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STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

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A STUDY OF SUPPLIERS CERTIFICATION AT DIFFERENT LAYERS AND ITS IMPACT ON QUALITY IN AUTO COMPONENT INDUSTRY

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ABSTRACT

Vendor evaluation and development has an immense importance in today's competitive world. Especially after globalization for Indian Manufacturing companies' vendor development becomes the important priority in order to cope up with global completion. The automobile industry has seen phenomenal growth during last two decades or so. It was observed that there was a tremendous pressure on the giants in this field to produce vehicles and fulfill the production processes carried out by these companies. This gave rise to outsourcing. This outsourcing has led to increase in SSI units supplying material to these giants. Even the giants have shown interest in starting such a venture. The work load was such heavy that these vendors have further processed for sub- vendor ship. This has led to the creation of multi-layer production process. The objective of the study is to check whether this multi layer, hierarchical process has really benefited the auto industry by reducing the cost and increasing the quality of the product or has lead to increased rework and rejection. Collection of data was done through a structured questionnaire, from records and individual interviews. The sample size was 46 tier-I , 114 tier-II and 300 tier -III suppliers. The researcher can conclude that the hypothesis "Rejection is higher in case of companies whose proportion of non certified supplier is more than that of certified supplier" is validated and rejected and the null hypothesis: "There is no difference in overall rejection in case of companies whose proportion of non certified vendors is more than that of certified vendors" is accepted.

KEYWORDS

Certification, Multilayer, Quality.

INTRODUCTION & REVIEW OF LITERATURE

1) Vijaya Perumalla¹

In India technological modernization is difficult as there are a huge number of small industrial units manufacturing variety of products. As industries are small in size the entrepreneurs themselves are engaged in day-to-day activities of production and managing the business and they hardly find time for keeping themselves update with the technological development, making these units fall behind in modernization.

Various policies proclaimed and implemented by Indian governments before 1990s were aiming at protection the small scale units rather than making them competitive. Some of the issues which were left unaddressed were problems of obtaining credit from banks. The SSIs was always short of their internal financial resources and have no surplus money for bad times in the business. As due to unstable profits banks were reluctant for issuing unsecured loan to the SSIs, this left these industries with no option than depending for funds on money-lenders at higher interest rates. And those who have tried to obtain loans from the various financial institutes have only faced corruption associated with grant of loans and long delays in delivery.

Large numbers of SSIs were close down due to financial and marketing problems. As the owner himself used to manage all the business activities, poor management was also a major cause of sickness of these units

It was also seen that government reservation policy played a negative role. It is observed that the policy is actually counterproductive as those producing non-reserved items have performed better than those in reserved areas. Hence the reservation policy tends to become large redundant.

2) T.A.Bhavani²

Small units in developing economics are known for technologically backwardness and India is not an exception. In majority of Indian SSIs there is lack of competitive strength which is due to use of outdated technology. It is observed that Indian industries are almost the last imitator when it comes to adaptation of technology.

SSI (small scale industries) sector in India constitutes 95 percent of units, 40 percent of value added, 80 percent of employment of the manufacturing sector and 35 percent of total exports of India.

Small enterprises in India has a very simple structure one man strategic apex and is called as owner manager who is responsible for all the decisions regarding expansion of production facilities and hence, expected to possess the investment capabilities to search, identify, evaluate, select, negotiate and commission new production facilities.

These technological capabilities depend on the formal education and training, on-the-job experience, and attitudes of the concerned individuals. It is also that 50 percent of these units are managed by non professionals. It was also revealed that around 50 percent of the units have not employed even a single person with a formal degree and in the remaining 50 percent units only 33 percent people employed were having some professional qualification. It is also seen that larger percentage of small scale units still use manual machines and at times second hand machinery for production purpose and result of all this is that there is no quality control system in the small manufacturing sector at large.

3) Richardson³

Major evolution in business environment for parts has become apparent. Development of parallel spare part market has emerged and OEMs are facing competition from their own suppliers. As the volume of business is increasing along with the competition, these OEMs have no alternative than to rely on outsourcing the components. Inevitably, this means increasing amounts of "genuine" spare parts are also produced by third parties. The OEMs does not have any control over these suppliers as they would have over in-house suppliers.

Now the OEM's monopoly has been taken over by rising competition and also possibility of losing of the grip on the major distribution channels in the market. As due to intense competition margins on vehicles is decreasing now, these OEM's industries have to concentrate more on after sales revenue for their financial health.

