Study of Impact of new product design process on automobile & bamboo sector in Mumbai-Pune region

Chapter 5

Summary & Conclusion
Summary and Conclusion

Indian economy is at a very crucial stage. After the IT revolution, ‘Knowledge’ economy became the buzz word. Joining the bandwagon of knowledge and information, “Design” has caught on the imagination of the world. Globally the “Design” based economy has grown multi-folds. It has impacted the social structure of the global society.

The United Kingdom’s design professionals are among global veterans for over seven decades. Their professional body, the UK Design Council, set up by Winston Churchill in 1944, has been experiencing design’s ability to transform organizations, to improve products, services and even lives.

In India, design is being discussed in the media after the premier National Institute of Design was set up in 1961 with the government initiative. That was the period when the Indian industry survived with the government support and intervention. Various developments in the country took place during the last few decades that spurred activities in the design arena. Over these years, the government of India took major steps to formulate National Design Policy, set up India Design Council in 2009. Instituting the “India Design Mark,” Good Design Awards and similar initiatives gladdened the designers and corporate honchos. Numerous design schools have been established across the country to cater to the demand of the trained manpower in Design

The automobiles are now designed and produced in various centers in India. Similarly, there are designers trained to conceptualize, design and produce products for diverse industries including craft, bamboo artefacts. The product designers and academicians believe that the better designs are responsible for sale and profitability of the commodities. How far are these assumptions true? Is design only a hype? Is there an impact on consumers? Is an elaborate design process necessary for the market? Is it only a myth? Is there concrete evidence that designs impact the consumers? Design happens only in the West, not in India,. Isn’t it?
There are very few empirical studies to respond to these points, and to assert definitely that there is an impact of the product design on the Indian consumers. This is not withstanding the general perception that the customers are attracted to the products who buy these for various reasons including because of the design. Against this background, it has to be noted that the UK Design Council undertook a broad-based study of design processes of 11 major global companies in 2007 with businesses in diverse areas. There is need for a similar study on impact of design in diverse field. This researcher chose to take up a study in two fields: automobiles and bamboo craft. To substantiate the research, the researcher felt the need to study the design processes used in other product companies as well.

5.1 Design

Design is a multidisciplinary activity involving masters of various expertise. The designer is an amalgamator / catalyst who creates meaningful products for the society. The new world order now influences a country’s relative position in economic development. One of the drivers behind this relative differentiation among countries is the design-oriented creative edge that a nation adopts to create global competitiveness and distinctive strategies. Design has a major role to play in Indian industry at this stage in global competitiveness. Design Enablement would help the country to move away from cost and price based competition to value based competitive advantage. The society needs to create competitive advantage for “Developed India” through its business and industry. Social goal of development, encouraging rural design and products for the needy and the large disadvantaged population in India can be achieved with appropriate design.

5.1.2 Design Process

Success of any product depends on the journey of evolution than the destination itself. This brings forth the importance of the ‘process’ by which the design is done to ensure its success. The more the process is followed the better are the results of the user getting satisfied with the product. The adherence to the methodical stages in the quest for converting an idea into reality helps in achieving that goal. The design process is the transformation of an idea, needs, or wants by consumers or the
marketplace at large, into a product that satisfies these needs. (Jay Molding, 2013). Design is a problem solving exercise. The design of a new product consists of phases, and stages that the professional designers refer to as ‘Design Process.’

5.1.3 Design Industry in India
Design activities in India are carried out by in-house designers employed by businesses. Another component is the consultancies / studios offering specialized design services i.e. the Design Industry. Design industry is characterized by small to medium sized firms. Many of them are one to five people operations. Of these many are established at the beginning of the new millennium. Majority of design activities is focused in four cities, namely, Mumbai, Delhi, Bangalore and Pune. Design activities are urban in character.

India is one among the few countries to have formulated and adopted a National Design Policy. It recently constituted an India Design Council to implement the major provisions of the National Design Policy in 2011. There have been constructive efforts in this direction by the union government to evolve a draft concept paper on design policy.

Various initiatives have been taken by governments, educational institutions, corporate companies and industry bodies to stress the importance of design for commercial success.

The National Design Policy, India Design Council, India Design Mark supported by the government and industry promoted organizations like Association of Designers of India, IDEAS Design in India, International Council of Communication Design (ICOGRADA) are some of the prominent examples of these initiatives. Various design related events like CII-NID Design Summit from 2001, Pune Design Festival from 2006, Kurious Design yatra, Goa, UnBOX, Delhi help in spreading design awareness.
5.2 Need for the research

This researcher is a professional industrial product designer trained at Industrial Design Centre of the Indian Institute of Technology, Mumbai. He has been a visiting faculty and has interacted with peers as trustee and national executive member of the industry organisation – Association of Designers of India. He has worked as a designer and R&D professional at Design Directions, Forbes Marshall & Mahindra Composites. He runs an organisation called BambooVishwa, which creates new bamboo products, trains artisans, publishes bi-annual e-newsletter called BambooMitra with a vision to develop the bamboo craft sector. During the last 20 years, he has come to realise that there is a need to enhance design consciousness in the country. For this, it is necessary to study the level of design reach in the industry. There should be a constant thrust on innovation and there should be close Industry-Academia tie-up. Towards that end, the present study focuses on two sectors where design has shown impact of design processes: namely, automotive and bamboo sectors. To substantiate these focus areas, study of other product designs, its process and the impact is also included in this research. The awareness about design in production and services has been growing during the last four decades due to the government and private initiatives.

