MOCK TEST PAPER – 1

FINAL COURSE: GROUP – II

PAPER – 5: STRATEGIC COST MANAGEMENT AND PERFORMANCE EVALUATION

SUGGESTED ANSWERS/HINTS

1. (i) DMAIC technique analyses operational problems by assessing them in the following phases (1) Define; (2) Measure; (3) Analyze; (4) Improve and (6) Control.

(1) *Define the problem, project goals and customer requirements*: Poor quality leading to erosion of clientele.

Customers feedback indicates that product quality requires improvement. Dis-satisfaction is reflected in the form of sale returns and warranty claims. Competitors have no sale returns on account of poor quality as well as no warranty claims on its products. Hence, in an environment where 100% quality can be achieved, **ABC is facing quality issues**. This is the problem to be addressed. Failure to do so would result in loss of clientele, leading to a possibility of going out of business. The goal of the project is to identify what is the sigma level at which the company is operating and to suggest improvements to the production process it achieve 6σ level of operations.

(2) *Measure current performance*: Indicators of poor quality to find out what is the sigma level of the current operations?

Current performance focusing on quality can be determined based on the cost incurred in the following phases:

(a) Sale returns: Sale returns are 1% of total sales. Gross sales are 25,000 units per annum at selling price of Rs.20,000 each, therefore having a value of Rs.50,00,00,000. Sales returns @1% amount to Rs.50,00,000 that represent the return of 250 units per annum. The cost of poor quality on account of these sale returns is the variable cost of the product Rs. 12,500 per unit. This is an avoidable cost amounting to ₹31,25,000 per annum that is 0.63% of sales (Rs.31,25,000/ Rs. 50,00,00,000).

(b) Warranty claims: Warranty is an undertaking given by the company to repair the electronic component free of cost if defect occurs within a specific period of time. Hence, when the customer files a claim that is accepted by the company, it means that there has been an issue with the quality of the product. This is a liability / cost that should ideally be kept minimum, if not nil like ABC's competitors.

Warranty for the product is for one year from the date of sale. Warranty claims this year is Rs.30,00,000, which is given to be representative of the average yearly warranty cost. Therefore, currently this cost amount to 0.60% of sales (Rs.30,00,000/ Rs.50,00,00,000).

Summarizing sale returns and warranty claims alone represent 1.23% of current sales. Considering the current percentage of deficiency, the **company is operating between 3σ and 4σ level**. The rest of the industry is able to achieve 6 σ level of operations. At zero defective production, there are no sale returns on account of quality and no warranty claim costs. Therefore, is **tremendous scope for improvement in ABC's operations**.

(3) *Analyze:* What is the cause of poor quality? What is the cost of resources focused on quality?

Six sigma team studied the production process in detail. Replicating the issues detailed in the given problem:

(a) Problem 1: Assembly line workers, including new hires, learnt on the job as to how to assemble the input material to produce the final electronic component. This lead to many errors due to lack of proper standardized training. Therefore, on account of these errors, the entire electronic component has to assembled again.

(b) Problem 2: Sub-standard quality of raw material is detected on inspection only at the assembly line. Inspection leads to 10% rejection of units. By this time, the defective material is already fitted into the final electronic component. Therefore, to entire component has to be reworked upon to replace the defective raw material input.

(c) Problem 3: Machines are outdated and are not entirely suitable for the current production methodology.

The above factors result in rework on products, an internal failure cost, that lead to wastage of material, resources, and capacity.

Two costs incurred to focus on quality are cost of inspection and cost of rework, 2,525 units are reworked upon. Time required to rework 2,525 units per year = 2,525 units / 5 units per hour = 505 hours per year. Cost of rework is given to be Rs.6,250 per hour. Therefore, total cost of rework per year = Rs.31,56,250.

Inspection cost for 2,000 hours at the assembly line is given to be Rs.10,00,000 per annum.

Therefore, total cost of resources currently incurred for quality = Rs.41,56,250 per annum.

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(4) *Improve:* Reduce errors and improve quality of the product

While cost of resources currently incurred for quality is only 0.83% of sales (Rs.41,56,250/ Rs.50,00,00,000), a detailed analysis brings forth many qualitative aspects that ABC needs to be address. If its competitors are able to achieve excellence in quality, so must ABC, in order to remain in business. Therefore, following are the proposals that can provide solutions to the problems referred to above:

(a) Solution to Problem 1: Periodic training sessions to educate new hires and update workers in the assembly line on the latest techniques in production. Standardized and informed working will lead to lower errors and thereby improving product quality. Cost per year = 5,000 hours yearly training × Rs.1,000 per hour = Rs.50,00,000.