The OEM's can differentiate themselves through the "genuine parts" stamp; the OEM cannot justify a large price gap between his "genuine parts" and the price of alternative suppliers for two reasons. Firstly, some of the largest alternative suppliers have a strong brand name themselves, either reducing or completely

¹ Problems In Modernization Of SSI's Seminar on industrial modernization June 2,1997 (<http://www.cherry.gatech.edu/sim/students/paper97S/perumalla.html>)

² Study of Technological Change in Small Enterprises of A Developing Nation: Analytical framework and empirical examination Institute of economic growth Delhi- India Email:adi@ieg.ernet.in <http://www.iegindia.org/adipub.htm>

³ Automotive Industries: parts industry being redesigned May, 2005 <http://www.google.co.in/search?hl=en&q=Automotive+Industries+%3A+parts+industry+being+redesigned+By+Richardson&btnG=Search&meta=&aq=f&oq=>

eliminating consumer and dealer quality concerns. Secondly, the consumer mostly leaves the choice of the spare parts up to his / her dealer, who is in a much better position to judge the value proposition of the spare parts.

Automotive companies in the west are in danger of being left behind by competitors in Asia because of the resistance to new technology

4) V. Sumantran, Tata Motors⁴

Indian vendors lack on quality standards. Out of 480 companies only about 10 companies managed to produce as per international standards. It is the question how we are going to bring the rest of the companies upto the similar level.

"It is found that Indian vendors are very good at meeting the quality and quantity expectations for India. But look outside, and their ability to come out with a product for the international market might be missing." Indeed. Leave out Suzuki and Hyundai, and you will find that the component industry is still a fragmented, unfamiliar place. The long-awaited consolidation still has not happened. The second reason: infrastructure and logistics affect all three companies equally. Maruti's Khattar gets worked up as he talks about how his vehicles are handled on the way to the ports. When the company decided to start using the railways to transport its cars to Vapi, and route to JNPT, the Railways told him to construct his own sidings at the Gurgaon railway station. Scowls Khattar: "Most of the wagons are in such bad shape that they have to be repaired before we use them."

5) Haritha Saranga⁵

In this paper, the performance analysis of the Indian auto component industry is carried out from the perspectives of an original equipment manufacturer and a component supplier. Various efficiency measures are estimated using Data Envelopment Analysis with publicly available financial data on a representative sample of 50 firms. The first stage analysis reveals various operational inefficiencies in the auto component industry which are subsequently decomposed into *technical*, *input mix* and *scale* efficiencies. The study finds evidence that a majority of the inefficient firms are operating in the diminishing returns to scale region and demonstrates potential savings through benchmark input targets. A second stage analysis aimed at exploring root causes of inefficiencies finds that substitution of labour for capital could be causing a variety of inefficiencies including the *input mix* inefficiency in the Indian component industry. The empirical results also suggest that, unlike the global auto supply chain, higher average inventories are required for higher operational efficiencies in the Indian context. Contrary to the popular expectations, the technology licensing does not show significant influence on efficiency, at least in the short term, whereas efficient working capital management does result in higher operational efficiencies. The study also unearths the need to reform labour laws which are significantly contributing to various inefficiencies in the Indian component industry.

INDUSTRY STRUCTURE MAKING INDIA A GLOBAL AUTO COMPONENT HUB

TATA CONSULTANCY SERVICES

Even though the Indian auto component industry is relatively small by global standards, there are close to 400 players in the organised sector and over 5,000 in the unorganised sector competing against each other for market share. However, the share of the organised sector has increased over time. Players in the organized sector supply to vehicle manufacturers directly. The unorganized sector, on the other hand, mostly has small units, producing low-technology components and predominantly competing in after-market space.

The automotive components industry is a combination of different product segments, with each segment having a different market structure. However, the number of companies present in each segment differs because of the difference in the level of technology requirement. No single company is a prominent player in more than one product segment.

6) G.V. Prabhushankar, S.R. Devadasan, P.R. Shalij⁶

Developing countries such as India, Mexico and Brazil are turning out to be hub for global automobile manufacturing companies. Hence, researchers are required to examine the developments that occur in these countries. The research reported in this article, has brought out certain findings from Indian automobile components manufacturing scenario. During this research, the practitioners of automobile components manufacturing companies located in Bangalore city of India were interviewed. The aim was to assess the trend in implementing Quality Management System (QMS) standards, Six Sigma programme and innovation practice in Indian automobile components manufacturing sector. The overall assessment was that the conglomeration of these three strategies to bring out synergy out of them is missing. This prompts the need for exclusive model of QMS which would link the standards, innovation practices and Six Sigma for enabling the automobile manufacturing sector of not only India, but also of other developing countries to achieve world class competitiveness.

7) Analyzing supplier development criteria for an automobile industry: Kannan Govindan, Devika Kannan and A.Noorul Haq⁷

Purpose of the research article is to present an approach to identify and rank the criteria used for supplier development using interpretative structural modeling (ISM).