Earlier not enough attention was given to the design at the strategic level and for promoting Indian products, services, and ideas on the global arena when changes due to globalisation began to take place. The government and private initiative since the 1990s, however, brought in a major change in the attitude of decision makers and corporate leaders.

This study attempts to document this phase in Indian economy where changes due to introduction to design process were visible.

5.2.1 Automobile Industry

The automotive industry in India is one of the largest in the world and one of the fastest growing globally. India’s passenger car and commercial vehicle manufacturing industry is the sixth largest in the world, with an annual production of more than 3.7 million units in 2010. India is set to overtake Brazil to become the sixth largest
passenger vehicle producer in the world, growing 16-18 per cent to sell around three million units in the course of 2011-12. The majority of India’s vehicle manufacturing industry is based around the clusters in the South: Chennai, West: Mumbai-Pune-Nashik, East: Kolkata-Jamshedpur and North: Delhi – Gurgaon – Faridabad. Vehicle segments are classified as Passenger Cars, Commercial Vehicles, Utility Vehicles, Farm and off road vehicles, two wheelers and four wheelers. The major automotive companies operating in India are Mahindra, Tata, Force Motors, Hindustan Motors, ICML, Premier Automobiles, Maruti Suzuki and the foreign companies operating in India are BMW, Fiat, Ford, General Motors, Honda, Hyundai, Daimler Chrysler Mitsubishi, Nissan Skoda, Audi. Various industry organizations like Confederation of Indian Industry (CII), Society of Indian Automobile Manufacturers (SIAM), the author is part of the Design Initiative, Automotive Component Manufacturers Association of India (ACMA), AUTO Expo help promote the needs of the industry in India.

Having actively worked in the Design & Styling committee of SIAM for three years, the researcher was able to interact with many automobile designers, design related professionals, academicians and student at this forum. The researcher felt the need to study, analyze and document the design successes of the automobile industry with his experience in the Industry. He realized that there are very few studies done in the automobile design space in India. This led the researcher to take up this present study of impact of design processes on success of the automobiles. He decided to take up this research activity through studying how the automobile companies have benefited by using design processes for commercial success. The researcher also decided to deploy the design process evolved by him as part of the action research on one of his Mini Tractor design & development project.

5.2.2 Design for Craft

The handicraft sector of India is one of the critical economic drivers of our rural economy which has supported and complemented the major occupation of agriculture. As a highly decentralized activity, it provides local manufacturing capabilities with very low capital outlay and much of the value addition and wealth creation rests on the use of human skill and local knowledge that has been harvested over many
generations of craftspeople. The range of products and services help support many agricultural activities and meet the needs of local households. Local patronage in the past had helped maintain a high degree of skill in the making of religious objects as well as in the preparation of exotic gifts for auspicious occasions.

This researcher believes that in the 21st century, India will face a further set of challenges that could threaten the very survival of the sector and its skilled artisans and women. Globalization and an open economic landscape will see new and renewed competition in all sectors of our economy. We will be called upon to innovate and uplift the ability of our rural crafts-persons and we are sure that the ingenious craftsperson, with the support of our established Institutions will be more than capable of facing this challenge. One of the major contributors to this effort is deploying ‘Design’ for the development of these sectors. Organizations like Fab India, Industree, Mother Earth, Sangaru Designs, and Rhizomes have proved that Design is the key factor for its success. Using design processes along with the traditional skills of the craftsmen has ensured the emergence of these organizations as corporate entities ensuring the repeatability and quality of the products. It has also helped them establish as a brand in the competitive market.

5.2.3 Bamboo Craft

Bamboo craft in India traditionally is being practiced primarily in the North Eastern states, some parts of Maharashtra and Kerala. India is the second largest grower of bamboo after China. The handicrafts of cane and bamboo are one of the oldest crafts known to man. It is universally practiced at various regions throughout India. India had a rich source of bamboo material, and the Indian artisans had a practice to produce stunning utility articles. These items are meant for household uses. In modern days, various forms of decorative items are also made out of bamboo. Baskets of different kinds have significant place. The ordinary work baskets of day labours are made of bamboo. There is great demand of decorated travel basket in modern days. It forms an important feature in the indigenous economy of a rural India. The decorative value of Bamboo craft items is huge. The utilitarian aspect of these bamboo articles serves as an added attraction. The range of bamboo products is wide from boxes, chairs, teapots, baskets, and hand bags, etc. Carving work on bamboo is also seen in some cases.
5.3 Research Methodology

5.3.1 Conceptual Framework
Product design is a process of creating a new product for the users for commercial gain. It is directly related to the effective, efficient generation and development of ideas to create new products. Design is a multidisciplinary activity involving masters of various expertise. The designer is an amalgamator / catalyst who create meaningful products for the society at large. Design is the best creative and feasible solution for a given problem for commercial success.

