"Improving Quality with reducing cost" an approach by applying TQM and Outsourcing with their combined impact on automobile OEMs

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***Abstract*— The OEMs have to react quickly on trends to fulfill the customer demands and be technically innovative as the customer taste changes frequently, also the gap between demand and supply require minimum. The Original equipment manufacturers (OEMs) are facing fundamental changes as it is utmost important and primary objective of the manufacturing industries to provide high quality and less cost products to the customers for creating the market leadership. The importance of the quality of products in the automotive industry has changed to being exclusively dependent on the demand and sense of the customer. These innovations and intensity of their implication lead to a high cost pressure for the OEMs again. Therefore, the OEMs need to work together with their suppliers. Production strategies like TQM and outsourcing are known as the key to success. Although cost and quality management themselves are quite well-investigated in literature, and the use of both TQM and outsourcing are widely implemented in the OEMs' strategies to improve quality and reduce costs, studies about the combination of TQM, outsourcing and subcontracting and their impact on quality and costs cannot be limited. The wide spread opinion of managers is that quality and costs cannot support each other but the use of TQM and Outsourcing are widely implemented in the OEMs' strategies to improve quality and reduce costs. We wanted to find out how they are related to each other to fulfill the given goals.**

***Index Terms*—** Quality, and Quality Management; Costs, and Cost Management; Outsourcing, Total Quality Management (TQM), and TQM in Automotive/ Automobile Industry.

I. INTRODUCTION

Automobile OEMs outsource many parts of their manufacturing to gain cost and quality improvements. Moreover, the automotive industry, which we wanted to analyze, faces an outstanding tough competition. Nowadays, consumers expect lowest possible costs and highest possible quality at the same time. Today, this is the main challenge for automobile manufacturers. (Fawcett et al., 2000)

We chose the concepts of outsourcing and total quality management for three main reasons:

- First of all both are especially important in the automotive industry. TQM was first used a large dimension in the automotive industry and the outsourced value creation amount to 70% (Kleinhans & Dannenberg, 2002).
- The relation and interaction between these concepts is not well researched in literature, which gives us the possibility to find new approaches.
- The basics of these two concepts are very different. Outsourcing or Subcontracting is not only part of a company strategy; it is also the well defined action of outsourcing or Subcontracting processes to suppliers, while TQM is more or less a management philosophy concerning several issues inside the company.

The implementation of these two concepts should cut costs and improve quality. We wanted to find out if and how there is an interaction between outsourcing or subcontracting and TQM concerning the OEM's cost and quality. Do they support each other or are they not compatible? Is there a connection at all? We wanted to analyze these problems with help of articles and data concerning the automotive industry and try to find the connection between TQM and outsourcing and their impact on costs and quality.

II. THEORY

Your goal is to simulate the usual appearance of papers in a Conference Proceedings or Journal Publications of the AMAE Press. We are requesting that you follow these guidelines as closely as possible.

A. *Total Quality Management*

The main result of TQM should be a profitable company. Hence, TQM wants to lead to a more efficient company. This is gained through satisfied customers which is the basis for profitability. TQM strongly focuses on customers to meet customer needs and expectations, and to achieve satisfied customers. Some main results of a successful TQM are improved quality through reduction of COPQ, easier problem solving, and improvement of products, processes and efficiency of employees.

B. *Outsourcing in General*

Outsourcing is subcontracting a process, like product design or manufacturing, to a third-party company. It involves the transfer of the management and/or day-to-day execution of an entire business function to an external service provider. The goal of outsourcing is a maximal specialization on activities of high value with low risk and preferably low costs. The companies want to keep the overhead cost low and try to concentrate on their core business.

