

# Model to build cost competitiveness through material productivity – a case study

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**Abstract.** Companies are facing increased customer expectations and cut throat market competition. Organizations are driving three major performance measures which are market outperformance, incremental margin, and cash flow conversion. As companies continue to outsource large portions of their manufacturing, managing material costs in the supply chain are important in reducing overall costs and remain competitive in order to ensure that all supply chain partners particularly in the upstream supply chain survive and be part of the future growth. The purpose of this paper is to present the detailed analysis of the various cost factors which affects the organizational performance and developing a unique model for the material productivity program. The key criterions include the innovative ideas of cost reduction, continual focus to eliminate wastes in the supply chain and also to drive excellence in execution of these projects. As the case industry has become global, it is essential for the case industry to carryout structured and sustained material cost reduction activity in order to capture the potential market through cost leadership and to emerge as best cost supplier among the other plants. This particular research work discusses more in detail about Indian market conditions, the changing customer needs due to entry of the global multinationals, the new challenges that we face in the local and the global market and how we respond to it and also to spell out the changing customer demand for the reduced cost, the challenges of price escalations of various input costs, the processes which case industry follow to reduce the cost, and suggesting a cost reduction methodology to achieve sustained cost reduction year on year. The result shows 4% reduction in material costs and the quality improvement of the production of automotive ancillary components.

## 1. Introduction

Every organization aims for profit and competency so that it can sustain in the market. The challenge is despite the increase in material costs, manufacturing costs, material costs contribution in the product cost is maximum since it plays a significant role in determining the revenue of the company. The case industry is a multi-national and there is a lot of opportunity available across the world. It is important for the case industry to do a structured, sustained material cost reduction activity in order to capture the potential market and to emerge as a competitive supplier.

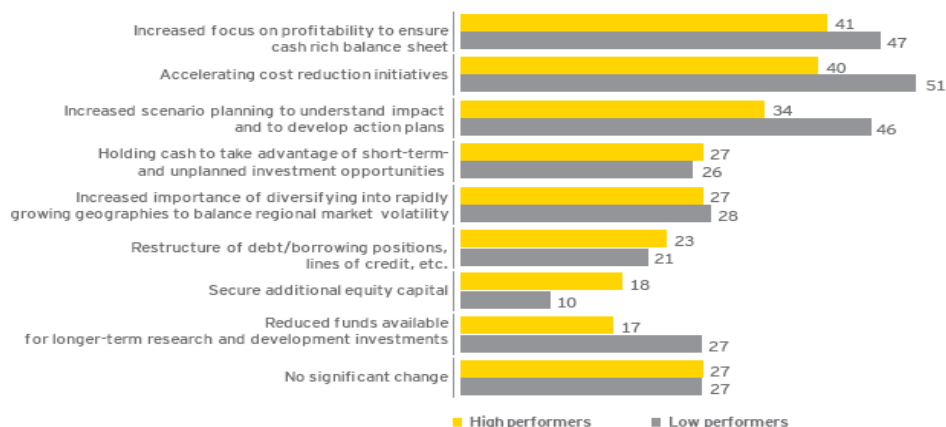


This work discusses more in detail about market conditions of India, the fluctuating customer demands, the fresh challenges that the country faces in the local and the international market with respect to cost and how we react to it. The objective of this study is to demonstrate the altering customer ultimatum for reduced costs, the challenge of input costs, the procedures, which case industry follow in order to lessen the cost and developing a method for refining the cost competitiveness of the upstream supply chain.

## 2. Literature review

In complementarities and cost reduction magazine, from the auto supply industry by [1] Susan Helper Apr 1997, shown the need to manage costs across the entire company by Japanese corporations. According to Aqua MCG Special [2] Report – Supply Chain Cost reduction is, for any organization, meeting the end customer expectations, maximizing the value or return to the investors is the key requirements. as General Motors seeks cost reduction by setting up a global competitive market, while Ford and Chrysler are trying to attain the same goal by making long term commitments to a few firms. The voice relationship with suppliers reduces the customer's bargaining power Helper and Levine, (1992). The incremental strategy demands on cost reduction to create shareholder value by improving capital and labor productivity. As mentioned in the report published by [3] Ernst & Young on Cost competitiveness from [5] complexity to confidence, during the last few years of economic and market volatility, reducing costs have been a constant focus of management around the world.

