Assessing Innovation Quotient (InQ) of Indian Auto Component Manufacturers

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Abstract:

Innovation is an imperative in global industry today as a key tool for corporate sustainability. Post economic liberalization in 1991, India has witnessed a boom in Auto vehicle as well as component industry. This has further been accelerated and intensified in last 5 years (2002 onwards) .Today many auto manufacturers globally have decided to set up their manufacturing and sourcing operations in India to realize low cost advantage of India. This has also brought intense competition for local players, which are expanding and setting up their units outside India while at the same time global players are also setting up shops in India. This has made competitiveness an extremely important parameter for survival and growth. Indian companies are now exposed to manufacturing excellence techniques used globally .They need to scale up on innovations to remain competitive. This paper, through an empirical study identifies drivers of Innovation through a cross sector study. Further, it attempts to probe as to where does Indian auto component Industry stand on Innovation; what are the enablers and barriers of innovation and what strategy should the industry adopt to accelerate innovation.

Key words: Innovation; Innovation quotient; India; Innovation drivers; Auto component industry

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1. *Introduction:*

The business landscape and context is drastically changing worldwide as a consequence of globalization, IT revolution and the emergence of new business models. Business organisations are increasingly experiencing the heat of competition and Darwinian challenge for survival is only possible through continuous innovation and application of newer technologies. Unless organisations develop binocular vision and alert antenna, to scan the ever changing technological scenario and develop appropriate action agenda, their very survival, leave alone the growth, will be at stake. Thus, it is vital to: (a) Understand the process of innovation; (b)What drives innovations; (c) Where do we stand and (d) How do we carve out a proper Innovation strategy to build competitive edge.

In the present context of severe competition, where even survival itself is not a easy task, the growth and even faster growth is imperative and is the biggest challenge for all top management executives.

The captions-***"Innovate or perish"***, ***"If you donot Innovate, someone else will and you will be out of the race"*** and ***"Faster, Better, Cheaper"*** are gathering relevance today.(Business standard-The Strategist, Dec18, 2007; Interview, Tucher, R., Oct 2, 2007)

In a global survey of top management executives, Innovation is rated as one of the top 3 agendas of the Global CEOs (Business Standard, Jan 28, 2008; Carrier Executive, Jan 2008). In another survey of world's top 1250

R&D spending companies having total R&D spend of 500 Billion $, only 7 Indian companies found their place in the list with just 1.2% of total R&D spend. (Business Standard, Nov. 05, 2007). The long term growth will only be the outcome of sustainable competitive advantage which can be achieved only through **Innovation in Product, Processes and Strategy**. All types of innovation namely Incremental (Continuous), Modular and Architectural as well as Break through and Disruptive will be required in organisations. Its selection will depend on severity of competition, urgency and scale of growth required and the gap w.r.t. bench marks in various organisational efficiency parameters. (Tushman, 1997)

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Indian Auto Industry forms over 5% of GDP. With automobile penetration of passenger vehicles (which accounts for 70% of auto industry sales) of 7/1000 people as compared to over 400/1000 in developed nations, industry is slatted for growing at over 20% CAGR till year 2015 (ACMA-Mc-Kinsey report, 2005.*Vision 2015*). The study, further has confirmed that capability of auto component will be the key success factor to this growth. This has seen emergence of many Indian auto component MNCs. These companies are expanding organically as well as inorganically through domestic and overseas Mergers and acquisitions. As growth of auto industry in developed nations has come down to a dismal 2-3 % per year, they plan to grow by going global .They are setting up manufacturing base in India and other developing nations for meeting local demand and for using India as base for cost effective exports capitalizing on India's Low Cost Country(LCC) advantage. This has also prompted many global players to enter India for component manufacturing .The competition is heating up from other LCCs, global manufacturers setting up local mfg. base and Indian manufacturers trying to expand local and global. (ACMA-Mc-Kinsey report, 2005.*Vision 2015;* Government of India, 2005-*India auto vision 2015*).

Though Indian Auto component manufacturers (ACM) have started focusing on innovation as strategy for last 5 years, practically no research has been done on Indian Innovation climate and that too in emerging auto component industry in India. The development of technological and innovation capabilities thus are the defining strategies to survive the severe competition and also accelerate the growth.