The paper develops a framework to analyze the interactions among the criteria such as competitive pressure, evaluation and certification system, incentives, supplier development programs, inter-organisational communication, buyer-supplier relationship, supplier commitment, supplier performance, asset specificity, joint action, trust, long term strategic goal, top management support, purchasing performance, and supplier strategic objective for the development using ISM.

Findings: Research in the area of SCM has intensified in recent years for number of reasons. Managers have now realized that actions taken by one member of the chain can influence the responsiveness, efficiency and profitability of the complete supply chain. Firms are increasingly thinking in terms of competing as part of a supply chain against other supply chains, rather than as a single firm against other individual firms.

IDEA GENERATION

The automobile industry has seen phenomenal growth during last two decades or so. It was observed that there was a tremendous pressure on the giants in this field to produce vehicles and fulfill the production processes carried out by these companies. These changes are distinct from the changes forced by the technological development. Further, these changes have added different dimensions to the traditional approaches in almost every function of the business. Certain new concepts have emerged, such as, Vendor Development, Supply Chain Management, forward and backward Integration of the production processes, outsourcing etc. While introducing each of such new concepts, it has been stated that these concepts will lead to reduction of cost with high quality and greater speed in the production processes.

On this background, the researcher has decided to probe into the claims made (as mentioned above) in the context of automobile industry. The focus of this study, however, is not on the giants in automobile sector, though initially they were manufacturing 100% of the parts and the products on their own. But the researcher has concentrated on the Small Scale Industries (hereafter referred to as SSI) supplying materials to these giants these days. This is because practically the production takes place at these SSI's and also because, the aspect of quality is crucial in this context.

⁴ "So far, Tata Motors' passenger car project has cost the company \$550 million. That is significantly cheaper than it would cost anybody in any other country in the world" <http://www.businessworldindia.com/jan1904/coverstory01.asp>

⁵ The Indian auto component industry – Estimation of operational efficiency and its determinants using DEA Indian Institute of Management Bangalore, Production and Operations Management Area, Bannerghatta Road, Bangalore 560076, India. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VCT45790674&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=991154080&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=8ec91206a8cc580c3756294e4b3c2e87

⁶ Journey of Indian automobile components sector: from Quality Management System certification to innovation via Six Sigma <http://www.inderscience.com/search/index.php?action=basic&wf=author&year1=1995&year2=2007&o=2&q=G.V.%20Prabhushankar>

⁷ Research paper: Industrial Management and Data System Vol.110 No.1,2010

THE RESEARCH QUESTION

The question that appeared in the mind of the researcher was that:

Due to phenomenal growth of the automobile sector it has increased the strength of the giants. This has led to an increase in the number of SSI units supplying materials to these giants. Even the giants have shown interest in starting such a venture. The work load was so heavy that these vendors (i.e. SSI units) have further proceeded for sub-vendor ship. This has led to the creation of multi-layer production process for the production of one unit/part of the unit. The multi-layer, hierarchical process leads to decrease in margin of profit at each such level of process as also reduction in quality, delay in supply and increase in the number of rejections. This resulted in the framework of the present study entitled "Technical Impediments to vendor development: A Study of some selected industrial units in Pune region".

STATEMENT OF PROBLEM

The multi-layer, hierarchical process leads to increase in rejection level and reduction in quality.

CORE CONCEPT

The phenomenal growth of the automobile sector has increased the strength of the giants. This has led to increase in the number of SSI units supplying materials to these giants. Even the giants have shown interest in starting such a venture. The work load was such heavy that these vendors (i.e. SSI units) have further proceeded for sub-vendor ship. This has led to the creation of multi-layer production process for the production of one unit/part of the unit. The multi-layer, hierarchical process thus had leads to increase in rejection level and reduction in quality.

IDENTIFICATION OF THE PROBLEM

After discussion with the authorities from vendor development and purchase department from various auto component industries and after collecting the data with the help of questionnaire following technical impediments (hurdles) were identified:

- 1) Many vendors or suppliers further outsource the processes due to insufficient in-house facility, capacity, expertise, specific operations, access to better technology, better efficiency; firm want to focus on core competency etc. which may leads to increase in rejection levels at further stages.
- 2) As number of levels increase in a supply chain the proportion of non certified vendors to certified vendor increases.
- 3) As number of tiers or levels increases there is increase in rejection rate which is incremental.

Hence the researcher has decided to study the impact of 'multi-operations' and "multi-vendor outsourcing" on the level of rejection and thus the following objectives were set.