According to [4] Neil De Koker, (2002) managing director of the OESA (Original Equipment Suppliers Association), merger and acquisition activities do not provide any increased margins.. In most industries sourcing & procurement plays an important role, as company's profitability rests substantially on its ability to obtain goods, services at the lowest total cost. Refer following figure 1

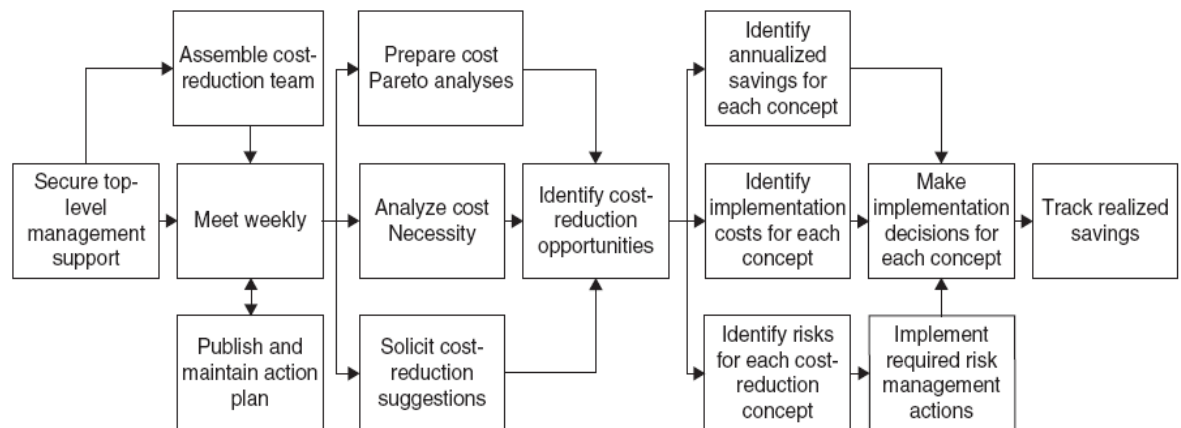


Shown: Percentage of respondents. Note: Multiple responses allowed.  
Source: EIU panel survey, September 2011.

**Figure 1** Survey output.

### 3. Cost reduction framework

The framework followed for reducing the cost in the case industry is shown below in figure 2.

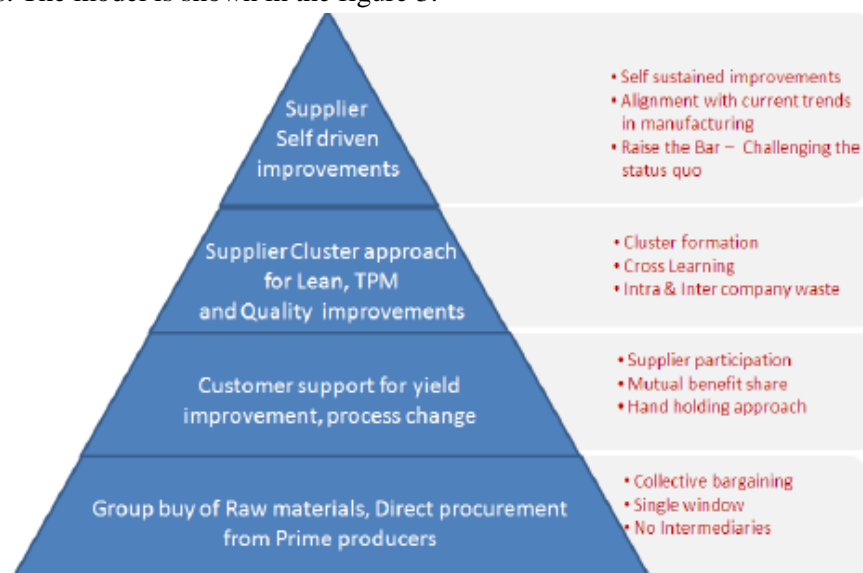


**Figure 2** Cost reduction methodology.

### 4. Supplier competency improvement

#### 4.1. Cost Effectiveness Model

This model is applied explicitly to tier 1, tier 2 suppliers of case industry . In the triangular model developed, the bottom of the pyramid seeks the support of the customer and as it reaches the top of the pyramid, it drives the development to the substitute suppliers to be on their own to build cost competitiveness. The model is shown in the figure 3.



