INNOVATION IN INDIAN MANUFACTURING
CONTENTS

1. INDIAN MANUFACTURING SECTOR: AN OVERVIEW ................................................................. 4

2. INNOVATION ......................................................................................................................... 5
   2.1 Innovation in Sourcing....................................................................................................... 6
   2.2 Innovation in Manufacturing Process ............................................................................. 8
   2.3 Management Innovation ................................................................................................. 9
   2.4 Innovation through technology ....................................................................................... 10

3. TRENDS IN INNOVATION IN INDIAN MANUFACTURING SPACE .................................... 12
   3.1 Indian manufacturing sector’s innovativeness ............................................................... 12
   3.2 SMEs outpace large manufacturing firms on innovation intensity .............................. 13

4. INDIA’S ADVANTAGE IN MANUFACTURING INNOVATION .............................................. 13
   4.1 Domestic market provides a platform for testing new products and services ............ 13
   4.2 Domestic fundamentals driving growth in R&D activities .......................................... 14
   4.3 Reactive innovations to overcome Indian market’s inbuilt barriers ........................... 16

5. CONCLUSION ...................................................................................................................... 17
EXECUTIVE SUMMARY

Innovation in manufacturing sector is defined as any change in the business, which generates monetary benefits directly or indirectly. Innovation is a requisite for growth in any business. The Indian manufacturing sector recognises the fast rising importance of constant innovation in order to excel as a near-term benefit, and in the race for survival in a globalised world as a long term need.

Innovation in manufacturing activities can be broadly classified under four categories. Innovation in Sourcing that is done by change in raw material or supplier or the influence of supplier in the manufacturing supply chain. Innovation in Manufacturing Process is modification at any level of production. Management Innovation covers introduction of a new method of carrying out business. Innovation through technology involves change in the manufacturing process through adopting a different technology usually away from the conventional method.

Indian manufacturing sector has marked its presence in the global manufacturing sector and as per the World Bank report India is a leading player in innovativeness in biotechnology, pharmaceuticals, automobile parts and assembly sectors. While innovations in the sector come from both large firms as well as SMEs; as per Government of India’s National Knowledge Commission, the SMEs are demonstrating higher innovation intensity compared to large firms.

India is a heterogeneous market with diverse needs. To successfully cater to this market the solutions need to be customised and focused on the needs of the target market segment. Therefore the Indian market provides an ideal platform for companies to capture higher market share by creating innovative solutions. In other words, the heterogeneity of the Indian market creates a strong incentive for manufacturing players to innovate. In addition, other factors like government measures promoting R&D, low cost advantage, and the large and proficient workforce of India contributes to rising innovation in the sector.
1. INDIAN MANUFACTURING SECTOR: AN OVERVIEW

Manufacturing holds a key position in the Indian economy, accounting for nearly 16 per cent of real GDP in FY12 and employing about 12.0 per cent of India’s labour force. Growth in the sector has been matching the strong pace in overall GDP growth over the past few years. For example, while real GDP expanded at a CAGR of 8.4 per cent over FY05-FY12, growth in the manufacturing sector was marginally higher at around 8.5 per cent over the same period. Consequently, its share in the economy has marginally increased during this time – to 15.4 per cent from 15.3 per cent.

Strong growth has been accompanied by a change in the nature of the sector – evolving from a public sector dominated set-up to a more private enterprise-driven one with global ambitions. In fact, according to UNIDO, India (with the exception of China) is currently the largest producer of textiles, chemical products, pharmaceuticals, basic metals, general machinery and equipment, and electrical machinery. Over the coming years, the sector’s importance to the domestic and global economy is set to increase even further as a combination of supply-side advantages, policy initiatives, and private sector efforts set India on the path to a global manufacturing hub.

Exhibit 1
Size of the manufacturing sector in India

Source: RBI, Aranca Research
2. INNOVATION

Government of India’s National Knowledge Commission defines innovation as a process by which varying degrees of measurable value enhancement is planned and achieved in any commercial activity.

In manufacturing context, innovation can be said as something that is newly introduced at any level of value addition entailed in the production process and the change is successfully commercialised.

