PGDM/IB, Batch 2021-23
Total Quality Management
DM-443/IB-443
Trimester – IV, End-Term Examination: September 2022

Roll No: _____

Time allowed: 2 Hrs
Max Marks: 40

Instruction: Students are required to write Roll No on the cover page of the Answer Sheet. All other instructions on the question paper / Admit card should be followed meticulously.

Sections	No. of Questions to attempt	Marks	Total Marks
A	Minimum 4 questions with internal choices and all COs (Course Intended Learning Outcomes) covered in the Question Paper	4* 5	20
B	Compulsory Case Study	(7+7+6)	20
			40

SECTION A – (5 marks * 4 questions) = 20 Marks

Q1. CO 01
A. The following data shows the number ofr training programs organized by a company for its employee per month and the number of complaints received from its customers per month.

X: Number of training programs for Employees/month	Y: Number of customer complaints/month
0	36
1	55
2	26
3	34
4	27
5	57

Draw a scatter diagram in MS Excel and find the correlation coefficient.

Or

B. How can you justify that Motorola's Six Sigma is actually somewhere between 4.5 and 5 sigma level of quality?

Q2. CO 02

A. Discuss the role of management in reducing total quality costs. As management becomes involved, which costs actually rise and which fall? Explain in the context of an organization.

Or

B. Area A company manufacturing PCBs
Customer Expectation: Board must function when I plug them in
CTQ name: Board functionality
CTQ Measure: No functioning or improperly functioning boards
CTQ Specification: All boards functioning properly (a board will not function properly if any individual component is bad)
Defect: Any non-functioning or improperly functioning board
Unit: A board Opportunities of defects per unit
Total number of parts plus solder points = 70(1 board+17 resistors + 7 Capacitors + 3 doides+42 solder points)
Number of defects 26 boards
Depicts DPMO and the sigma level.

Q3. CO 03

A. In an agreement between a supplier and a customer, the supplier must ensure that all the parts are within tolerance before shipment to the customer. What is the effect on the cost of quality to the customer? Also share whether it effects the cost of quality to the supplier also?

Or

B. Working, as an individual or in a team of 3-4 people, write an annual quality improvement program for either of the company type
a. Manufacturing Facility
b. Large Bank
c. Large Retail store

Q4. CO 04

A. Procter & Gamble Co., a leading pet food manufacturer, has experienced a loss of market share and a downturn in top line revenue over the past 5 years. P&G's primary channel of distribution is veterinarians who recommend the brand to their customers and sell directly from their offices. In fact, veterinarians are largely responsible for the launch of the company and the identity of the brand, as they contributed freely to the development of the quality formula that distinguishes P&G from competitors.

P&G now must make a decision critical to its future. The company has just been approached by retail chains Wal-Mart and asked to sell its most popular products through Wal-Mart's chain of stores. There is one problem: Wal-Mart would sell the products at significantly lower prices than could the veterinarians. You have been asked to help P&G to decide?

Or

B. Deming's 14 points for management provide a road map for continuous quality improvement. In implementing these points, certain practices of management, which Deming labels as deadly diseases or sins, must be eliminated. Discuss these sins and their relevance.

SECTION B – CASE STUDY (20 Marks)

Sona Koyo Steering Systems Limited is a technical and financial joint venture company of Koyo Seiko Company, Japan-the global technology leader in steering systems. With a market share of 50%, the company is the largest manufacturer of steering gears in India and is the leading supplier of

- hydraulic power steering systems,
- manual rack and pinion steering systems, and
- collapsible, tilt, and rigid steering columns for passenger vans and MUVs.

