Indian Institute of Management Bangalore

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ABC Transport Equipments Ltd. (B)

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ABC Transport Equipments Ltd. (B)©

Competition means different things to different companies. Some companies are blissfully ignorant of the impending challenges and eventually vanish into oblivion. Some others understand the challenges but do not respond adequately. However, a few companies decisively fight the new forces of competition and continue to remain competitive. It is still not clear as to which of the last two categories does ABC Transport Equipments Ltd. belong. They have understood the need to reposition their value propositions and have embarked on a series of studies. Will they succeed in their efforts? What else should they do?

Introduction

ABC Transport Equipments Ltd. is a private limited company started in the year 1955. The company began its operations in the manufacture of public transport equipments. However, after a few years of operation, ABC under took a business strategy exercise and decided to enter into industrial applications of transport equipments, mainly in the area of earth moving equipments. There were hardly any players in the field and ABC could foresee certain advantages of entering this field fairly early. Consequently the earth moving equipments division (**ABC-EM**) was formed in 1971.

ABC-EM invested huge sums in R&D facilities and also established high-tech test laboratories for testing and research purposes. Until recently, the company has been a dominant player in the market with an over all market share of around 70% in the earthmoving equipment industry. The underlying strategy of ABC-EM has been one of providing technologically superior products to the customers in India. Over the last one decade, ABC-EM undertook many exercises as a part of its overall strategic plan. The company was able to provide a wide range of earth moving equipments by introducing new products of latest technology.

A few years back ABC-EM set up it's own engine division and the hydraulics division. This was as part of the backward integration strategy that the company adopted at that time. The existing manufacturing facilities were also modernised recently by adding several CNC machines. Three years ago, the company also launched a major redesign and upgradation of some of its existing products. This was necessary due to some developments at the market place.

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This case is sequel to the earlier case ABC Transport Equipments. This case can be used independent of the earlier case. However, if this case is used in conjunction with the earlier one, it may be noted that issues raised in the first four pages of this case significantly overlap with the earlier one.

Products & Markets

Twenty years back, ABC-EM was purely operating on high-end markets, which largely included high-tech, high technology earth moving equipments (Product Line A). ABC-EM was able to command a premium for its products for reasons of technological superiority. Moreover, competition was also less since operating in these products typically would involve huge capital investments, good infrastructure, and technical manpower. The competitors could not match well with ABC-EM on these dimensions.

Over time, ABC-EM could not achieve the targeted growth purely on the high-end markets. In fact way back in 1983, ABC-EM realised that it cannot sustain the growth of the company merely on the high-end market of the earth moving equipments. The company diversified into related areas such as transport equipments for underground mining, aircraft towing applications, oil exploration purposes etc (Product Line B). However, a few years later, the future projections for the new product mix indicated a very slow growth rate. In view of the severe financial crunch the company faced during that period, ABC-EM started manufacturing products in the low end of the earth moving equipments category, ten years ago (Product Lines C and D[1]). Consistent with its strategy, ABC-EM provided good technological features that were not available in the competitors' products of this range.

New Products - Problems

In spite of a good growth rate in the new products that it began to manufacture recently, ABC-EM soon realised that operating in this range was very different from that of it's earlier products. These markets were already over crowded by many players. A typical customer for this product is a private building/civil works contractor to whom price, reliability, and after sales support are extremely important in the order mentioned. Hence although high technology products are welcome in the market, it is the price that would largely influence the market share in the long run.

Furthermore, the opening up of Indian economy had a significant impact on the various types of industries. The industry in which ABC-EM was operating was no exception to this. The abolition of licenses, broad banding of the licences in certain categories and the virtual removal of the monopoly component of the Monopoly Restrictive Trade Practices Act, 1969 have all led to intense competition in the segment in which ABC-EM is operating.

This realisation meant something fundamental to ABC-EM. Traditionally, ABC-EM has been geared up to a situation where it is technology that would matter. Relatively, the cost of manufacture was not a serious issue. The development of manufacturing practices, the costing and management control systems, organizational structure and processes were all guided by this understanding. However, the new products dictated

[1] The rest of the discussion in the case is focused on these two product lines only. Henceforth, for brevity we will use the term "new products" to denote product lines C and D.

that price, service and lead time are more valued that high technology features in the product.

Some pilot studies were conducted to understand the gravity of the problem. Based on a sample of five important components belonging to the new products, studies were made to estimate the lead time. Exhibit 1 has the details. The actual time taken to complete processing in these cases were ranging from 7 to 18 times the allowed time for processing. Such huge variations were not expected and the preliminary analysis opened up the eyes of the management and prompted them to perform additional analyses to understand what was causing these delays.