Innovation is measured with respect to performance and growth, led by upgradation in efficiency, productivity, quality, competitive positioning and/or market share of the company. It can be broadly classified into the following four categories, depending on the area of business where a change has been introduced:
Innovations in the Indian business sector are recognised as outstanding illustrations worldwide, be it by large MNCs or SMEs. Illustrations of innovation in the manufacturing sector are mentioned below in detail.

2.1 Innovation in Sourcing

A unit can be said to have innovated with the sourcing of raw materials, when any change in the raw materials or suppliers, and change in the degree of involvement of suppliers in the supply chain leads to quantitative benefits directly or indirectly.

The Indian food processing industry is making waves with innovation in sourcing of raw materials. Being highly dependent on the perishable nature of raw materials, the effective sourcing of these goods plays a vital role in the success of a company in this industry.

**Indian Tobacco Company (ITC)** innovated its sourcing channel by introducing **E-Choupal**, a tool empowering farmers with internet-based kiosks in villages for direct transactions, thereby eliminating the
middleman. The innovation divided the procurement of raw materials into two parts – information related to pricing, and transactions that involved weighing and delivery.

Apart from educating farmers about best practices, the kiosks provide them the best price for their crop, information related to grading standards, and the cost and availability of cost-effective raw materials (seeds, fertiliser information). The next step of procurement is carried through ITC’s warehouses set up in villages, which help in reducing the transaction cost, screening for quality and efficient logistics due to single point of transaction.

ITC is effectively saving more than a million US dollars in raw material procurement annually. Notably, the benefits to the company are not restricted to low cost of raw materials alone. Due to the visibility in supply chain, the company also gets the flexibility to customise its products as per local taste that varies by region. ITC’s Aashirvaad Atta [brand of whole wheat flour] has different wheat combinations for the product sold in North India and South India.

The success of the innovative supply chain was a win-win situation for both ITC and the farmers as the company was able to obtain raw food at a low cost directly from the source of harvest and the farmers who got a larger exposure to markets and earned better returns. The success of ITC’s E-Choupal network can be gauged from the fact that it includes 6,500 centres spread across 40,000 villages.

**Amul or Gujarat Cooperative Milk Marketing Federation (GCMMF)** has evolved as the world’s biggest co-operative with the largest amount of milk processed globally. Amul follows a hierarchy of cooperatives and procures milk daily from its 15 dairy unions. The innovative strategy of capitalising on the vast rural base of India is the primary growth driver for the company. The unions in total have over 3 million members, spread across more than 15,000 villages in the country. Amul has targeted to produce 20 million litres of milk per day by 2020, after it achieved the 10 million litres per day mark in 2009.

Efficient supply chain management by GCMMF has added to its competitiveness, led by low prices resulting from a low cost system. The federation is responsible for sale of products, and distribution and coordination with retailers and wholesalers. The dairy unions manage the supply side activities that include monitoring milk collection contractors and other supporting activities to maintain quality. This includes other services such as animal feed and other supplies, provision of veterinary services, and educational activities for the union members.
2.2 Innovation in Manufacturing Process

Innovation in manufacturing process entails modification in the method of production. The alteration in the procedure can be a result of amendments within the company or across the value chain.

The aim of such innovation can be to reduce the turnaround time, enhance the product quality, trim the cost of production, achieve the flexibility of customising the product as per customer demands as well as reap other benefits that result into better product competitiveness. Few illustrations of innovations in the Indian manufacturing sector are mentioned below:

**Ambuja Cement** innovated their manufacturing process at various levels, thus enabling the company to lower production costs, improve responsiveness to customer demand and maintain its position as the largest exporter in India consistently for the last 15 years.

Generally, manufacturing facilities of cement are located in close proximity to the limestone mines due to the bulk nature of the raw materials. The final product is then transported to the end market. Ambuja Cement introduced the concept of “Split-Plants” as a solution to the bottlenecks of transportation. The preliminary stage of the cement production process that enabled to reduce the weight of the material was carried close to the mines. The next step of cement manufacturing (grinding and packaging of raw materials) was carried at facilities close to the market. This enabled the company to respond quickly to any change in market dynamics.

