CA Final SPOM Set B – Strategic Cost & Performance Management
ICAI Module Questions Compilation

Chapter 2 - MODERN BUSINESS ENVIRONMENT

Illustration 1

Livewell Limited is a manufacturing company that produces a wide range of consumer products for home consumption. Among the popular products are its energy efficient and environment friendly LED lamps. The company has a quality control department that monitors the quality of production. As per the recent cost of poor quality report, the current rejection rate for LED lamps is 5% of units input. 5,000 units of input go through the process each day. Each unit that is rejected results in a Rs 200 loss to the company. The quality control department has proposed few changes to the inspection process that would enable early detection of defects. This would reduce the overall rejection rate from 5% to 3% of units input. The improved inspection process would cost the company Rs 15,000 each day.

Required

(i) ANALYSE the proposal and suggest if it would be beneficial for the company to implement it.

(ii) After implementation, ANALYSE the maximum rejection rate beyond which the proposal ceases to be beneficial?

Solution

(i) Analysis of the proposal to make changes to the inspection process:

The company wants to reduce the cost of poor quality on account of rejected items from the process. The current rejection rate is 5% that is proposed to be improved to 3% of units input.

The expected benefit to the company can be worked out as follows:

The units of input each day = 5,000. At the current rate of 5%, 250 units of input are rejected each day. It is proposed to reduce rejection rate to 3%, that is 150 units of input rejected each day. Therefore, improvements to the inspection process would reduce the number of units rejected by 100 units each day. The resultant cost of poor quality would reduce by Rs.20,000 each day (100 units of input × Rs.200 cost of one rejected unit).

The cost of implementing these additional controls to the inspection process would be Rs.15,000 each day.

The net benefit to the company on implementing the proposal would be Rs.5,000 each day. Therefore, the company should implement the proposal

(ii) Analysis of maximum rejection rate beyond which the proposal ceases to be beneficial

The cost of improving controls to the inspection process is Rs.15,000 each day. The number of units of input processed each day is 5,000. The cost of rejection is Rs.200 per unit.

It makes sense to implement the improvements to controls only if the benefit is greater than the cost involved. To find out the point where the benefits equal the cost, solve the following equation.

Let the number of reductions in rejections each day due to improved controls be R. At Rs. 200 per unit, benefits from reduction in rejection would be Rs. 200 × R.

At what point, would this be equal to the cost of control of Rs. 15,000 per day?

Solving Rs. 200 × R = Rs. 15,000; R = 75 units. That is if the improvements to inspection process control reduces the number of rejections by 75 units each day, the benefit to the company would be Rs.15,000 each day.

That is if the rejection rate improves by 1.5% (75 units / 5,000 units) then the benefits accruing to the company will equal the cost incurred.

In other words, when the rejection rate is 3.5% (current rate 5% - improvement of 1.5% to the rate) or below, the proposal will be beneficial. In this range, the savings to the cost of poor quality will be more than the cost involved. For example, as explained above, when the improved rejection rate is 3%, the net benefit to the company is Rs.5,000 each day.

Beyond 3.5% rejection rate, the proposal will result in savings to the cost of poor quality that is less than the cost involved of Rs. 15,000 each day.

Case Scenario 1

JK Ltd. produces and sells a single product. Presently the company is having its quality control system in a small way at an annual external failure and internal failure costs of Rs 4,40,000 and ₹ 8,50,000 respectively. As the company is not able to ensure supply of good quality products upto the expectations of its customers and wants to manage competition to retain market share considers an alternative quality control system. It is expected that the implementation of the system annually will lead to a prevention cost of Rs 5,60,000 and an appraisal cost of ₹ 70,000. The external and internal failure costs will reduce by ₹ 1,00,000 and ₹ 4,10,000 respectively in the new system. All other activities and costs will remain unchanged**.**

Required

(i) EXAMINE the new quality control proposal and recommend the acceptance or otherwise of the proposal both from financial and non-financial perspectives.

(ii) What is your ADVICE to the company, if the company wants to achieve zero defect through a continuous quality improvement program ?

(iii) SUGGEST a suitable quality control level at a minimum cost.