After some more data collection and brain storming exercises, it was decided to perform a detailed mapping of the activities for these components. For each component various activities were first documented based on an observation of the process over a two-month period. Typically for one of the five components, there were 81 activities in all, which were required to complete and it took on an average a whopping 1680 hours of time (see exhibit 2 for the process mapping details). On an average, it was found that fewer than 10% of the activities added value at the time of the study. The analysis of the data revealed the following:

		Time taken	% of total
Value added activities	**5**	**102 hrs**	**6.1**
Non-value added activities	**76**	**1578 hrs**	**93.9**
(a) Waiting : 53		1099 hrs	5.4
(b) Moving : 18		373 hrs	22.2
(c) Adding cost : 5		106 hrs	6.3

In addition to the long lead time, excessive waste and several non-value added activities, the existing set-up was primarily responsible for high costs of the products. Hence, changes in manufacturing set-up were contemplated. Simultaneously a study conducted by a consultant indicated the current position of ABC-EM in new products. Exhibit 3 is a representation of the over all findings by the consultant with respect to the competitive position of ABC-EM. The study concluded that the cost of goods manufactured was relatively high and highlighted the need for immediately reducing them. The study also emphasized the need to look at the costing system afresh.

Consequently, two important decisions were made at ABC-EM. The first was to redesign the costing system and the other was to use the new costing system for identifying possible areas for cost reduction. Task forces were set-up to develop a blueprint and action plans for improving the competitive position of ABC-EM by cost reduction initiatives.

Redesigning the costing system

ABC-EM employed a typical traditional costing system. The expenditure pertaining to Materials Management (including stores), Materials Accounts, Bills Payable, Receiving inspection, MIS, and the Clearing office (at Madras) were collected and

charged to material issued on work orders on a percentage basis as material overhead (**MOH**). Similarly, factory overheads were collected and using a composite labour hour rate as the basis it was allocated to the products. The labour hour rate for each direct department was obtained by dividing the net expenditure by the direct labour hours. Similarly, *the composite labour hour rate* for the entire division was computed by dividing the net expenditure for the entire division by the total direct labour hours.

The total cost of sales for a product was arrived at in the following manner: The direct material and direct labour costs were obtained based on the specifications of the product. The unit material cost was taken and material overhead was computed based on MOH%. The labour hours multiplied by the composite labour hour rate gave the factory overheads. Other costs such as tooling, financing, sales overhead, and warranty were added based on the percentages determined. The sum of all the above items was the cost of sales for the product under consideration. Exhibit 4 is a schematic representation of the existing product costing system at ABC-EM.

However, there were several indications that the costing system was faulty and "out of sync" with the current realities. A few examples bear testimony to this:

> *Last year ABC-EM produced four numbers of HL2020 and 175 of LC45R. The costing system should have distributed more overheads to the first product because manufacturing in low volumes typically involves a greater degree of customisation. This would mean a lot of effort in design, production planning, purchase, and production control. However, the unit standard labour hours per equipment for the two categories were 1542 hours and 7941 hours respectively. Clearly, the product costing favourably biased the HL2020 category and adversely biased LC45R. Ironically the competition in LC45R was pushing ABC-EM out of the market due to high price.*

> *If we carefully look at the activities at the design department we will notice a few interesting things. The costs incurred in this department are a function of two factors. Firstly, the maturity level of the product is an important cost driver. Last year ABC-EM introduced model HL2025L. We should have visited the design department around that time. More or less the whole department was working on the new product. Even after a year, the product had not yet stabilised. There were substantial revisions in specifications. On the other hand, the oldest of the product range LC42RF and LC45R deserved no attention. Occasionally there will be some requirements for customisation. The impact on the planning department was no different. The learning curve effect influences both these activities. However, the existing costing system did not take these into consideration at all.*

With rapid advances in machine tool technology, automation in manufacturing was on the increase in the organisation in recent years. While the direct labour effort in manufacturing was on the decline, the overhead was on the increase because of high capital costs and maintenance of these equipments. Moreover, collecting and processing information related to various activities was much easier due to advances in computers and other electronic monitoring devices. Since overheads formed a greater percentage of product costs (as compared to labour costs), overhead allocation

assumed greater importance. The costing system was redesigned with the following objectives:

- With a view to eventually move towards activity based costing system, new cost drivers that are representative of the ground realities will be introduced
- Support departments that have significant differences in the manner in which they serve the various product families will be the candidate areas for new cost drivers.
- Once the new cost drivers are identified, estimate of cost incidences for each of these drivers will be prepared to identify priority areas for cost reduction.
- Based on this information, these departments will be required to prepare detailed and specific action plans for cost reduction.

Exhibit 5 shows the new cost drivers developed by the task force. The costs were extracted from the expenses ledger and cost per unit of the chosen cost driver was computed for all the new cost pools (exhibit 5). In a nutshell, the proposed costing system replaced two overhead cost pools with nine and sought to overcome the limitations faced by the operating personnel in initiating cost reduction opportunities. Rather than looking at either direct material or the direct labour for potential cost reduction opportunities, it was possible to look at other areas such as design, planning and control.

For instance, an analysis of the total expenses for the previous year showed that overhead contributed to 30.5% and the direct labour 15.8% of the product cost. Manufacturing overhead accounted for 23.2% of the total overhead incurred. When cost pools such as Design & Planning, Inspection, Production control, and Diesel charges were added to this, it constituted over half of the total overhead. MOH – I forms about 10% of the total overhead. This was driven by the number of Receipt Reports (**RRs**) raised, which often resulted in excessive follow up for material.