Although some work in US and Europe has been done on defining and measuring Innovation Quotient (InQ), (also referred as Innovation Index in some researches), not much work has been done on Indian innovation status and still less for ACM. Most of the work done relate to measuring the InQ of individuals for the purpose of hiring (Irving H.Buchen, 2005) or defining innovation or competitiveness of Nations. Joyce Wyckoff has defined a test to assess InQ through a 10 point questionnaire which has very few attributes and thus lacks width. Similar work by Ilan Mochere in Sept, 2002 through a 20 point questionnaire has attempted the same but with less coverage of attributes. Drivers of imitation (not innovation) have been mapped by Eric Bonabeau (HBR, June 2005) but cannot be applicable for the innovation climate and InQ mapping. Most of the other works on Innovation Index has been at country level mapping and hence donot find relevance to this work (George K.Beard, 2007). World economic forum also uses various macro-economic indicators like FDI, GDP growth, levels of productivity etc, to define competitiveness. These all factors are more relevant for assessing innovation and competitiveness of nations. It cannot be applied to innovation assessment of organisations. In the same way, Competitiveness of American companies (Porter, 2006) also reviews all factors of competitiveness and can be considered for innovation assessment, but has country level perspective. Thus there is a need to workout an Index for assessing innovativeness of companies which is simple to understand, customizable to various industry sectors, applicable across geographies and can help organisation to plan their strategy to improve innovation after their assessment of status

2) Research Methodology:

As the case study method and surveying companies, for understanding specific cases have been taken as best suited for theory building; the case survey method for research was adopted for exploring the innovation status in ACM. (Eisenhardt, 1989; Mintzberg 1987, 1978; Mintzberg & Walters, 1985; Yin, 1994; Wieck, 1989).

The research methodology adopted is described below:

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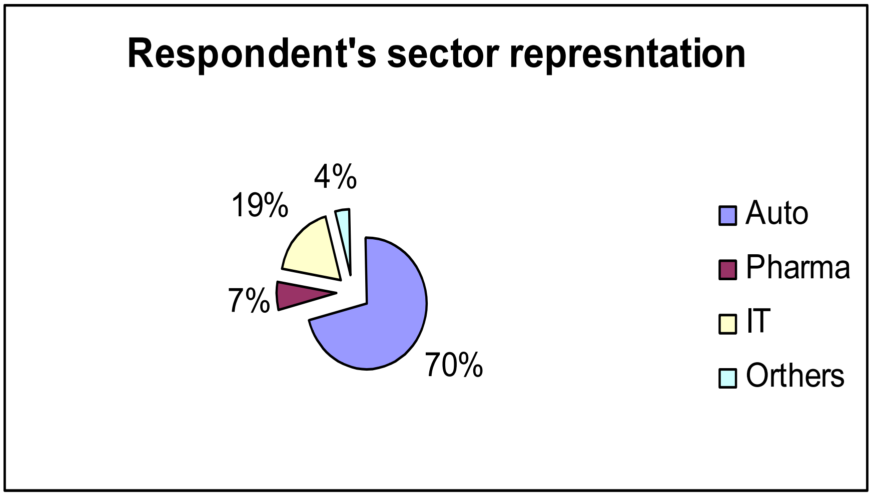
1. Identifying the attributes and enablers to innovation through a cross sector, cross organisation level survey. Sectors identified were IT, Auto component, Pharma, Food, Engineering and reality. These sectors were chosen as they represented key sectors in economy as well as sectors where innovation is happening at higher level, is urgently needed for survival and growth and/or those are emerging sectors.
2. Categorization of the attributes to identify factors
3. Rating of the attributes, through a survey questionnaire, on a 5 point scale ,to define their relevance to innovation in selected sectors
4. Arriving at a measure of innovation –Innovation quotient
5. Mapping the Innovation Quotient **(InQ)** of selected key organisations in ACM sector (auto component manufacturing) .The ACM organisations selected represent various regions of country, size(in terms of sales, investment and people employed) as well as type namely Ancillary units of OEM, Joint ventures with OEM, JV with foreign collaboration, as well as type of product tier (assembly— Engine, Drive line, axle and Turbocharger; Sheet metal ,Machining and Forgings) .The mapping has also been done of at least one unit each of other key sectors so as to compare and neutralize the sector impact.
6. Coming out with recommendations to the ACM units to improve on the InQ index to build the competitive edge.