Solution

(i) Implementation of new system will reduce costs of the non - conformance (internal and external failure) by Rs 5,10,000 (-40%). However, this will also increase costs of conformance by Rs 6,30,000. There is inverse relationship between the costs of the conformance and the costs of non-conformance. JK Ltd. should try to avoid costs of non- conformance because both internal and external failure affect customer's satisfaction and organisations profitability. 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. 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. Accordingly, from the financial perspective point of view the new proposal for quality control should not be accepted as it will lead to an additional cost of Rs 1,20,000 (Rs 6,30,000 - 5,10,000).

However, from non-financial perspective point of view as stated above the company should accept the new proposal.

(ii) It is possible to increase quality while at the same time reducing both conformance and non-conformance costs if a programme of aiming for zero defect/ and or continuous improvement is followed. Zero defect advocates continuous improvement. To implement this elimination of all forms of waste, including reworks, yield losses, unproductive time, over-design, inventory, idle facilities, safety accidents, etc. is necessary.

(iii) To achieve 0% defects, costs of conformance must be high. As a greater proportion of defects are accepted, however, these costs can be reduced. At a level of 0% defects, cost of non-conformance should be nil but these will increase as the accepted level of defects rises. There should therefore be an acceptable level of defects at which the total costs of quality are at a minimum.

Illustration 2

Cineworld is a movie theatre is located in a town with many colleges and universities around it. The town has a substantial student population, most of whom are avid movie goers. Business for Cineworld has been slow in the recent years due to the advent of streaming websites, that show the latest and popular movies online. However, the management of Cineworld continue to feel students would still enjoy the watching movies on big screen, along with the facilities and ambience that only a movie theatre can offer. Accordingly, they have framed a plan to attract students by offering discounts on movie tickets.

The average time a student spends at the college or university is 4 years, which is the average duration of any course. For a nominal one-time subscription fee, Cineworld plans to offer students discounts on movie tickets for a period of 4 years. By attracting more footfalls, Cineworld targets to cross sell it food & beverages and souvenirs. This would help it sustain a reasonable revenue each year.

Cineworld would attract attention to the plan by initially offering free tickets, food and beverage and gift vouchers. This one-time initial expense, net of the one-time subscription fee collected, would cost ₹ 5,000 per student. On subscription to the plan, the viewership and purchases of each student is expected to be as follows:

Particulars	Years 1 and 2	Years 3 and 4
Spend on movie tickets per year	2,000	1,500
Spend on food and beverage per year	4,000	3,000
Spend on souvenirs and accessories per year	2,250	750

Assumptions

1. Only 50% of the subscribers are expected to visit the theatres in years 3 and 4.
2. Across all years, only 75% of the subscribers who visit the theatre are expected to buy food and beverage.
3. Only 25% of the subscribers who visit are expected to buy souvenirs in years 1 and 2, and 10% of them in years 3 and 4.

Given that PVIFA of Rs 1 for 4 years at 10% = 3.169 and PVIFA of Rs 1 for 2 years at 10% = 1.735.

Required

Calculate the customer lifetime value per subscriber for the above plan.

Solution

Customer lifetime value per subscriber can be found by calculating the present value of the revenue that is generated over the period of 4 years. This netted out with the cost incurred to attract subscribers, would give the customer lifetime value per subscriber**.**

Sr. No.	Particulars	Revenue (per year)	PVIFA	PV of Revenue	Probability of Usage	Net Revenue
1	Net cost of attracting students (onetime expense)					(5,000)
2	Net revenue from movie tickets					
	Years 1-2	2,000	1.735	3,470	100%	3,470
	Years 3-4 (refer note 1)	1,500	1.434	2,151	50%	1,076
3	Sale of food and beverages					
	Years 1-2	4,000	1.735	6,940	75%	5,205
	Years 3-4 (refer note 2)	3,000	1.434	4,302	37.5%	1,613
4	Sale of souvenirs and accessories					
	Years 1-2	2,250	1.735	3,904	25%	976
	Years (refer note 3)	750	1.434	1,076	5%	54
5	Total revenue (Steps 2+3+4)					12,394
6	Net revenue from subscription plan (steps 5-1)					7,394

Note 1:
PVIFA (10%, 4 years) = 3.169 and PVIFA (10%, 2 years) is 1.735. Therefore, PVIF for years 3 and 4 = PVIFA (10%, 4 years) - PVIFA (10%, 2 years) = 3.169 - 1.735 = 1.434.