OBJECTIVE OF THE STUDY

1. To study the impact of certification of vendors on quality.
2. To study the proportion of certified to non certified suppliers at tier-II and their rejection.
3. To study the rejection by certified and non certified suppliers.
4. To study the percentage of operation outsourced by certified and non certified suppliers.

METHODOLOGY

UNIVERSE

There are close to **400** players in the organized sector i.e. tier-I and over **5,000** in the unorganized sector i.e. tier-II and tier-III. Players in organized sector supply to organized vehicle manufacturers directly. The unorganized sector, on the other hand, mostly has small units, producing low-technology components and supply to tier-I organized supplier and predominantly competing in after-market spare.

SAMPLE SIZE

- 1) **46** number of tier-I manufacturer who falls in organized sector and who supplies to vehicle manufacturer directly.
- 2) **114** number of tier-II manufacturer who falls under unorganized sector and who are suppliers to tier-I manufacturer.
- 3) Approximately **300** tier-III vendors the information of whom was taken from tier-II suppliers

Total sample size organized and unorganized is **46+114+300=460**

SAMPLING TECHNIQUE USED

The research is about Automobile Sector in Pune region. Pune region has been selected as there are plenty of SSI's in this sector and secondly, the researcher found it convenient to focus on the region on the grounds of vicinity. In the context of the topic, vendors were identified at three different levels.

Tier-I- who are direct vendors to the giant's vehicles manufacturer.

Tier-II- Suppliers to Tier-I vendors

Tier-III- Supplier to Tier-II vendors

It was desirable on the part of the researcher to gather relevant information from all the three categories.

Though multi stage sampling is a part of random sampling the researcher has used multistage sampling for non random sampling for Tier-I and Tier-II vendors.

Sampling design for Tier-I vendors.

- N= 200 approximate
 - n=46
 - Sampling ratio 25%
 - Method of sampling- Non random- Combination of convenience and Judgmental sampling. Judgmental on the basis of possibility of getting data.
- Sampling design for Tier-II vendors
- N=1000 approximate
 - n=114
 - sampling ratio 11.4%
 - Sampling technique- Non random- Combination of convenience and Judgmental sampling.

Stage I –selection of Tier-I vendors was Non random- Combination of convenience and Judgmental sampling.

Stage II – Selection of 114 vendors was done on the basis of recommended by 46 Tier-I vendors.

Selection of 2 or 3 vendors was done from each Tier-I vendor.

Tier-III vendors around 300

The required information was provided by 114 (Tier-II vendors). As per the availability and convenience

DATA COLLECTION

Taking into consideration all the facts the researcher has used.

- 1) Questionnaire: A structured questionnaire was prepared.
- 2) Records: Information, data specifically related to the rejection rate and outsourcing tendency was taken from the records.
- 3) Individual interviews: Individual's responses, opinions and views were considered.

Important note: The range of quality, as measured by defects found in incoming components – expressed in 'parts per million' defective. International best practice for car makers in the U.S., Japan and Europe predominantly competing in after-market spare currently aims to bring the large majority of suppliers under 100 PPM. The 'parts per million' defective allowed by the Indian companies studied ranges between 200 to 500 PPM and in some cases it's up to 1000 PPM.

ANALYSIS AND INTERPRETATION

The data so collected was analyzed according to the alternatives of the closed ended questionnaire and interpreted as per the graphical representations provided.

HYPOTHESIS TESTING**OBJECTIVE**

To study the impact of certification of vendors on quality.

The researcher has collected the data for tier-1, tier 2 where it is found that all tier -1 suppliers are certified suppliers hence the researcher has concentrated on tier -2 suppliers where there were both certified and non certified suppliers and tried to compare the rejection separately for both the groups.

The researcher has collected data on average rejection per process for tier –I supplier and for tier-II and tier-III suppliers. The researcher has the data for total rejection along with number of operations carried out on that component by the supplier. To bring the whole sample on equal platform and to be more realistic the researcher has converted total rejection into rejection per process by dividing total rejection for that supplier by number of operations carried out at that suppliers end. Hence the data for certified and non certified suppliers is the average rejection for that particular supplier divided by number of operations carried out for that particular component.

Hypothesis: "Rejection is higher in case of companies whose proportion of non certified vendors is more than that of certified vendors"

H0: "There is no difference in overall rejection in case of companies whose proportion of non certified vendors is more than that of certified vendors"

H1: "Rejection is higher in case of companies whose proportion of non certified vendors is more than that of certified vendors"

t-Test

The researcher wanted to explore whether there is any difference between the certified and non-certified vendors in terms of the rejection rate. The researcher has divided total number of companies in two groups 1 and 2. Here group 1 is of certified vendors and group 2 is of non-certified vendors. In group 1 there are 58 vendors and in group 2 there are 54 vendors.