The company's product range also extends to rear axle assemblies and propeller shafts. Named as a Global Growth Company in 1997 by the World Economic Forum, the company is now well positioned to lead the Indian automotive component industry to global standards in the new millennium. Sona Koyo Steering Systems has three plants located in Gurgaon and two plants located in Chennai. Its customers include Maruti Udyog Limited, Tata Motors, Hyundai Motors, Toyota Kirloskar Motors, and Honda Siel. 'The Deming process is like getting a doctorate. In PhD there is no syllabus. One has to choose an area that has not been researched previously by somebody else and come out with your own findings', says Dr Surinder Kapur, Chairman and Managing Director, Sona Koyo Steering Systems Limited, a postgraduate in mechanical engineering from Michigan State University, USA, with a quality medal last year from JUSE. A great admirer of the Toyota Production System (TPS), Dr Kapur yearns for Sona Koyo to be able to resemble the Japanese auto company. He knows, however, that the journey will be a long one. At Sona Koyo, quality was built into process right from its inception. Machines were arranged into a cellular layout (product layout). Quality checks were made part of the process and were conducted by the operators. From 1999-2002, when its net profit came down to a record low, the company was determined to do something about it. There was a marked change in the quality process when Toyota Production Systems' (TPS) expert M. Tanaka from Koyo Seiko, Japan-started guiding the company in the early '90s. Many poka-yoke (fool proofing) systems were installed to avoid operator mistakes. That is when the company started gaining a real understanding of TPS. Problem-solving was made a necessary process in production management. The company learnt how to become capable of supplying products just-in-time to customers. Its quality system was strengthened in line with ISO-9002 in 1994. In 1997, Maruti Udyog Limited suggested that Sona Koyo should join the first total quality management (TQM) cluster of 10 suppliers to be trained in the TQM methodology.

When it began to implement and experience TQM, the managers' model lines, daily work management, gap analysis, and root cause analysis with scientific tools were introduced. Guidance and education from Prof. Yoshikazu Tsuda, a JUSE counselor and member of the Deming 'prize committee', and learning and sharing with other cluster companies provided Son a Koyo with a great learning opportunity, especially in learning to focus more on customers' requirements. The policy deployment exercise with 'management for objectives' (MFO) helped the organization to focus on the company's objectives, thus helping all the employees look at one direction. The teachings of TQM with emphasis on 'learning through experiencing began to give the company a direction towards customer focus. The quality visits by top management and reviews of MFOs clearly defined the accountability of senior and divisional managers. The company formed a separate team to coordinate TQM activities. Initially, a team of three engineer- level persons was formed in 1999. In 2001, this was upgraded to a Quality System Division under a General Manager. Under this division, four departments-TQM, Total Productivity Maintenance (TPM), Quality management Systems (QMS), and Environmental Management Systems (EMS) were formed, which were to be headed by a manager.

There were three noticeable roadblocks. These were: (1) understanding about TQM across the organization, (2) involvement of all the employees, and (3) obtaining the commitment of managers. These were overcome by imparting training at all levels and making 'quality visits' to all the divisions by the top management. Sona Koyo started Implementing Toyota Production System (TPS) techniques in 1992, taking guidance from a TPS expert through, its collaborator. The techniques helped in increasing its productivity and reducing waste. To speed up the process of shop floor activities, in 2000, Sona Koyo decided to take the assistance of the Japanese Institute of Plant Maintenance (JIPM) to implement TPM techniques. TPM ha~ helped Sona Koyo to reduce rejects as well as the breakdown of

machines. It has helped in achieving zero defects in various areas.

This integrated approach in Sona Koyo's quality journey, lead by TQM and supported by TPS and TPM, is helping it to involve all the members of the Sona Pariwar (family) 'with education and training.

The development of new products like the actuator and the cost-effective collapsible column gave it the confidence to apply for the Deming award. The benefits the company started deriving after it started practicing TQM have been outlined in Table 1.0. TQM and the Deming. medal have helped the company collect customer/market information post sales. Earlier, the company was collecting information on the product quality in the field from the customers. Later, it started visiting car dealers to gather this information. Apart from these two sources, today, the company collects this information from end users (drivers). It has been learning to implement quality function deployment (QFD) techniques; to capture and utilize the customer voice.

