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Abstract

The auto market is one of the largest segments in world trade. The annual size of automotive export trade in the world has grown to a massive level of over US$600 billion, which accounts for about 10 percent of the world export. Changing models, improving fuel efficienc

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Index terms—

1 Analysis of Technological advancements in

Pakistani Automobile Car Industry M. Shahrukh Mirza ? , Irfan Anjum Manarvi Abstract-The auto market is one of the largest segments in world trade. The annual size of automotive export trade in the world has grown to a massive level of over US$ 600 billion, which accounts for about 10 percent of the world export.

Changing models, improving fuel efficiency, cutting costs and enhancing user comfort without compromising quality are the most important challenges of the auto industry in a fastly globalizing world. Hence there is a need for exploring the industrial collaborations in this sector globally for better quality, favorable costs, fuel efficiency and attractive designs.

Therefore, the requirement of information exchange is much more pronounced now then ever before for keeping the auto industry afloat and competitive.

In third world countries, due to non availability of indigenous development, lack of necessary skill level and industrial infrastructure, no institutionalized set up appears to be available to back up the acquired technology and facilitate its absorption.

The Pakistani Automobile Industry is amongst the fastest growing sector in national economy. Heavy investments have been made in establishing Automobiles assembling plants by various global automobile manufacturers during past few years. Under 'The Auto Industry Development Programs', through incentives offered by 'The Government of Pakistan, deletion of automobiles spare parts up to a certain level is being carried out by automobile manufacturers depending upon the potential capabilities and infrastructure availability with the local vendors. The objective of this research is to understand the advantages attained by Pakistani automobile car assemblers and vendors, during last thirty years through mutual collaboration and technology acquisition from global automobile manufacturers. This paper also focuses on the deletion of spare parts of various locally assembled automobile cars by analyzing those vendors who are generating maximum revenues through production of these spare parts under foreign technical assistance, cost effectiveness of these parts compared to imported parts and the manufacture of complex parts locally.

Based on the analysis of above mentioned variables through graphs, various inferences are drawn and recommendations given for further improvement of the automobile industry of Pakistan.

2 INTRODUCTION

"Give a man a fish and you will feed him for a day. Teach him how to catch fish and you will feed him for the whole life" (Chinese Proverb) he Asia-Pacific region is considered by many scholars, practitioners, and investors to be one of dynamic and rapidly growing economic regions in the world. Countries included in this region are Japan, China, Taiwan, South Korea, North Korea, Hong Kong, Thailand, Malaysia, Indonesia, Singapore, Philippines, Vietnam, India and Pakistan. The region is a voracious importer of new technologies and an innovative user of existing technologies. Many of these countries have undergone major economic reforms to be able to facilitate the domestic firms to compete in the global market. Many strategic alliances, joint ventures (JVs), and collaborations came into existence. Lately, many of these firms expanded their operations in other countries to evolve into multinational companies.

In Pakistan, the process of economic reforms started in 1960s, which was followed by partial accessibility in 1980s. The market was fully opened up for foreign firms in late 1980s.

In the wake of globalization of trade, commerce industry and liberalization of economies of the various countries of the world, it has become mandatory for all the players to have a sound technology base, without which accomplishing operational and strategic goals would become not only uneconomical but almost impossible. The increasingly demanding global business environment calls for a separate management function which looks after corporate interests of the technology.

At the global level, there are perceived advantages of technological collaborations that are taking place all over the world. Developed and developing countries stand to gain from legislative and economic reforms. Technology transfer is now taking place in Pakistan with organizations from many developed countries like US, Japan, UK, Germany, etc.

Competitiveness of an organization can be accessed from various parameters, the most important of them being technological innovations and breakthroughs which the organizations realize over a period of time. It may be difficult to measure the impact of adopting an innovation or rejecting the same, but over a period of time overall financial and marketing results can definitely help in drawing conclusions regarding technology-based decisions. Technological changes and decisions to adapt to changes in the environment can make or break an organization. Examples of the significant impact of commercializing a technology on the overall performance of the organization are numerous, from the invention of the steam engine to intelligent cars. In the changing global scenario, those organizations that integrate technology related decisions into business strategies have considerably improved their chances of reaping benefits from technological innovations. There is always an element of risk associated with adoption of a new technology.