The operating personnel felt that the new costing system reflected the ground realities better. The accounting personnel felt that the new costing system provided traceability of various events leading to consumption of organisational resources resulting in cost incidences. This according to them could play a vital role in prioritising continuous improvement initiatives in the long run and drive costs down more effectively. The new costing system provided a basis for the top management to answer which products to produce and which to discard. Further, it also helped ABC-EM in adjusting the prices to match the competition and in some cases trigger cost reduction initiatives to remain competitive in the market.

For instance, it was no longer viable to manufacture and profitably sell the new products. Since there were compelling reasons to maintain the product line ABC-EM was better equipped to launch cost reduction initiatives in these product lines. Detailed studies were conducted to identify cost reduction opportunities based on the information available from the new costing system.

Two key areas emerged as possible candidates for cost reduction. First, the number of parts was far too many in some products leading to increased costs on account of four new cost drivers (diesel charges, production control, planning and inspection). Specifically, the new cost drivers indicated that for every part reduction, the overhead cost was likely to come down by nearly Rs. 3,000. It was felt that a part/variety reduction exercise would give the much-needed relief. Second reason for high costs was on account of diesel charges. While part reduction exercise could bring down the cost to some extent it was felt that much more could be done by looking at material handling and layout of the shop.

Changes in the manufacturing set-up for new products

ABC-EM had a functionally oriented layout. In all there were 12 shops spread across a vast area (see exhibit 6 for the layout). Shop 1 was the new material preparation shop in which many pieces were cut and the first operation required for the product was done. Alongside shop 1 was shop 12, which was the fabrication and final assembly shop. The components travelled from shop 1 to various other shops situated all over the factory and finally reached shop 12 before it was assembled and kept ready for final dispatch. The typical routing for one component is shown in exhibit 6.

A cursory glance at exhibit 6 suggests that the components are likely to travel great distances before they completed their processing. Exhibit 7 has the details for the four product lines. For instance, in the process of producing 1080 components and assembling them together, product A on an average travelled 375.7 kilometres. The average distance per item for all the four product lines indicated that the company did not make any major layout changes in the last thirty years, despite adding new product lines. The layout was conducive to Product A, which formed a small proportion of the total turnover. On the other hand, products C and D were considered to be the future products of the company. Ironically, these products were perceived in the market to be technologically good but highly priced. As products travelled long distances, the lead time went up, overhead costs increased and the investment in inventory also increased.

The salient aspects of the revised design included the following:

- 270 components belonging to the new products were identified for the purpose of redesign. These constituted nearly 80% of the components manufactured at ABC-EM. These involved as much as 1925 operations to be performed in the factory.
- Two dedicated manufacturing set-up for these components were identified. The required machines, tooling and other resources were segregated for the new manufacturing set-up (see exhibit 8 for a schematic representation).
- Due to poor machine utilization, non-availability of adequate number of certain types of machines, there was still a need to visit other parts of the factory. But these instances were considerably reduced by some changes in the process.
- Consequent to the new design, the number of movements from one shop to another was reduced by 73% from 1082 to 298. Material handling costs and related overheads will drop significantly. Further, this will improve the quality and reduce expenses related to inspection and quality control.
- For these 270 components, the savings in production planning & control expenditure was estimated to be more than 55%.

Organisational Structure Changes

The process mapping and subsequent analyses provided vital clues for further improvement in the existing processes. For instance, bulk of the non-value added time was attributed to the poor organization structure at ABC-EM. Exhibit 9(a) has the old organization structure. The organisation structure was the result of the old manufacturing set-up, which had a set of common manufacturing facilities irrespective of the number of product variations made. Every functionally entrenched group began building castles around it and operated like isolated islands. Protecting the self-interests of the groups became more important than satisfying customer needs. All these resulted in complicated material and information flows. Every time the material and the paper changed hands from one group to the other several procedural aspects related to the processes were carried out leading to greater delay and waiting.

Unfortunately, this resulted in serious conflicts of priority and confusion in the minds of the managers holding various positions. According to Chief Manager (Industrial Engineering):

> *Consider for instance, the role of Assistant General Manager (Manufacturing). He has the responsibility to monitor the progress in manufacturing of components that go into all the three product families and so was the case of all his sub-ordinates. The problem becomes real when the fabrication & assembly shops of all the three product families are getting stuck for want of components from the feeder shops. Similar problems exist in production control, design and other manufacturing support functions. Conflict resolution and prioritisation of these jobs are done by various means. These include simple rules such as "do the job of the person who shouts the most" or "who wields more power in the organisation" to handing out personal favours or returning such favours received some time earlier. Thus the system quickly de-generates into a personal one. Eventually nobody in the system is responsible for Product A except General Manager (Product A) and his sub-ordinates. Similar is the case with respect to product B, and new products.*

The organization structure was redesigned in order to improve the existing scenario with respect to the new products. The revised organization structure is presented in Exhibit 9 (b).