Note 2:
Only 50% of the subscribers are expected to attend in years 3 and 4. Out of those only 75% are expected to buy food and beverage. Therefore, only 38% of the subscribers (75% of 50% subscribers who visit) are expected to buy souvenirs in years 3 and 4.

Note 3:
Only 50% of the subscribers are expected to attend in years 3 and 4. Out of those only 10% are expected to buy souvenirs. Therefore, only 5% of the subscribers (10% of 50% subscribers who visit) are expected to buy souvenirs in years 3 and 4.
Present value of total revenue generated over the four-year period by a customer is Rs. 12,393 while the corresponding expense is Rs. 5,000. Therefore, the customer lifetime value per subscriber is Rs. 7,393. Cineworld has to multiply this with the expected number of subscribers each year, to find out if this would be a profitable proposition.

Case Scenario 2

Raya Health Care Limited is a leading healthcare service provider in Mumbai, it has approximately 450 potential beds, it provides diagnostic and day care speciality facilities also. In diagnostic centres they are using traditional devices for CT Scan and MRI which are not enough as per demand. Patients waited more than weeks for CT and MRI scans, this problem can cause delay in diagnosing illness; waste of time and other resources; not just in radiology but throughout the healthcare system.
Raya has planned to outsource CT scan and MRI services to Livlife, which has world-class international chain of diagnostic centre. Livlife promise to provide radiologist report within 24 hours. However,

finance manager of Raya doubt that it will not be a profitable arrangement. For the satisfaction of Raya, Livlife has entered an agreement to provide its services to Raya with no guarantee of receiving payment. Raya agrees to the following conditions:

- Cost savings generated in first year, the same will be retained by Livlife.
- Cost savings generated in second and third year will be shared between Raya and Livlife at a ratio of 30%:70%.
- Cost savings generated in the fourth year will be passed to Raya.
- Any cost savings generated by an idea proposed exclusively by Raya that does not require capital investment by Livlife will be immediately passed along to Raya.

Required
Discuss the agreement between Raya and Livlife.

Solution
The agreement between Raya and Livlife is **Gain Sharing Arrangement**. Gain sharing (also known as cost saving sharing) arrangement is an approach to the review and adjustment of an existing contract, or series of contracts, where the adjustment provides benefits to both parties. A fundamental form of gainsharing is where a supplier agrees to perform its side of the contract with no guarantee of receiving a payment. Instead, any payment received is based upon the benefits that emerge to the customer as a result of the successful completion of the supplier's side of the bargain.
Livlife and Raya has also entered into such arrangement. This is clearly a risky stance for the supplier i.e., Livlife, because it could spend a fortune and walk away with nothing. Alternatively, if the benefits to Raya are substantial, Livlife could find itself rewarded with a large return. Cost savings might be attained from reducing the cost of supplies, implementing new skill and technologies, revised delivery time, improvements in operations etc.
The gain, benefit, or advantage to be shared is **not necessarily financial,** although financial benefits are expected to occur frequently. The Raya, for instance, will not necessarily take cost savings in the form of a lower contract value but might require a higher specification for medical treatment. However, to assess any financial benefit, both parties have to provide each other with access to relevant cost numbers to determine the basis for the assessment of the benefit and the calculation and sharing of the benefit.
Many contracts involving these arrangements have emphasis on greater openness and shared development and improvement. In the given case gain-sharing deals are, on the face of it, a win- win situation for both Raya and Livlife, interest of both are aligned. Livlife is trying to save costs of Raya while Raya is trying to get world class services

TEST YOUR KNOWLEDGE

Question 1

CIMZ is a new banking company which is about to open its first branch in INDIA. CIMZ believes that in order to win customers from the market, it needs to offer potential customers a new banking experience. Other banking companies are focusing on interest rates and bank charges, whereas CIMZ believes that quality and timely availability of service is an important factor to attract customers.

Required
EXPLAIN how Total Quality Management would enable CIMZ to gain competitive advantage in the banking sector.

Answer

Total Quality Management is a management philosophy. It concerns itself with managing the processes and people to make sure that the customer is satisfied at each and every stage. This means making the needs of the customer the priority, expanding the relationship beyond traditional services and incorporating the customer's needs in the company's business plan and corporate strategy. In TQM, the concept of "quality" is perceived exclusively from the frame of reference of the customer. These customers can be internal, such as, those working in another department and there can be external customers who are the end recipients of the product or services. The organisation should attempt for continuous improvement in the quality that it delivers with the ultimate aim of achieving zero defects in this quality.