The Indian cement industry was majorly dependent on road and rail transport, which accounted for 90 per cent of the shipments. Ambuja Cement introduced **sea-borne transportation**, which improved cost-efficiency and allowed the company to tap the under-served domestic coastal markets. Its access to ports has also helped the company to emerge as India’s largest exporter since last 15 years¹.

Furthermore, the company targeted to **reduce power costs** (25-30 per cent of production cost²). It set up a captive power plant fuelled by quality coal from South Africa and furnace oil from the Middle East that facilitated the power cost to be lower than the national grid. This has made the company self-sufficient with power, while it is positioned to generate extra income by supplying excess power to the national grid.

Innovation in manufacturing process can be outbound as well – by involving other stakeholders engaged in the production process. Mahindra & Mahindra (M&M), a

---

¹ Source: Ambuja Cement website
² Source: Ambuja Cement website
private sector automobile company in India, showcased a successful story with this strategy.

M&M introduced a new process (Integrated Design and Manufacturing) while developing its multi-utility vehicle ‘Scorpio’. The process involved cross-functional teams (including Tier 1 suppliers) which collaborated extensively in the product development process – designing, testing and marketing. The result was a shorter product development cycle. M&M was able to roll out ‘Scorpio’ on an investment of USD120 million in the project – one-fifth of the average spent on similar projects globally.

2.3 Management Innovation

Management innovation is a change introduced in a firm’s management principles to improvise any area of business activity.

The Indian automotive manufacturer Brakes India Limited transformed the management approach for its Foundry division and attained success. The top management’s approach to attain Total Quality Management (TQM) was to adopt active leadership roles ensuring that the company’s vision was passed down the hierarchy line clearly and encouraged employee participation through various schemes. One of the measures was the “suggestion scheme”, wherein an employee’s suggestion was implemented and rewarded with special payments. This innovation led Brakes India Limited to become a recipient of internationally recognised awards for excellence in quality such as the Deming Application Prize and TPM Excellence Award in 2003.

The ongoing TQM practices led to tangible gains in the business; a few of these are mentioned below:

<table>
<thead>
<tr>
<th>Exhibit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in management approach led improvement in Brakes India Limited</td>
</tr>
<tr>
<td>Foundry Division</td>
</tr>
<tr>
<td><strong>Metrics</strong></td>
</tr>
<tr>
<td>Change from 2002-03 to 2006-07</td>
</tr>
<tr>
<td>Customer return rate – PPM</td>
</tr>
<tr>
<td>Developmental lead time</td>
</tr>
<tr>
<td>Scrap cost / turnover per cent</td>
</tr>
<tr>
<td>Tonnage per employee per year</td>
</tr>
<tr>
<td>Number of suggestions per employee per year</td>
</tr>
<tr>
<td><strong>Source:</strong> TPM Club India Newsletter March 2008, Aranca Research</td>
</tr>
</tbody>
</table>
Another successful innovation with management is illustrated by Biocon Limited (Biocon), India based fully integrated healthcare company that is engaged in manufacturing of biopharmaceutical products. Biocon adopted a polycentric innovation model. This was done as Biocon entered a strategic arrangement of USD350 million with pharmaceutical company Pfizer in October 2010 for marketing of four products of the former in the non-overlapping markets.

The success of the polycentric innovation model is dependent on building global innovation networks which comprises of four specialised players with responsibility ranging from creating to marketing of the product.

The four players include Inventors – who generate the idea of inventing; Transformers – who convert the idea into a marketable product; Financiers – who provide the required financial resources and the Connectors – who brings all the above three players together.

The chairman and managing director of Biocon plays the role of Connector. The management enters into strategic alliances and has placed Biocon on all of the other three different roles in various agreements. Biocon has been inventors and transferred it to Pfizer allowing them to transform into a global product. In another deal, Biocon acted as transformers by sourcing invention from Cuba-based CMI and manufactured and marketed the product in India and abroad under its own brand name.

Biocon has been able to actively, finance CMI’s inventions with the funds it sources from Pfizer deal which are also utilised to fund R&D activities in Biocon. Due to these practices adopted by the management, Biocon has been able to outpace competition by registering strong growth as the model allows the company to deliver affordable drugs to serve the masses in India and abroad.