(b) Solution to Problem 2: Delay in detection of poor quality input can be resolved by streamlining the work flow. New function for quality planning and improvement, at the beginning of the process helps in early detection, without wastage of resources. Cost per year for introducing this functionality = Rs.1,50,00,000.

(c) Solution to Problem 3: Replace old machines with newer ones. Machine upgrade will align the resource with the production requirements. This reduce chances of errors in the production process.

Cost of procurement: Rs.3,60,00,000 has a life of 3 years. Therefore, annual depreciation is Rs.1,20,00,000.

(d) Consequences of implementing these proposals, as given in the problem, can result in the following improvements:

(i) Rework of products can be entirely eliminated.

(ii) Sale returns will reduce from 1% to 0% due to better quality of products.

(iii) Yearly Warranty claims will reduce from Rs.30,00,000 to nil per annum.

(iv) With the introduction of the new facility, time required for inspection at the assembly line would reduce from 2,000 hours to 1,200 hours. Cost of inspection at the assembly line would reduce from Rs.10,00,000 per annum to Rs.6,00,000 per annum.

(v) Due to better quality, ABC can build better reputation with the customers which can further yield additional sales of 5,000 units per year.

When the company is capable to achieve points (i), (ii) and (iii) milestones, it would have achieved 6 σ operational level. The cost of quality report summarizes the above discussion:

Cost of Quality Report

Cost of Quality Component	Before Improvements		After Improvements	
	Current Cost Rs.	% of Sales	Projected Cost Rs.	% of Sales
Preventive Cost				
Training (5,000 hrs. × Rs.1,000 per hour)	×××	×××	50,00,000	0.83%
Quality Planning and Improvement	×××	×××	1,50,00,000	2.50%
Appraisal Cost				
Inspection Cost	10,00,000	0.20%	6,00,000	0.10%
Internal Failure Cost				
Rework	31,56,250	0.63%	×××	0.00%
External Failure Cost				
Sale Returns	31,25,000	0.63%	×××	0.00%
Warranty Claims	30,00,000	0.60%	×××	0.00%
Total Cost of Quality	1,02,81,250	2.06%	2,06,00,000	3.43%
Yearly Sales	50,00,00,000		60,00,00,000	
Total Cost of Quality / Sales (%)	**2.06%**		**3.43%**	

(e) Cost of quality is 2.06% of sales of which 1.23% alone is external failure cost. This has an impact on the customer experience and can erode customer base. By implementing the six-sigma team's proposal, this external failure cost on account of sale returns and warranty costs, can completely eliminated. Internal failure cost can also be eliminated. The increase in cost of quality proposed to be made would be a preventive cost to avoid failure of quality. The company should focus on preventing the error such that it ensures that product is of good quality when it reaches the customer at the very first instance. This enhances the customer experience and therefore eliminating the scope for external failures like sales returns and warranty claims. Better quality can yield further sales of 5,000 units per year. Therefore, an increase in spending

on quality measures is justified since it not only yields significant improvements to quality but also brings in more sales orders.

Improvement to the financial position of the firm is summarized below:

Particulars		Amount Rs.
Improved Contribution Margin (Ref. note 1)		3,75,00,000
Elimination of Goods Replacement		31,25,000
Elimination of Warranty Claims		30,00,000
Elimination of Rework		31,56,250
Savings in Inspection Cost		4,00,000
Total Benefit	...(A)	4,71,81,250
Additional Costs Incurred		
Training		50,00,000
Quality Planning and Improvement		1,50,00,000
Increase in Fixed Cost (Yearly Depreciation of Upgraded Machines)		1,20,00,000
Total Additional Cost	...(B)	3,20,00,000
Net Benefit	...(A) - (B)	1,51,81,250

Note 1: Incremental Contribution:

Sales have increased by 5,000 units. Selling Price is Rs.20,000 per unit while variable cost is Rs.12,500 per unit. Contribution is Rs.7,500 per unit.

Conclusion: Six Sigma team's proposals are focused on preventing the error from occurring. Consequently, quality improves, sale improves and thereby can yield a net benefit of Rs.1,51,81,250 per year to the company.

(5) *Control:* Maintain quality at 6σ level and keep the production facilities updated.

(i) Training sessions with workers can serve as two-way communication platform to detect other problems that can be resolved in more timely manner. Inputs received can also be used to improve the production work flow as well.

(ii) New function of quality planning and improvement can help the company be better informed about the latest production methodologies.

(iii) Updated machines are better equipped to handled changes in the production process since they are built with the latest technology. ABC should do a continuous assessment of the state of its machines and upgrade them when necessary.