This indicates that technological innovations cannot be adopted without prior analysis in context to a particular organization. Technology involves moderate to high investments, and it also has an effective lifetime, after which the same technology may not remain commercially viable and hence, needs either upgrading or total replacement. Under the circumstances, where total replacement is called for, the previous technology which was in use must generate enough revenues so that the investment for the new one may be either totally or partly funded from operations.

New organizations must consider all these factors quite carefully, and the choice of technology becomes an extremely crucial decision for them. For existing organizations, a watchful approach will help not only in survival and growth but also in taking and maintaining technological leadership in their respective industries. For those organizations that are already technology leaders of their respective industries, technology management strategy becomes a more crucial weapon by which they can sustain their positions in their existing businesses and also explore new markets, thereby restricting the entry of competitors and exit of customers in different parts of the world. By evolving suitable technology strategy leading firms can identify and cultivate core competencies in the businesses they are in.

II.

3 RESEARCH METHODOLOGY

4 THE AUTO INDUSTRY DEVELOPMENT PROGRAM

Pakistani auto industry observed a "Preparation Phase -1985-2005" which was based on the formulation and implementation of compulsory local content conditions, commonly referred as deletion programs. Deletion programs worked on the basis of Industry Specific Deletion Programs (ISDPs) and Product Specific Deletion Programs (PSDP). Under these programs annual deletion targets for each model of vehicle would be set by giving choice to assembler to choose components from a basket carrying fixed indices based on their individual values. The Engineering Development Board (EDB) would conduct the technical audits annually to determine the achievement or shortfall of deletion targets. In case of shortfall, assemblers would be penalized by charging the Component Based Unit (CBU) rate of duty on the value of components which were not indigenized in that period.

The auto industry expressed resilience during the next 1 ½ year before it switched over from compulsory local content conditions for Trade Related Investment Measures (TRIMs), to compliant tariff based system (TBS), which came into effect on 1 st July, 2006. The changeover was relatively hassle free for the assemblers but has posed many challenges to the vendors who remained comfortable in the previous system and are now pushed to improve the quality, supply systems, shop floor efficiencies and better marketing. The industry nevertheless faces a challenge of relatively poor human resource skills and productivity despite it being cheap and abundantly available. The issues of re-location, mergers and lean / mean production technologies are now more frequently discussed in the stakeholders meetings. Investment in modern production infrastructure, testing equipment and automation remains high priority.

The vendors are mostly SMEs (Small Medium Enterprises), which are developing their approach and are looking for professional support to reintegrate and re-design their work flow processes and improve quality through better technologies, testing equipment and adoption of best manufacturing practices.

Government has approved a 5 year tariff plan in 2008, 'The Auto Industry Development Program', for the auto sector to ensure a stable and predictable environment and to facilitate investment. Government is now focused on facilitating the industry through development of infrastructure, human resource development, technology acquisitions, investment in productive assets, cluster development and development of standards on safety, quality and environment through a well structured and deliberate approach. The cornerstone of approach remains close consultation and ensuring stake holders participation in implementation and assessment of policy.

AIDP envisage to achieve a critical mass of production, double the contribution of auto industry to GDP from the existing 2.8%, by the year 2011-12 with high focus on investment, technology up gradation, increasing its exports to US$ 650 million, enhancement in jobs alongside the development of critical components to further increase the competitiveness of domestically produced vehicles.

IV.

5 MAJOR AUTOMOBILE CAR ASSEMBLERS IN PAKISTAN

There are three major automobile assemblers of passenger cars dominating the Pakistani market with maximum business volume and annual production. In this study, the area of research is focused on the "Car Manufacturing Companies and Vendors associated with them". Details are described as following.

6 a) Indus Motor Company

Indus Motors have established a Joint Venture with Toyota Motors Corporation Japan, in 1993, to acquire essential training and knowhow for assembling Toyota and Daihatsu vehicles. Currently they are producing following vehicles.

Daihatsu Cuore -1000 cc (production: 200-300 vehicles per month). Toyota Corolla-1300 cc and 1800 cc (production: 3000-3500 vehicles per month). Toyota Corolla Diesel -2000 cc (production: 2000-2500 vehicles per month). Toyota Hilux -3000 cc (production: 500-700 vehicles per month).