TQM should be view as an investment rather than as a cost that should be minimised. There are many ways in which investment can be made in TQM.:

- fine-tuning the product mix,
- fine-tuning of the processes of ensuring quality,
- introducing employee development programmes with the nature of an academic course,
- empowering the employees professionally and personally,
- improving the top management commitment to quality,
- monitoring of the performances and proper rewarding based on achievements,
- ensuring the customer satisfaction etc.

CIMZ could provide its employees with training in the technical aspects of banking practice as well as in customer care. Customers would thus get a better service not only technically but also from a customer care perspective. This should lead to smaller customer complaints and greater customer satisfaction. It could also motivate customers to recommend others to use this bank.

TQM also requires CIMZ to respond to its customer's requirements immediately for example by providing more staff to reduce the lengths of queues in festive/ seasonal/ busy time. If Bank could also be opened for longer hours to allow customers to complete t heir bank related requirements and have meetings with bank employees at a time that is more convenient for the customer, this would lead to more satisfaction to customers. In long run, if bank continue to follow TQM, the bank would have higher profits and competitive advantage in banking sector despite incurring additional expenditure to improve quality.

Question 2

The CEO of P Ltd. is concerned with the amounts of resources currently spent on customer 'warranty claims. Each box of its product is printed with the logo: "satisfaction guaranteed or your money back". P Limited is having difficulty competing with X Limited because it does not have the reputation for high quality that X Limited enjoys. Since the warranty claims are so high, the CEO of P Limited would like to evaluate what costs are being incurred to ensure the quality of the product. Following information is collected from various departments within the company relating to 2022-23:

Particulars of Costs	(Rs)
Warranty claims	4,25,000
Employee training costs	1,20,000
Rework	3,00,000

Lost profits from lost customers due to impaired reputation	8,10,000
Cost of rejected units	50,000
Sales return processing	1,75,000
Testing	1,70,000

For the year 2023-24, the CEO is considering spending the following amounts on a new quality programme:

	(Rs)
Inspect raw material	1,20,000
Reengineer the production process to improve product quality	7,50,000
Supplier screening and certification	30,000
Preventive maintenance on plant equipment	70,000

P Limited expects the new quality programme to save costs by the following amounts:

	(Rs)
Reduction in lost profits from lost sales due to impaired reputation	8,00,000
Reduction in rework costs	2,50,000
Reduction in warranty costs	3,25,000
Reduction in sales return processing	1,50,000

Required

(i) PREPARE a 'Cost of Quality Statement' for the year 2022-23 showing the percentage of the total costs of quality incurred in each cost category.

(ii) PREPARE a 'Cost Benefit Analysis' of the new quality programme showing how the quality initiative will affect each cost category.

(iii) STATE how the manager trade-offs among the four categories of quality costs.

Answer

i. Cost of Quality Statement For the year 2022-23

Particulars of Costs	**Cost Incurred(Rs)**	**Total Cost Incurred (Rs)**	**% of Total Costs of Quality**
Preventive Costs:			
Employee training	1,20,000	1,20,000	5.85%
Appraisal Costs:			
Testing	1,70,000	1,70,000	8.29%
Internal Failure Costs:			
Rework	3,00,000	3,50,000	17.08%
Cost of rejected units	50,000		
External Failure Costs:			
Lost profits from lost sales due to impaired reputation	8,10,000		

Sales return processing	1,75,000	14,10,000	68.78%
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**

(ii) 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

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.

Question 3

A company produces and sells a single product. The cost data per unit for the year 2024 is predicted as below:

	₹ per unit
Direct Material	35
Direct Labour	25
Variable Overheads	15
Selling Price	90

The company has forecast that demand for the product during the year 2024 will be 28,000 units. However, to satisfy this level of demand, production quantity will be increased.

There are no opening stock and closing stock of the product.

The stock level of material remains unchanged throughout the period.

The following additional information regarding costs and revenue are given:

— 12.5% of the items delivered to customers will be rejected due to specification failure and will require free replacement. The cost of delivering the replacement item is Rs 5 per unit.

— 20% of the items produced will be discovered faulty at the inspection stage before they are delivered to customers.

— 10% of the direct material will be scrapped due to damage while in storage. Due to above, total quality costs for the year is expected to be Rs 10,75,556.

