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Detection and Prioritization of Significant Supply Chain Menace Factors in Small Scale Manufacturing Industries Using Quality Function Deployment

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Abstract

The purpose of this research is to investigate of significant supply chain menace factors exist in small scale manufacturing industries (SSI) in India. The small scale segment is a manifestation of India's socio-economic development model and has met with the country's long term expectations in terms of contribution to GDP, industrial base, employment and exports. This segment forms a major part of Indian industrial base. Small scale industries contribute about 10% of total GDP. The small scale industries are supported by the government and financial institutions like MSME,TIIC, SBI etc. in terms of technical and financial assistance. Even then MSE's are lagging in infrastructure, skilled labour. In order to analyse the various menace factors in SSI, the survey was conducted in 20 small scale industries who are supplying their product to many Tier 1 companies and leading automobile companies (OEM) in India. This paper brings out most significant supply chain menace factors exist in every business processes inside and outside the company (SSI). Quality function deployment is used to prioritize supply chain menace factors and also the SSI owners and managers are advised to focus from the highest ranking Supply chain significant factors to improve their technical and financial performance.

Keywords: GDP (Gross Domestic Product), SSI (Small scale industries), OEM (Original Equipment Manufacturer), Small and Medium Enterprises (SME)

1. Introduction

Supply chain menace management (SCRM) is a field of escalating importance and is aimed at developing approaches to the detection, assessment, analysis and treatment of areas of Vulnerability and menace in supply chains. Vincent et.al (2012).Menace Management is an ongoing process that can help improve operations, prioritize resources, ensure regulatory compliance achieve performance targets, improve financial stability and ultimately, prevent loss/damage to the entity. Ragavan,R.(2005). In India,the SMEs contribute to 45% of industrial output, 40% of

exports, employ 60 million people, create 1.3 million jobs every year and produce more than 8000 quality products for the Indian and international markets. The contribution of Indian SMEs towards GDP was 17% in 2009 which is expected to increase to 22% by 2012 (Small and Medium Business development Chamber of India 2011). Therefore, ensuring the competitiveness of SME sector is important as it would help in overall growth of Manufacturing Sector as well as the National Economy. Globalisation provides both opportunities and challenges for the SMEs. Alok Mathur et.al (2012) The small scale industries are been accepted as the boon for the Indian economy. It has provided employment to many and has stamped itself as a major revenue source for India. The generation of employment in SSI is five times that of large scale sector. But still the SSI face the supply chain issues from medium and large scale industries. The bullwhip effect is the major disruptions to SSI and has to be countered by the suppliers. Vincent et.al (2012)

2. Supply Chain menace factors in SSI:

2.1Supplier menace

Suppliers are the backbone of any industries. The quality and on-time delivery is the order of the day. The frequent supplier visits enable to access supplier facilities such as capacity, machinery, processes, product lines, Quality management systems, etc. Chris Ellegaard (2008). Supply side menaces happening mainly due to suppliers, supplier relationships, and supply networks. These include supplier business menaces, production capacity constraints on the supply market, quality problems, and changes in technology and product design was among the first who emphasized that firms should proactively involve and manage the uncertainties in their supplier portfolio in order to guard against costly supply. Another type of disruption occurs when a supplier is vertically integrated by a direct competitor of the customer. The inability of suppliers to adapt to technological or product design changes may have harmful effects on the customer's costs and competitiveness. Wagner et.al (2008).

Supplier development, for instance, involves upgrading of suppliers' process capabilities, educating supplier personnel, investing in supplier processes, and placing buying company personnel for extended time periods at supplier facilities Chris Ellegaard (2008).Supplier dependence has been viewed as the one of the major uncertainty and shall be avoided by multisourcing.Wagner et.al (2008).

2.2 Production Menace

Majority of the small scale units use old techniques of production and outdated machinery and equipment. They cannot afford new machines and equipments and are therefore not in the position use latest techniques of production. Therefore productivity and quality in SSI tends to be low while unit cost of production is generally high. Lack of communication problem between the owner and worker affects the rate of production to a large extent. Vincent et.al (2012),There is often a fluctuation of demand for any manufacturing products. In some cases, the OEM may give bulk orders to SSI. But the SSI could not keep up with the demand as there is a shortage of labourers. In sometimes there may be shortage of orders

from the OEM or Tier 1 Company which results in less amount of work to the SSI. Moreover, the SSI uses old form of production techniques which is generally not encouraged in this competitive scenario and it will not increase the production rate. Lack of professionals in production area, leads to irregular monitoring of work schedule and line area Jorn-Henrik et.al (2011) The SSI is not updated with modern technological machines like CNC, EDM, etc. Lack of preventive maintenance frequently affects production of SSI. SMEs give less attention to planning and control methods mainly in the absence of expertise and knowledge on latest concepts in manufacturing. Jitesh Thakkar et.al (2013). World class manaufacturing includes the best practices, inter alia, in the fields of lean manufacturing, quality improvement and supply chain management. Many researchers have noted the growing number of World class Manufacturing tools under the lean manufacturing and quality improvement umbrellas, as well as the supply chain management (SCM) and enterprise resource planning (ERP) tools for enterprise-wide co-ordination and improvement. Implementation of lean manufacturing requires expertise, which often does not exist within small organisations Alok Mathur et.al (2012), This menace includes socio-technical accidents such as equipment malfunctions, machine breakdowns, disruptions in the supply of electricity or water, IT failures or breakdowns, in addition to local human centered issues Wagner et.al (2008), Owner of company X explains "Most of the OEMs expect us to use high quality machines like HURCO, CHMER, FANUC, etc.", but we use mostly low grade machines which are not more precise".