**Figure 3** Competitiveness of the supply chain.

- Bar made to cold forging of Turned parts:

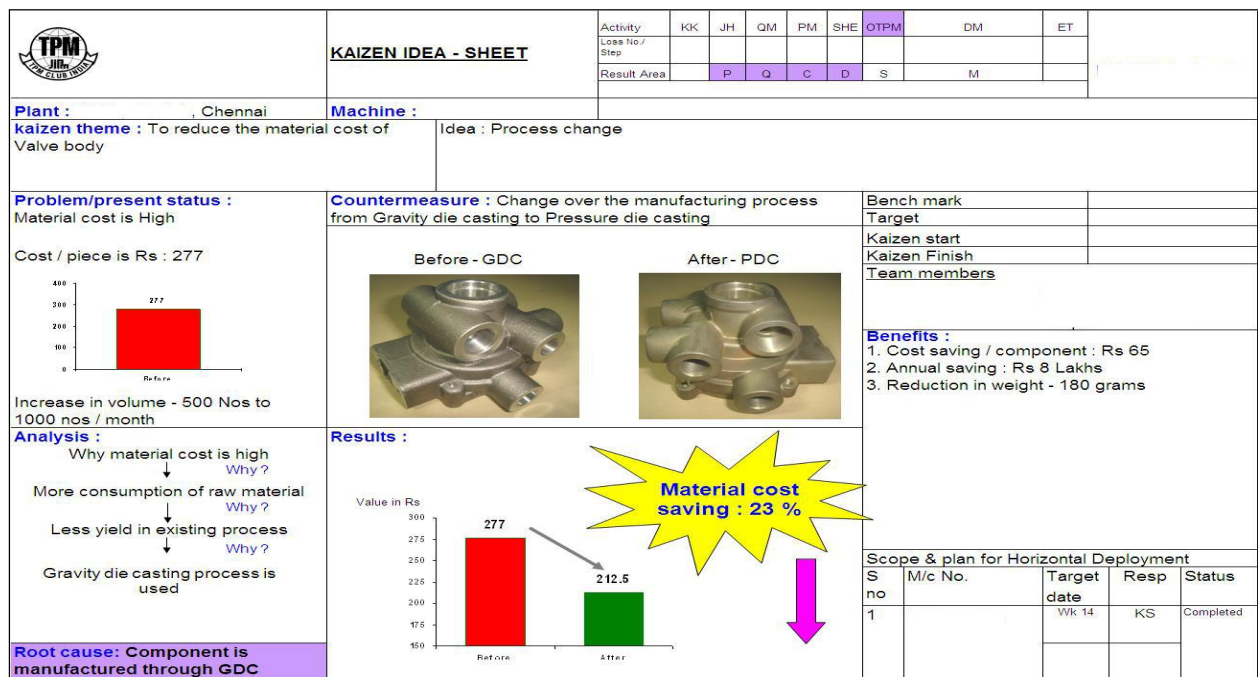
The traditional practice of turning bar using single spindle, multi spindle auto machines. About 20-30% of the material will be wasted in the form of burr removal. The cycle time taken for machining was replaced with cold forging method which resulted in an overall cost reduction of 30-40% per part. The before and the after comparison is shown in the figure 4.



**Figure 4** Hose adaptor manufacturing - process change.

- Gravity Die casting (GDC) to Pressure die castings of Aluminium castings (PDC)

There is a possibility to reduce the weight of the input alloy material through conversion from GDC to PDC. The investment cost of the PDC die was higher than the GDC. Converting from GDC to PDC depends on the return on investment (ROI) calculation. One such example of GDC to PDC is shown in the figure 5.