Product designers conceptualize and evaluate ideas, making them tangible through products in a more systematic approach. Their role is to combine art, science, and technology to create tangible three-dimensional goods. Product design is the process that brings that sort of artistic form and usability usually associated with craft design to that of mass produced goods.

The stages of the present study were as follows:

- An initial desk research project for the background study summarized the evolution and development of design process methodologies from an academic perspective as outlined in this chapter above. This data was collected from brochures, annual reports, and websites of the companies.
- The researcher took face-to-face interviews with the design or creative heads of the users of design, and sought and received responses through email or telephone.
- Prior to each interview, basic corporate data and information was gathered for each company. This was useful to understand the strength of each company.
- This was used both as a background for the interviews, and in the formulation of the summary report and the case studies. With this background and methodology as its starting point, the interviews were planned and conducted.

To study the Design processes used in the industry the researcher felt the need to study various design processes used in the design companies. He felt that it will help to substantiate the use and impact of the design process to create successful products. He selected 6 design companies, Tata Elxsi, Lokus Design, Elephant Design, Onio Design, Design Directions and Ticket design operating from Pune for this study. The products studied by this researcher as part of this case study were from the industrial,
consumer durables, automobile equipment, medical device, home appliance and FMCG sectors. The aim was to study product design processes deployed in a various different field of the industry. This researcher then focused on design processes of automobile companies around Pune, Maharashtra. He faced several problems, mainly because of the copyrights and confidentiality concerns of the designers. Design professionals and corporate leaders were reluctant to part with the data on design processes because of, mainly, the confidentiality restrictions. Some professionals did agree to respond to questions raised during the interviews by this researcher. Their responses have been part of the data included in the chapter Data and Analysis.

The next part of the study was to study the craft sector in general and bamboo craft in particular. Since the bamboo craft is not an established industry, it was pertinent to first evaluate the craft sector for the use of design processes in developing products. Prominent companies using design in the craft sector in India were identified. The researcher collected secondary data from websites, portals and primary data through interviews of key decision making people in the following organisations – Industree, Fab India, INTACH & Crafts council of India for the craft based industries and bamboo product based organizations like Bamboo Masters, Bamboode, VEDA, Rhizome, KONBAC.

5.3.2 Research methodology adopted

A. Secondary Data
Secondary data was collected through Websites, newspapers, magazines, books, reports, research papers, and journals

B. Primary Data

1. Product Design Process case studies : Exploratory & Qualitative Research
To substantiate the importance of design and the design processes used, the researcher studied some design companies in Pune. It included the case studies of different products designed by various design companies using a defined design process, its development journey, impact on products through user feedbacks and views expressed by senior executives of the respective product companies
2. **Automobile case studies : Qualitative and Quantitative Research**

- Vehicle segments studied – Passenger Car, Utility Vehicle, Light Commercial Vehicles.
- Design Processes executed by Mahindra and Tata Motors
- Products commercially successful were selected and compared with similar vehicle in the category using defined parameters

<table>
<thead>
<tr>
<th>Segment</th>
<th>Under Study</th>
<th>Comparison against</th>
</tr>
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<tbody>
<tr>
<td>1 Utility Vehicle</td>
<td>XUV 500</td>
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<td>Tata Manza</td>
<td>Mahindra Logan</td>
</tr>
<tr>
<td>3 Light Commercial Vehicle</td>
<td>Tata Ace</td>
<td>Mahindra Maximo</td>
</tr>
</tbody>
</table>

- Design Audit (analysis of design features) was conducted on selected vehicles in the above segments by this researcher.
- User survey conducted to access the buying decision which eventually helps the vehicle to succeed in the market was conducted by administering a questionnaire

3. **Design for Bamboo Craft : Qualitative Research**

- Discussion about various craft forms and craft based industries
- Discussion on how design has helped the enterprises to grow
- Bamboo Craft industry in India
- Various bamboo craft based organizations and its journey through design
- Case studies of design process used in organizations and its impact

4. **Action Research**

- Action research case study of I-CAN Design process for Mini Orchard Tractor and TerraBambu Pendant design

C. **Research Instruments**

   a. Questionnaires : Open ended and close ended questionnaires used
   b. Interviews conducted
   c. Case Studies : Case study analysis was carried out for successful designs.
   d. Action study : A participative research was carried out with design teams.

