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Drivers of Competitiveness of Indian Auto Component Industry: An ISM Approach

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Abstract:

The main aim of this study is to analyse drivers of competitiveness relating to the Indian auto component industry, set within a globalised economy. The relationship is established in the form of hierarchal model by applying interpretive structural modelling. Ten Drivers are identified by perusing existing literature on the subject. These drivers are then modelled by ISM. The key inputs to ISM include expert opinion taken through focus group interview. An iterative process leads to hierarchal model of drivers of competitiveness. Findings of the study include different levels of drivers, which are created by applying ISM. Government policies emerged as the basic driver of the competitiveness. It leads to creation of SEZ, adoption of new technology, low operating cost and finally the competitiveness. Drivers are categorised into four groups depending upon their driving powers and degree of dependence .It help s organisation to strategise accordingly. This study could be further extended by considering other drivers of competitiveness like strategy development, such as, Market, human resource, Supply chain, organization culture, etc. Modelling and classification of the drivers helps auto component manufacturing units to develop strategic plans for enhancing competitiveness. This study helps in designing competitive strategies of auto component manufacturing units by modelling key drivers of competitiveness.

Key words: Competitiveness, Indian auto components industry, Drivers, Technology adoption

1. Introduction

The automotive Industry is globally one of the major industries and a key sector of the economy. Due to its deep forward and backward linkages, it has a strong multiplier effect and acts as one of the vital drivers of economic development. Indian auto component industry is flourishing its branches global and is close to a completion of success in the global competition. (Borgave and Chaudhri, 2011).

The auto industry comprising of automobile manufacturers and component manufacturers, is a major driver to improve the Indian economy contributing 6% of country's GDP in the financial year 2011-12. It provides direct and indirect employment to over 13.1 million people. In 2011-12, the total turnover of the automotive Industry stand at USD 73 billion and its contribution to the manufacturing GDP and the excise duty was 22% and 21% respectively (Lumx Industries limited, Annual Report, 2012).

International automobile manufactures see India as a manufacturing hub for auto components and are promptly ramping up the value of components they source from India due to the following factors:

- The cost competitiveness in terms of labour and raw material
- Its recognized manufacturing bases
- Fine quality of components manufactured in India (used as original components for vehicles made by General Motors, Mercedes, IVECO and Daewoo, among others).

The Indian auto component industry is one of the minority sectors in the economy that has a split global competitive advantage in terms of cost and quality. The value in sourcing

auto components from India *includes* low labour cost, raw material availability, technically skilled man power and quality assurance. An average cost reduction of nearly 25-30% has attracted several global automobile manufacturers to set base since 1991. India's process engineering skills, applied to redesigning of production processes, have enabled decrease in manufacturing costs of components. Today, India has become the outsourcing hub for several global automobile manufacturers. (Menon Pistion Ltd, 34 Annual Report, 2011).

2. Competitiveness

The Oxford Dictionary of Economics defines the term competitiveness as 'the capacity to compete in markets for goods or services' and The Free Dictionary explains it as 'a forceful willingness to compete'. National Manufacturing Competitiveness Council, (NMCC) Government of India, (2006) defines Competitiveness of manufacturing sector is a very broad multi-dimensional concept that embraces frequent aspects such as price, quality, productivity, efficiency and macro-economic environment. Buckley et al. (1988). According to him, a firm is Competitive if it can produce products and services of superior quality and at lower costs than its domestic and international competitors. Liberalisation and the WTO agreement saw boundaries between nations disappearing and along with it, increasing product diversity, decreasing product life cycles and shifting cost Patterns. These changes are driving firms to compete on several dimensions such as design, manufacturing, distribution, communication, sales and others. The auto component industry is the centre segment of the Indian economy. After Globalization, many global automobile manufacturers have set up base in India. With the entry of foreign companies and the increase of vendors in the market, the bargaining power of buyers (vehicle manufacturers) has increased and buyers evaluate

vendors continuously on the basis of the infrastructure and competencies.

Increased globalisation demands customisation of products to fit different international market conditions - thus making the ability to produce variety essential. In the coming years, firms are going to face even tougher competition for continued existence. Success or failure will depend on their ability to capture or control scarce resources. A manufacturing firm able to quickly deliver any number of competitively priced, high quality, customized products right on time will be considered competitive because it will be able to compete on competitive priorities such as fast delivery, high quality, low price, volume and product flexibility (Singh et al 2004).