Here the researcher has taken the average rejection for number of operations for both the groups.

The mean of overall rejection for group1 is 3393.8 and the mean of overall rejection for group 2 is 5114.1

GROUP STATISTICS

	Groups	Mean
Overall rejection	1	3393.8
	2	5114.1

To check the hypothesis: "Rejection is higher in case of companies whose proportion of non certified vendors is more than that of certified vendors" the researcher has applied independent sample t-test.

It is observed that there is difference between the overall rejection in certified and non-certified supplier (t score= -1.889) which is not statistically significant (p-value=0.062).

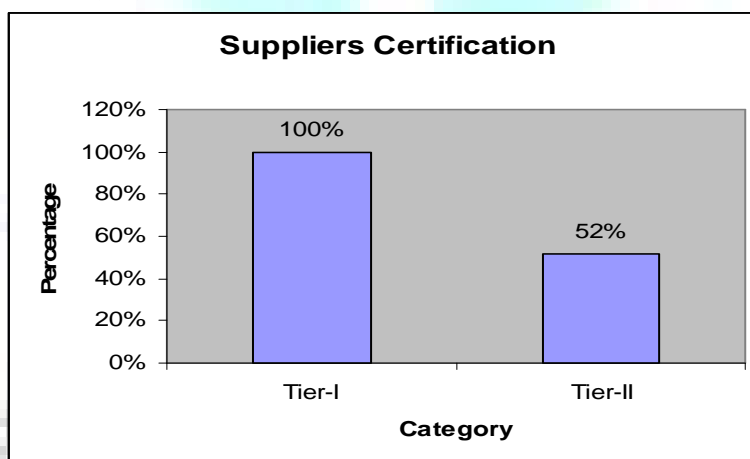
The researcher can conclude that the hypothesis "Rejection is higher in case of companies whose proportion of non certified supplier is more than that of certified supplier" is validated and rejected and the null hypothesis: "There is no difference in overall rejection in case of companies whose proportion of non certified vendors is more than that of certified vendors" is accepted.

INDEPENDENT SAMPLES TEST

		t-test for Equality of Means			
		t	Df	Sig. (2-tailed)	Mean Difference
Overall rejection	Equal variances assumed	-1.889	110	0.062	-1720.37

DATA ANALYSIS

1) Certification of the suppliers: The researcher wanted to find out the percentage of certified suppliers and non certified suppliers. Hence researcher collected data for certification of supplier from both the groups i.e. tier-I and tier-II suppliers.



After analyzing the data for tier-I and tier-II suppliers it is observed that 100% suppliers from tier-I are certified whereas only 52% suppliers from tier-II are certified. This means tier –II suppliers consists of 52% certified and 48% non certified supplier.

Data regarding tier-III suppliers was not available with tier-II suppliers.

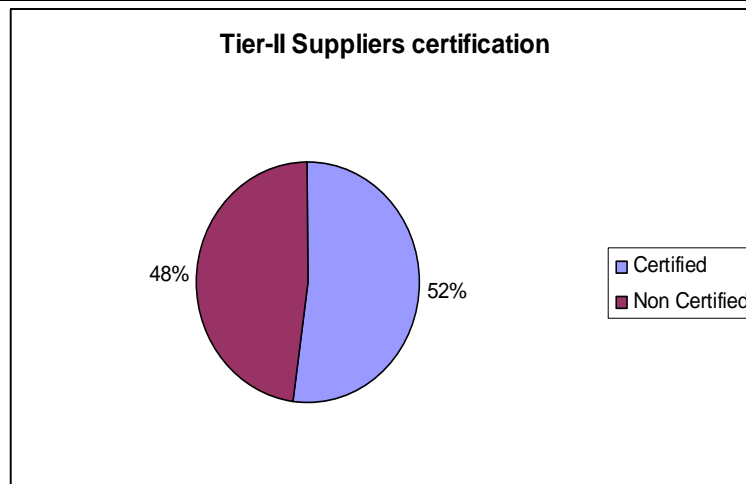
Observation: It is observed that as we go on outsourcing further from tier- I to tier-II and tier-III proportion of non certified to certified supplier increases.

Comment:

➤ Multi-level sourcing leads to larger number of non certified suppliers.