D. **Sampling methods** : Non-probability convenient sampling method was adopted

   Respondent type (a) : End Users : 50 respondents for each vehicle studied
   Respondent type (b) : Designers & Designer enablers : 20
E. Objective of Study

- To study various new product design processes used in the Industry
- To document case studies of design of products for business success
- To study the impact of new product design process on automobile sector
- To study and analyze the importance of ‘Design’ in the craft and Bamboo sector
- To study the similarities in new product design process for these sectors

F. Scope of Study

- Studying Product Design Processes used in the industry in Pune region
- Studying products designed by design companies in Pune
- Studying vehicles designed and developed in Pune-Mumbai-Nashik region
- Documentation of success stories of products in craft, bamboo and automobiles
- Study was conducted for the products designed and launched after 2005

G. Limitation

- Funds and availability of time
- Secrecy and confidentiality of companies
- Lack of established companies in bamboo sector
- Availability of literature

H. Hypothesis

H1: A good designed product positively impacts directly as well as indirectly on the society.

H2: Good Designed & Styled vehicles in the same segment are more successful than others.

H3: Adoption of New Design processes in developing new products in Bamboo craft sector has a positive impact on the success of the artisan entrepreneur.

H4: New Product Design Processes are common and can be effectively used for the Automobile and the Bamboo Sector for commercial success.
5.4 Data & Analysis

As part of the research methods for this study, the researcher conducted case studies to find if a good designed product positively impacts the consumers directly and on the society indirectly.

For this, the researcher carried out the exploratory, quantitative, qualitative study of the design process. The study was carried out on the lines of the pioneering research conducted by the UK Design Council. (Eleven Lessons Design Council). Like the researchers of the UK study, this researcher planned to conduct case studies in which a purposive sample of products and their designers of the concerned corporates were involved. This study included the following types of products, designers from corporate companies as well as design consultancies:

- a. Design Companies (Consultancies) who designed Product packaging, Medical equipment, Home appliances, Electronic equipment for different product companies.
- b. Automobile Companies: Passenger Cars, Sports utility vehicle, light commercial vehicles from Mahindra and Mahindra, and Tata Motors, who are among the leading auto makers in Pune-Mumbai region which is the scope of this study.
- c. Craft based organizations / institutions in India
- d. Bamboo based organizations in India

5.4.1 Product Design Processes Case studies

Products designed by different companies using their own version of the Design Process which were successful in the market was selected for study. Success was determined by the market penetration and the brand establishment of the respective company. An introductory questionnaire sent through mail and discussions over phone as well as face-to-face interviews were conducted with the principal designers of the product design companies and senior executives of the product companies. The impact of good design was gauged with a survey conducted with the users of this product. They were asked to rate the product on a scale of 1:10 on looks and user interface – the key to good design. These two parameters were taken as the important aspects to define GOOD product design. The users rated this in comparison with
similar products in the category. User feedback in verbatim were also documented. The companies covered in this study are Tata Elxsi, Lokus Design, Elephant Design, Design Directions, Onio Design, Ticket Design. The data for these cases was collected and analyzed in the following manner:

7. Company Name
8. Brief about the design company - information from interview and literature
9. Person interviewed, date of interview
10. Design process used,
11. Use of the process for designing a product
12. Design Enabler - Product company comments
13. User - consumer feedback about how the product is good design.
   Parameter for good design was taken as Looks (Styling features) and users interface of the product. Users who have used the product were taken as purposive samples for the verbatim feedback.
14. Analysis and conclusion of the case study

The summary of this activity is explained in this chapter as follows

Design company name and product, Design process, product selected for study, Impact of design: feedback from user, product company and the designer

A. Lokus Design: Dabur Vatika shampoo bottle
Impact of Design:

Product Company

Mr Tamal Ghosh, Sr. Category Head-Packaging Development & Innovation at Dabur India Limited elaborated on his experience of this design. The Vatika shampoo was well accepted in the market for many years. While planning for the launch of the new product, we wanted to position our product as a premium brand. We looked at design to be a key differentiator. The design of the bottle – contemporary shape and the innovative cap design proved to impress our buyers. The bottle design stood out on the shelf of shops.

Design Company – Lokus Designs

Response by Siddharth Kabra, Director Lokus Design on how the design of Dabur Vatika Shampoo bottle impacted them:
Dabur Vatika Shampoo bottle design project has helped us to understand the toiletries’ market in general and shampoo products market in particular. This was because of our teams efforts to use the design process meticulously. Due to a very responsive client the development process was interesting and could come out with a unique design of the bottle. The entire duration of the project and the final outcome has helped us to establish ourselves as a better design company. It will also be a building block for getting projects in the future.

Consumers – Users:

Mrs Roopali Salunkhe, housewife, “The shape of the bottle is unique with nice smooth curves. I was attracted to it when I saw it in the shop. I was not using Dabur shampoo before. Wanted to try something new, the design of the bottle was one of the reasons which prompted me to buy the shampoo.