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2. (i)   The current cost and profit per unit are calculated as below:

Cost Component	Units	Actual Cost p.a. for 10,000 racks (Rs.)	Actual Cost per rack
Revenue	10,000 racks	75,00,000	750
Direct Material	5,20,000 sq. ft.	20,00,000	200
Direct Labour	1,00,000 hrs.	10,00,000	100
Machine Setup	15,000 hrs.	1,50,000	15
Mechanical Assembly	200,000 hrs.	30,00,000	300
Total Cost		61,50,000	615
Profit		13,50,000	135

Therefore, the current cost is Rs.615 p.u. while the profit is Rs.135 p.u. Machine setup is the time required to get the machines and the assembly line ready for production. In this case, 15,000 hours spent on setting up does not add value to the storage racks directly. Hence, it is a non-value add activity.

(ii) New sale price per rack is Rs.675 per unit. The profit per unit needs to be maintained at ₹135 per unit. Hence, the new target cost per unit = new selling price per unit – required profit per unit = Rs.675 - Rs.135 = Rs.540 per unit.

(iii) As explained above, current cost per unit is Rs.615 while the target cost per unit is Rs.540. Hence, the cost has to be reduced at least by Rs.75 per unit. Analysis of the cost data shows the variances between the budget and actual material usage and labor hours. It is given that the material procurement rate and labor hour rate is the same for budgets and actuals. Hence, the increment in cost of direct materials and labor is due to inefficient use of material and labor hours to complete the same level of production of 10,000 storage racks.

Corrective actions to address these inefficiencies could result in the following savings:

(a)   Inefficiencies resulted in use of extra 20,000 sq. ft. of material.

Material cost per sq. ft. = Actual cost / Actual material usage = Rs.20,00,000 / 5,20,000 sq. ft. = Rs.3.85 per sq. ft.

Therefore, inefficiencies resulted in extra cost = 20,000 sq. ft. × Rs.3.85 per sq. ft. = Rs.77,000.

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If corrective action is taken, for 10,000 racks this translates to a saving of Rs.7.70 per unit.

(b) Inefficiencies resulted in extra 10,000 hrs. to be spent in production.

Labor cost per hr. = Actual cost / Actual labor hrs. = Rs.10,00,000 / 10,000 hrs. = Rs.10 per hr.

Therefore, inefficiencies resulted in extra cost = 10,000 hrs. × Rs.10 per hour = ₹100,000.

If corrective action is taken, for 10,000 racks this translates to a saving of Rs.10 per unit.

(c) Machine setup cost is a non-value added cost. Value analysis can be done to determine if the setup time of 15,000 hrs. can be reduced. However, since these activities have been carried out for a reason, care should be taken to ensure that this change should not adversely impact the production activity later down the stream.

(d) Mechanical assembly cost is almost half of the total cost. These are costs incurred during the production process on the assembly line. Value analysis can be done to determine if the production process can be made more efficient. For example, the process can be streamlined, such that steps can be combined that can be handled by fewer people (process centering). Similarly, value analysis / value engineering can focus on the product design.

Some questions to raise may be:

- Can the product be designed better to make the production more efficient?

- Can the design be minimized to include fewer parts and thus make it easier and efficient to manufacture?

- Can be substitute parts to make it more efficient? Or

- Is there simply a better way of producing the same product?

While target costing is a dynamic and corrective approach, care must the taken the product quality, characteristics and utility are maintained.

3. (i) **ROI**

Division 'Z'

Controllable Profit = Rs.5,290K

Net Assets = Rs.19,520k + Rs. 4,960K – Rs.5,920K = Rs.18,560K

ROI = 28.5%

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Division 'E'

Controllable profit = Rs.3,940K

Net Assets = Rs.29,960K + Rs.6,520K – Rs.2,800K = Rs.33,680K

ROI = 11.7%

In computation of ROI of both division, *controllable profit* has been taken into consideration. The reason behind this is that the Head Office costs are not controllable and responsibility accounting considers that managers should only be held responsible for costs over which they have control. The assets figures being used also depend on the same principal. Figures of current assets and the current liabilities have been taken into consideration as they are such items over which managers have complete control.

(ii) **Bonus**

Bonus to be paid for *each percentage point* = Rs.7,20,000 × 3% = Rs.21,600

Maximum Bonus = Rs.7,20,000 × 20% = Rs.1,44,000

Division 'Z'

ROI = 28.5% (16 whole percentage points above minimum ROI)

16 × Rs. 21,600 = Rs.3,45,600

Therefore, manager will be paid the bonus of Rs.1,44,000 (max.)