Variety reduction exercises

Based on past records and discussions with the operating personnel in some departments such as Design and Planning a sample set of 40 components currently used in new products was selected for the study. These components were either B class or C class items, whose value is less but often generated too many transactions in the departments that had number of parts as the cost drivers.

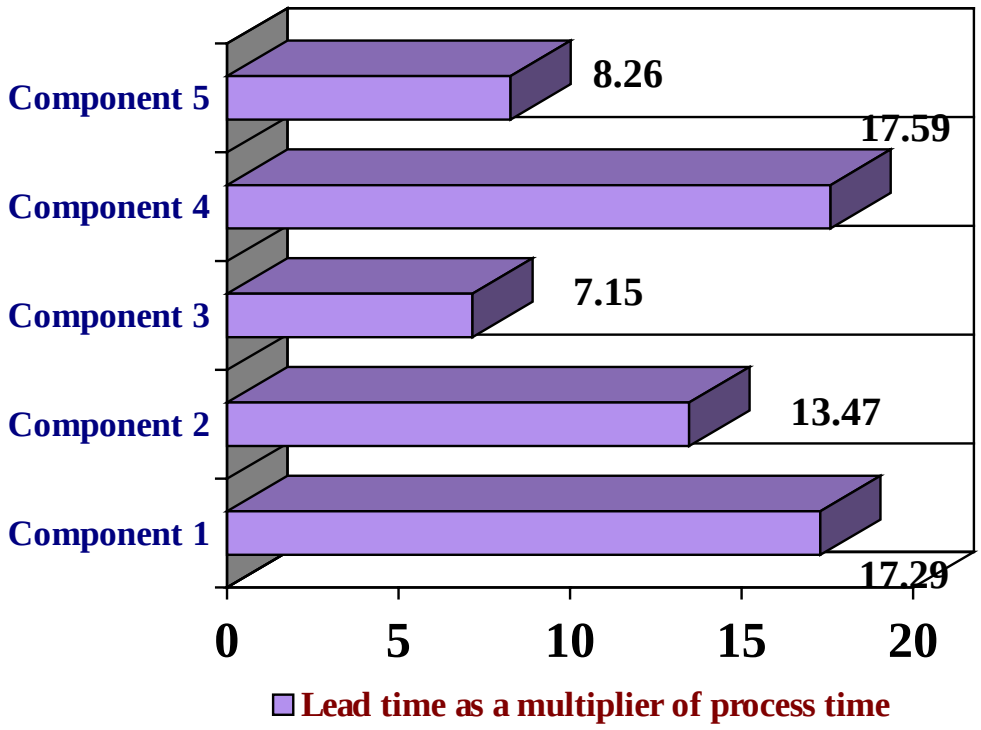
Several guidelines were evolved to identify variety reduction opportunities. These include investigating mirror image components, those having similar purposes on different assemblies (for example caps for fuel and hydraulic tanks), and other considerations including physical dimensions such as length (in the case of hoses, and

fasteners) and type of material used. Exhibit 10 has the list of findings of the team with respect to the part reduction exercise carried out. The study showed that variety reduction in the product could be as high as 25 to 30%.

The journey for the task forces at ABC-EM has so far been very revealing. When they began the studies, they were not clear where the problem was. However, the nature of changes proposed in the costing system clearly helped identify the problems areas in the company. The future of these efforts is interestingly poised. Several new questions have emerged at the end of this exercise. Were the efforts by the task forces worth? What capabilities have the task forces acquired in this process? Are these capabilities useful in the future? How should ABC-EM proceed further? Who will champion the implementation of these recommendations? What is the role of top management?

Exhibit 1

Lead time analysis for five major components belonging to new products[2]



[2] The above graph shows lead-time as a multiplier of the process time. For example, for Component 1, the lead-time was 17.29 times the processing time.

Exhibit 2

Mapping of activities for a typical component belonging to new products

No.	Activity
1.	Progress department generates material request (MR) for Raw material
2.	MR given to shop production control
3.	Search for MR for 375 MF 12963
4.	Enter MR details in register
5.	Take MR to purchase for co-ordination
6.	Check stock of item in stock balance list
7.	Enter MR details in bin card
8.	Waiting for progress to collect MR
9.	Hand over MR to stores
10.	Check balance and enter particulars
11.	Update bin card and issue material
12.	Progress department waits for fork lift
13.	Move material from RM yard to shop 754
14.	Progress department generates job card
15.	Job cards given to progress chasing person in the shop
16.	Enter job card details in register
17.	Issue job card & Route card to shop
18.	Wait for fork lift truck
19.	Move Raw Material to work centre
20.	Issue job card to operator
21.	Load required tools and set up machine
22.	Wait for overhead crane
23.	Load RM on machine
24.	Perform flame cutting operation
25.	Unload the part & move to dressing area
26.	Dress and hand grind edges
27.	Components wait for completion of the entire batch
28.	Inspection of the finished components
29.	Wait for overhead crane
30.	Move to shot blasting area
31.	Load on machine & perform shot blasting operation
32.	Unload from machine
33.	Wait for completion of batch
34.	Inspection of the completed component
35.	Wait for fork lift
36.	Move to sheet metal to shop 727
37.	Release Job card to shop
38.	Issue job card to operator
39.	Wait for overhead crane
40.	Load on straightening machine
41.	Perform straightening operation
42.	Unload & stack the components
43.	Wait for completion of batch
44.	Inspection
45.	Wait for over head crane
46.	Move to Press shop