3. Drivers of Competitiveness of Indian Auto Component Industry

According to Joshi et al. (2010) India is one among the fastest-growing economies of the world. They have identified some factors critical to the success of the Indian auto component industry. In their findings they revealed that technology, R&D capabilities, D&D (design and development) capabilities, developing status of allied industries, low cost advantage associated with the country, following global quality norms and developing the socio-economic status of the country's population are some of the critical success factors to the Indian auto-component industry. However, government policies, nodal agencies, escalating demand condition, intensifying competitive rivalry and large number of choices available to the ultimate customer derive the industry competition as a whole. The study also discovered the fact that cost and delivery are the core competencies of the auto component and ancillary industry. Moreover, the well-implemented Govt Policies will advocate the

growth of individual auto-component manufacturers and finally the country as a whole.

According to Borgave and Chaudhari (2010), the auto component industry was growing gradually and was making significant developments in domestic as well as in international market till 2006-07. The internal barriers in the country and constraints at international level had sluggish- down the industry growth. These barriers predominantly are hindrances like – Tax structure especially the disparity in custom and excise duties on the raw material of auto components, and automobiles. The unavailability of resources at reasonable cost for example, power, skilled labour, technology etc are also major constraints. The challenges are mainly to overcome these hindrances and sustain into international competition with other low cost countries. Adding up the additional values to the products and seeking active involvement from the government in the allocation meagre resources may help to break the barriers. The active involvement is also needed in making the goods cost effective by allowing for various parameters like providing extended help to bring overall sector under organized platform, liberalized policies, SEZ assistance and marketing assistance.

National Skill Development Cooperation (2011) has identified the following key drivers of competitiveness in the Auto Components Sector:

3.1 ***Access to new technologies:*** In addition to imitating new products and upgraded machinery of competitions, technology is also playing an important role. The prerequisite of updated technologies has driven domestic players into acquisition or collaborations or JVs with international majors. Moreover, at a time when a large segment of Indian customers is looking to upgrade to higher segments, companies with latest technologies and latest models are bound to attract more interest. New technology adoption leads to wealth creation and imparts

competitiveness to the organisation (Balasubramanian, 2005; Momaya and Ajitabh, 2005; Bennet and Vaidya, 2005; Khalil, 2000).

3.2 *Investments in Research and Development*: Investments in R&D are crucial for retaining and enhancing the competitiveness of the Indian automobile and auto components sector. This competitiveness depends on the ability as well as the speed of players in the industry to innovate and improve.

Quality practices are investment in-competitive resources and capabilities which bring competitiveness to the firm, by enhancing reliability, in the eye of customers through superior firm performance (Mohanty, 1998; Hopp and Spearman, 2000; Krajewski and Ritzman, 1996 ; Khalil, 2000).

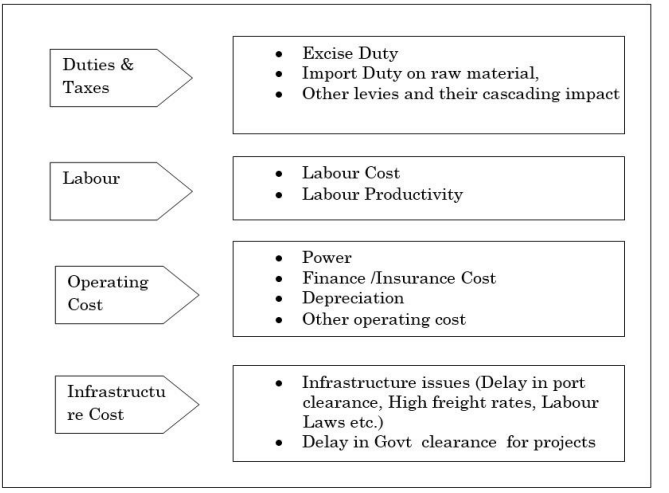
3.3 *Availability of Trained Human Resources*: The availability of trained manpower at competitive costs is one of the contributors to India rising as one of the favourite investment destinations for foreign manufacturers. This is one of the major *contributors* to players such as Volkswagen, Nissan, BMW and Renault-Nissan, having set up manufacturing operations in India in the recent past and in making India a positive destination for investment by global majors.