The company is now considering the following proposal:

1. To introduce training programmes for the workers which, the management of the company believes, will reduce the level of faulty production to 10%. This training programme will cost Rs 4,50,000 per annum.
2. To avail the services of quality control consultant at annual charges of Rs 50,000 which would reduce the percentage of faulty items delivered to customers to 9.5%.

Required

(i) PREPARE a statement of expected quality costs the company would incur if it accepts the proposal. Costs are to be calculated using the four recognised quality costs heads.

(ii) Would you RECOMMEND the proposal? Give financial and non-financial reasons (in brief).

Answer

(i) Statement of 'Expected Quality Costs'

Particulars	Current Situation (₹)	Proposed Situation (₹)
Prevention Costs	---	4,50,000
Appraisal Costs	---	50,000
External Failure Costs	3,20,000	2,35,120
Internal Failure Costs	7,55,556	3,91,538
Total Quality Costs	**10,75,556**	**11,26,658**

Workings External Failure Cost

Particulars	Current Situation	Proposed Situation
Customer's Demand …(A)	28,000 units	28,000 units
Number of units Dispatched to Customers …(B) $\frac{28{,}000\ units}{87.5\%}$; $\frac{28{,}000\ units}{90.5\%}$	32,000 units	30,939 units
Number of units Replaced …(B) – (A)	4,000 units	2,939 units
External Failure Cost {4,000 units × ₹ (35+25+15+5)}; {2,939 units × ₹ (35+25+15+5)}	Rs3,20,000	Rs2,35,120

Internal Failure Cost

Particulars	Current Situation	Proposed Situation
Number of units Dispatched to Customers …(A)	32,000 units	30,939 units
Number of units Produced & Rejected … (B) $\frac{32{,}000\ units}{80\%}$; $\frac{30{,}939\ units}{90\%}$	40,000 units	34,377 units
Number of units Discovered Faulty … (B) – (A)	8,000 units	3,438 units
Cost of Faulty Production …(D) {8,000 units × ₹ (35+25+15)}; {3,438 units × ₹ (35+25+15)}	₹ 6,00,000	₹ 2,57,850
Material Scrapped $\left(\frac{40{,}000\ units}{90\%} \times 10\%\right)$; $\left(\frac{34{,}377\ units}{90\%} \times 10\%\right)$	4,444.44 units	3,819.67 units
Cost of Material Scrapped …(E) {4,444.44 units × ₹ 35}; {3,819.67 units × ₹ 35}	₹ 1,55,556	₹ 1,33,688
Internal Failure Cost …(D)+(E)	₹ 7,55,556	₹ 3,91,538

ii) Recommendation

On purely financial grounds the company should not accept the proposal because there is an increase of Rs. 51,102 in quality costs. However, there may be other factors to consider as the company may enhance its reputation as a company that cares about quality products and this may increase the company's market share. On balance the company should accept the proposal to improve its long-term performance.

This question can also be solved by considering rejections of 3,500 units (12.5% of 28,000) Hence, total 31,500 units are required to be produced

Question 4

EKS Ltd. manufactures a single product, which requires three components. The company purchases one of the components from three suppliers. DE Ltd., PE Ltd. and ZE Ltd. The following information are available:

	DE Ltd.	PE Ltd.	ZE Ltd.
Price quoted by supplier (per hundred units)	Rs. 240	Rs. 234	Rs. 260
% of Defective of total receipts	3%	5%	2%

If the defectives are not detected, they are utilized in production causing a damage of Rs200 per 100 units of the component. Total requirements are 12,000 units of the components.

The company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated at Rs26 per 100 units of the components. Such as inspection will be able to detect only 90% of the defective components received. No payment will be made for components found to be defective in inspection.

Required

(i) ADVICE whether inspection at the point of receipt is justified?

(ii) Which of the three suppliers should be asked to supply?