B. Elephant design – DiET Coolers for Symphony

Design process followed at Elephant

The company follows a four-step design process in all its products as follows:

Discover: Understand the context and the ecology of all stake holders
Define: Analyse the insights and prepare a strategic direction to design
Design: Design as per Design strategy based on form concepts, materials, manufacturing and service

Deploy: Detail, prototype and test, refine, prototype and test

The key part of this process is the “Design User Research.” This is an immersive research carried out by design teams.

Impact of Design:

Product Company

Email interview with Mr. Vijay Joshi Sr. V. P. (Operations), Symphony Limited
Impact of design intervention in our product is important because it creates the differentiation with competitor’s product. New design or model may open the new market or customers. ‘Design’ input is directly related to the success of the product as customers attention is drawn by the design of product with pre assume perception. It is also necessary to perform the product to fulfill the perception. Also design inputs are the needs/Expectations of the customers.

Design Company – Elephant Design

Response by Mr Ashish Deshpande on the success of DiET coolers in particular and the impact of design on the Elephant design company
Success of “Design Process” and the final design eventually is the business, functional and emotional acceptance of the product. To gauge the impact multiple responses were utilized in this case
d. User reactions: We got very good and positive response from the buyers of the product – the details of which cannot be shared due to confidentiality clause with our client.

e. Market reaction through sales channels: Over One million units soled and opening of exports. Today the DiET range of products are soled in over 28 countries. We feel that is the biggest impact of the design efforts.

f. This project gave Elephant design wide appreciation in the industry. Our association with Symphony was strengthened further and gave us more business from them.

Consumers – Users:

Mr Sachin Ghatpande, Journalist
Super cool product. Is very handy and portable. Does not occupy much space, looks good even when not in use.

Mrs Kanchan Thorat
It is a moving Air conditioner. Could not imagine a cooler being so sleek and almost noiseless. Very easy to store in off season.

C. Design Directions – Dry Powder Inhaler, Sun Pharma

Impact of the design product and the company
A decision-maker executive of the company, SUN Pharma (name with held on request, for secrecy issues), was interviewed in for understanding how design had impacted the product and the company.
What is your view of the impact of Design Intervention on your range of products?

The product is an excellent blend of technology, science and design. The basic intention of preventing infringement of the concept of drug delivery was achieved. The functional critical requirement of the drug molecule delivery – quality and quantity - was achieved through collaborative development. The other important aspect of any product – user interface and product design – to present the product to the customer has been excellent in this case.

How important is the ‘Design’ inputs for the success of the product?

It was the design which helped deliver the drug in the correct quantity and the desired location. As you can see, it is the most compact and user friendly interface. The design helped the company the product established as a brand against competition. It enabled the company to offer the product cheaper against the competition. Its price is half the competition’s (Glaxco).

D. Onio Design

Impact of Design:

Product Company

Mr Indeevar Govardhanagiri, Head of Operations, AMARON, responded to the questions of this researcher, on impact of the design on the product.

We definitely gained attention and mind space of our channel partners and end customers. My team was interacting closely with Onio Design team at every stage of
the process but in hindsight the interaction should have been more. The product did not get commercial acceptability as expected, although it had all the ingredients for success. We could not iron out the cost and mechanical hitches. There was no issue on the Design of the product. The organizational commitment to market this revolutionary design evaporated with failure to get initial sales.

**Design Company**

Mr Prakash Khanzode, in an interview on 20th October 2012 explained the impact of design with respect to the Inverter project

- Styling of Industrial Utility item has become household necessity needed design up-gradation. This project gave us the opportunity to work on a seemingly unexplored product category. The product company realized the importance of home appliances styling as a necessity of the product category which gave them an edge in this segment with respect to competition
- We were able to provide the much needed portability for a product like an home inverter. The heavy battery handling was minimized and changed from stationary utility product to portable power source.
- For the consumers the ease of usability with respect to periodic flooding (refilling of water) was made as a clean and convenient operation

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**E. Ticket Design, Trackit  Advanced Telematics for Tata Motors**

![Diagram of design process](image-url)
Impact of Design:

Product Company

The researcher interacted with Mr Rahul Shandilya, Manager development ERC (Engineering Research Center) Tata Motors to document his responses about the product.

The Trackit product achieved much more than what it was designed for. The close interaction of the design team with the field marketing and service personnel was the turning point of the product. Many new features got added to the product as a result of the design process deployed.

The features which are common in today’s products was very contemporary at the time of the launch. The truck connectivity with the head office, user-friendly interface for the drivers, tamper proof design of the product were the unique features offered first time in this truck segment. It created a benchmark for such tracking devices for truck fleet owners. Track it is even a recommended product in the Tata world truck program the PRIMA. This is a clear design benchmark to follow for our future developments in this same field.

Design Company

The impact of design on the Trackit device was elaborated in a face to face interview with Mr Bala Mahajan of Ticket Design.

One of the parameter of success of the product for us was the receipt of two prestigious awards – the Appliance Device Design Excellence Award from USA in 2007 and the Business World NID Design Excellence award 2008.