Division 'E'

ROI = 11.7% (Zero, percentage point above minimum)

Therefore Bonus = NIL

(iii) **Discussion**

FAI will not receive any bonus since he has not earned any point above minimum percentage. This is due to the large asset base on which the ROI figure has been computed. Total assets of Division 'E' are almost double the total assets of Division 'Z'. The major reason behind this is that Division 'E' invested Rs.13.6 million in new equipment during the year. If this investment were not made, net assets would have been only Rs.20.08 million and the ROI for Division 'E' would have been 19.62% resulting in payment of a bonus Rs.1,44,000 (7 × Rs.21, 600 = Rs.1,51,200; subject to maximum of Rs.1,44,000) rather than the nothing. FAI is being penalized for making decisions which are in the best interests of his division. It is very surprising that he decided to invest where he knew that he would receive lesser bonus subsequently. He acted in the best interests of the X Ltd. altogether. On the other hand, HAI has taken benefit from the fact that he has not invested anything even though it was needed for computer system updation. This is an example of sub-optimal decision making.

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Further, Division 'Z''s trade payables are over double those of Division 'E'. In part, one would expect this due to higher sales (almost 66% more than Division 'E') and low cash levels at Division 'Z'. Higher trade payable leads to reduction in net assets figures. The fact that X Ltd. is rewarding HAI with bonus, even though relationships with suppliers may be badly affected, is again a case of sub-optimal decision making.

If the profit margin (excluding head office cost) as percentage of sales is calculated, it comes to 18.24% for Division 'Z' and 22.64% for Division 'E'. Therefore it can be seen that Division 'E' is performing better if capital employed is ignored. ROI is simply making the division 'E''s performance worse.

FAI might feel extremely disappointed by getting nothing and in the future, he may opt to postpone the investment to increase the bonus. Non- investing in new technology and equipment will mean that the X Ltd. will not be kept updated with industry changes and its overall future competitiveness will be affected.

Briefly, the use of ROI is resulting in sub-optimal decision making and a lack of goal congruence i.e. what is good for the managers is not good for the company and vice versa. Fortunately, Division 'E''s manager still seems to be acting for the benefit of the X Ltd. but the other manager is not. The fact that one manager is receiving a much bigger bonus than the other is not justifiable here and may result in conflict in long run. This is disappointing for the company especially in the situation when the divisions need to work in unison.

4. **(a)** For each day, 'F' spends Rs.360 per clerk (Rs.90 per hr. × 4 hrs.). Therefore, 'F' spends Rs.1,080 per day to employ three clerks. Annually, this outlay amounts to Rs.2,59,200 (Rs.1,080 per day × 240 days).

Over five years, the outlay would be Rs.12,96,000. If the WCMS is implemented, the initial cost is Rs.1,25,000. If we add the annual cost of Rs.36,000, the total cost over five years amounts to Rs.3,05,000. Since one clerk will be needed as well, 'F' has to incur Rs.4,32,000 over five years to pay clerk (Rs.4,32,000 = Rs.90 × 4 hrs. × 1 clerk × 240 days × 5 years). Therefore, the total cost of this option is Rs.7,37,000.

Accordingly, there is cost saving of Rs.5,59,000 from WCMS implementation.

Relevant Non-Financial Considerations

The WCMS may be a lot more efficient, but more rigid. For instance, what if, a student forgets to bring his/ her card or transaction failure due to connectivity issue, and may not have enough cash to pay. Automated systems may be less able to handle these situations. Having clerks may add an aspect of flexibility and a human aspect that is hard to quantify.

Conclusion

Obviously, WCMS option is more cost effective for 'F' because there is a cost saving of Rs.5,59,000. But, non- financial factors should also be taken into consideration.

(b) Decision Making – P Ltd.

(i) With increasing completion, dynamic market changes, changing needs of customers, *non-financial* and *ethical considerations* have gained relevance in the decision- making process. A company may face the dilemma of meeting customers' needs while protecting employees' rights. While there are no clear-cut parameters to measure the impact of such decisions, they have a <u>long-term impact on the company's operations that ensures profitability and sustainability of an organization</u>.

In the given scenario, a customer who contributes close to 60% of P Ltd.'s profits has been making turnaround demands that are unreasonable for the company employees to meet. P Ltd. has to decide whether to continue doing business with the customer based on the current terms or protecting the work environment of its employees. In the current scenario, *it is in P's <u>long term interests to protect its employees' rights (a non-financial consideration).</u> Keeping this approach in mind, P Ltd. decided to terminate business with the profitable client. While this had a significant impact on revenues in the short term, <u>in the long run P Ltd. was able to get business from new clients.</u> Also, <u>realizing the value of service provided, the dropped client came back with projects on equitable terms.</u>* Therefore, even though it did not make financial sense in the short run, decisions based on non-financial metrics played an important role in ensuring P Ltd.'s long term sustainability.