2) Certification of Tier –II Supplier:

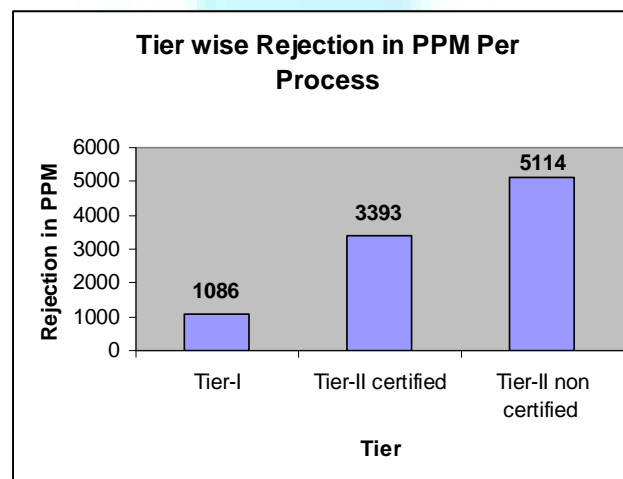
From the above analysis it is observed that as number of tiers increases the proportion of certified supplier to non certified supplier falls. Thus researcher also wanted to find out what is the proportion of certified suppliers to non certified suppliers at tier-II.



From the data analysis it is observed that 52% of tier-II suppliers are certified where as 48% of tier-II supplier are not certified.

Observation: After analyzing and comparing the data for tier-I, tier-II suppliers it is found that as number of tiers increases the percentage of certified suppliers falls.

3) Certification and rejection: From the above analysis it is found that multi sourcing leads to less number of certified suppliers hence it becomes necessary to find out whether certification has any impact on quality of the product.



After comparing the data for certification, the researcher wanted to test whether certification has any impact on the rejection level. Hence researcher felt it necessary to compare the data with the rejection level for all the groups.

After comparing the data with the rejection level in PPM per process it is found that as percentage of non certified supplier increases, rejection increases but which is not statistically significant.

Observation: It is observed from data analysis that as number of tier increases percentage of non certified supplier to certified supplier at every incremental level increases. It is also observed that higher number of certified suppliers leads to better quality and lesser rejection and vice-versa.

Comments:

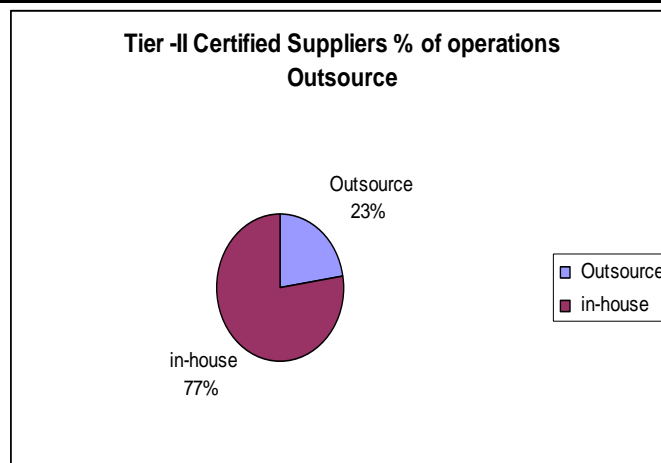
➤ Tier –I suppliers are 100% certified suppliers this is because OEMs while selecting their supplier it is obligatory and mandatory for the suppliers to be certified and hence rejection is less at tier-I. When it comes to selection of tier-II supplier tier- I supplier gives more importance to cost than certification and hence it can be seen from the data analysis that proportion of certified suppliers fall down drastically at tier –II level.

4) **Operations outsourcing:** Average numbers of operation on a component to be carried out at tier-II supplier are 7.59.

Operations outsourced by Tier-II certified suppliers:

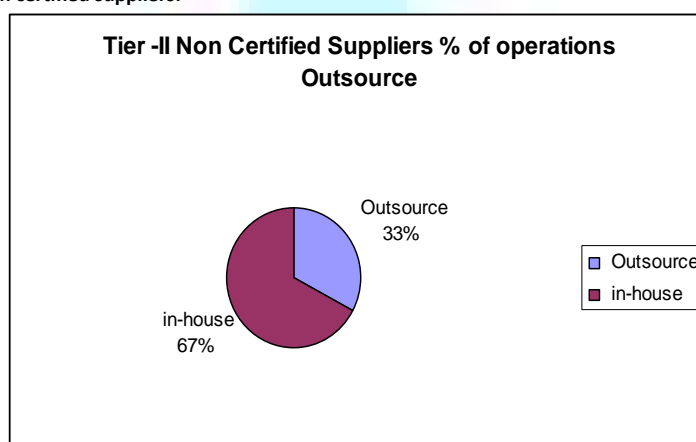
Earlier we have seen the tendency of outsourcing by tier-I, tier-II certified and tier-II non certified suppliers. It has also been analyzed the proportion of suppliers carrying out all the operations in house and suppliers outsourcing the part or the whole operation to the next tier.

Now the researcher wanted to check the percentage of operation outsourced by these suppliers and the objective was to find out the trend of operation outsourcing by these suppliers.