The main objectives of outsourcing are:

- Reduction of operational costs
- Focus on core competencies
- Improvement of measurability of costs
- Access to external competencies and improvement of quality
- Transformation of fixed costs into variable cost.
- Regaining control of internal departments

C. *Outsourcing in the Automotive Industry*

After mass production in the 1920s and lean production in the 1980s, the global automotive industry is in the midst of another structural evolution, toward collaborative engineering and production. Component outsourcing was mainly the result of this change. Hence the OEM's value creation decreased from 41% in 1989 to 35% in 2002. Figure shows that the average share of the OEM's value creation will decrease for all kind of brands. (Kleinhans & Dannenberg, 2004)

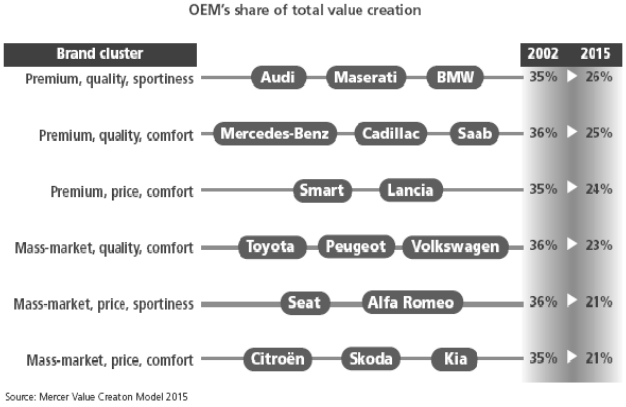

Figure 1. OEM's Share of Total Value Creation.

III. ANALYSIS

A. *Impact of TQM on Quality and Costs for OEMs*

The impact of the eleven TQM characteristics showed that they are closely related and interact at several points. But if the OEM does consider all these points, TQM might have many benefits according to the theoretical discussion of Benefits of TQM - especially quality improvements and COPQ reduction, for an example Toyota is able to provide excellent cars at low prices and still has a good profit margin.

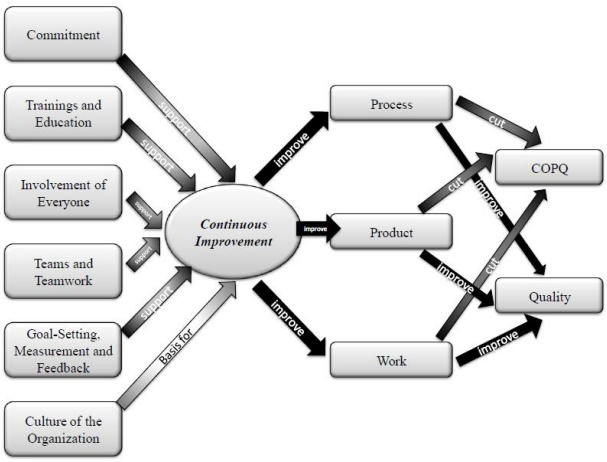

Figure 2. The impact of the eleven TQM characteristics.

The main goals of outsourcing have changed from cost discipline and control to more strategic goals like focusing on core competencies or the access to external competencies and the improvement of quality.

The focus on core competencies has a great impact on quality in the understanding of deficiency freedom and customer satisfaction. For example, if a car producer focuses mainly on engineering and car styling and chassis, but outsources the nonstrategic manufacturing and logistics; its engineering and styling can only get better because that is now the company's main focus. Workers will not be spread too thin, managers will have time to focus more on styling processes and chassis, while leaders can concentrate on new engineering and design, as opposed to manufacturing and distribution. The result is most likely to improve styling and chassis and in addition the customer will get an overall improved car because the outsourced manufactured parts are produced by companies whose sole purpose is to manufacture these components

Another outsourcing effect that improves quality is the access to new technologies and innovative components. For example, the world's largest automotive supplier Robert Bosch GmbH invested 3,583 million € into R&D in 2007 which corresponds to a 7.8% share of the total revenue (www.bosch.com) while well known innovative car companies like Toyota (3.7%) or BMW (5.2%) spent a much smaller share of their revenue for R&D.

Outsourcing is not only used to cut costs it is also a tool to improve cost controlling.

- The overhead costs decrease through the outsourcing of production capacity.