The lessons learnt by the company during its TQM journey were as follows:

- TQM helps in identifying the weaknesses in an organization land in working to eliminate these weaknesses
- Improvement techniques are very simple to understand, persistence in implementation is important.
- Involvement of all employees is vital to get extraordinary results.
- Developing its own product and production technology helps in improving competitiveness.
- Setting up challenging goals is the first step of achieving great results.
- Change will always bring resistance; one has to learn how to cope with it.
- Complacency after achieving good results brings the performance down. The compariy has, therefore, set even higher goals.
- One has to continuously search new ways of keeping people energized

Table 1.0 Benefits *the company started deriving after TQM*

Area	*Before (F 97)*	*After (F03)*	*Now (F04)*	*World class*	
Management Objective	Target setting	Management for Objectives (MFO)	Management for Objectives (MFO)	MFO, BSC	
Business scope	Manual steering, 5 customers, 24 products	Hydraulic power steering, 18 customers, 56 products	Electric power steering (order development), 20 customers, 67 products	*-N/A-*	
In-house rejection	17300 ppm	2241 Ppm	876 ppm	50 ppm	
Customer returns	1579 ppm	213 Ppm	112 ppm	5 ppm	
Warranty returns	3800 ppm	1597 Ppm	3209 ppm	*-N/A-*	

Supplier rejections	35000 ppm	1318 Ppm	932 ppm	100 ppm	
Manufacturing Expenses	7.5% of sales	5.2% of sales	4.9% of sales	-N/A-	
Schedule v/s supply	92%	99%		100%	
Gross sales per	Rs.32lacs ..	Rs. 45 lacs	Rs. 58 lacs	-N/A-	
Accidents	18	1	1	0	
Absenteeism	11.30%	7.10%	5.90%	0 (Unauthorized)	
Training per employee	36 hours	57.4 hours	60 hours	70 hours	
Suggestions per employee	2	10.4	20.6	24	

Key BSC: Balanced Score Card

The Deming award has helped the company to enhance the brand equity of Sona Koyo. Customers, prospective employees, shareholders, industry observers, and the general public now take it more seriously. The biggest impact will be on its export plans. The award has catapulted Son a Koyo into the radar screens of global auto, majors looking for low-cost but world-class suppliers.

The company can now leverage the Deming Prize to rapidly scale up exports. While bidding for export orders, it no longer needs to convince prospective customers about its business practices and product quality. Prior to receiving the Deming medal, the company was confident of achieving an export volume of, perhaps, Rs 40-50 crore by 2006-07. Now it is confident that it can cross Rs lOO crore by that year.

The automobile industry is expected to maintain its strong growth momentum. Much of its future growth prospects will depend on its ability to deliver on orders in the future. The company intends to continue making investments in enhancing. capacity to fulfill the orders-in hand. Apart from manufacturing excellence, Sona Koyo also plans to' harness its design and development capabilities. In accordance with its vision of becoming a 'supplier of choice' to global customers, the management is focusing on

- developing and retaining the company's human capital,
- de-risking the business' by diversifying to different markets in terms of geography, - products, and clients,
- strengthening its platform. as a specialized player in steering systems, and
- building infrastructure to service overseas clients.

As a part of its strategy, the company has plans to invest RS 125 crore in expanding its capacities. It has established an export-oriented unit with a capacity of 2,50,000 manual steering gears and 1,20,000 power steering gears for catering to the requirements of overseas customers. In addition, it has acquired a minority stake in a French company

Q1. How has the application of just-in-time (earlier called the Toyota Production System) helped Sona Koyo to reduce the number of defects? (7 marks)

Q2. Table 1.0 shows that the number of warranty returns have now increased drastically compared to just after implementing TQM. What reasons can you attribute to this deterioration? (7 marks)

Q3. The Deming award has catapulted Son a Koyo into the radar screens of global auto majors looking for low-cost but world-class suppliers What lessons can Indian auto component suppliers take from this revelation? (6 marks)