No.	Activity
47.	Issue job card to operator
48.	Set up machine for forming operation
49.	Perform forming operation
50.	Unload
51.	Wait for completion of batch
52.	Inspection
53.	Wait for fork lift
54.	Move to machine shop 721
55.	Wait for crane
56.	Move the component to the layout table
57.	Issue job card to shop
58.	Issue job card to operator
59.	Perform layout operation
60.	Wait for completion of batch
61.	Inspection
62.	Wait for crane
63.	Move to radial drilling machine
64.	Drilling operation
65.	Unload from machine
66.	Perform deburring operation
67.	Wait for completion of batch
68.	Inspection
69.	Wait for fork lift
70.	Move to painting shop 758
71.	Issue job card to shop
72.	Issue job card to operator
73.	Arrange all parts for painting
74.	Apply spray paint primer
75.	Reverse the plate
76.	Apply spray paint primer
77.	Wait for drying
78.	Stack the components for moving to the next stage
79.	Inspection
80.	Wait for fork lift
81.	Move to fabrication area 789

Exhibit 3

A schematic representation of the competitive position of ABC-EM

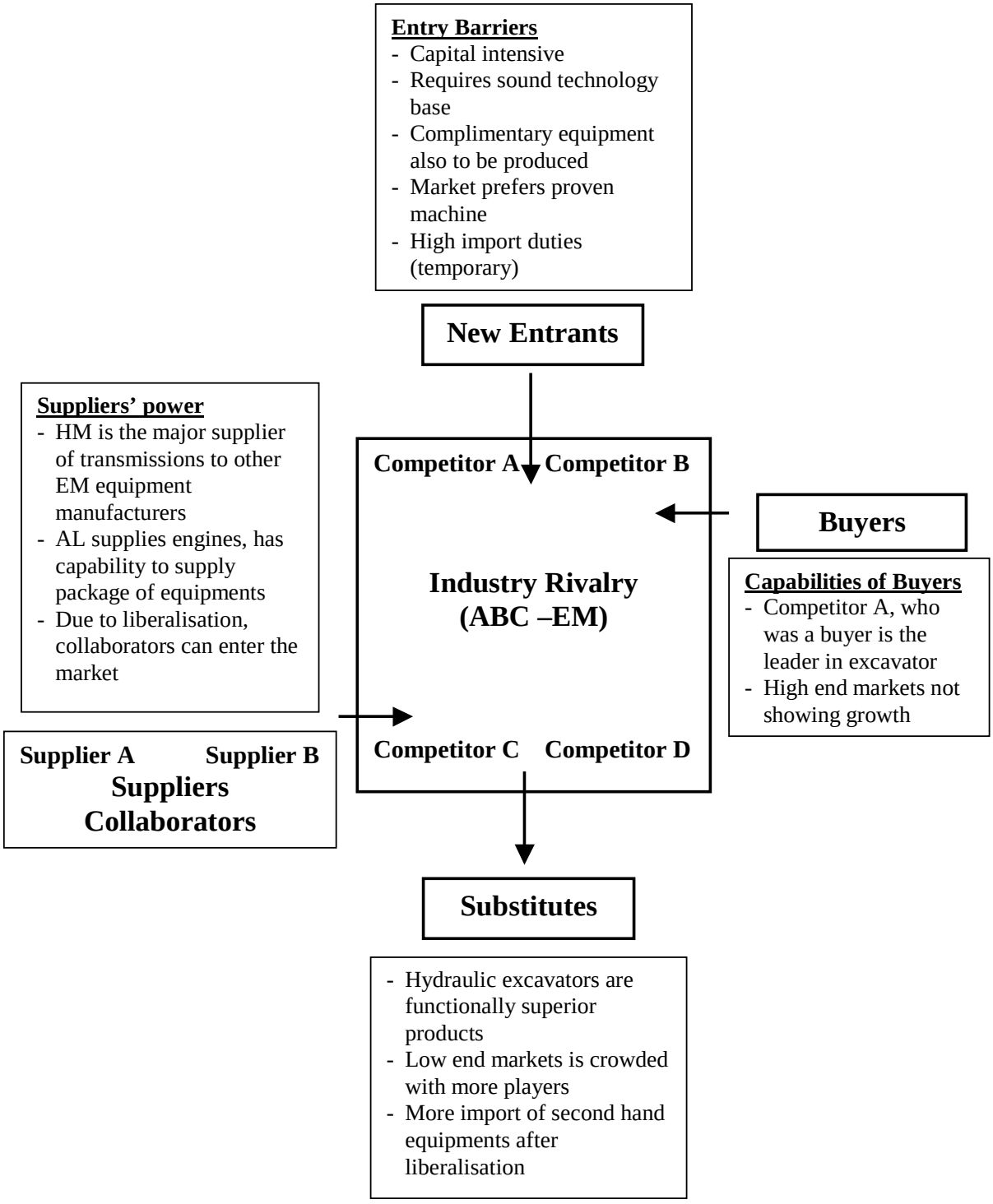


Exhibit 4
Existing Product Costing Scheme at ABC-EM

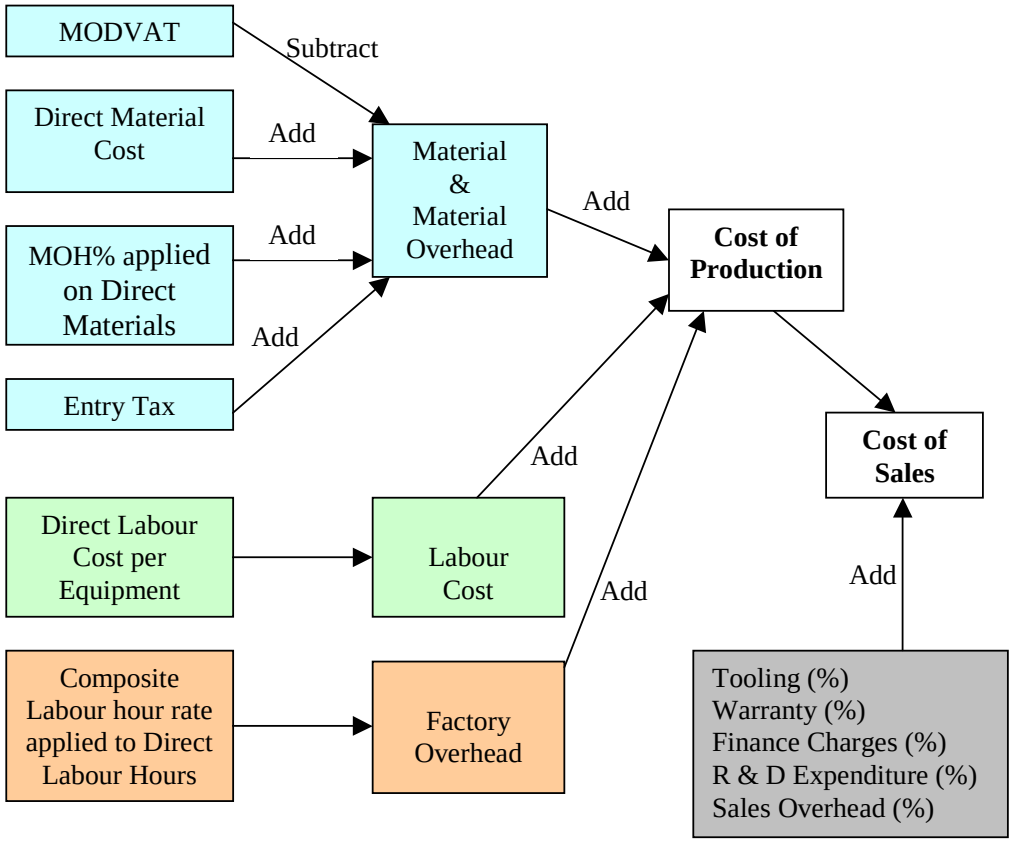


Exhibit 5

Cost drivers in the new costing system

No	Cost Pool	Cost Driver	Cost per unit of the cost driver
1	Manufacturing Overhead	Machine Hours	Rs. 35.90 per m/c Hr.
2	Design & Planning	No. of part numbers x maturity factor	Rs. 332.19 per part number
3	Inspection	Number of Job cards (JCs)	Rs. 45.77 per J/C
4	Production Control	Number of documents (No. of J/Cs + No. of Material Requests)	Rs. 45.95 per document
5	MOH – I	Number of Receipt Reports (RRs)	Rs. 2260.99 per RR
6	MOH – II	Value of material	Rs. 0.012 per rupee of material
7	Diesel Charges	Total number of parts	Rs. 10.68 per part
8	Direct Labour Support	Labour Hours	Rs. 10.28 per labour hour
9	Administration & Welfare	Total of above overheads	Rs. 0.54 per rupee of the total of other overheads

Exhibit 6
Existing manufacturing set-up at ABC-EM[3]