Toyota is involved in technology transfer directly to local vendors through parts, drawings and process sheets. Infrastructure and manufacturing facility is monitored first to judge the potential of a local vendor before permitting him to provide sample of the product for testing/ approval. Japanese are ready to provide technological assistance up to a certain level, but still no adequate infrastructure and skilled manpower has been evolved to meet the desired standards.

An average of only 45% parts of various models have been permitted to be developed locally by Toyota after their extensive test trials in Japan. Due to non availability of expensive quality control equipment, all precision safety components are imported. Extensive training at all levels is being imparted locally at factory area in Karachi as well at dealerships throughout Pakistan. Highly trained engineers and technicians are also sent to Toyota Behren Training Centre for further skills enhancement.

Manufacturing knowhow is transferred directly to local vendors as per their qualification and skills, whereas assembly and operational knowhow is provided to Indus Motor Company.

Initially, manufactured product sample by a vendor is tested locally by Toyota experts. Later it is sent to Toyota Japan for further trials. The benefits achieved by Toyota include saving of foreign exchange through development of 45% local parts. Also, local industry is promoted and developed resulting in employment benefits and economic boost as per Pakistani government policy. There is no long term government policy for auto industry development. Yet short term policies are made time to time, following tariff based systems with no fixed quantity of parts to be developed locally (AIDP). Many auto assemblers in Pakistan are not getting any parts manufactured locally, due to non implementation of any policy forcefully and to avoid giving design and manufacturing knowhow to local vendor industry.

Due to non availability of research and development facilities in automobile industry, lack of highly skilled manpower and well developed infrastructure, it is extremely difficult for any foreign automobile manufacturer to provide any manufacturing technology to Pakistan.

7 b) Pak Suzuki Motor Company

Pak Suzuki was established as a Joint Venture with Suzuki Motors Japan, in 1982, to acquire essential training and knowhow for assembling Suzuki vehicles. Currently they are producing following vehicles .

Suzuki Mehran -800 cc (production : 3000-3500 vehicles per month). Suzuki Bolan -800 cc (production : 3000-3500 vehicles per month). Suzuki Alto -1000 cc (production : 2500-3000 vehicles per month). Suzuki Cultus -1000 cc (production : 1500-2000 vehicles per month). Suzuki Swift -1000 cc (production : 50-100 vehicles per month). Suzuki Liana -1300 cc (production : 300-500 vehicles per month). Various Globally accepted parts manufactured by local Vendors.

(Figure **??**2)

Self Reliance in automobile Vendor Industry cannot be achieved without adequate government support through Investment friendly policies, basic infrastructure and facilities provision. In addition, a close interaction between Academia and Industry is essential in human resource as well as in R&D support. Due to availability of all these above mentioned requirements, India is advancing speedily towards self reliance. Results indicate that Suzuki has followed maximum deletion program by supporting local vendors. However , despite generating high business volume and large scale products, the company has given secondary importance to Quality of parts. No strict Quality Control measures have been adopted to avoid compromise on product reliability and performance. This gives Low Quality Products with Dissatisfied Customers.

8 VI.

9 MAJOR VENDORS ASSOCIATED WITH AUTOMOBILE PARTS MANUFACTURING

Toyota has although slightly less % of parts deletion, yet it has never compromised on parts quality until proven successful. This has resulted in satisfactory performance of its products, considered trust worthy by customers and truly claimed as Reliability in Motion.

Honda, on the other hand has entirely different picture. Instead of relying on local vendors, Honda has continued to import their vehicle parts. It can be a short term advantage for them but in the long term, they are losing credibility in local market through increased production cost by depreciation in currency value and non availability of local vendors for manufacturing their vehicle parts. b) Toyota, Suzuki, Honda-% of Major/ Complex parts developed by vendors.

Although Suzuki is getting more complex parts developed through vendors locally, however no rigid quality control is applied. Unless it takes strong measures and adequate quality checks on local parts production, its products quality will never improve. This may result in reduction of its share in local automobile market, no matter how much bulk production it carries.