3) Innovation attributes study:

1. As the study was to cover innovations in product, process and strategy, and also the fact that innovation drivers-facilitators and enablers across various sectors of business (manufacturing, IT and services) may have commonality for cross learnings; it was planned to do a first a pilot study. The objective of this study was to explore the attributes with various senior and middle level executives across different sectors. The attributes were sought from 41 executives and experts through a questionnaire; asking 6 attributes /respondent (total 300 entries) **.**The 27 respondents who replied included executives and entrepreneurs from Auto component manufacturer (in majority since this is the sector of interest—70%) as well as from IT (19%), Pharma (7%) and services and other sectors (Engineering and Reality) accounted for the rest.



2. These attributes were processed for duplication, ambiguity, similarity and affinity and were categorized in Five categories namely
   a. Culture related (13 attributes)
   b. Employee related (8 attributes)
   c. Environment (5 attributes)
   d. Management related (11 attributes) and
   e. Network of technology partner, suppliers , customers, competitors etc. (3 attributes)

   They were finalized as the 5 categories and 40 attributes and are listed in annexure 3. ***(Refer annexure 1)***

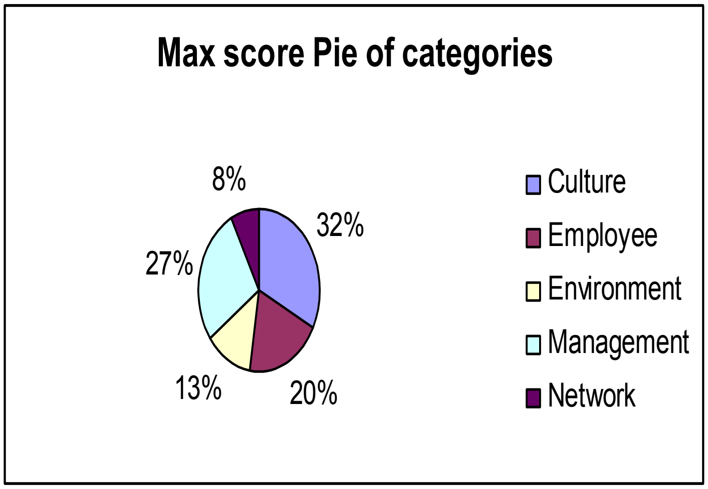
4) Attribute Rating and weightages finalisation:

The attribute finalized were sent as questionnaire (refer annexure 4 attached) to the same pool of cross sectoral respondents to arrive at the importance of these drivers to the promotion of innovation. This was done by seeking their rating on a 5 point Likert scale. The scale for rating was chosen to be on 0 to 5 for ease and familiarity of the respondents and to provide a step of 20% rating differential for each step of the scale. Due to the phenomenon under study, it may not be possible for the respondents to differentiate the attributes on lesser scale justifiably and would have other wise created scale bias in case respondents do not actually perceive to differentiate but they chooses their response differently while rating. The zero on the scale represented no relation of that attribute on the innovation while a rating of 5 meant a very high impact of this attribute on driving the innovation.

Based on the above attribute study, category wise maximum score of each category works out as under:

1. Culture 13 Attributes *5 Maximum rating =65 (32.5% of total score)
2. Employee 8*5=40 (20% of total score)
3. Environment 5*5=25 (12.5% of total score)
4. Management 11*5=55 (27.5% of total score)
5. Network 3*5=15 (7.5% of total score)
6. Total score 40*5=200