OR

(ii) Qualitative factors to consider while making the outsourcing and make or buy decisions:

(a) Quality of goods produced outside vs. in-house production of the component. Outsourcing or buying a component from the external market, should not impact the overall quality of the product. Therefore, *any component critical for a product would generally not be outsourced unless its supplier gives quality assurance.*

(b) *Reliability of suppliers* in the outsourcing arrangement. Assurance must be given by the supplier in terms of both quality and timely delivery of components for the given price. Also, there must be a sufficient pool of suppliers from whom the company can buy the product. If one supplier closes shop, there must be alternate suppliers available.

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(c) *Availability of skilled labor and infrastructure* to make the component in-house. If not available, then the component may have to be bought from the external market.

(d) *Regularity of demand for the product* – If made in-house, seasonal demand for a product may result in the risk of holding high inventories (including that of raw materials) or making high capital investments that will prove unproductive during off-season. Therefore, *outsourcing or buying from external market may be more viable when the demand for the final product is seasonal*.

(e) *Risk of technological obsolescence for the component* – when the risk is higher company may favor outsourcing.

(f) *Confidentiality of process or patent of process* – Confidential processes or critical components may not be outsourced.

(g) The shutting down of company's manufacturing facility might have a negative impact on the morale of remaining employees.

(c) **(i)**   **Customer's Profitability Statement**

Particulars	Customer- 'Ax'	Customer- 'Bx'
Sales (units)	**350**	**500**
	Rs.	Rs.
Selling Price *per unit*	5,400	5,400
Less: Discount (Quantity)	270 (Rs.5,400 × 5%)	270 (Rs.5,400 × 5%)
Less: Discount (Delivery)	---	432 (₹5,400 × 8%)
Selling Price (Net of Discounts) *per unit*	5,130	4,698
Less: Variable Cost *per unit*	4,420	4,420
Contribution *per unit*	710	278
Total Contribution	2,48,500 (Rs.710 × 350 units)	1,39,000 (Rs.278 × 500 units)
Less: Additional Overheads		
Delivery Cost	17,500 (5 × Rs.3,500)	---
Order Processing Cost	10,000 (5 × Rs.2,000)	20,000 (10 × Rs.2,000)

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Profit *per customer**	2,21,000	1,19,000
Profit *per customer per unit*	631.43	238.00

Analysis

Even though Ax has lower sales volume (30% lesser from 'Bx'), it is contributing almost double profit that is being contributed by 'Bx' as overall discount offered to customer 'Ax' is quite less.

(ii) Comments on the "Discount Policy on Delivery"

Discount on delivery offered to customer 'Bx' is Rs.432 *per unit*. If transport for delivery is provided to customer 'Bx' then the cost would have been Rs.70 *per unit* (10 deliveries × Rs.3,500 / 500 units), which is lesser by Rs.362. It may also be noted that delivery cost in case of customer 'Ax' is only Rs.50 per unit (Rs.17,500 ÷ 350 units). Hence, company needs to review discount policy on delivery but significance of profitability of customer 'Bx' should also be kept in mind while doing so.

5. (a) Material M

The requirement of 2,000 units of Material M has to be purchased in entirety since there are no units in stock. Therefore, the relevant cost will be the replacement cost at Rs.8 per unit, which for 2,000 units is Rs.16,000 (2,000 units × Rs.8 per unit).

Material N

There is a requirement of 3,000 units of Material N, of which 1,200 units are in stock. Material N used regularly in the production of all types of dyes. If the 1,200 units in stock are used, they need to be replenished (replaced) in order to meet production demands of other dyes. In addition, for the special order, additional 1,800 units of Material N is required to be procured from the market. Therefore, 3,000 units of Material N has to be procured if the special order is undertaken. The relevant cost will be the replacement cost at Rs.10 per unit, which for 3,000 units is Rs.30,000 (3,000 units × Rs.10 per unit).

Material O

There is a requirement of 2,000 units of Material O, of which 1,400 units are in stock. The balance 600 units have to be procured at the replacement (market) price of Rs.14 per unit, which would be Rs.8,400. Material O has no other use, so if the special order is not undertaken the stock of 1,400 units can be sold at Rs.9 per unit. So, the opportunity cost of undertaking this order is Rs.12,600. Therefore, the relevant cost for Material O is procurement cost of 600 units plus the opportunity cost of not disposing the current stock of 1,400 units, which would be Rs.8,400 + Rs.12,600 = Rs.21,000.

Material P

The entire requirement of 500 units of Material P is in stock. If the special order is not accepted, Golden paints has two options (i) sell the excess material at Rs.12 per unit or (ii) use it as a substitute for Material Z, which would otherwise need to be procured.