Toyota, is having relatively lesser share in developing complex parts through local vendors. Yet it has never compromised on product quality and reliability. Through adequate technological support and quality checks, it will certainly come up having largest automobile products share in local market in near future. Suzuki is getting more minor/body parts developed through vendors locally, still no rigid quality control is applied.

Unless strong measures and adequate quality checks on local parts production is not taken, its products quality will never improve. This may lead to the reduction of its share in local automobile market, no matter how much bulk production it carries.

Toyota, having slightly lesser share in developing minor/body parts through local vendors. Yet it has never compromised on product quality and reliability. Through adequate technological support and quality checks, it is gradually coming up having largest automobile products share in local market.

Honda is continuing to import their vehicle parts and have only utilized the Tires and Batteries, produced locally, in Honda Cars. Misinterpretation of Government Policy will continue to occur unless implemented forcefully. Honda is also losing its credibility amongst the local customers. d) Vendors Vs Business Volume in local market.

The graph shows that General Tires is having the highest business volume, being the sole manufacturer of tires in Pakistan. This is followed by Atlas Battery, being utilized in bulk for all kinds of automobiles especially the cars.

Small and bulk utilized parts manufacturing firms are also having major share in local business. Reason being producing frequently replaced parts like shock absorbers, brake parts, gears and shafts.

Complex and larger parts manufacturing vendors are having lesser share in local business, having the production of less replaced parts. Moreover, most of them are also exporting parts. For example, Rastgar Engineering is having 70 % of its parts exported and only 30% supplied to local market. The graph clearly indicates General Tires, Atlas Battery and Baluchistan wheels are having relatively higher production volume, being the sole manufacturers of products in Pakistan.

Small and bulk utilized parts manufacturing firms getting major share in production volume having frequently replaced parts in production like shock absorbers, brake parts, gears and shafts.

Complex and larger parts manufacturing vendors like Atlas, Infinity, Mecas and Rastgar Engineering are having lesser share in local production, manufacturing less replaced parts. Some of them are also exporting parts. f) Vendors Vs Maximum number of Complex parts producing.

The graph shows Rastgar, Mecas, Infinity and Atlas engineering produce maximum number of complex parts like steering knuckle, axle hubs, disc plates, gears, shafts, piston.

Rastgar is the leading vendor in innovation and technological advancement. Having acquired state of the art manufacturing techniques from US and Germany, it is producing a vide range of precision products for the global vendors as per their requirements. g) Vendors Vs Savings because of vendors.

The graph clearly indicates General Tires, Atlas Battery and Baluchistan wheels are getting maximum savings through larger differences in prices of imported products as compared to their locally manufactured products.

Small and bulk utilized parts manufacturing companies give comparatively lesser savings in terms of cost difference, because of having lesser price variations in smaller parts as compared to larger parts. For example, difference in price of imported and local shock absorber will be much lesser as compared to the Tire prices.

Complex parts manufacturers may have larger differences in their product prices as compared to imported, but many of them are getting their products exported as per global car manufacturers requirements. Hence their profit margins cannot be termed as the Savings.

10 VIII.

11 FINDINGS FROM ROLE OF CAR MANUFACTURERS AND VENDORS a) Performance of car manufacturers 1. PAK SUZUKI MOTOR COMPANY

The company has followed maximum deletion program by supporting local vendors. However, despite generating high business volume and large scale products, the company has given secondary importance to Quality of parts. No strict Quality Control measures have been adopted to avoid compromise on product reliability and performance resulting in low quality products and dissatisfied customer.

Suzuki is getting many complex as well as minor / body parts developed through vendors locally, but no rigid quality control is applied. Unless it takes strong measures and adequate quality checks on local parts production, its products quality will never improve. This may result in reduction of its share in local automobile market, no matter how much bulk production it carries.

12 INDUS MOTOR COMPANY

Although having slightly less % of parts deletion, yet Indus Motors have never compromised on parts quality until proven successful. This has resulted in satisfactory performance of its products, considered trust worthy by customers and truly claimed as Reliability in Motion.

Indus Motors have relatively lesser share in developing complex as well as minor / body parts through local vendors. But they have never compromised on parts quality and reliability. Through adequate technological support and quality checks, they are gradually coming up with largest automobile products share in local market in near future.