- The productivity of the suppliers increases which leads to lower variable cost for the outsourced processes.
- The inventory carrying cost decrease.
- Another important outcome of outsourcing is the reduction of staff. Outsourcing always leads to a downsizing of jobs, which is another positive impact on costs for the OEMs.

B. Impact of Outsourcing on Quality and Costs for OEMs

According to Kakabadse and Kakabadse (2005) the main goals of outsourcing have changed from cost discipline and control to more strategic goals like focusing on core competencies or the access to external competencies and the improvement of quality. Looking at the advanced outsourcing development in the automotive industry we expect that these strategic goals mainly, concerning the quality and focusing the customer demands, are even more important for the automotive OEMs.

The focus on core competencies has a great impact on quality in the understanding of deficiency freedom and customer satisfaction. The strategic outsourcing of competencies which do not fit into the company's orientation implicates several benefits for automotive OEMs. The core functions can be improved. Most OEMs focus on high-tech components or corporate identity components like styling or design which give them a competitive advantage and are therefore part of the brand management. (Nellore & Söderquist, 2000; Kleinhans & Dannenberg, 2004) For example, if a car producer focuses mainly on engineering and car styling and chassis, but outsources the nonstrategic manufacturing and logistics, its engineering and styling can only get better because that is now the company's main focus. Workers will not be spread too thin, managers will have time to focus more on styling processes and chassis, while leaders can concentrate on new engineering and design, as opposed to manufacturing and distribution. The result is most likely to improve styling and chassis and in addition the customer will get an overall improved car because the outsourced manufactured parts are produced by companies whose sole purpose is to manufacture these components (Tomkins et. al., 2005).

Another outsourcing effect that improves quality is the access to new technologies and innovative components. For example, the world's largest automotive supplier Robert Bosch GmbH invested 3,583 million € into R&D in 2007 which corresponds to a 7.8% share of the total revenue (www.bosch.com) while well known innovative car companies like Toyota (3.7%) or BMW (5.2%) spent a much smaller share of their revenue for R&D. Bosch developed 3,280 patents worldwide in 2007 (www.bosch.com). These patents will be implemented in several products of different car brands, which show the advantage of outsourcing compared to a situation where every car company had to develop their own technologies and innovations. These simple figures show the difference between suppliers & OEMs. A supplier like Bosch supplies several of the 13 major automotive OEM companies with high-tech and high quality components and subsystems. Natural high technology systems like the Anti-lock braking system (ABS) or the traction control system (TCS) are mainly developed and produced by 2nd and 1st tier suppliers, because they are specified for it. The impact on quality through the technological advantage is therefore fundamental.

The following figure should give an overview about the most important outsourcing goals stated by managers (Kakabadse & Kakabadse, 2005). We changed the exact terms to adjust these outsourcing goals to the specifics of our analysis and the automotive industry.

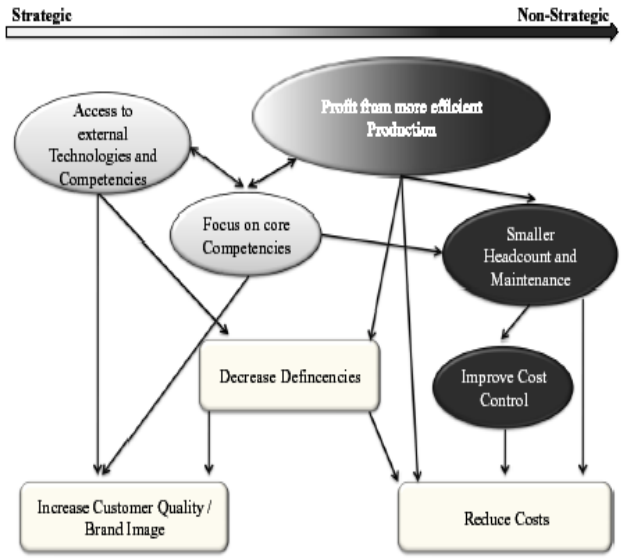

Figure 3. Important outsourcing goals.