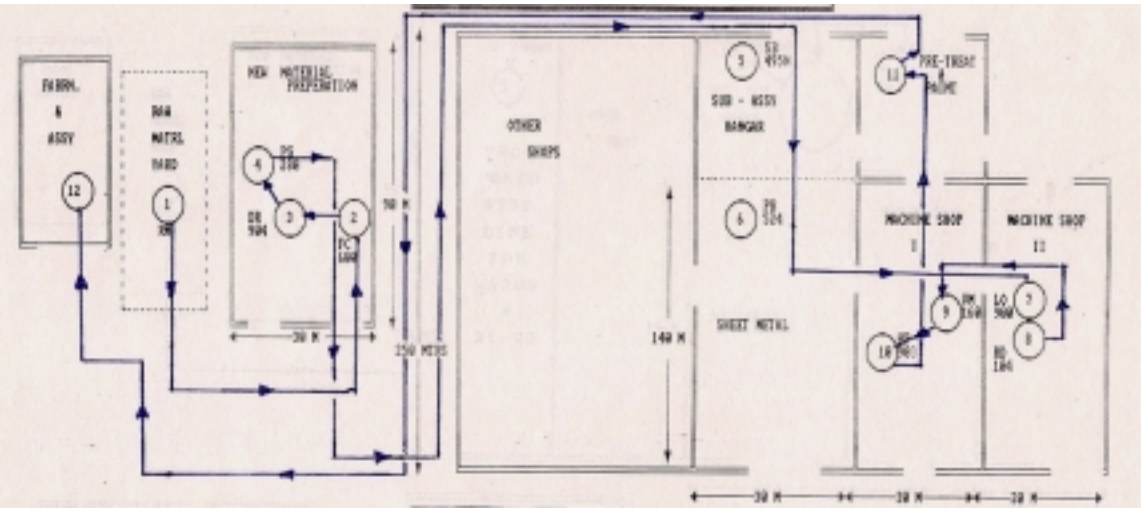


Exhibit 7
Effect of layout on different product lines

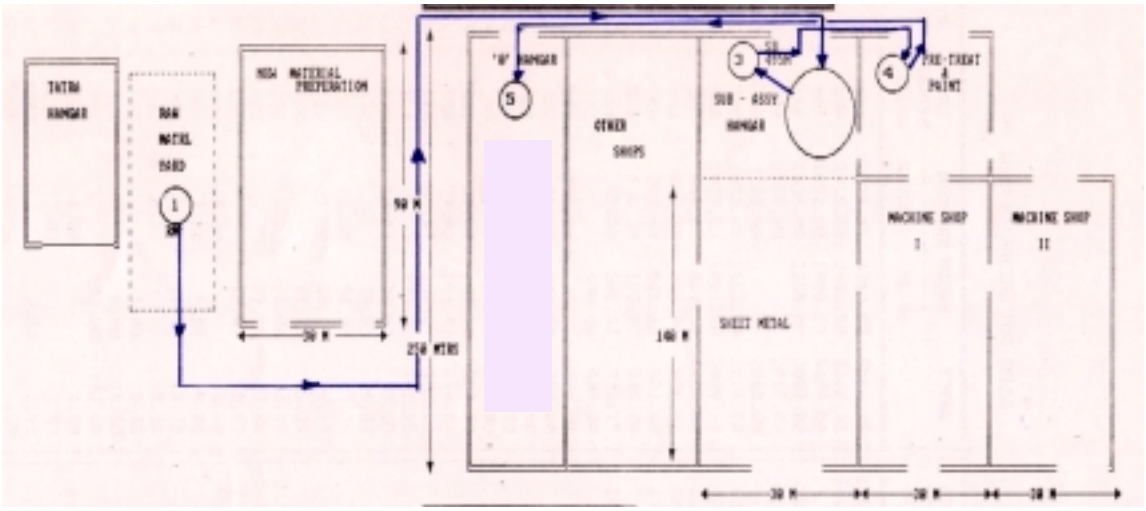
Product Line	Total Distance Travelled (in meters)	Number of items Manufactured*	Average Distance per item
Product A	375,655	1080	347.83
Product B	415,125	757	548.38
Product C	288,710	301	959.17
Product D	297,110	405	733.60

* The total distance travelled includes only those of the items manufactured on the shop floor. The number of items that finally get assembled into the final product includes many bought out items in addition to these.

[3] The lines in the layout show the manufacturing sequence in the existing set-up for a typical component belonging to the new products. It is estimated that the component travels a distance of 1086 meters before it reaches shop 12 for final assembly.

Exhibit 8

Alternative manufacturing set-up for the new products[4]



[4] The revised computation for the distance travelled for the same component in this layout is 425 meters.

Exhibit 9 (a)
The existing organization structure at ABC-EM[5]