13 HONDA ATLAS CARS

They have entirely different picture. Instead of relying on local vendors, Honda has continued to import their vehicle parts. It can be a short term advantage for them but in the long term, they are losing credibility in local market through increased production cost by depreciation in currency value and non availability of local vendors for manufacturing their vehicle parts. b) Performance of Vendors

14 BUSINESS AND PRODUCTION VOLUME.

Large scale manufacturers like General Tires, Atlas Battery and Baluchistan wheels have managed the highest business and production volume, being the sole manufacturers of specialized products in Pakistan. Small and bulk utilized parts manufacturing firms including Alsons, Allied and Agri Auto Engineering have also acquired major share in local business and production volume, manufacturing frequently replaced parts like shock absorbers, brake parts, gears and shafts.

Mecas, Infinity, Atlas and Rastgar Engineering are the major complex parts manufacturing vendors having lesser share in local business because of production of less replaced parts like steering knuckle, axle hubs, disc plates, gears, shafts. Many of them are also exporting parts. For example, Rastgar Engineering is having 70 % of its parts exported and only 30% supplied to local market.

15 SAVINGS DUE TO LOCALLY MANUFACTURED

PRODUCTS.

Due to larger differences in prices of imported products as compared to locally manufactured products, large scale manufacturers like General Tires, Atlas Battery and Baluchistan Wheels are getting maximum savings.

Small and bulk utilized parts manufacturing companies are giving comparatively lesser savings in terms of cost difference, because of having lesser price variations in imported and local parts.

Complex parts manufacturers have larger differences in their product prices as compared to imported, but many of them are exporting major share of their products. Hence their profit margins cannot be termed as the Savings.

IX.

16 RECOMMENDATIONS a) Technology strategy

In absence of a clear statement of strategy the firm keeps hitting in the dark. Short term success in the market does not guarantee the strength of technology strategy. Strong technology strategy ensures long term success in the market. The top management commitment to build strategic attitude is of utmost importance and needs to be visible in its decision making process in general and regarding technology in particular. Quick and effective adoption of the product technology to local conditions, developing capabilities to adopt manufacturing technology, promoting innovation culture and formation of core technology group are few determinants of technology strategy.

Technology strategy needs to be derived from the long term corporate goals and should take into account each and every component of technology management function in an organization. Short term strategy may emphasize on product and technologies absorption and making incremental innovations as continuous basis, but long term strategy must clearly indicate the firm's intention of cultivating the core competencies.

Two of the companies, Pak Suzuki and Indus Motors, discussed above, had rightly identified the need of the hour as indigenization. Sense of competition will keep them adopting opportunities to develop Innovation Capabilities.

17 b) Competitiveness

Vision to develop core competencies can only keep a firm front runner in the race of competitiveness, which can only be based on competitive advantage. A firm essentially relies on technological strength to achieve sustainable competitive advantage while it seldom depends on market forces, which are highly dynamic in nature, and beyond one's control. Honda Atlas Cars should envisage the need for developing technology base locally as an effective way of sustaining competitiveness. Pak Suzuki and Indus Motors flourishing under protected market. However, Pak Suzuki Motors got exposed with the entry of new passenger car manufacturers in Pakistani market, the Indus Motors. Pak Suzuki may loose market up to some extent. They are still considered as cheaper and user friendly car manufacturers of the country. They need to concentrate on their technology, durability and quality to stay in the competition. Indus Motors seems to be more competitive in terms of price, reliability and performance of its products to become dominant in smaller cars category also, in addition to bigger cars. c) Technological Leadership.

Capability to develop technology on its own, being able to provide technologically superior products, being able to compete at the global level, to be able to afford state-of-art technology in the core and allied industries, competence to make breakthroughs and radical innovations and ability to retain competitive advantage in terms of technology are the characteristics of technology leaders. Indus Motors seem to be marching ahead on this aspect in entire Pakistani automobile industry. When the collaboration part will be over, these companies should be able to work out their future survival and growth plans. Concern for technology leadership and technological independence appears to be figured in the strategy of Pak Suzuki and Indus Motors only.