The two main reasons we just highlighted also interact together. The R&D investment rate of the OEMs is comparatively low because they concentrate more on their core competencies. Kleinhans and Dannenberg (2004) call this brand management. The car producers need to create an image for their brand which builds up a competitive advantage. Therefore the OEMs invest more resources into marketing and the conception of innovations but less into the research and the development itself. The OEMs research the customer demands in order to create new conceptions which they develop in collaboration with their major suppliers. The suppliers provide the OEMs with the main technical implementation and the best quality.

The outlook to 2015 shows that the OEM's value creation will decrease for every manufacturing process and even their production share of body structure and exterior will drop below 50%. The number of suppliers in the automotive industry has decreased since 1980 from approximately 40,000 to 5,600 in the year 2000 and will decrease to around 2,600 in 2015. At the same time their total value creation will double between 2,000 and 2015,

which leads to a variety of powerful specified companies (Kleinhans & Dannenberg, 2004). Hence these suppliers can lower their costs through the economies of scale and scope. Therefore this development has a positive impact on the OEMs costs in two ways:

- The overhead costs decrease through the outsourcing of production capacity.
- The productivity of the suppliers increases which leads to lower variable cost for the outsourced processes.

C. Interaction of TQM and Outsourcing on Quality and Costs

We have found the main points here, the interaction of TQM and outsourcing and how this interaction supports and influences costs and quality of automobile OEMs.
TQM is often seen as an internal philosophy to improve customer satisfaction. Outsourcing is often done to improve the OEMs' costs situation. However, nowadays, TQM and outsourcing have increased, and there are definitely overlaps between the two. For instance, the earlier analysis showed that both TQM and outsourcing concentrate on quality improvements and cost reduction. Both approaches start with the same aim - they want to improve the efficiency of automobile OEMs. Furthermore, both techniques focus on the same issues we wanted to investigate, namely costs and quality.

According to Hendricks and Singhal (2000) the conventional wisdom of TQM is that it is less beneficial to smaller companies. The two authors negate this theory in their empirical study. We would like to use the results of Hendricks and Singhal's research and transfer them to our case as we did in the previous chapters The results are presented below

- Outsourcing leads to specialization and concentration on core competencies for OEMs and suppliers. The focus on core businesses improves the OEM's TQM. But an efficient TQM is only possible if the automotive OEM collaborates closely with its suppliers and customers.
- The automobile OEMs must usually be seen as large companies. Hence, outsourcing helps the OEMs to concentrate on core businesses, which means that the OEMs become smaller. The depth of the organization decreases. According to Hendricks and Singhal's (2000), this procedure should lead to a more efficient TQM. Thus, outsourcing is able to support an efficient TQM.
- A main TQM philosophy is to focus on its customers, who should lead to more valuable processes with an outsourcing. Hence, you can say that outsourcing can enables an automotive OEM to better focus on its customers, and thus outsourcing supports TQM in doing so.
- Moreover, the concentration on core competencies also enables the OEMs to only improve processes they are skilled in. Continuous improvements are concentrated on the main issues of the automobile OEM, and thus no resources are wasted for non-value adding activities.
- Outsourcing flattens the hierarchy and depth of the organization. Thus, it is easier to involve everyone in teamwork and communicate the TQM philosophy. The communication within the company becomes much easier and leads to more creativity and participation, which according to Kakuro (2004) is essential for progress.
- The automobile OEMs try to guarantee high quality throughout the entire supply chain through quality standards. This means that the OEMs require their suppliers to achieve the quality standards of ISO; especially the TS-2 standards. Due to increased outsourcing and raised quality and cost expectations of customers these standards attain more and more importance for an efficient TQM, which leads reduction in cost as the failure costs, appraisal costs decreases.