The category wise max score graph is given herewith



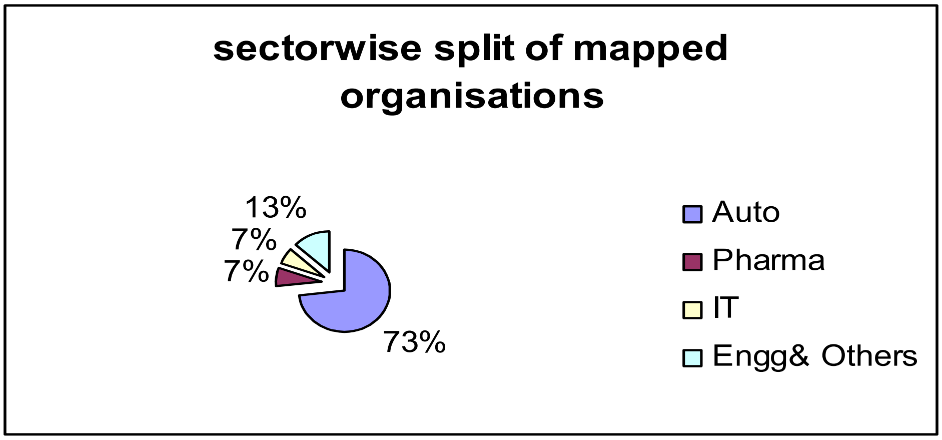
The above category score shown as % of total score for each category can be considered as their weightages in driving innovation in an organisation with each factor (attribute) contributing max 5 score. The rating of these attributes was between 4 and 5 for most of the attributes by many of the respondents proving that all these attributes contribute a great degree in driving innovation in any organisation. After discussion with experts, it was also felt that all these factors at a score of 5 ,will contribute for sure their maximum to InQ and hence the rating given by respondent for individual attribute was considered to be the executive and organisation specific (respondent bias).Thus this was not taken to moderate the weightages of categories as found earlier through category % score in total score. The order of importance or weightages for all the attributes thus was taken to be equal. The respondent's weightages are indicated in the ***annexure 2*** in excel sheet-as pilot scale-map summary sheet for reference only)

5) Mapping of organisation Innovation status: Through a separate questionnaire, various respondents were also asked to rate their organisations on these attributes on a 5 point scale. Total 15 respondents rated their organisations on a 5 point scale which was taken to develop the organisation specific weightages.

The summary of the organisations mapped for innovation status in these organisations is as follows—

1. The sector wise representation of 15 organisations mapped (including expert who represents ACM)for status of innovation

climate in these organisations on identified 40 attributes is given below—



2. Since auto component manufacturing organisations are major focus of the study, 11 nos (73 %) respondents (representing organisations) were from auto component sector (Assembly and Components supplier status- Tier 1 and Tier 2).However, representation from other sectors was also taken to compare the auto sector with other sectors. In these other sectors the level of innovations in these sectors is known to be high due to severe competition and specially one sector (Pharma) is characterized with long development time as well as high cost of innovation.
3. Since assembly suppliers are much bigger by their scale of operation (namely axle assy, engine assembly, drive line assembly and turbo charger assy) and these organisations also had support from their technology and equity partner/ collaborator, they were at a higher level of innovation status .Their rating on the parameter of culture, employee and network was on a better status as compared to tier 1 and 2 suppliers**.** ***(refer status mapping of these organisations on annexure 3 –excel sheet titled InQ status summary and analysis)***

6) Arriving at Innovation quotient (InQ):

As discussed in the previous section while arriving at the attributes and scores maximum possible as well as categories weight, total max scope of the 40 attribute will be 200.The % contribution of the category can be taken as the weightages of the category in the total scale. Since all the factors are equally important as rated by respondents (rated mostly 4 or 5 by most of them) and to propose a simple formula for working out InQ, it is proposed to directly sum the mapped score of the organisation and take this as percentage of total max score of 200. For example any organisation which scored 120 on these 5 categories (Individually for Culture(A)+ Employee(B)+ Environment(C)+ Management(D)+ Network(E)) , through 40 attributes , its InQ will be –

InQ=Organisational score of (Category A + B + C + D + E) * 100/max score possible of 200

That is InQ=120*100/200 =60%

7) Assessing the InQ status of the studied organisations:

Orgn----> category--I	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Culture(65 max)	47	31	29	38	31	15	34	13	25	35	14	34	26	34	14
Employee(40 max)	32	28	27	31	21	13	21	13	22	31	13	31	22	22	13
Environment(25 max)	19	17	17	19	17	6	16	5	8	18	7	18	14	16	6
Management(55 max)	46	36	34	37	33	14	32	14	26	41	10	37	26	32	12
Network(15 max)	13	11	7	11	11	3	11	3	11	11	3	11	11	11	3
Total score(200 max)	**165**	**130**	**121**	**145**	**119**	**54**	**121**	**52**	**98**	**143**	**52**	**139**	**102**	**123**	**53**
InQ	**82.5**	**65**	**60.5**	**72.5**	**59.5**	**27**	**60.5**	**26**	**49**	**71.5**	**26**	**69.5**	**51**	**61.5**	**26.5**
Sales,Rs Crores	**400**	**800**	**450**	**800**	**560**	**20**	**140**	**1.5**	**6**	**160**	**6**	**400**	**20**	**75**	**12**
Employees	**200**	**900**	**900**	**450**	**1050**	**70**	**550**	**70**	**150**	**650**	**120**	**180**	**400**	**150**	**60**
Tech tie up	**JV**	**TA**	**no**	**JV**	**MUL**	**no**	**no**	**no-**	**no-**	**JV**	**no-**	**no**	**no**	**no**	**TA**

The organisations above are ---

1. Srl 1 to 4—Assy manufacturers (Engine, Drive line, Turbo charger and Axle)
2. Srl 5 to 7 and 10 are tier 1 supplier (Sheet metal, tooling mfg, machining of forgings and forgings,
3. Srl 8 and 9 are ancillary to Eicher—truck manufacturer for machining and large sheet metal parts
4. Srl.11 Tier 2 supplier , ancillary to Eicher
5. 12, 13, 14 and 15 are Pharma, Engineering, IT and Spices-Food mfg units respectively

The analysis of the InQ scores and individual attributes is given below**---** ***(see annexure 3 for details of category wise and attribute wise mapping of each organisation)***

1. The large auto component suppliers – assy as well as parts (sales above Rs 100 Crs are having better understanding of business processes, have threats of competition more and are more organized to have better innovation climate w.r.t. small units with sales from Rs 2 to 20 Crores
2. Assembly units which have technology back up like for Turbocharger and Axle, have an access to better technology, updated knowledge and have better employee and culture as well as network ratings. Foreign counter parts have been able to add value to their success and are in better position to innovate.
3. Smaller traditional Indian organisations which have very less sales revenue, manpower strength, low management bandwidth and weak improvement culture; are not in a position to realize the power of innovation, donot have global perspective and are more busy meeting supply requirements. This is even thue for long

standing units which are ancillary to a Truck OEM as well as recently started offshoots of a large car OEM JV company; for manufacturing of tooling.

4. Conservative approach of management to define vision and culture is also largely proportional to size as well as exposure to global technology e.g. JV or Technology partner. Even large organisations like assy suppliers who donot have global exposure and management vision, are low on the innovation score.
5. Pharma and IT companies are better placed on the innovation front due to their global orientation and exposure, management approach etc.
6. Food processing unit which is quite small but has technology transfer agreement for specific product has also not gained from the partner in terms of access to newer technologies and is just being used as a low cost manufacturing base to meet the current product supply requirements.
7. Organisation wise details can be further studied to analyse and recommend the strategy to improve the innovation quotient and build competitive edge. ***(See annexure 7)***

8) Discussion:

InQ of an organisation can be analysed on three levels—

1. At the overall InQ level to see the gap with respect to (w.r.t.) total score of all companies studied and as compared to bench marks
2. At the category level, the score need to be compared again to find category specific gap for helping in understanding and then working out improvement strategies in that category.
3. Finally going down at the attribute level to workout the status w.r.t. bench marks and plan improvements.

It would be important to note that since every organisation's score at total, category and attribute level may be different, the strategy for improvement of InQ has to be organisation specific. Also, benchmarking with Industry InQ and InQ of successful global organisation can be done to assess gap in InQ of their own organisation in total and in each category, with respect to these good organisation so as to devise strategies for improving the InQ.