ANSWER

i. A: Statement Showing Computation of Effective Cost before Inspection

Particulars	DE Ltd.	PE Ltd.	ZE Ltd.
Units Supplies (No.s)	12,000	12,000	12,000
Defectives Expected (No.s)	360	600	240
Costs:			
Purchase of Components	28,800	28,080	31,200
Add: Production Damage on Defective Components (@ Rs200 per 100 components)	720	1,200	480
Total	29,520	29,280	31,680
Good Components (Nos.)	11,640	11,400	11,760
Cost per 100 Good Components	253.61	256.84	269.39

B: Statement Showing Computation of Effective Cost after Inspection

Particulars	DE Ltd.	PE Ltd.	ZE Ltd.
Units Supplies (No.s)	12,000	12,000	12,000
Defects Not Expected (No.s)	36	60	24
Defectives Expected (No.s)	324	540	216
Components Paid For	11,676	11,460	11,784
Costs:			
Purchase of Components	28,022.40	26,816.40	30,638.40
Add: Inspection Cost	3,120.00	3,120.00	3,120.00
Add: Production Damage on Defective Components (@ Rs200 per 100 components)	72.00	120.00	48.00
Total	31,214.40	30,056.40	33,806.40
Good Components (Nos.)	11,640	11,400	11,760
Cost per 100 Good Components	268.16	263.65	287.47

Advice Whether Inspection at the Point of Receipt is Justified

On comparing the cost under situation, A and B shown above, we find that it will not be economical to install a system of inspection.
Further we also need to consider that presently many organizations are undergoing Just in Time (JIT) implementation. JIT aims to find a way of working and managing to eliminate wastes in a process. Achievement of this is ensured through eliminating the need to perform incoming inspection. Inspection does not reduce the number of defects; it does not help in improving quality. In general inspection, does not add value to the product. It simply serves as a means of identifying defects the supplier has failed to recognize subsequent to the manufacturing of the product.
As a matter of fact, organizations implementing JIT are seeking eventually to eliminate the need for performing incoming inspection activities through a combination of reducing the supplier base, selection through qualification and vendor development. Vendor development and its proper management seeks to assist the supplier who maintains an interest in striving to provide 100% defect-free materials and parts.
So, to decision whether inspection at the point of receipt is justified or not will also depend on Qualitative factors as well.

(ii) On comparing the buying cost of components under different situations, as analysed and advised above, if company decides not to install a system of inspection, supplier DE would be cheaper otherwise supplier PE would be cheaper and company may choose supplier accordingly.

This question can also be solved by assuming receipt of good components as requirement i.e. 12,000 units.

Question 5

H Automobile Group is among top 20 business houses in India. It has been founded in the year 1930, at the height of India's movement for independence from the British, the group has an illustrious history. H's footprint stretches over a wide range of industries, spanning automobiles (two wheelers manufacturer and three wheelers manufacturer). H's headquarter is located at Hyderabad. Bike Production is one of segment of H Group. Management of H wants to analyse the following actual information for the April:

Cost Data

Customer Complaints Centre Cost	35 per hr.
Equipment Testing Cost	18 per hr.
Warranty Repair Cost	1,560 per bike
Manufacturing Rework Cost	228 per bike

Volume and Activity Data

Bikes Requiring Manufacturing Rework	3,200 bikes
Bikes Requiring Warranty Repair	2,600 bikes
Production Line Equipment Testing Time	1,600 hrs.
Customer Complaints Centre Time	2,000 hrs.

Additional Information

Due to the quality issues in the month, the bike production line experienced unproductive down time' which cost Rs 7,70,000. H carried out a quality review of its existing suppliers to enhance quality levels during the month at a cost of Rs 1,25,000.

Required

(i) PREPARE a statement showing 'Total Quality Costs'.

(ii) ADVISE any TWO measures to reduce the non- conformance cost.

Answer

(i) Statement Showing 'Total Quality Costs'

Particulars of Costs	₹
Prevention Costs	
Supplier Review	1,25,000
Appraisal Costs	
Equipment Testing (Rs18 × 1,600 hrs.)	28,800
Internal Failure Costs	
Down Time	7,70,000
Manufacturing Rework (Rs228 × 3,200 bikes)	7,29,600
External Failure Costs	
Customer Complaints (Rs35 × 2,000 hrs.)	70,000
Warranty Repair (Rs1,560 × 2,600 bikes)	40,56,000
Total Quality Costs	**57,79,400**

The reporting of quality costs highlights the cost of quality activities at H. The total quality costs statement clearly displays the relationship between conformance costs (prevention and appraisal costs) and non-conformance costs (internal failure and external failure costs) and the drivers of a reduction in the overall spending on quality. Statement indicates that only 2.16% of the total quality cost is the cost of preventing quality problems while 0.50% is the cost of appraisal activities. Thus, prevention and appraisal costs make up only 2.66% of total quality costs. In contrast, 97.34% of quality control costs are incurred for internal and external failure costs. Following two measures can be used to reduce non- conformance cost:

Total Productive Maintenance (TPM) is a system of maintaining and improving the integrity of production and quality system through keeping all equipment in top working condition so as to avoid breakdowns and delays in manufacturing processes. It involves identifying machines in every division (including planning, manufacturing, maintenance) and then planning & executing a maintenance programme covering their entire useful life.