IV. CASE STUDY

A. Outsourcing and TQM in one Industry.

A highly innovative feature of the new plant of Hyundai is the number of key roles that Hyundai has entrusted to outside suppliers. The entire logistics function has been outsourced. Three main third-party service providers share the task: one for body shop logistics,2nd logistics for assembly, and 3rd handles non-series production logistics, including spare parts, both for offices and for the plant, such as light bulbs, printer cartridges, conveyor motors etc. 80% of the daily material is supplied "Just in Time" or "Just in Sequence" by the logistic service providers. There are no communication barriers between the integrated partners and Hyundai. But it is also an example for the right choice of outsourced components. Hyundai produced strategically important components like the chassis or the painting mainly itself, but also integrated their suppliers in-house by having a high level of collaboration, while the suppliers of basic components and materials are not integrated in the plant organization.

An automobile is created from thousands of parts from various suppliers; it is the creation of a collaborative effort between a car company and a large number of suppliers. Naturally, competition in the automotive market is fought by both automakers and suppliers in partnership. As a manufacturer on the forefront of competition, HMC is implementing fair trade practices in conjunction with suppliers to foster a stronger partnership. HMC is also providing supplier support for quality, technology and environmental management to increase the competitiveness of our key suppliers. Suppliers Fostering Global Competency of Suppliers Supplier support programs for fostering global competency includes technology development support, quality management capacity building, and productivity improvement support programs. HMC were already operating a number of supplier support programs including the Guest Engineer program, on-site training for second-tier suppliers, and supplier participation

in R&D Motor Show. In addition to these programs, it established the Supplier R&D Support Corps, the Supplier Quality Management Training Centre, and a number of tailored policies for different types of suppliers in order to boost technological competency and product quality.

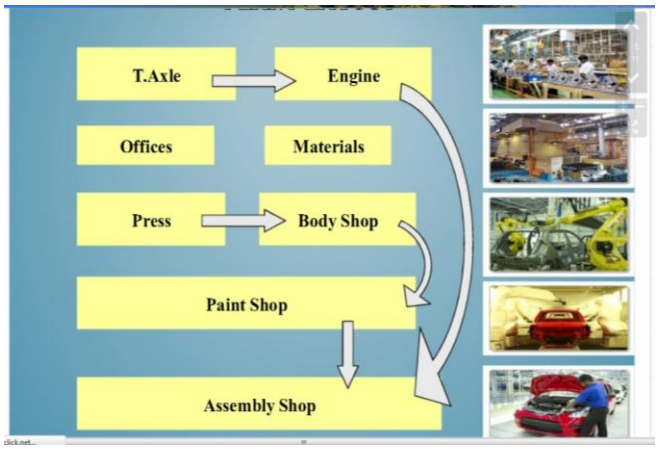

Figure 5. Ground Plan of the HYUNDAI Plant, CHENNAI.

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The Hyundai plant in Chennai is an example for a good interaction of outsourcing and TQM. The whole construction plan of the factory is based on supplier integration and the interaction of HYUNDAI personnel and supplier personnel, but also the use of innovations and technology lead it to be one of the most efficient plants worldwide.

We think that outsourcing can be seen as a precondition for the successful implementation of TQM concepts. The focus on the processes assembly, body shop and design processes gives HMC the opportunity to focus their resources on these few processes.

The figures of HYUNDAI show that this kind of plant organization with its

- high degree of outsourcing,
- its close integration of important suppliers,
- its focus on the main production core competencies,
- and its strongly implementation of TQM

It Leads to highly efficient production with high quality, less deficiencies and lower costs.

The example of the HYUNDAI plant in Chennai shows how a well planned integration of suppliers, a high level of outsourcing and TQM concepts can interact together and improve the production in terms of quality, efficiency and costs. The factory is also a benchmark for the organizational structure of future automotive plants because the success of the plant will most likely inspire and influence other OEMs

