily rate each day must adjust menu, using a menu planning system.

(i) **System for stores issue and control**

Subsystem for stores issues to cooks

INPUT

- Menu for (today's date + 2 i.e., if today's date is 20.04.03 menu is given for 22.04.03).
- Number of meal to be cooked for (today's date + 2).

PROCEDURE: Using inputs find items to be issued on (today's date + 2).

OUTPUT: Items to be issued on (today's date + 2) sent to mess manager.

Subsystem for inventory control

INPUT: Daily use of stores items, perishables and vendor supplies.

PROCEDURE

- Based on past month's total consumption of each item, estimate consumption of current month. Add 2 days consumption as buffer.
- Work out minimum amount (=4 days needs) of all critical items.
- Decide on order quantities, and place orders.
- When goods come in, check in order file and update inventory if items accepted.
- Send the cheques to vendors on item acceptance.
- Update stores inventory after each issue.
- When critical items go below minimum level inform mess manager

OUTPUTS

- Orders to vendors
- Cheques to vendors
- Low item stock message to mess manager

(This system is run once a day)

This system satisfies main goal M2 and sub-goals S2.1-S2.4.

ii. System for menu planning

INPUT

- No. of items in menu
- Alternative for each item
- Cost of each item
- Maximum cost.

PROCEDURE

- Reduce total cost by trying alternative items in menu.

- Try an optimization package such as Linear Programming.
- Rank menus by cost and keep 14 different menus for each meal.
- Randomize menus each week.

OUTPUT: Balanced menu at reduced cost.

(This system is run once a month)

This system satisfied main goals M3.1, M3.2 and sub-goal S3.1.

Anticipated problems. Procedures should be set up to regularly back up all files and store billing information on floppy disks. Power failure may lead to difficulties, if it is very frequent. Hostel management may consider installing higher capacity batteries for 1 hour back up for the uninterrupted power supply system.

Implementation plan. Implementation may begin with the billing system first. It may be followed by stores issues and inventory control and finally menu planning (see Table below).

Table 4.2 Implementation Plan

<i>Start Time</i>	<i>Time Schedule in weeks</i>	<i>Design</i>	<i>Implement</i>	<i>Test</i>	<i>Parallel Run Manual System</i>
0	Billing system	3	3	1	4
0+3 week	Stores issue system	4	3	2	3
0+6 week	Inventory system	4	3	2	3
0+12 week	Menu planning	5	3	2	2

Conclusions

The proposed system will cost Rs.1,30,000 capital cost and will pay for itself within the first five months of operation. It will meet all the main goals approved by the wardens and can be implemented within 3 months. We are confident that it will fully meet the expectations of the management.