2.4 Innovation through technology

The Indian manufacturing sector has been incorporating various technologies to serve the varying needs of the diversified Indian customer base. For instance, the Indian market on a macro level is divided into urban and rural, with the factor of differentiation being the purchasing power of customers, which is lower in the latter group. Thus, the manufacturing sector is introducing products to capitalise on the large untapped price-sensitive Indian rural market.
A private sector consumer electronics company, **Godrej Appliances** innovated its technology to launch an affordable refrigerator for rural India that costs 35 per cent lower than the cheapest available refrigerator. This was achieved by changing the engineering process of the refrigerator. The company introduced “**Chotukool**” (little cool), a 43-litre refrigerator that is assembled with 20 parts vis-à-vis 200 in a regular refrigerator. The product is customised in order to penetrate successfully in rural India, which peculiarly faces power shortages. The product has an option of operating on battery, and the high insulation enables it to remain cool for hours even without power.

Another instance of innovation in manufacturing, targeting the price-sensitive Indian consumer, can be quoted from the automobile sector: **Tata Nano – world’s cheapest car**. This milestone was attained as the engineers thought differently from the conventional way of manufacturing cars. Tata Nano’s cost savings were a result of changes that included similar handles and mechanisms for left and...
right side doors; reduced size of the engine that allowed its placement under the rear seat, thus permitting a smaller-sized car; and positioning of the instrument cluster in the middle unlike in front of the driver usually.

3. TRENDS IN INNOVATION IN INDIAN MANUFACTURING SPACE

3.1 Indian manufacturing sector’s innovativeness

According to a World Bank report\(^3\), India is among the world’s leading innovation players in the biotechnology, pharmaceuticals, automobile parts and assembly sectors of the manufacturing industry.

For instance, the pharmaceutical sector’s innovation has gained momentum due to the rising spending on research & development as a proportion of turnover by Indian pharmaceutical companies. Other fundamental factors that contribute to the sector’s innovative developments are its skilled human resource, and cost-competitiveness along with the high number of facilities operating with international standards. India has over 120 USFDA-approved and 84 UK MHRA-approved manufacturing facilities. These facilities significantly support the companies engaged in Contract Research and Medical Services (CRAMS).

![Exhibit 7: Number of USFDA-approved facilities in different countries](image)

Source: Business Monitor International (BMI), Aranca Research

---

\(^3\) Source: Unleashing India’s Innovation, 2007
3.2 SMEs outpace large manufacturing firms on innovation intensity

The Indian manufacturing sector has been witnessing a rise in the average innovation intensity, as per a survey carried out by Government of India’s National Knowledge Commission. Furthermore, SMEs registered a higher rate of innovation intensity (33 per cent) compared to large firms (12 per cent) during 2005-06. An illustration of innovation by an SME in the healthcare sector is as follows:

**Jaipur Foot**, a hand-made prosthesis (artificial foot), is a solution for more than 5.5 million amputees in India, who are below the poverty line. This innovative and economical product enables them to carry on with their active lifestyle as it permits movements such as squatting, sitting cross-legged, climbing, and working in wet fields, unlike other available artificial foot products. The product thus offers the patient accessibility to work and earn livelihood. The benefits of the product have generated interest internationally. About 20,000 fittings of Jaipur Foot have been conducted abroad in emerging and developing countries such as Philippines (3,000), Sudan (1,800), Sri Lanka (1,210) and Afghanistan (3,051).

4. INDIA’S ADVANTAGE IN MANUFACTURING INNOVATION

4.1 Domestic market provides a platform for testing new products and services

The diverse consumer base in India requires focused and customised solutions from the market. The players who are able to develop innovative customized solutions for target consumer segments tend to capture large market share. Thus the heterogeneity of Indian consumer base acts as a facilitator for innovation in the manufacturing sector. This can be illustrated as follows:

**Pharmaceutical sector**: Clinical trials are a key driver for innovation in the pharmaceutical sector. Being the world’s second most populous country with a genetically diverse population, India offers inherent benefits, thus encouraging innovation in this area. Along with this, availability of skilled doctors and a cost advantage (65 per cent lower than in the US) make India a lucrative destination for clinical trials. The country’s clinical trials industry was estimated to be worth USD485 million in 2010, according to a Frost & Sullivan study.