3.4 *Cost Competitiveness*: The Auto Components Sector is very sensitive to costs; there are several fundamental drivers of cost competitiveness which are vital to the performance of the industry domestically as well as when compared with other competing countries. Cost effective manufacturing capabilities are central to investment for manufacturing firm which leads to firm competitiveness (Nobel, 1995;; Tunalv, 1992; Wathen, 1995; Boyer Leong Ward & Krajewski, 1997).

Availability and quality of men, machine, money, material including land are usually considered to be factors of production in economic literature, Labour productivity and attitude toward productivity, cost of labour, availability of skilled labour and unskilled labour, availability and transfer of qualified technical and managerial personnel, land availability for building and expansion, cost of land, cost of construction, financing opportunities, banking services, access to raw materials (De Noble and Galbraith, 1992; Hekman,1992; Galbraith and DeNoble, 1988).

Agarwal (2004) suggests Infrastructure development and by providing special economic zones privileges i.e. lower taxes and rebate to a liberalised economy. The individual government adopted development strategy by emphasising either on outward or inward orientation of the trade policy, especially on exports.

Figure 1: Drivers of Cost Competitiveness



Source: IMaCS Analysis, (2010)

Country-wide development of infrastructure is expensive and implementation of structural reforms requires time due to various socio-economic and political realities. Export processing

zones (EPZs) therefore are considered as a strategic tool for promotion of exports (Mondal, 2001).

Economic zones emerged as a powerful tool for integration with world economy; some of the successful examples are Chinese Special Economic Zones and Mexican Maquildoras. This can be seen with the rise in numbers of economic zones, worldwide and also a rise in number of countries adopting this trade policy to impart competitiveness and outward orientation to their trade (Guangwen, 2003). Govt. support and promotion comes in macro environment perspective and it creates atmosphere to make the firm competitive (Schmitz, 1995).

Global Competitiveness Report (2003, 2004, 2005, 2006, 2007; World Competitiveness Yearbook, 2007) indicates that Roads, Electricity, Telecom, Internet and Port are the drivers of competitiveness, it is a part of macro environment and is considered basic infrastructure of a country. Export market assistance increases the exports (Wilkinson, 2006).

4. Objectives of the Study

a) To identify the key drivers of competitiveness of Indian auto component industry
b) To develop a hieratical model of drivers of competitiveness by applying interpretive structural modelling (ISM).

5. Research Methodology

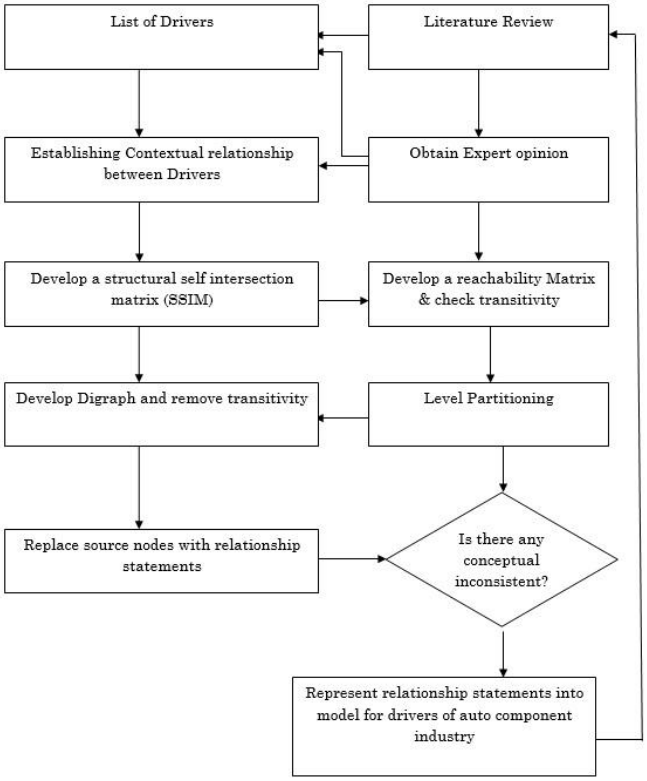
Secondary data analysis approach has been adopted to analyse the factor of competitiveness of Indian auto component industry. Research papers and reports are studied to identify the key variables of the study .This approach as a known as ISM.