The project gave us good visibility in the international market. The project was a good example of use of technology for India centric product development. The design team got key insights in Indian consumer understanding for such a technically advanced product generally used in developed countries. This gave us a platform to prove our capability of developing an ‘India centric’ product for global companies. The success of the product can be gauged with its increasing demand for the retrofitting market.
Consumers - Users.

Mr Bhausaheb Pawar, Driver Tata Prima
Interesting. Good features. Easy to use for me. Feels high tech.

Mr Jadhav, Truck Fleet owner
Useful to keep track of my trucks. Customers whom I deliver the goods are happy. Reliability increased. Definitely useful. Should be incorporated into my other trucks.

Mr Sunny, Driver
Useful if I get lost or delayed. Simple to operate. Advantageous.

5.4.2 Conclusion of Product Design processes case studies
To study the Design processes used in the industry the researcher felt the need to study various design processes used in the design companies. Methodology adopted for this research was Qualitative. He selected 6 design companies, Tata Elxsi, Lokus Design, Elephant Design, Onio Design, Design Directions and Ticket design operating from Pune for this study. The products studied by this researcher as part of this case study were from the industrial, consumer durables, automobile equipment, medical device, home appliance and FMCG sectors. The aim was to study product design processes deployed in a various different field of the industry.

It was observed that all these companies had their individual Design Processes suited for their respective philosophies. All the design processes were based on the Double Diamond model of Discover, Define, Develop & Deliver.

The use of the design process for developing the product is useful and ensures that all the aspects of the product requirement are taken care off. The design processes of all the companies are focused on satisfying the needs of the user.

A robust design process followed judiciously ensures a good designed product. A good designed product positively impacts the design company, product company and the user. The entire ecosystem revolving around the product gets positively impacted due to good design. The key constituents of the society get directly as well as indirectly impacted as a result of a good designed product. The good designed product is developed and brought into the market with a view of satisfying the needs of the customer. A happy customer who is referred as ‘user’ in this study gets directly impacted positively with a good designed product. His / her needs and wants get satisfied.
The design company and the product company get the indirect benefit of increase in business due to a successful good designed product. Since the company manufacturing and selling the product grows the cycle of the industrial output increases impacting the entire value chain positively, thus positively impacting the society.

This proves the hypothesis

H1 : A good designed product positively impacts directly as well as indirectly on the society.

5.4.3 Automobile case studies

This section dealt with case studies of design processes of in-house designers of the auto makers in the Pune – Mumbai region. The researcher selected two leading companies having their design centers in the area of research – Mahindra & Mahindra – Kandivali, Mumbai and Tata Motors – Pune. These companies constitute major market share (SIAM reports) in number of units manufactured in the Pune-Mumbai region. The Utility vehicles, Passenger and the Light Commercial Vehicles segment were selected for this study.

Vehicles selected for this research

<table>
<thead>
<tr>
<th>Segment</th>
<th>Successful Vehicle : Considered successful on basis of number of units sold than the comparison vehicle in the same segment</th>
<th>Comparison vehicle</th>
</tr>
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<td>1 UV- Utility Vehicle</td>
<td>Mahindra XUV 500</td>
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</tr>
<tr>
<td>2 Light Commercial Vehicle</td>
<td>Tata Ace</td>
<td>Mahindra Maximo</td>
</tr>
<tr>
<td>3 Passenger Car - Sedan</td>
<td>Tata Manza</td>
<td>Mahindra Logan</td>
</tr>
</tbody>
</table>
5.4.3.1 Mahindra XUV 5OO case study

XUV 500 is a Utility Vehicle (UV) by Mahindra & Mahindra launched in September 2011. It was designed and developed at Mahindra's design and vehicle build center in Kandivali in Mumbai, Nashik and Chennai. It is manufactured in Mahindra's Chakan & Nashik plant.

A. Design Audit: Study of product features by this researcher

A detailed study of the product features, which the researcher refers to as a Design Audit was conducted by him. It involved analyzing the good design features as perceived by the researcher. Product images were taken and the features were explained. This was conducted to understand the finer aspects of the product styling, considered as ‘good design’ by the researcher.

XUV 5OO Exterior details

- Head lamp
- Front Grill
- Tail lamp
- Rear Wheel fender arch

XUV 5OO Interior details

- Indicator Dials
- Door Inner
- Instrument console
- Steering wheel
B. Design Process of Mahindra Automotive

Mahindra and Mahindra has the Integrated Design and Manufacturing (IDAM) center in Kandivali, Mumbai which is responsible for the design and styling of all the Mahindra vehicles. It has an experienced and expert team of designers from across the globe.

Design Process used by the design team at Mahindra has following stages

1. CONTEXT

“The team at Mahindra studied the various markets and interacted with customers to understand needs. We studied trends and predicted what the possibilities were for the future. We brainstormed to derive a theme for the product. And then we started sketching. The theme was ‘feeling the power’ which we felt was a perfect fit for our customer profile and the Mahindra DNA.