**FMCG sector**: CavinKare, a personal care product company, introduced a herbal-based shampoo targeting consumers who show resilience to traditional shampoos due to the presence of chemicals, which are considered harmful. The company introduced Meera Shampoo, a herbal-based hair wash product. The product was designed keeping the South Indian consumers in mind who are more

---

4 Innovation intensity is the percentage of revenue derived from products/services which are less than three years old. As per the report the innovation intensity rose from 7.4% in 2001-2002 to 12% in 2005-06
inclined to using herbal-based products. Further, the usage of herbs for hair wash varies by states within South India. Thus, Meera shampoo was customised to capture the local flavours in South India. The Shampoo was launched in Andhra Pradesh with Reetha (herb name) base; Shikakai base in Tamil Nadu; Hibiscus base in Kerala and Karthika base in Karnataka. This strategy of the company to innovate its products by offering different variants of the same product as per the regional consumer taste enabled it to emerge as a market leader in South India.

4.2 Domestic fundamentals driving growth in R&D activities

The manufacturing sector is concentrating on research & development (R&D), with its focus on enhancing competitiveness. Although lower than emerging market peers such as China, India’s share in global R&D spending has been increasing. For instance, in 2011, India’s R&D spending made up 2.8 per cent of the total global spending on R&D, higher than the 2.6 per cent share in 2010. The Intellectual Property (IP) applications registered in India are also on the rise. Over FY06-10, IP applications filed for patents rose to 34,287 from 24,505, while patents filed for designs rose to 6,092 from 4,949. Interestingly, the patentee with the largest number of IP applications from India in FY10 was from the manufacturing sector – Hindustan Unilever (FMCG sector, 103 applications). Pharmaceutical companies were not far behind – the top five Indian firms filed 112 IP applications.

Exhibit 8
R&D spending in India (USD billion)

Source: Battelle, 2011 R&D spending estimate by Battelle, 2011 R&D Funding Forecast, Aranca Research
The key factor essential for ensuring R&D in the manufacturing sector is in place in India is the availability of a pool of skilled manpower to support the nation’s industrial development. India has more than 250 universities; 1,500 research institutions; and 10,428 higher-education institutes. The country adds 500 PhDs; 200,000 engineers; and 300,000 technically-trained graduates annually. Furthermore, the combination of low cost manpower with English-speaking proficiency has added to the competitiveness of human resources in the country.

Furthermore, the government is increasingly focussing on contributing towards the encouragement of home-grown innovation. Under the 11th Five-Year Plan (2007–12), the government has approved setting up 14 world-class universities for innovation. The universities would be set up on the public private partnership
model under the “brain gain” policy of the Ministry of Human Resource Development (MHRD).

Both government as well as private players in the Indian manufacturing sector realise that R&D is a key to their global ambitions. Consequently, investments towards research have been stepped up. Given below are some notable investments in the field:

<table>
<thead>
<tr>
<th>Date</th>
<th>R&amp;D investment (implemented and/or announced)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May-11</td>
<td>ISRO announced the setting up of a spacecraft R&amp;D centre in Chitradurga</td>
</tr>
<tr>
<td>Apr-11</td>
<td>Hitachi to invest USD400 million to set up an R&amp;D centre in Bangalore</td>
</tr>
<tr>
<td>Aug-10</td>
<td>Alstom earmarked USD39 million to establish an R&amp;D centre for power products</td>
</tr>
<tr>
<td>Jan-10</td>
<td>Huawei allocated USD500 million investment for an R&amp;D centre</td>
</tr>
<tr>
<td>Oct-09</td>
<td>Hyundai set up an R&amp;D centre at an investment of USD25 million</td>
</tr>
<tr>
<td>Jun-09</td>
<td>LG Electronics doubled its annual R&amp;D investment outlay to USD83 million</td>
</tr>
</tbody>
</table>

ISRO: India Space Research Organisation

### 4.3 Reactive innovations to overcome Indian market’s inbuilt barriers

India depends greatly on non-renewable sources of energy. Thermal sources coal (55 per cent) and natural gas (10 per cent) together account for majority of the country’s total installed capacity. Thus, rise in price of these resources has increased the energy cost, which is a major cost component in key manufacturing sectors.