V. CONCLUSION

It is known that outsourcing is often used in companies and reduces the costs of OEMs. We have also highlighted how TQM alone leads to quality improvements. But they work not only separated very well in companies. Outsourcing lays good foundations for an efficient TQM implementation. Therefore we conclude that precisely these two methods, outsourcing and TQM, supplement each other and fit together very well to assure the efficiency of the automobile OEMs with high quality and low costs at the same time. Today, Toyota is the largest automotive company worldwide. It implemented TQM, and is the best example for having high quality and low prices/costs at the same time. But as we analyzed TQM is more successful in SMEs. Automobile OEMs are large companies, but with outsourcing and its focus on core competencies different parts arise within the OEMs. These parts can also be seen as "small" OEMs. The employees have smaller task and therefore they are more involved and skilled in their area. It is rational that the TQM philosophy of more teamwork, worker empowerment, involvement and commitment to perform, will be implemented more easily and with greater success in smaller firms because everything is clearly arranged and on a more personable

scale. In addition, the change to the TQM philosophy could be easier in smaller companies due to the fact that the resistance might be less compared to large companies.

REFERENCES

[1] E. Adam,L. Corbett, B. Flores, N. Harrison,T. S.Lee, D. Samson & R. Westbrook, "*An international study of quality improvement approach and firm performance,* " International Journal of Operations & Production Management, Vol. 17, No. 9, pp. 842-873,1997.

[2] S. Ahire, M. Waller, & D. Golhar, " *Quality management in TQM versus non-TQM firms,: an empirical investigation,* ". International Journal of Quality & Reliability Management, Vol. 13, No. 8, pp. 8-27,1996.

[3] E. Anderson, V. Mittal, "*Strengthening the Satisfaction-Profit Chain,* Journal of Service Research, Vol. 3, No. 2, pp. 107-121,2000.

[4] J. Bandyopadhyay, & D. Sprague, "*Total Quality Management in an Automotive Supply Chain in the United States,* "International Journal of Management, Vol. 20, No. 1, pp. 17-23,2003.

[5] J. Barthelemy & D. Geyer, "IT *outsourcing: - Evidence from France and Germany*". European Management Journal, Vol. 19, No. 2, pp. 195-202,2001

[6] R. J. Boaden,"*What is total quality management…and does it matter?,* " Total Quality Management, Vol. 8, No. 4, pp. 153-171,1997.

[7] S. Fawcett, R. Calantone, A. Roath , "*Meeting quality and cost imperatives in a global market*, " International Journal of Physical Distribution & Logistics Management, Vol. 30, No. 6, pp. 472-499,2000.

[8] R. Cooney & A. Sohal, " *Teamwork and Total Quality Management: a Durable Partnership,* " Total Quality Management & Business Excellence, Vol. 15, No. 8, pp. 1131-1143,2004

[9] B. Godfrey, R. Kenett, "*Joseph M. Juran, a perspective on past contributions and future impact,* "Quality and Reliability Engineering International, Vol. 23, No. 6, pp. 653-663,2007

[10] L. P. Huggins, " *Total quality management and the contributions of A.V. Feigenbaum,* " Journal of Management History, Vol. 4, No. 1, pp. 60-67,1998.

[11] V. Khanna,P. Vat,R. Shankar,B. Sahay, A. Gautam, "*TQM modeling of the automobile manufacturing sector: a system dynamics approach,* " Work Study, Vol. 52, No. 2, pp. 94-101,2003.

[12] C. Kleinhans, J. Dannenberg, "*The Coming Age of Collaboration in the Automotive* Industry, " Mercer Management Journal, Vol. 17, pp. 88-94,2004

[13] K. Matzler, F. Bailom, H. Hinterhuber, B. Renzl, B. & J.Pichler, "*The asymmetric relationship between attribute-level performance and overall customer satisfaction: a reconsideration of the importance-performance analysis*, " Industrial Marketing Management, Vol. 33, No. 4, pp. 271-277,2004

[14] R. Nellore & K. Soderquist, "*Strategic outsourcing through specifications,* " Omega, Vol. 28, No. 5, pp. 525-540,2000

[15] J. Richardson, "Parallel sourcing and supplier performance in the Japanese automobile industry, " Strategic Management Journal, Vol. 14, pp. 339-350,1993.