In this scenario, TPM will help in reducing internal failure cost (i.e. downtime and manufacturing rework cost), which constitutes 25.95% of total quality cost, by keeping all equipment in good working conditions so that there is no downtime or machine breakdown and ensuring that all equipment run smoothly. If machines work properly, the chances of rework will reduce, ultimately will also reduce chances of warranty repair and customer complaints (comprising 71.39% of total quality cost which is the major part of total quality cost).

Total Quality Management (TQM) aims at improving the quality of organisational output, including goods and services, through continual improvement of internal practices. Its objective is to eradicate waste and increase efficiency without compromising with the quality. It requires that company maintain this quality standards in all aspects of business by ensuring that things are done right the first time so that defects and waste are eliminated from operation

It appears that H is not a TQM company at present due to huge disparity between conformance costs and non-conformance costs. In order to make H to be successful, all staff at H must be engaged in the

improvement process and share in the continuous improvement ethos. In order to establish a reputation as a high- quality bike manufacturer H must ensure staff are focused on quality and attitudes changed toward the importance of conformance activities, for instance, H can conduct third party inspection of raw material at supplier's workplace leading to maintenances of quality standards. Overall, while applying above two measures, in the H, consideration must therefore be given to the optimum balance between the costs of conformance and the costs of non-conformance.

Question 6

Cool Air Private Ltd. manufactures electronic components for cars. Car manufacturers are the primary customers of these products. Raw material components are bought, assembled and the electronic car components are sold to the customers.

The market demand for these components is 5,00,000 units per annum. Cool Air has a market share of 100,000 units per annum (20% market share) for its products. Below are some of the details relating to the product:

Selling price	Rs. 2,500 per unit
Raw material cost	Rs. 900 per unit
Assembly & machine cost	Rs. 500 per unit
Delivery cost	Rs. 100 per unit
Contribution	Rs. 1,000 per unit

The customers due to defects in the product return 5,000 units each year. They are replaced free of charge by Cool Air. The replaced components cannot be repaired and do not have any scrap value. If these defective components had not been supplied, that is had the sale returns due to defective units been nil, customers' perception about the quality of the product would improve. This could yield 10% increase in market share for Cool Air, that is demand for its products could increase to 1,50,000 units per annum.

Required

I. ANALYZE, the cost of poor quality per annum due to supply of defective items to the customers.

II. The company management is considering a proposal to implement an inspection process immediately before delivery of products to the customers. This would ensure nil sales returns. The cost of having such a facility would be Rs 2 crores per annum, this would include materials and equipment for quality check, overheads and utilities, salaries to quality control inspectors etc. ANALYZE the net benefit, if any, to the company if it implements this proposal.

III. Quality control investigations reveal that defective production is entirely on account of inferior quality raw material components procured from a large base of 30 suppliers. Currently there is no inspection at the procurement stage to check the quality of these materials. The management has a proposal to have inspectors check the quality control at the procurement stage itself. Any defective raw material component will be replaced free of cost by the supplier. This will ensure that no product produced by Cool Air is defective. The cost of inspection for quality control (materials, equipment, salaries of inspectors etc.) would be Rs4 crores per annum. ANALYZE the net benefit to the company if it implements this proposal? Please note that scenarios in questions (ii) and (iii) are independent and not related to each other.

IV. Between inspection at the end of the process and inspection at the raw material procurement stage, ADVISE a better proposal to implement (a) in terms of profitability and (b) in terms of long-term business strategy?