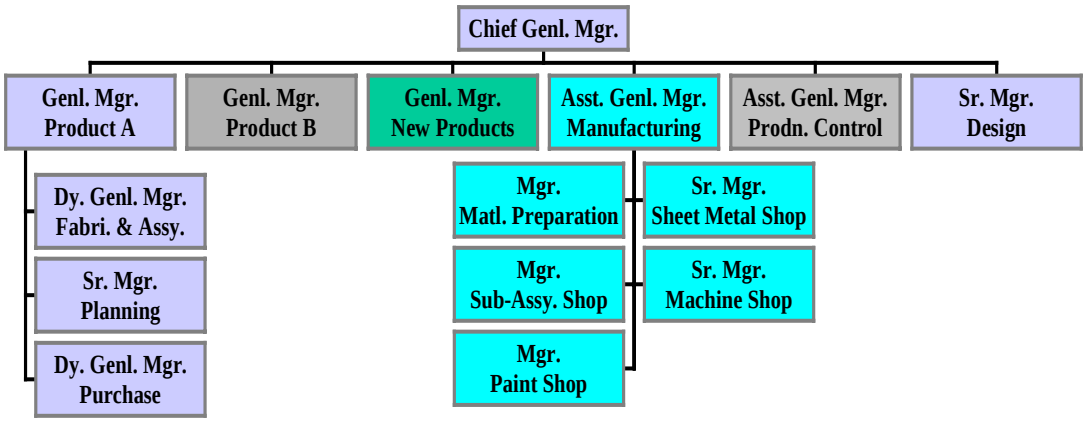
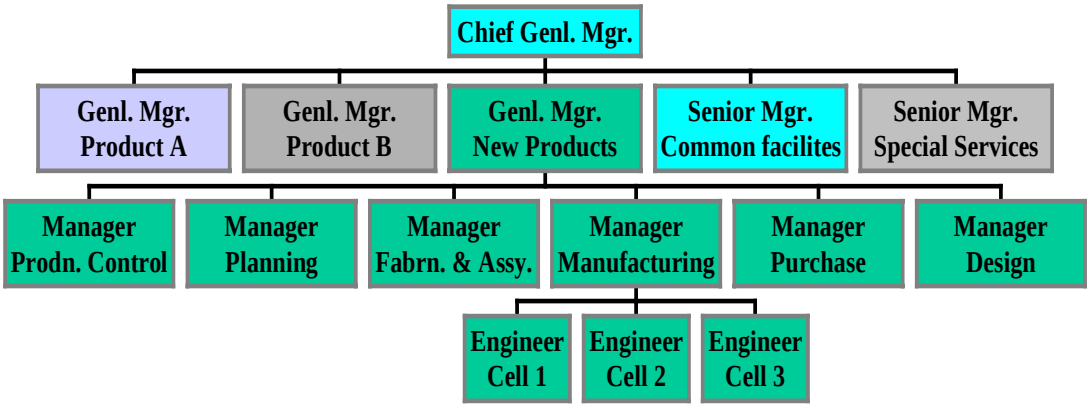


Exhibit 9 (b)
Alternative organization structure for new products[6]



[5] The structure indicates production related functions only. General Manager (Product B) and General Manager (Product C) have similar line and span of control as that of General Manager (Product A).

[6] The structure indicates production related functions only. General Manager (Product A) and General Manager (Product B) have similar line and span of control as that of General Manager (New products).

Exhibit 10

Variety Reduction Opportunities in new products

Sl. No.	Part No.	Description	Remarks
1	375 PH 02321	Hose	These hoses can be substituted with one variety after careful examination of the assemblies
2	CHH 18 01615	Hose	
3	CHH 18 01616	Hose	
4	375 PH 02046	Hose	These hoses can be substituted with one variety after careful examination of the assemblies
5	CHH 04 00805	Hose	
6	375 PH 02184	Tube Str. (LH)	LH and RH parts can be eliminated by suitable redesign
7	375 PH 02281	Tube Str. (RH)	
8	375 PH 02176	Tube Str. (LH)	LH and RH parts can be eliminated by suitable redesign
9	375 PH 02168	Tube Str. (RH)	
10	375 PH 02208	Tube Str. (LH)	LH and RH parts can be eliminated by suitable redesign
11	375 PH 02257	Tube Str. (RH)	
12	375 PH 02216	Tube Str. (LH)	LH and RH parts can be eliminated by suitable redesign
13	375 PH 02265	Tube Str. (RH)	
14	375 LL 31583	Corner Tooth (LH)	Both these teeth can be substituted with a straight teeth
15	375 LL 31575	Corner Tooth (RH)	
16	375 LL 11551	Bolt	Both these bolts can be eliminated if corner teeth as above are removed
17	375 LL 11673	Bolt	
18	0709121200	Cap (Fuel Tank)	Can be substituted with 0709201000 after suitable redesign
19	0709201000	Cap (Hyd. Tank)	
20	375 FL 11638	Cover (Fuel Tank)	Can be substituted with one variety
21	375 HS 11093	Cover (Hyd. Tank)	
22	7208000400002	Plate Str. (LH)	LH and RH can be avoided and substituted with one variety.
23	7208000500002	Plate Str. (RH)	
24	375 FG 02122	Hand Rail (LH)	Can be substituted with one variety after suitable redesign.
25	375 FG 02114	Hand Rail (RH)	
26	375 FE 02011	Hand Rail (LH)	Can be substituted with one variety after suitable redesign
27	375 FE 02028	Hand Rail (RH)	
28	418 06 11112	Battery Box (LH)	Can be considered for substitution with one variety after suitable redesign
29	418 06 11122	Battery Box (RH)	
30	724301010001	Catwalk Str.	Rework being carried out by Shop on these structures can be avoided by redesigning for single variety
31	724301040001	Catwalk Str.	