5.1 Interpretive Structural Modelling

In order to accomplish the research objectives, interpretive structural modelling is employed. ISM was developed by Warfield (1973). It is a modelling technique in which the specific relationships of the variables and the overall structure of the system under consideration are portrayed in a digraph model. ISM is primarily intended as a group learning process, but it can also be used individually. The various steps involved in the ISM methodology are as follows:

1. Identification and listing down the variables affecting the issues under confederation.
2. A contextual relationship is established among variables, depending upon the objective of the modelling exercise.
3. A Structural Self-Interaction Matrix (SSIM) is developed for variables, which indicates pair-wise relationships among variables under consideration.
4. A reachability matrix is prepared, by converting symbolic relationship in SSIM into binary matrix. Further, transitivity is checked at this point. Transitivity of the contextual relation is a basic assumption in ISM which states that if element A is related to B and B is related to C, then A is necessarily related to C.
5. Level portioning is done in order to classify the variables into different levels.
6. On the bases of reachability matrix, a directed graph is drawn and the transitive links are removed.
7. The digraph is converted into an ISM, by replacing variable nodes with actual elements description.
8. The ISM model is reviewed to check for conceptual inconsistency and necessary modifications are made.

Fig 2: Flow diagram for preparing ISM



5.2 Structural Self-Interaction Matrix (SSIM)

After identifying and enlisting the 10 drivers of competitiveness of Indian auto component industry through literature review and expert opinion, the next step is to analyse these drivers. For this purpose, a contextual relationship of 'reaches to' type is chosen. This means that one driver reaches to another chosen driver. Based on this principle, a contextual relationship is developed. Some experts, both from industry and academia, have been consulted in developing the contextual relationship among the drivers of competitiveness. Keeping in mind the contextual relationship for each driver, the existence of a relation between any two drivers (i and j) and the associated direction of this relation has been decided.

The following four symbols have been used to denote the direction of the relationship between two drivers (i and j):

- V is used for the relation from driver i to driver j (i.e. if driver i influences or reaches to driver r j).
- A is used for the relation from driver j to driver i (i.e. if driver j reaches to driver i).
- X is used for both direction relations (i.e. if drivers i and j reach to each other).
- O is used for no relation between two enablers (i.e. if drivers i and j are unrelated).

Table 1: Structural Self-interactive Matrix (SSIM)

Driver	10	9	8	7	6	5	4	3	2	1
1	V	O	O	V	O	V	X	A	A	
2	V	O	O	O	V	O	O	V		
3	X	A	A	A	O	O	O			
4	V	V	O	V	O	V				
5	V	V	O	V	O					
6	O	O	O	O						
7	V	V	O							
8	V	V								
9	V									
10										

5.3 Reachability Matrix

By substituting 1 and 0 in place of V, A, X and O in the SSIM, initial reachability matrix is formed. Following conversation rules apply.

1. If the cell (i, j) is assigned with symbol V in the SSIM, then, this cell (i, j) entry becomes 1 and the cell (j, i) entry becomes 0 in the initial reachability matrix.
2. If the cell (i, j) is assigned with symbol A in the SSIM, then, this cell (i, j) entry becomes 0 and the cell (j, i) entry becomes 1 in the initial reachability matrix.
3. If the cell (i, j) is assigned with symbol X in the SSIM, then, this cell (i, j) entry becomes 1 and the cell (j, i) entry also becomes 1 in the initial reachability matrix.

4. If the cell (i, j) is assigned with symbol O in the SSIM, then, this cell (i, j) entry becomes 0 and the cell (j, i) entry also becomes 0 in the initial reachability matrix.