Indian cement sector has innovated with the manufacturing process to harness the surging cost of production driven by rising energy costs. Cement players are sourcing fuel from alternate sources to gain cost benefit. For instance, Madras Cement’s Alathiyur plant uses bio energy by burning coffee husk and cashew nut shells, and saves INR80 million annually on costs; India Cements Ltd’s Dalavoi plant uses Low Sulphur Heavy Stock (LSHS) sludge as an alternate fuel that contributes to annual savings of INR0.3 million.

Another example of innovation in the manufacturing sector, aimed at overcoming the constraints of the Indian power sector, is the power interface unit (PIU) by Acme Tele Power. The PIU is a solution-based innovation for the issues faced by the telecom sector related to installing sensitive electronic telecom equipment.
every 10–20 kilometres. Telecom service providers were facing a constraint with the operation of these units due to insufficient and fluctuating power outside the metropolitan areas. Acme introduced PIU in 2003, which operated on an electronic chip, in contrary to traditional voltage stabilisers working on motors. The innovation was commercially successful as it improved power corrections and led to 20 per cent power savings. The current installations of this product exceed 75,000\(^5\), and the product has received wide acceptance internationally.

5. CONCLUSION

Innovation has been the key factor enabling transition of India into a global manufacturing player. Indian manufacturing players in each sub-sector have innovated in wide areas of business in order to serve the large as well as heterogeneous Indian consumer market.

Innovation by the sector has harnessed the diversity in the Indian market. Successful stories of innovation in sourcing have involved capitalising on the large rural market, an example of which is ITC’s E-Choupal. Manufacturing process has witnessed transformational innovations such as integrating SME suppliers into product development cycle. For example, Mahindra & Mahindra involved suppliers in product development to reduce the investment to one-fifth of similar projects. Among Indian manufacturers, innovation rollouts have not been only large firms’ forte which have advantage of large R&D budgets. The SME’s in this sector have also shown sensitivity towards subtleties of consumer demands and introduced products with global market acceptance, as seen in the exemplary success of Jaipur foot.

Indian market, with its diverse characteristics across regions, makes innovation a powerful competitive advantage in manufacturing sector. The players who are able to generate new ideas for better product customisation are better placed to gain market share, as demonstrated by the success of CavinKare. Further, government incentives to foster innovation, growing entrepreneurial culture and a skilled workforce are acting as added supporting factors for innovation. Over the years, Indian manufacturing players have gained experience in managing and excelling while facing resource constraints. This has led to solution based innovation with wider industrial applications.

While the innovations in Indian manufacturing sector have already begun to make significant footprints in the global arena, it is set to attain many milestones further.

\(^5\) Source: Acme Tele Power Limited company website
DISCLAIMER

India Brand Equity Foundation (IBEF) engaged Aranca to prepare this report and the same has been prepared by Aranca in consultation with IBEF.

All rights reserved. All copyright in this report and related works is solely and exclusively owned by IBEF. The same may not be reproduced, wholly or in part in any material form (including photocopying or storing it in any medium by electronic means and whether or not transiently or incidentally to some other use of this presentation), modified or in any manner communicated to any third party except with the written approval of IBEF.

This report is for information purposes only. While due care has been taken during the compilation of this report to ensure that the information is accurate to the best of Aranca and IBEF’s knowledge and belief, the content is not to be construed in any manner whatsoever as a substitute for professional advice.

Aranca and IBEF neither recommend nor endorse any specific products or services that may have been mentioned in this report and nor do they assume any liability or responsibility for the outcome of decisions taken as a result of any reliance placed on this presentation.

Neither Aranca nor IBEF shall be liable for any direct or indirect damages that may arise due to any act or omission on the part of the user due to any reliance placed or guidance taken from any portion of this report.