(i)   The realizable value of Material P is Rs.6,000 (500 units × Rs.12 per unit).

(ii) Material P can be used as a substitute for 700 units of Material Z. Since there is no stock of Material Z currently, if the special order is accepted, the entire quantity would have to be procured at Rs.11 per unit. This would cost the company Rs.7,700 (700 units × Rs.11 per unit).

Both options (i) and (ii) represent opportunity cost if the special order is accepted. The relevant cost for Material P, if the special order is accepted would be higher of either of these two opportunity costs. The higher opportunity cost of that of procuring Material Z from the market at Rs.7,700. Therefore, the relevant cost for Material P is Rs.7,700.

Therefore, the relevant cost to accepting the special order would be the cumulative of the relevant cost for Materials M, N, O, and P. This works out to Rs.74,700.

(b)   Analysis of Variances

It can be seen that total unit sales increased by 40,000 rolls resulted in a favorable volume variance. Therefore, a potential increase of Z$2.3 m in contribution margin was achieved as a result of change in sales volume compared with budgeted volume. The sales volume variance is further divided into a sales quantity and sales mix variance. In the case of ZM, sales quantity variance came out to be favorable 1.70 m and the sales mix variance came out to be 0.60 m favorable. ZM's sales quantity variance can be further subdivided into market size and share variances. ZM gain 2 market share percentage points from 10% budgeted share to the actual share of 12%. The Z$5.95m favorable market share variance is the effect of the *decline in contribution margin*. Market size is Z$ 4.25m adverse as actual market size decreased 12.5% compared to budgeted market size. Further, it appears that accountant has committed a blunder in the computation of variances related to sales. He/ She completely ignored the price variance which is a substantial part of the analysis. If we look closely at the data given, the *price variance* for domestic as well as industrial roll can be computed without difficulty. Price variance is Z$ 8.085m adverse (refer below computations) and having *significant impact* on the contribution margin. Revised structures after the computation of price variance are as under:
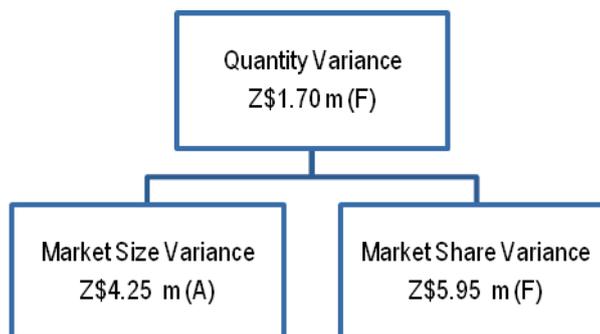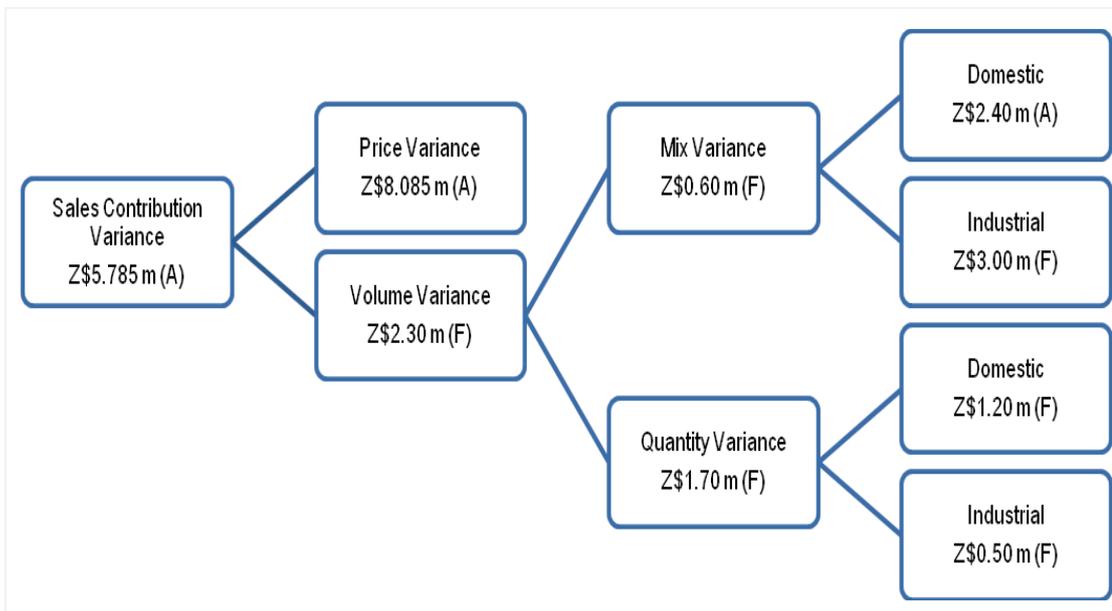
Workings