Table 2: Initial Reachability Matrix

Driver	1	2	3	4	5	6	7	8	9	10
1	1	0	0	1	1	0	1	0	0	1
2	1	1	1	0	0	1	0	0	0	1
3	1	0	1	0	0	0	0	0	0	1
4	1	0	0	1	1	0	1	0	1	1
5	0	0	0	0	1	0	1	0	1	1
6	0	0	0	0	0	1	0	0	0	0
7	0	0	1	0	0	0	1	0	1	1
8	0	0	1	0	0	0	0	1	1	1
9	0	0	1	0	0	0	0	0	1	1
10	0	0	1	0	0	0	0	0	0	1

Then transitivity is checked, which implies if Cij = 1 and Cjk = 1 then Cik = 1. Sometimes incorporation of transitivity may lead to conceptual inconsistency, which may be referred to the expert for a re- check (Raj, Shankar and Suhaib, 2008).

After transformation, the final reachability matrix is worked out featured in table 3 .In this matrix the driving power and the dependence of each driver are also indicated .the driving power of a particular variable is the total number of drivers (including itself) that it influences. The dependence is the total number of drivers (including it) which may be impacting it. These driving powers and dependency values will be used in classification of drivers (variables) in the MIC MAC analysis (Godet, 1986), where these variables shall be classified into four categories, namely autonomous, dependent, linkage and independent.

Table 3: Final Reachability Matrix

DRIVERS	1	2	3	4	5	6	7	8	9	10	Driving power
1	1	0	1*	1	1	0	1	0	1*	1	7
2	1	1	1	0	0	1	0	0	0	1	5
3	1	0	1	0	0	0	1*	0	1*	1	5
4	1	0	0	1	1	0	1	0	1	1	6
5	1*	0	0	1*	1	0	1	0	1	1	4

6	0	0	0	0	0	1	0	0	0	0	1
7	0	0	1	0	0	0	1	0	1	1	4
8	0	0	1	0	0	0	0	1	1	1	4
9	0	0	1	1*	0	0	1*	1*	1	1	6
10	0	0	1	0	0	0	0	0	0	1	2
Dependence	4	2	7	4	3	2	6	3	6	9	

5.4 Level Partitions

Level partition is done in order to classify the drivers into different levels of the ISM structure. A reachability set (Ri) that is a set of all the drivers that can be reached from the driver (Ci), and antecedent set (Ai),that is a set of all the drivers that driver Ci can be reached by, are formed from the final reachability matrix (Warfield, 1974). Then the intersection of these sets is derived for all the drivers. In the first iteration, all drivers for which the reachability and intersection set are the same are considered as top –level drivers. In successive iterations, the drivers identified as level drivers in the previous iterations are deleted and the new drivers are selected using the same rule. In this way all the drivers are arranged in a topological order.

Table 4: Iteration I

Drivers Ci	Reachability Set (Ri)	Antecedent Set(Ai)	Intersection Set	Level
1	1,4,5,7,9,10	1,2,3,4	1	
2	1,2,3,6,10	2,	2	
3	1,3,10	2,4,7,8,9,10	-	
4	1,4,5,7,9,10	1,4	1,4	
5	5,7,9,10	1,4,5	5	
6	6	2,6,	6	I
7	3,7,9,10	1,4,5,7	-	
8	3,8,9,10	8	8	
9	3,10	8	-	
10	3,10	1,2,3,4,5,7,8,9,10	3,10	I

Table 5: Iteration II

Drivers Ci	Reachability Set (Ri)	Antecedent Set (Ai)	Intersection Set	Level
1	1,4,5,7,9,	1,2,3,4	1,4,	
2	1,2,3,	2,	2	
3	1,3,	2,3,7,8,9,	3	
4	1,4,5,7,9,	1,4	1,4,	
5	5,7,9,	1,4,5,	5	
7	3,7,9,	1,3,4,5,7,9,	3,7,9,	II
8	3,8,9,	3,8,9,	3,8,9,	II
9	3,9	1,4,5,7,8,9,	9	

Table 6: Iteration III

Drivers Ci	Reachability Set (Ri)	Antecedent Set (Ai)	Intersection Set	Level
1	1,4,5,9,	1,2,3,4,	1,4	
2	1,2,3,	2	2	
3	1,3,9,	2,3,9	3,9	
4	1,4,5,9,	1,4,5,9,	1,4,5,9,	III
5	5,9,	1,4,5,	5	
9	3,9	1,3,4,5,9,	3,9	III

Table 7: Iteration IV

Drivers Ci	Reachability Set (Ri)	Antecedent Set(Ai)	Intersection Set	Level
1	1,5,	1,2,3,5,	1,5	IV
2	1,2,3,	2	2	
3	1,3	1,2,3,	1,3,	IV
5	1,5,	1,5	1,5	IV