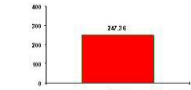


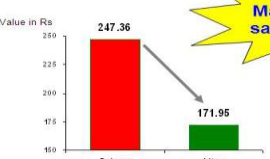
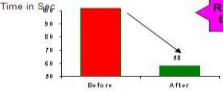
**Figure 5** Aluminium castings process change.

- Self-driven improvement: 3 CNC machines used for machining aluminium castings. The modification of set up time, cost, cycle time by the supplier is shown in figure 6.

Supplier : <b>Engineering Works</b>	Type Prevention <input type="checkbox"/> Detection <input type="checkbox"/>	Effect on Customer complaint <input type="checkbox"/> Productivity Improve. <input checked="" type="checkbox"/> Quality Improvement <input type="checkbox"/>	Function Shut down <input type="checkbox"/> Control <input checked="" type="checkbox"/> Warning <input type="checkbox"/>	Standardisation Control plan <input checked="" type="checkbox"/> Operation standard <input checked="" type="checkbox"/> Fixture/Tool drawing <input checked="" type="checkbox"/>
Part no : <b>Lower Body</b>				
Present Status: <b>Drilling &amp; Tapping Done through 3 Machines</b>				
Improvements: <b>Processing time reduced by combining the VMC Operations in single Machine (M22,M12,M16,M14)</b>				
Description of Process: <b>VMC Operations done through 4th axis</b>				
<b>Before Improvement</b>			<b>After Improvement</b>	
 <b>M16 x 1.5 Port</b> 3.00 min	 <b>M22 x 1.5 Port</b> 2.00 min	 <b>M12 x 1.5 Port</b> <b>M14 x 1.5 Port</b> 1.57 min	 <b>Ports (M16,M14-M12,M22)</b> 2.40 min <b>[Rotary Fixture]</b>	
Implemented by		Verified by		Authorized by

**Figure 6** Cost reductions through innovation - A supplier case study.

. The implementations of various kaizens are shown in following figure no 7, 8, and 9.

<b>KAIZEN IDEA - SHEET</b>		Activity Loss No / Step Result Area	KK	JH	QM	PM	SHE	OTPM	DM	ET															
			P	Q	C	D	S	M																	
Plant : Chennai	Machine :	Idea : Process change																							
kaizen theme : To reduce the material cost of Flange																									
<b>Problem/present status :</b> Material cost is High Cost / piece is Rs : 247.36  Increase in volume - 10000 Nos to 15000 nos / month <b>Analysis :</b> Why material cost is high Why? More consumption of raw material Why? Less yield in existing process Why? Gravity die casting process is used <b>Root cause: Component is manufactured through GDC</b>	<b>Countermeasure :</b> Change over the manufacturing process from Gravity die casting to Pressure die casting Before - GDC  After - PDC  <b>Results :</b>  Value in Rs 247.36 171.95 <b>Material cost saving : 27 %</b>					<b>Bench mark</b> Target Kaizen start Kaizen Finish Team members N Selvaganapathy G Balaji B Neelakandan <b>Benefits :</b> 1. Cost saving / component : Rs 75 2. Annual saving : Rs 91 Lakhs 3. Reduction in weight by 243 grams 4. Reduction in machining time - 63 sec - 100%  <b>Reduction by 100%</b> <b>Scope &amp; plan for Horizontal Deployment</b> <table border="1"> <thead> <tr> <th>S no</th> <th>M/c No.</th> <th>Target date</th> <th>Resp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>DDU Body</td> <td>Wk 12</td> <td>MSRK</td> <td>Completed</td> </tr> <tr> <td>2</td> <td>Air Cylinder</td> <td>Wk 15</td> <td>RDS</td> <td>Completed</td> </tr> </tbody> </table>					S no	M/c No.	Target date	Resp	Status	1	DDU Body	Wk 12	MSRK	Completed	2	Air Cylinder	Wk 15	RDS	Completed
S no	M/c No.	Target date	Resp	Status																					
1	DDU Body	Wk 12	MSRK	Completed																					
2	Air Cylinder	Wk 15	RDS	Completed																					