Statement Showing Sales Contribution Price Variance

System	Actual Qty. (units'000)	Actual Contribution Margin per unit (Z$)	Standard Contribution Margin per unit (Z$)	Difference (Z$)	Variance (Z$)
Domestic	570	27.00	40.00	-13.00	7.41 m (A)
Industrial	270	47.50	50.00	-2.50	0.675 m (A)
Total	840				8.085 m (A)

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Strategic Inputs

The expected demand for industrial flooring rolls was 2,00,000 units. Against this the actual sales has been 2,70,000 rolls. Even after adjustment for the sales mix (revised actual quantity) that could have resulted in a proportional volume of 2,10,000 units, the actual sales 28.57% higher than projections. Actual contribution margin of Z$47.5 is *marginally lower* than standard contribution margin of Z$50 per unit. ZM may have *cut its selling price to maintain or gain market share*. This indicates that the industrial flooring rolls are in the **Growth Phase** of product life cycle. Due to increase in demand, there is a possibility of higher sales and profits to be made in future years.

The expected demand for domestic residential flooring rolls was 6,00,000 units. Against this the actual sales has been 5,70,000 rolls. After adjustment for the sales mix (revised actual quantity) given the increased sales volume, sales should have been 6,30,000 units as per the standard sales mix ratio. Actual sales are about 9.52% lower than the revised expectations. Actual contribution margin is Z$27 per roll i.e. 32.5% lower than the standard contribution margin. ZM may have sold these at *substantially reduced* price to increase the sales volume. This indicates that the domestic residential flooring rolls might be in the **Decline Stage** of product life cycle.

The market size for flooring rolls has reduced from an expectation of 80 lacs rolls to 70 lacs rolls. Therefore, the market size has shrunk significantly by 12.5% for the year 2019. This is a *threat to profitability* of business. The management has to understand the reasons behind this shrinkage. For example, dwindling demand maybe on account of cheaper substitutes available for flooring rolls. The management has to take cognizance of this threat to business. A positive for ZM is that its actual market share for flooring rolls was higher than expected at 12%. An increase in market share would have a beneficial impact on the company's profitability. Also, despite the shrinkage in market size, demand for industrial flooring rolls seems to be on the rise. This could be an opportunity for the management to consider.

As explained above, the industrial flooring rolls seem to be in the Growth Stage of product life cycle, while the domestic residential rolls are in the Decline Stage. Industrial flooring rolls have a higher contribution margin per roll as compared to domestic residential rolls. Accordingly, ZM may consider *phasing out domestic flooring rolls* and *concentrate on industrial flooring rolls*. In view of shrinking market conditions, it would be more profitable to phase out the weaker product and concentrate on the fast moving and profitable product. At the same time, since domestic flooring roll still has *significant demand*, the strategy to phase out this product may have to be done in a *phased* and *well-planned manner*. In view of the shrinking market size, ZM should not end up losing its market share due to phasing out domestic flooring rolls.

For your conceptual understanding

"Budgeted Vs Actual Figures"

Product	Budgeted Qty. Rolls ('000) [BQ]	Standard Cont. *per Roll* (Z$) [SC]	Budgeted Cont. (Z$'in millions)	Actual Qty. Rolls ('000) [AQ]	Actual Contribution *per Roll* (Z$) [AC]	Actual Contribution (`'in millions)	Revised Actual Qty. ('000) [RAQ]
1	2	3	4 = 2×3	5	6	7= 5×6	8
Dom.	600	40	24.00	570	27	15.390	630 (840 ×75%)
Ind.	200	50	10.00	270	47.5	12.825	210 (840 ×25%)
	800		34.00	840		28.215	840

Budgeted Market Share (in %) $\quad = \dfrac{8,00,000 \text{ Rolls}}{80,00,000 \text{ Rolls}} = 10\%$

Actual Market Share (in %) $\quad = \dfrac{8,40,000 \text{ Rolls}}{70,00,000 \text{ Rolls}} = 12\%$

Average Budgeted Contribution (per Roll)

$\qquad =$ Z$ 34 millions/ 800,000 Rolls

$\qquad =$ Z$ 42.50

Sales Contribution Mix Variance

	Standard Contribution per unit (Z$)	Actual Qty. (units'000)	Revised Actual Quantity (units'000)	Difference ('000)	Variance (Z$)
Domestic	40	570	630	-60	2.40 m (A)
Industrial	50	270	210	+60	3.00 m (F)
Total		840			0.60 m (F)