Observation: From the data analysis it is observed that out of total operations 23% operations are further outsourced by tier-II certified suppliers to tier-III suppliers whereas 77% operations have been performed in house by the suppliers.

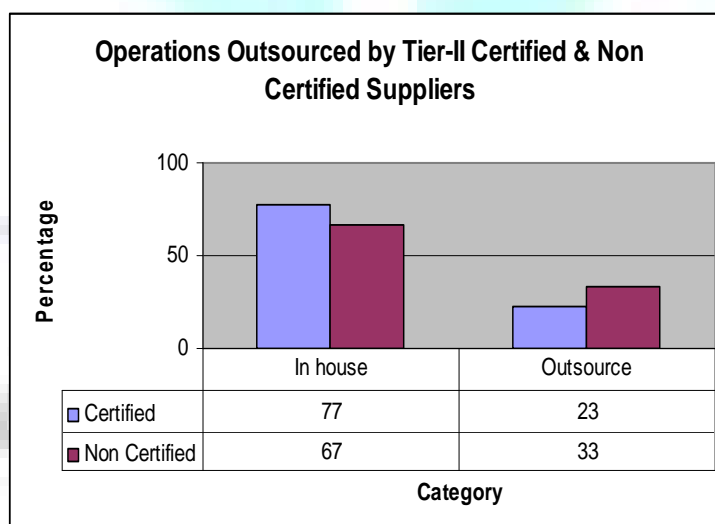
5) Operations outsourced by Tier-II non certified suppliers:



Observation: From the data analysis it is observed that out of total operations 33% operations are further outsourced by tier-II non certified suppliers to tier-III suppliers whereas 67% operations have been performed in house by the suppliers.

6) Comparison of operations outsourced by Tier-II certified and non certified suppliers:

The comparison between certified and non certified suppliers has been done to find out whether there is any correlation between the certification and the percentage of outsourcing of tier-II supplier.



After comparing the data for percentage operations out sourced by certified and non certified suppliers it is observed that outsourcing is greater in case of tier – II non certified suppliers than that of certified suppliers.

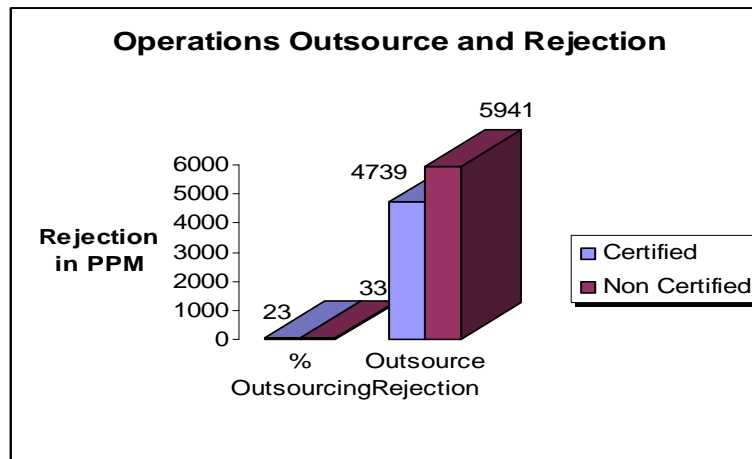
Observation: It is observed that non certified suppliers outsource more number of operations than certified suppliers

Comments:

- From the data analysis it is observed that non certified suppliers outsource more number of operations than certified supplier. As non certified supplier do not have the range of machines required to carry out all the operations required for a particular component. It is also seen that these suppliers are not the preferred suppliers by tier-I suppliers and tier-I gives preference to tier-II certified supplier and if anything is left out then tier-II non certified supplier is given chance. Hence these supplier do not have sufficient load which can satisfy their capacity requirements and also these supplier are given those components which has non similar operations, non uniform requirements of machines and facility and the volume of which is also very less.

- It is also seen that non certified suppliers tap different sources at the same time due to instability of orders as they are also not assured of constant flow of business as they don't have vendor code and hence it is observed that these supplier take work from different companies. Due to more number of sources from whom they take the work load it is observed that their order is in excess of their capacity and at times their own facility is ideal. As non certified suppliers not supplier for limited numbers of companies the components which they get for operations are non uniform this requires different operation on different machines and also requires different skill set which they do not have and hence their outsourcing is more as compared to certified suppliers.