Atlas Honda Cars should also emphasize on developing their technological strengths locally. Active transfer of technology through long term collaborations is strongly recommended to take place to give better chances to local car manufacturers for developing themselves as technology leaders at least in the domestic market.

18 e) Indigenization

Government regulations should not be the guiding force behind indigenization agenda of the firm. Indigenization process may be looked upon as a measure of technology absorption capability. Low volumes, poor capacity utilization and higher investment will always disapprove the economics of indigenization only initially, but efforts on the global marketing and quality fronts will restore the balance. In collaborations, the firms know that they need to be self sufficient or at least reduce the dependence on technology providers considerably after the arrangement is over. There is fair amount of clarity in indigenization schedule. The domestic firms can always expedite implementation of indigenization programs. The capability to indigenize is the important step in the process of realizing technological innovations and subsequent developments.

19 f) Effectiveness of technological collaboration

Successes of collaborations lie in the faith which the partners have in technological capabilities of one another. Clarity of technology transfer and subsequent absorption also plays an important role in smooth functioning of local firm. Efforts should be directed towards reducing the dependence on technology providers. Generally, the problem arises when the firm grows strong in the local market and starts planning for market expansion. A healthy collaboration is one which develops its own strengths and exploits the opportunities it is exposed to. Management control by technology providers should be used to strengthen the firm technologically and financially.

X.

20 CONCLUSION

Collaborations are very effective when the local firm has the competence to absorb the acquired technology within the period already decided by both the parties. Joint Ventures (JVs) have the advantage of attracting the foreign investments and the commitment of the technology providers towards market success. In view of the fact that no technology provider transfers state-of-the art technology to a JV located in the same or different country, the technology acquired in JV is either in the late maturity stage of technology life cycle or an obsolete one. In JVs, the process of transfer of out of use technology continues and JV becomes the dumping ground for old technologies. As long as the products succeed in the market, technology borrowers do not mind such an arrangement.

In case of collaboration, the short term or one time arrangement succeed only when the firm has enough experience of technology acquisition and subsequent absorption. When the hand holding part is over, the firm is free to acquire-state-of-the art technology and stand in front of its earlier collaborators in the international market. Self Reliance in automobile Vendor Industry cannot be achieved without adequate government support through Investment friendly policies, basic infrastructure and facilities provision. In addition, a close interaction between Academia and Industry is essential in human resource as well as in R&D support. Having availability of all these above mentioned requirements, India is advancing speedily towards self reliance. [1] [2] [3]

Figure 1:

[1] Analysis of Technological advancements in Pakistani Automobile Car Industry©2011 Global Journals Inc. (US)

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Figure 2:

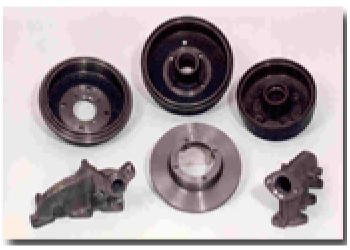

Figure 3:

infrastructure, manufacturing facility and the potential, a local vendor is permitted to provide sample of the

competitors in local market, the company remains unable to meet the technological assistance requirements of local vendors to the desired level. Still no adequate Quality Control Standards are emphasized to meet the required standards of the automobiles. This has resulted in consistently deteriorated quality of the finished products especially in Mehran, Bolan and Alto vehicles.

Averages of 65% parts amongst all products have been developed locally after their test trials. Due to non availability of expensive quality control equipment, many of the precision safety components are imported. Regular training at all levels is being imparted locally at factory area in Karachi as well at dealerships throughout Pakistan. Manufacturing knowhow is transferred directly to local vendors as per their qualification and skills, whereas assembly and operational knowhow is transferred to Pak Suzuki Motor Company.

The benefits achieved by Suzuki include saving of foreign exchange through development of 65% local parts. Also, local industry is promoted and developed resulting in employment benefits and economic boost as per Pakistani government policy.

c) Honda Atlas Car

Honda Motor Company Japan is getting only 5% parts manufactured locally, due to non implementation of Government policy (AIDP) forcefully and to avoid giving any design and manufacturing knowhow to local vendor industry. They are of the opinion that due to non availability of research and

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