Sales Contribution Quantity Variance

System	Standard Contribution per unit (Z$)	Revised Actual Quantity (units'000)	Budgeted Quantity (units'000)	Difference ('000)	Variance (Z$)
Domestic	40	630	600	+30	1.20 m (F)
Industrial	50	210	200	+10	0.50 m (F)
Total		840			1.70 m (F)

Computation of Market Size Variance

= Budgeted Market Share % × (Actual Industry Sales Quantity *in units* − Budgeted Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)

= 10% × (70,00,000 Rolls − 80,00,000 Rolls) × Z$ 42.50

= Z$ 4.25 m (A)

Computation of Market Share Variance

= (Actual Market Share % − Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)

= (12% − 10 %) × 70,00,000 Rolls × Z$ 42.50

= Z$ 5.95 m (F)

6. (i) **Cost of Quality Statement**

Particulars of Costs	Cost Incurred (Rs.)	% of Total Costs of Quality
Preventive Costs:		
Employee training	1,20,000	5.85%
Appraisal Costs:		
Testing	1,70,000	8.29%
Internal Failure Costs:		
Rework	3,00,000	17.08%
Cost of rejected units	50,000	
External Failure Costs:		

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Lost profits from lost sales due to impaired reputation	8,10,000	68.78%
Sales return processing	1,75,000	
Warranty costs	4,25,000	
Total Cost of Quality	**20,50,000**	**100%**

(ii) **Cost Benefit Analysis of New Quality Programme**

Particulars of Costs	Additional (Costs) / Cost Savings (Rs.)	Total New (Costs) / Cost Saving (Rs.)
Preventive Costs:		
Reengineer the production process	(7,50,000)	(8,50,000)
Supplier screening and certification	(30,000)	
Preventive maintenance on equipment	(70,000)	
Appraisal Costs:		
Inspect Raw Materials	(1,20,000)	(1,20,000)
Internal Failure Costs:		
Reduction in rework costs	2,50,000	2,50,000
External Failure Costs:		
Reduction of lost profits from lost sales	8,00,000	12,75,000
Reduction from sales return	1,50,000	
Reduction from warranty costs	3,25,000	
Total savings (costs) from quality programme		**5,55,000**

(iii) Investment in prevention costs and appraisal costs (also known as costs of good quality), reduces internal and external failure costs (also known as cost of poor quality).

Costs incurred before actual production begins, to prevent defects and other product quality issues, are known as preventive costs. In the given example, reengineering production process, screening / certification of suppliers and preventive maintenance of equipment are preventive costs. Likewise, appraisal costs are incurred to ensure that activities conform to desired quality requirements. They are incurred in all stages of production. In the given example inspection of raw material is an appraisal cost.

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While preventive and appraisal costs would not directly improve the quality of the product, they would definitely reduce internal failure costs like rework costs or external failure costs like sales returns or warranty claims. These would also enhance the reputation of the product for its standard of quality. Conversely, it follows that internal failure costs may be preferable to external failure costs since it affects the company's brand image.

Costs incurred to ensure conformance to quality will ensure higher chances of detection of defects in the product. At the same time ensuring zero defective rate may require huge resources and therefore may be costly. Instead, companies may have the ability to absorb costs incurred due to rework, warranty claims or lost sales. Therefore, they must determine a reasonable threshold defective rate that is acceptable, a normal cost in business operations. Tools for quality production management like Total Quality Management (TQM) will help in determining the optimum cost of quality that the company is willing to bear. TQM focus on continuous improvement of an organization's business activities. This creates an awareness of quality that the company comes to expect from various processes. Things need to be done right the first time, consequently eliminating defects and waste from operations. At the same time, an in-depth knowledge of business processes provides information that can help the management set acceptable threshold limits for reasonable level of defects it is willing to bear.

(b) There are potential advantages and disadvantages of the involvement of staff in the preparation of the budget.

Potential advantages include:

- Senior staff may agree to accept the targets because they would take ownership of it as their budget.

- Senior staff may have a better understanding of what results can be achieved and at what costs. For example, they may have a better knowledge of individual courses and how they may be delivered more efficiently and cost effectively.

- Senior staff cannot blame unrealistic goals as an excuse for not achieving budget expectations.

- Senior staff would feel that they are being appreciated for the value that their experience brings to the running of the management school.

- Senior staff may get the opportunity to discuss organisational issues, in which an exchange of information and ideas can help to solve problems and agree future actions.

Potential disadvantages include:

- Senior staff may be excellent academically but could lack the practical knowledge required to formulate their budget.

- Senior staff may limit the benefits of participation due to personality traits of participants.
- Senior staff may consume a great deal of time arguing with each other (and with the school director).

  Senior staff may decide among themselves to artificially inflate the proposed budget so that it is easier for them to attain the cost targets they have set.