2. IMAGERY & 3. IDEATION

Evolution of the Product Form:

An example of a beautiful automobile is one that evokes speed when standing still and one that triggers emotions when seen in action. With its powerful build and feline grace, the cheetah was the inspiration of the XUV500. It had evolved from the detailed study of the African wild cat – the Cheetah. The cheetah is the fastest animal on land. It is also exceptional in its agility and balance.

Sketch source: www.mahindraxuv500.com
4. FEASIBILITY
The ideation of using the Cheetah as an inspiration led to various feasibility options worked out by the team in the form of sketches – hand as well as CAD.

5. DETAILING
The feasible solutions are evaluated and finalised to be taken further in the design process. Product detailing was worked out by deploying prototyping methods. A scaled model as well as a full scale clay model was machined to give the final detailing of the vehicle form.

FINAL Product
The muscular wheel arches accentuate the XUV500's impressive, broad stance. The distinctive, cheetah paw-shaped door handles give it the minute details on which the design team worked on. The intimidating jaw-like honeycomb grille emphasizes the fierce, assertive look of the vehicle. The unique projection headlamps with the signature LED parking lights add a touch of class.
C. Impact of Design

Qualitative research

To gauge the impact of design on XUV 500, a vehicle in the same vehicle category was to be compared with. The nearest competitor in the Sports Utility Vehicle segment was the Tata Safari. The comparison was based on the number of units sold of the vehicle to decide the success of the vehicle. Mahindra XUV was considered successful vehicle for this study. The parameters of good design was Looks and Comfort features for buying decision of the consumer. This researcher administered a questionnaire to users of XUV 5OO and the Tata Safari between the period June 2009 – September 2013. The users were asked to rate their preferences on a scale of 1:10 for Looks, Comfort, Noise level, Milage-Performance, Safety & Price. The outcome of the data was averaged to identify the trend.

Comparison vehicles

![Comparison vehicles](image)

The data collected was analysed by T-test. This was done to test the Hypothesis 2: “Good Designed and Styled vehicles in the same segment are more successful than others”
## T-test analysis report for Mahindra XUV 500 and Tata Safari

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### Independent Samples Test

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Hypothesis 2A :
There will be difference between XUV 500 customers and TATA Safari customers in terms of their preference to comfort.

Result: XUV 500 customers prefer comfort of XUV 500 more than TATA Safari customers do.

Hypothesis 2B :
There will be difference between XUV 500 customers and TATA Safari customers in terms of their preference to Looks of the vehicle.

Result: XUV 500 customers prefer looks more than TATA Safari customers do.

In conclusion:
Hypothesis 2:
There will be difference between XUV 500 customers and TATA Safari customers in terms of their preference to Good Design and style of the vehicle

Result: XUV 500 customers prefer Good Design and style of the vehicle more than TATA Safari customers.

C 1 User Feedbacks
Some verbatim user responses from the survey:

Mr Sameer Wagale, Sr Executive in multinational company
I am a proud owner of the vehicle which gives me satisfaction about my status. The unique looks of the vehicle was the first thing which attracted me to the XUV 500. Hats of to the team which developed such a vehicle in India for India.

Mr Prasanna Naik, Businessman
Amazing experience. I am a loyal Mahindra customer, I owned a Mahindra Scorpio for six years. I had pre-booked the XUV immediately at its launch. Sexy styling and dominating road presence is what I like most about the vehicle.

C 2 Product Company
Mr Vijay Nakhara, Head Marketing Mahindra Auto Sector gave his views of the design of the XUV 500
We get many feedbacks about the good looks of the vehicle. Some customers are very specific about their responses, which surprise us. We had a very successful run for a year after the launch. We were pre-booked for 6 months. It captured the imagination of the section of the market which was taken up by the aspirational buyers for an SUV. It helped reinforce the Mahindra brand producing rugged and in addition now a better looking vehicles. It was very encouraging to know that the customers were very happy with the overall experience of the vehicle. The styling was unique and had a very strong road presence. It was appreciated and bought by cross section of customers – doctors, industrialists, corporate executives, politicians, lawyers, real estate operators. That was the biggest certificate of the impact this vehicle had made on the masses.

D. Conclusion of the Mahindra XUV 5OO case study
The above responses from the buyers, users, the design professionals and the marketing executive from Mahindra proves the success of the XUV 5OO was due to the good design of the vehicle compared to its nearest competitor the Tata Safari. The hypothesis “Good Designed & Styled vehicles in the same segment are more successful than others” is proved with the T-test analysis done for the XUV 5OO and Tata Safari.

5.4.3.2 Tata ACE and Tata Manza
Tata Motors also introduced India’s first Sports Utility Vehicle in 1991 and, in 1998, the Tata Indica, India’s first fully indigenous passenger car. In January 2008, Tata Motors unveiled its People’s Car, the Tata Nano. A development, which signifies a first for the global automobile industry, the Nano brings the joy of a car within the reach of thousands of families.
The research conducted by this researcher involves the study of two of Tata Motors successful products in recent years. The Tata ACE – India’s first mini-truck in the Light commercial vehicle segment and Tata MANZA – one of India’s indigenously developed vehicle in the passenger segment.
5.4.3.2A Tata ACE

The Tata ACE was described as testimony of the company’s efforts to identify new categories and develop logistic solutions that will improve the lives of the people. Ravi Kant, Vice Chairman, Tata Motors.