2.3 Labour Menace

The fluctuation of demand forces the SSI to have only a limited number of permanent labours, thus employing casual labour. The SSI are not able to meet out the demands of the labourers as they expect high salary which cannot be met out by the SSI. Most of the SSI have to give allowances like rent, food etc. which affects their profit very badly. SSI should satisfy the bonus demands made by the workers. The workers prefer MNC because they find it better for their Self-esteem and also they are provided with good food, transport and a better work environment. Vincent et.al (2012), moreover, their timings are fixed but in SSI the work pressure is more and hectic. Supervisor of Y Company explained, "We are not able to hold a labour for more than 2 years even we provide additional allowances and it goes in vain. As growth prospects are very limited in SME sector, it is prone to high degree of employee turnover and this may involve lot of wastage of manpower and additional cost in the form of training and knowledge updation, affecting continuity besides lowering the productivity. Qualifi ed and experienced personnel may not stay long as they may gain some experience and change employment. Ragavan, R.(2005). As labour being the major problem faced by the MSEs in India, they canbe solved by giving good salary, bonus, providing medical facilities etc. This will help in improving the percentage of retention and also makes the worker to have a mind set to work in a SSI or a long period. The government should provide flexible policies for repayment of loans to SSI. Vincent et.al (2012)

2.4 Financial Menace

The SSI gets poor support from financial sectors. Many employers saying that bank is ready to give financial support to those companies which are established 20 years back.SSI do not get enough loans to meet out their industry requirements. The payment to SSI is in terms of CREDIT. Most of the SSI have a credit period of about 45-70days.If the OEMs doesn't pay on time, and then it becomes difficult for the SSI to meet their industrial requirements. The TIER 1 Company, the OEM may have already signed an agreement or a mutual understanding with SSI such that the SSI Company shall provide a cost deduction of 3-5% per year on the products which marginally affects the profit of the SSI Company. SMEs are an important part of economic growth in the country and bank lending is the primary source of external finance to them . Ragavan,R.(2005) .The lesser support from banks and government channels,fluctuating market prices, mailnly raw materials like steel,demand for heavy cost cutting Tier-I and OEM.Jitesh Thakkar et.al (2013), The nature of constitution of the business entity limits the funds mobilisation efforts and leveraging capacity,also there is a limit up to which a small and medium business enterprise can raise capital and borrow. This naturally affects their capacity to leverage on the financial structure. As SME sector business entity is at the receiving end, this may put strain on the liquidity position of the business entity. However, the track record of SMEs as borrowers reveals that the default rate is low. Very low rates of bad debts may be the result of banks restricting their exposure to this sector, There is a misconception among the banks that a high proportion of small businesses fail within a few years of starting operations and it may be safe to lend to already working and established one than to run the menace of lending to new ventures. Ragavan,R.(2005), Empirical result shows that financial menace is directly proportional to asset turnover, debt structure, inventory turnover, accounts receivable turnover.Amalendu Bhunia1 et.al (2012)

2.5 Quality Management Menace

Most of the SSI do not have proper planning and lack many management techniques. Most of the SSI does not hold meetings about having a proper schedule.SSI will face lot of quality complaints and in house rejections.

They don't follow the quality aspects properly because of untrained quality inspectors, insufficient gauging and testing equipment, un established management techniques. Owner of Z Company says: "We do not know much about the quality techniques. We do face rejections due to insufficient inspection setup. Even though OEMs conduct audit, train us in quality techniques we do fail in implementing it in our company". Quality management system in SSI is less active. SSI don't bother about planning and production cost. SSI look after only quality, despatch and tool maintenance. Many of the SSI lack in ISO certification and other quality certifications as prescribed by OEMs.SSI do not follow quality techniques like POKA YOKA, 5S, KANBAN system and most of them do not follow JIT. The studied Indian SME units have adopted select improvement programmes, for example,ISO, quality circles, KANBAN, product development methods, lean manufacturing,JIT, etc. Jitesh Thakkar et.al

(2013),Several tools based on simple statistics are available for quality and productivity improvement. Through the use of statistics, management is better able to gain an understanding of the system, and therefore make informed decisions in regard to improving the system.These tools include statistical process control (SPC) techniques, process capability analysis, Pareto diagrams,cause-and-effect diagrams, continuous improvement teams, Poka Yoke, etc. Alok Mathur et.al (2012).Some of the companies in the industrial estate in Chennai do not have ISO certification. Recently OEMs have started demanding for ISO certification for giving orders. Vincent et.al (2012)