Although recommendations and suggested strategy for each organisation will differ based on the analysis of total InQ w.r.t. Industry InQ and w.r.t. Bench marks of best organisations in that technology, the trigger to work to improve will come from InQ score. Further, to reach a strategy and area of improvement, organisation will have to work on category and then attribute score.

However, as a generic strategy for Indian ACM, it must look at increasing the size of the organisation, have technology access through own R&D or JV/Technology partners and also promote improvement culture through kaizen and strong incentive schemes to reward innovations. A regular training on technology aspect and also attending seminars will help them build competence for innovation.

A further analysis through the questionnaire and exploratory interview, is suggested for all units and can further be studied by author himself to analyse the improvement aspects in detail**.**

9) Limitations and Direction for future research: Following are the limitations and directions for future research –

1. The spectrum of the companies studied although represent western ,northern and central India , representation from the companies of south and eastern India also need to be built in to generalize the study ,specially considering that south India has many good ,successful and advanced auto component and OEM companies like TVS group companies, Lucas, Mico, Simpson, Wheels and axle India, Amalgamation group companies-Rane group companies etc
2. Further exploratory study can be done through interviewing the sample respondents to understand the causality of innovation drivers.
3. Study of key successful in various technology segment can also be done to study the effect of innovation climate across technology and tiers e.g. Machining, forging, casting, sheet metal etc as well as Engine assy, axle assy, gear box assy, steering assy etc**.**
4. Bench marking through successful innovating companies of western developed nations as well as Japanese companies can also be done to arrive at recommendations learning from their experiences.
5. The study has not been statistically tested and verified for validity due to small sample size and is case study based.
6. The various attributes and categories are taken using rating and clubbed for simplicity to arrive at Innovation Quotient (InQ) using relative weightages of each category and attribute. These can be further studied to arrive at actual weightages in a broad based exploratory study and further through benchmarking study of successful global companies on innovations.
7. Since many attributes may also be related and may have a stronger co-relation among them, a large scale study with 100 companies minimum may be taken up to reduce the attributes and come out with factors through Factor analysis and co-relation method.

Authors plan to extend study further to broad base the current study, validate statistically the findings and arrive at stronger road map to accelerate innovations in auto component sector of India.

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Attribute consolidation and categorization **Annexure 1**

S.No.	Category	Attribute which drive- enable- facilitate Innovation
1	Culture	Global orientation
2	Culture	Attitude towards Cost competitiveness
3	Culture	Peaceful working culture of the Organisation
4	Culture	Culture of respecting others' ideas
5	Culture	Flexibility
6	Culture	Quick decision making
7	Culture	Learning Environment /continuous education
8	Culture	Promoting creativity at work
9	Culture	Encourage risk-taking
10	Culture	Innovation sustaining Organizational culture
11	Culture	Continuous improvement/Kaizen culture
12	Culture	TQM practices
13	Culture	TPM practices
14	Employee	Employee Involvement
15	Employee	Employee Empowerment
16	Employee	Employee Development/nurturing
17	Employee	Technical Competence
18	Employee	Motivated employees
19	Employee	Intrapreneurship-entrepreneural mind set of employees
20	Employee	Dedicated talent pool for ideation
21	Employee	Live by values of the organisation
22	Environment	Competition from the foreign companies
23	Environment	Global exposure
24	Environment	Market leader
25	Environment	Deep understanding of the Key Factors of Success of the Industry
26	Environment	Deep understanding of the trends in global auto business
27	Management	Management Commitment to Change
28	Management	Willingness to Change
29	Management	Accept the need of change
30	Management	Financial backup /support
31	Management	Appropriate Incentive policy to reward/share innovation benefits
32	Management	Visionary/strong leadership
33	Management	Clear business goals
34	Management	Strong-big -challenging Vision
35	Management	Encourage organizational Transparency
36	Management	Good R&D set up
37	Management	Strong KMS (Knowledge management system)
38	Network	Strong communication network with customers
39	Network	Collaboration and Partnership with their buyers
40	Network	Access to newer technology trends-alliance/partner/networks