Answer

(i) Customer demand for Cool Air's products is 1,00,000 units per annum. However, 5,000 defective units supplied are to be replaced free of charge by the company. Therefore, the total number of items supplied to customers per annum = 1,00,000 + 5,000 units = 1,05,000 units. The cost of replacement would include raw material cost, assembly & machining cost and delivery cost of 5,000 units = 5,000 units × (900+500+100) per unit = 5,000 units × Rs. 1,500 per unit = Rs75,00,000 per annum. Further, had the sale returns not happened, market share would have increased by 50,000 units. Contribution is Rs. 1,000 per unit, for 50,000 units contribution would be Rs5,00,00,000. Therefore, the cost of poor quality per annum = cost of replacement + contribution from lost sales = Rs. 75,00,000 + Rs. 5,00,00,000 = Rs. 5,75,00,000 per annum.

(ii) Inspection at the end of the process would detect defects before delivery to the customers. This would ensure that the sale returns would be nil. Given in the problem, 5,000 units supplied are defective and would need to be replaced, in other words, they need to be manufactured again. In other words, inspection after production, before delivery to customers would not prevent production of defective units. However, compared to the current scenario, since these defective units have not yet been delivered to the customer, the cost for additional delivery of replaced products would be saved. This savings in the extra delivery cost = 5,000 units × Rs100 per unit = Rs. 5,00,000 per annum. Further, had the sale returns not happened, market share would have increased by 50,000 units. Contribution is Rs. 1,000 per unit, for 50,000 units it would be Rs. 5,00,00,000 per annum. However, additional failure cost for 2,500 units due to increase in sales from 1,00,000 to 1,50,000 units would be incurred. Since these defective units have not yet been delivered to the customer, this cost would be net of delivery cost. This additional failure cost = 2,500 units × Rs1,400 per unit = Rs35,00,000 per annum. Therefore, the total benefit from the inspection process before delivery to customers = savings on delivery costs + contribution from incremental sales - additional failure cost = Rs. 5,00,000 + Rs. 5,00,00,000 – Rs. 35,00,000 = Rs. 4,70,00,000 per annum. The cost to the company to maintain good quality of its products through inspection = Rs. 2,00,00,000 per annum. Therefore, the net benefit to the company would be Rs. 2,70,00,000 per annum.

(This part can also be analysed by taking 7,895 defectives on 1,50,000 good units. For 95,000 good units, gross production is 1,00,000 units. For, 1,50,000 good units, gross production would be 1,57,895 units (1,00,000/ 95,000×150,000). Therefore, total defective units will be 7,895.)

(iii) Inspection of raw material at the procurement stage could entirely eliminate defective production. The benefit would be two-fold, the current replacement cost for 5,000 units will no longer be incurred. Secondly, due to better customer perception, market share would increase, resulting in an increased contribution / revenue to the company. In other words, cost of poor quality will be nil.
As explained in solution (i), the cost of poor quality per annum = cost of replacement + contribution from lost sales = Rs. 75,00,000 + Rs. 5,00,00,000 = Rs. 5,75,00,000 per annum. This would be the benefit by implementing the proposal.
Cool Air has to incur an inspection cost to ensure this highest standard of quality (0% defects) which would cost Rs. 4,00,00,000 per annum. Therefore, the net benefit to the company would be Rs. 1,75,00,000 per annum.

(iv)

a) The proposal to implement inspection immediately before delivering goods to the customer results in a net benefit of Rs. 2,70,00,000 per annum. Alternately, the proposal to implement inspection at the raw material procurement stage results in a net benefit of Rs. 1,75,00,000 per annum. Therefore, from a profitability point of view, inspection immediately before delivery of goods to the customer would the preferred option.

b) The drawback of inspection at the end of the production process is that

(1) It cannot prevent production of defective goods and
(2) Information regarding the root cause of defective production, in this case, supply of defective raw materials will not get tracked.

Therefore, inspection at the end of production does not contribute to resolving the root cause of defective production. On the other hand, inspection at the procurement stage can eliminate production of defective goods. This will ensure a much higher quality of production, better utilization of resources and production capacity. Therefore, from a long-term strategy point of view, inspection at the raw material procurement stage will be very beneficial. Currently the cost of ensuring this highest quality of production (0% defects) is Rs. 4 crores per annum. The cost of ensuring 100% quality is quite high, such that the net benefit to the company is lesser than the other proposal. However, due to its long-term benefit, Cool Air may consider some minimum essential quality control checks at the procurement stage. Although selective quality check might not ensure complete elimination of defective production, it can contribute towards reducing it. At the same time cost of selective quality check would not be so high as to override its benefits. To determine the extent of quality control inspection, Cool Air should determine its tolerance limit for defective production and do an analysis of the quality / cost trade-off.