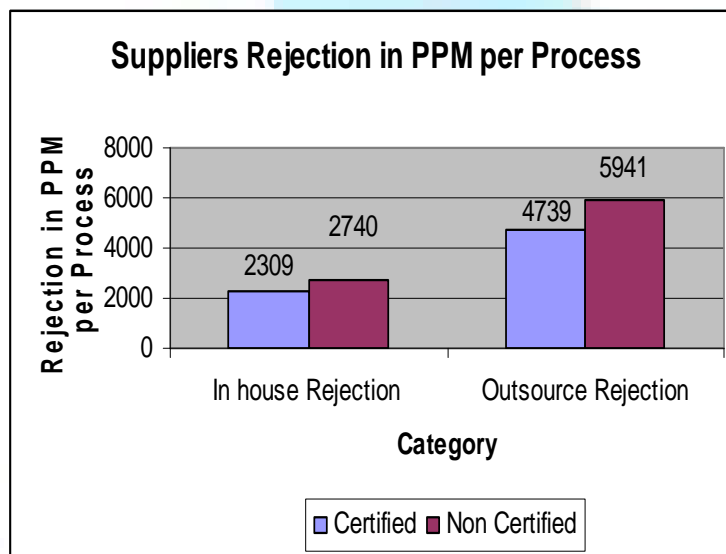
7) Percentage of operations outsourced and rejection: The researcher wanted to find out the relation between the percentage of outsourcing done by the suppliers and the rejection.



Observation: After analyzing the data it is observed that percentage of operations outsourced increases with an increase in level (tiers). Further from the analysis it is observed that tier –II non certified suppliers outsource more number of operations than certified suppliers.

It is also observed that there is an increase in rejection in case of operation outsourced for both the groups. It is observed that rejection is comparatively higher in case of operations which are outsourced by non certified suppliers.

8) Tier-II in house and outsource rejection for certified and non certified supplier:



Observation: From the data analysis it is observed that rejection is greater in case of non certified supplier for both in house and outsource operation.

Comments:

- The reason for higher in-house rejection by non certified suppliers is due to non standard component which requires different skill sets and learning which leads to higher rejection. It is also observed that these orders are non uniform and in less volume and many times non repetitive in nature and hence it is not possible for these suppliers to design a standard process and go for special purpose machines which is designed for carrying out a specific operation with higher productivity, less chances of rejection and at lower cost. It is also not possible to do any modification on the machines and also design a measuring instrument to measure the performance which will reduce rejection and save inspection time if required by that particular job because the order is not of repetitive nature i.e. assured business and volume is also not that high.

FINDINGS

- 1) It is observed that there is difference between the overall rejection in certified and non-certified supplier (t score= -1.889) which is not statistically significant (p-value=0.062).
- 2) It is observed from data analysis that as number of tier increases percentage of non certified supplier to certified supplier at every incremental level increases. It is also observed that higher number of certified suppliers leads to better quality and lesser rejection and vice-versa.
- 3) It is found that number of suppliers outsourcing their processes/ part of the process is more in case of non certified suppliers than that of certified suppliers. And it is found from the data analysis that rejection is higher in case of components which are further outsourced.
- 4) Percentage operations outsourced by non certified suppliers are more than that of certified suppliers. And it is found that rejection is higher in case of operations which are outsourced than the operations which are carried out in-house.
- 5) It is observed that rejection for the processes outsourced by non certified suppliers is more than that of certified suppliers. (It is observed that variation in rejection levels at certified vendors and non certified vendors is statistically insignificant).

CONCLUSION**Hypothesis Specific:**

"Rejection is higher in case of companies whose proportion of non certified vendors is more than that of certified vendors"

The hypothesis has been tested and elaborated. There is a difference between the overall rejection in certified and non-certified supplier (t score= -1.889) which is not statistically significant (p-value=0.062). This hypothesis has been disproved and hence rejected.

SUGGESTION

It is evident from the analysis that non certified vendors have rejection to the tune of 5114 PPM whereas, certified units has rejection of 3393 PPM per process. Whereas per process rejection of 100 PPM which ordinarily permissible with reference to international standards. Indian Companies are permitting 200 to 1000 PPM depending upon the job.

The point here is that it is shown insignificant in the findings with reference to hypothesis that certified vendors have lower proportion of rejection as compared to non certified but which is not significant. However, it should not be construed that certification is not as important or invalid. Considering other benefits of certification it is insisted that vendor selection should be on the basis of certification only.

AREA FOR FURTHER RESEARCH

1. This research is location specific hence further research should be carried out to check the applicability of the research at different locations.
2. Total impact study is required as in this study implication of cost of poor quality is not accessed.
3. This study is carried out for all the sectors which form a part of automobile. Further study specific to different sector is required to have better idea and its performance.
4. A study should be conducted for classifying the components in a way that it is suggested in respect of ABC analysis of inventory. In a similar way, the components should have ABC analysis on the basis of Quality Criticality.

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