**Figure7** Kaizen idea flange process change.



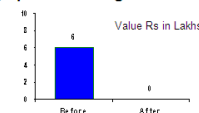

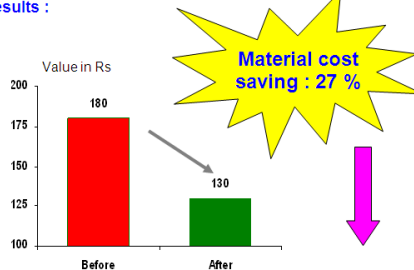
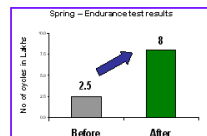
KAIZEN IDEA - SHEET		Activity	KK	JH	QM	PM	SHE	OTPM	DM	ET											
		Loss No./ Step																			
		Result Area	P	Q	C	D	S	M													
Plant : Chennai		Machine :																			
Kaizen theme : To reduce the material cost of Spring		Idea : Source Change / process change / material change of Spring																			
<b>Problem/present status :</b> Material cost of spring is high - Rs 180 <b>High line stoppages</b> Average line stopper hours /month is 25 Hrs <b>High premium freight :</b>  Increase in volume from 40,000 nos to 90,000 nos / month		<b>Countermeasure :</b> Develop alternate source for spring Comparison between existing source and proposed source <table border="1"> <thead> <tr> <th></th> <th>Source A</th> <th>Source B</th> </tr> </thead> <tbody> <tr> <td>Hourly output / hour</td> <td>160 Nos</td> <td>312 Nos</td> </tr> <tr> <td>Wire dia used</td> <td>15 mm</td> <td>14.4 mm</td> </tr> <tr> <td>Change over volume</td> <td>600 Kgs</td> <td>1300 Kgs</td> </tr> </tbody> </table> 					Source A	Source B	Hourly output / hour	160 Nos	312 Nos	Wire dia used	15 mm	14.4 mm	Change over volume	600 Kgs	1300 Kgs	<b>Bench mark</b> Target <b>Team members</b> N Selvaganapathy G Balaji B Neelakandan			
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Wire dia used	15 mm	14.4 mm																			
Change over volume	600 Kgs	1300 Kgs																			
<b>Analysis :</b> Material cost of spring is high ? Why ? High processing cost Why ? More overheads Why ? Low rate of production Material Yield is low		<b>Results :</b> 				<b>Benefits :</b> 1. Cost saving / component : Rs 50 2. Annual saving : Rs 150 Lakhs 3. Reduction in premium freight 4. Improved endurance life 															
<b>Root cause:</b> More overheads with the existing supplier		<b>Scope &amp; plan for Horizontal Deployment</b> <table border="1"> <thead> <tr> <th>S no</th> <th>M/c No.</th> <th>Target date</th> <th>Resp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>M 273550 - Spring</td> <td>Wk 35</td> <td>NSG</td> <td>Completed</td> </tr> </tbody> </table>									S no	M/c No.	Target date	Resp	Status	1	M 273550 - Spring	Wk 35	NSG	Completed	
S no	M/c No.	Target date	Resp	Status																	
1	M 273550 - Spring	Wk 35	NSG	Completed																	

Figure 8 Kaizen idea source change of heavy coil spring.