Table 8: Iteration V

Drivers Ci	Reachability Set (Ri)	Antecedent Set(Ai)	Intersection Set	Level
2	2	2	2	V

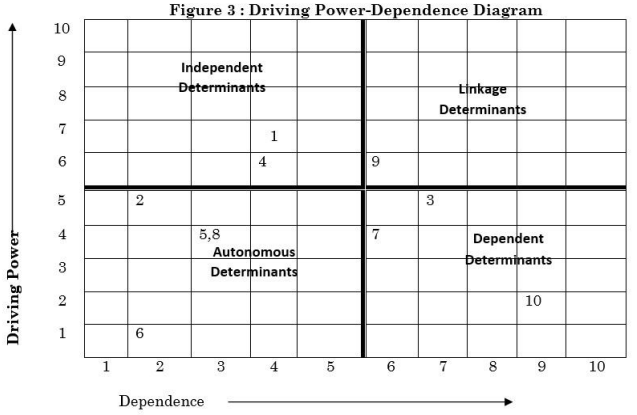
5.5 MIC MAC analysis

An important outcome of ISM methodology is the development of four categories of drivers through MIC MAC analysis. The objective of the MICMAC analysis is to analyze the driver power and the dependence power of the variables, (Mandal and Deshmukh, 1994, Faisal and Rehman, 2008). These category

names as Autonomous, dependent, linkage and driver .they key area of competitiveness are classified in these four categories.

1. ***Autonomous:*** It is observed from the matrix that the drivers having weak driving power as well as weak dependence are termed as autonomous. In this category govt policies, new technology, low cost finance and low cost labour rare falling.
2. ***Dependent:*** these driver are those which having strong dependence but comparatively less driving power they are ,creation of SEZs, Training human recourse and competitiveness .
3. ***Linkage:*** These are the most critical drivers identified through MIC MAC analysis .Matrix shows low operating cost is emerging as a key driver having high dependence and high driving power.
4. ***Driver:*** Globalization and research and development have strong driving power but less dependence enhances categorise as drivers.

Figure 3 : Driving Power-Dependence Diagram

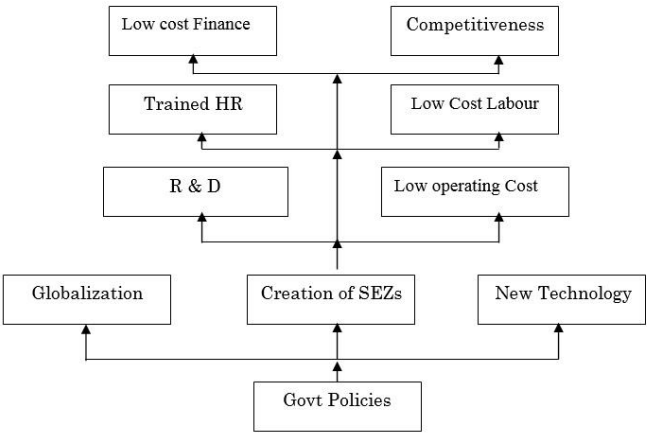


5.6 ISM based Model

The drivers of competitiveness are classified into 5 levels by using ISM methodology these levels set the hierarchy of ISM model of competitions. Level one comprises of govt polices as a

key driver of competitiveness which leads to level 2 comprising globalization, creations of SEZs, and new technology. Similarly drivers at level 3 and 4 give the final level of ISM model.

Fig. 4: ISM-based model for the Drivers of Competitiveness



6. Result and Discussion

The study attempts to develop hierarchal levels of the key drivers of competiveness of Indian auto component industry. This hierarchal model helps organisation in their strategic decisions related to the development of competitiveness by applying ISM methodology.

It is found from the model that Govt policies is the key driver of competitiveness which governs strategies towards globalization, creation of special economic zones and adaptation of new technology .It results identification of primary research and development activities which helps auto component manufacturers in building their core competencies. Govt policies also help recurring operating cost.

The model further suggest the availability of trained human resource at low rate as the key driver to the

competitiveness of Indian auto component industry which interns leads to low cost finance and competitiveness.

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