2.6 Information menace

Sharing of process information and joint learning with suppliers was very rare in these companies Chris Ellegaard (2008).There is no integrated information system like ERP,EDI etc for communicating OEM and Tier I companies to make quick decision to reduce the problems. With very little financial resources and poor ability for leveraging the financial structure, the SME sectors may not have the wherewithal to go for highly sophisticated technological advancement which would help them optimize their available resources in the best way. Ragavan,R.(2005),Moreover, modern Enterprise Resource Planning (ERP) systems force firms to open their internal processes and databases both to their suppliers and customers, thus increasing their exposure to IT-related threats. Wagner et.al (2008).Initiatives aimed at increasing knowledge cover information gathering from various relevant actors as well as e-business, and joint learning E business practices were largely absent in the studied companies. Lack of time, resources, and expertise excluded the use of on-line portals and emarketplaces. Internet activities consisted of occasionally browsing the yellow pages when a new component was needed Chris Ellegaard (2008)

3. Methodology

Based on literature survey and discussion with few SSI owners, the questionnaire was prepared with 5 point likert scale having options of 1-Poor,2-Low,3- Medium,4-High,5-Very high.Totally, 200 numbers of questionnaires were circulated to 20 manufacturing SSI companies in the level of owners, Managers, Quality Inspectors and supervisors in each company. The 35 responses were received with response rate of 17.5%.Then questionnaire was coded by likert scale and analysed using SPSS (Statistical package for social science).The supply chain menace factors and its items are analysed by descriptive statistics using SPSS.The weight age of items of each factor are listed in the form of mean and standard deviations are shown in Table-1.The QFD is used to prioritize the different items of supply chain menace management (i.e.mitigation strategies for differ factors which are mentioned in Table-1)with respect to customer requirements such as quality, on time delivery, cost reduction and flexibility are shown

4. Conclusion

This extensive study identifies the significant supply chain menace factors faced by SSI in India such as lack of banking support, lack of computer network facilities, Machine breakdown. Irrespective of different menace

factors, SSI has to satisfy the requirement of OEM and Tier I by sacrificing its profit to have good relationship with them. The labour issues could be solved by providing sufficient salary, bonus, incentives, food and other perks for all employee including long service causal labour. The SSI should adopt 5S, KAIZEN to improve quality, production rate and safety.OEM and Tier1 has to conduct regular audit on them to avoid supply delay, improve quality and also make them to achieve less than 100 PPM. OEM and Tier 1 have to train the SSI in the latest quality production techniques such as lean, agile manufacturing etc., The government should monitor the growth of the SSI and should bring in new schemes to develop the infrastructure required by the customers and also to provide uninterrupted power supply.

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Table 1- Statistics of Risk factors

Risk factor	Items of Risk factor	Mean	Std.deviation
Supply Risk	Selection of suppliers based on ISO certification etc.	3.08	0.62
	Availability of skilled labours at supplier company	2.08	0.682
	Financial stability of of suppliers	2.00	0.684
	Computer network facility at supplier side	2.92	0.682
	Conducting supplier audit	2.95	0.664
Labour Risk	Number of causal employees	3.95	0.621
	Training for causal employees	2.27	0.769
	Employee benefits	1.95	0.705
	Employee suggestion scheme	1.97	0.726
	Retention of skilled employees	2.03	0.726
Production Risk	Number of conventional machines	2.97	0.687
	Practicing preventive maintenance schedule	2.86	0.673
	Adoption of lean manufacturing	1.22	0.534
	Overall equipment effectiveness or efficiency	4.27	0.450
	Frequency of machine breakdown	2.92	0.640
Quality Risk	Implementation of 5S	1.81	0.660
	Practicing KANBAN for all parts	2.62	0.492
	Practicing 7QC tools	2.59	0.498
	Conducting Internal audit in the company	2.43	0.502
	Cost of poor quality	4.38	0.492
Information Risk	Availability of Extranet and EDI	2.95	0.664
	Availability of Intranet facility	1.16	0.374
	Usage of e-banking for all transaction	4.19	0.397
	Usage of e-sourcing for all purchasing	1.11	0.315
	Usage Software like ERP	1.19	0.397
Finance Risk	Cost of reduction every year	4.27	0.450
	Budget for modernization	2.11	0.567
	Adequate Margin	1.81	0.616
	Easy to get loan from bank	2.84	0.602
	Rate of accounts receivable	2.65	0.633

Table 2 – Quality Function Deployment

Customer requirement/Supply chain Risk Management	Supplier Relationship Management	Human resource management	Production management	Quality Management	Information Technology Management	Financial management	Importance(1 to 5)
Quality(Rejection should not exceed50PPM)	9	9	9	9	3	1	5
On time Delivery	3	9	9	3	9	9	5
Cost reduction(Considering economical changes)	3	3	9	9	1	9	3
Flexibility	9	9	9	1	1	9	3
Weightage	96	124	144	90	66	104	
Rank	**4**	**2**	**1**	**5**	**6**	**3**	