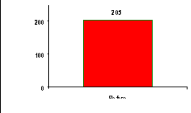
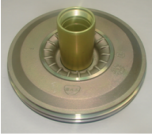

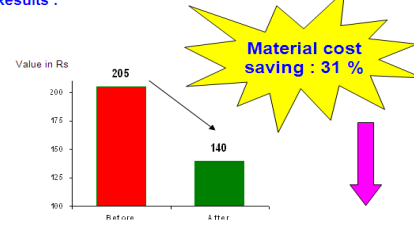
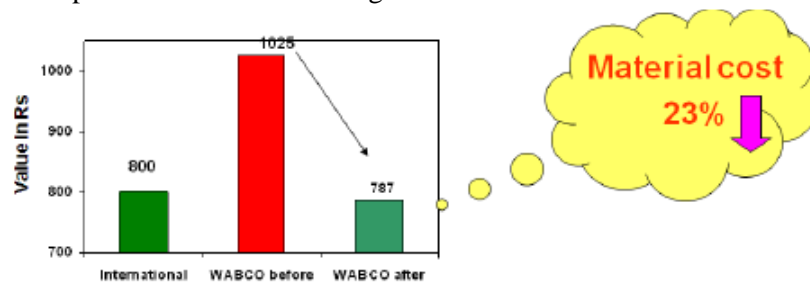
KAIZEN IDEA - SHEET		Activity	KK	JH	QM	PM	SHE	OTPM	DM	ET															
		Loss No./ Step																							
		Result Area	P	Q	C	D	S	M																	
Plant : SCL, Plant 2, Chennai		Machine :																							
Kaizen theme : To reduce the material cost of ram		Idea : Material change																							
<b>Problem/present status :</b> Material cost is High Cost / piece is Rs : 205 		<b>Countermeasure :</b> Change over the material from Aluminum to steel with Arcor coating Before - Aluminium ram  After - Steel ram 				<b>Bench mark</b> Target Kaizen start Kaizen Finish <b>Team members</b> N Selvaganapathy G Balaji																			
<b>Analysis :</b> Why material cost is high Why ? Cost of Input raw material is high Why ? Made out of aluminium		<b>Results :</b> 				<b>Benefits :</b> 1. Cost saving / component : Rs 65 2. Annual saving : Rs 78 Lakhs																			
<b>Root cause:</b> Component is made out of high cost raw material		<b>Scope &amp; plan for Horizontal Deployment</b> <table border="1"> <thead> <tr> <th>S no</th> <th>M/c No.</th> <th>Target date</th> <th>Resp</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>									S no	M/c No.	Target date	Resp	Status	1					2				
S no	M/c No.	Target date	Resp	Status																					
1																									
2																									

Figure 9 Kaizen idea Material change of Ram.

- *Benefits*

1. Productivity Improved from 450nos. /day (3machines) to 480nos. /day (1machine). 2. No. of machines used for this Operation is reduced from 3 to 1 by using 4th axis in new machine. 3. Man power, Electricity, pressured air, oils, etc. consumption reduced and floor space is saved for the production of this component. . Material Movement & component loading frequency reduced.

Because of the above cost reduction ideas, the material cost of the product has reduced significantly by 23%. The benefit was also shared with the customer and thus the case industry was able to offer the product at the best competitive rate in comparison with the competitor. The price comparison is shown in the figure 10.



**Figure 10** Price comparisons of spring brake actuator – after.

## 5. Conclusion

The work on material productivity resulted in synergy among different function, global alignment, and improving the supply chain. Material productivity Management process can support the organization to concentrate and bring in ownership with all the stakeholders. What was thought as not possible in meeting the international expectations on material productivity so far, have been changed with the approach to work on the system, the process and structures. This brought a cultural change within the organization to accept the material productivity as an organizational requirement.

The model on upstream – Supply chain competitiveness, gave a road map on how we bring about change with our tier 1, tier 2 suppliers to build their capability and be self-driven in bringing about changes at their factories.

## 6. References

- [1] Susan Helper 1997 *Complementarities and cost reduction: (Evidence from the auto supply Industry)*
- [2] Aqua MCG Special Report – *Supply Chain Cost reduction opportunities for Indian Companies* ([www.aquamcg.com](http://www.aquamcg.com))
- [3] Ernst & Young 2011 *Cost competitiveness – From complexity to confidence* ([www.ey.com](http://www.ey.com))
- [4] Neil De Koker 2002 —*The Global Automotive Industry: Strategies for Competing* ([www.oracle.com](http://www.oracle.com))
- [5] Ernst & Young 2011 *From Complexity to confidence* ([www.ey.com](http://www.ey.com))