A. Design Audit : Study of product features by this researcher

It was the first time a new segment was created with the launch of the ACE. The features of the interior and exterior were unique in the market. Efforts were taken to give the comfort of a car for the interior space and utilities design. Exterior body styling was given due importance to elivate the esteem value for the user of the vehicle.

Exterior :

- Flat front, clean uncluttered front grill with TATA motors trademark
- Wide windscreen creating feeling of openness – purity.
- Feature line above wheel arc to enable continutiy for passenger version
- Styling feature on the door to brake the monotony and an opportunity to add a distinguising belt line feature for the front door as well as the body panel for passenger version
- Clean clutter-free overall form to depict – purity, simplicity and clean
- Smooth external finish – exquisite look
- Flat faced large commercial vehicle look
- White color for executive look like a CAR
Interior
The new vehicle had the following features that can be seen also in the pictures below:

- Car like interiors – with upholstery, dash board & trims
- Gives a feeling of large space
- Comfortable seats
- Styled dashboard with tray
- Digital clock, radio fitment provision, utility tray
- Clearly visible instrument cluster
- Lockable glove-box for keeping valuable documents

The exterior looks – styling was unique for this segment of vehicles and first time in the market. It gave a feeling of elegance and high status thus improving the social
status of the owner / driver. The single piece front panel with bold head lamps gave a good stance to the vehicle. The contoured profile over the wheel arch which maintained the continuity of the front and the rear made the vehicle looked contemporary.

The interior gave a feeling of private usable space for the occupant. It gave a car-like feeling which for the owner / driver was unique in the type of vehicles he used before. It was first of its kind feeling for him which increased the morale of the driver. Features similar to a car interior are provided for the benefit of the driver.

**B. Design Process used**

**User Survey:**

Girish Wagh, the Head, Small Car Project of the Tata Motors, and his team, spent nearly six months on the field interviewing over 600 customers, drivers, owners, end users, mechanics as well as opinion makers, across the country to understand the area covered by commercial vehicles.

The design team carried out a user survey with the following objectives:

- Assess whether there existed a demand for such a vehicle, (mini-truck).
  
  Theme of the survey was “from the customer, for the customer.”

- Gain consumer insights

The respondents were 4000 drivers of trucks and three-wheelers.

**Product Development Brief:**

On the basis of the survey conducted by the cross functional team, the design team came out with the following development brief:

The stake holders - consumers expected a vehicle that would have these factors:

- High Status
- Feel Good
- ‘Better Marriage Proposals’ for vehicle owner’s family members

The consumers - users wanted the following to be considered in the new design:

  - Low price, Maneuverability, Fuel efficiency, Additional Payload, Comfort
  - Durability
Industrial Design & Styling in NPI (New Product Introduction) process

The researcher collected primary data from Mr Pankaj Jhunja, Head of Studio, TATA Design International, Tata Motors, during an interview in Pune. Design is integrated in the overall NPI process from the Product Strategy Review (DR0) stage of a new program/project initiation. There are sub processes defined with respect to the required inputs and desired outputs which are internal to the TATA Design team. The Design Studio, as the team is called, works in unison with the CFT (Cross Functional Team) formed for the project. They are fully involved in the following NPI stages - Concept and Project Approval (DR1), Concept and Project Approval (DR2).

Tata’s New Product Introduction Process

Broadly the design team works with the following phases – Conceptualisation, Creative, Maturation and Validation

Strength of TATA Design International

We are a team of about 140 professionals with diverse nationalities - India, Japan, Britain, France, and Italy spread across three locations, Pune-India, Turin-Italy & London-UK. The team consists of professionals in the field of Styling, Digital sculptors, CAD designers, Perceived Quality, Prototyping, Clay modelers, Fabric and colour experts. The biggest group sits in the Pimpri facility, near Pune.
Deisgn Philosophy of Tata Motors

- At Tata Motors, we are redefining the way we design. DesignNext, our new design language, shapes our philosophy in engineering vehicles that not only look good but feel good too. For our range of commercial vehicles, we are incorporating key elements of which an excellent combination of sleek, smart styling and enhanced comfort that increases driver productivity.

- All-new, next-generation designs for the Tata Truck range, delivers state-of-the-art, world-class aesthetics

Parameters of the success of ACE

- Ergonomics played a critical role in the success of the design for a product in this category. The user got good ingress-egress room, higher seating, good visibility all around, comfortable interior space.

- White colour of the vehicle gave the user a sense of purity & cleanliness. The vehicle was perceived as a higher class car-like vehicle. The user took more care to keep it tidy and clean.

- This vehicle helped create ‘businessman’ out of common people

- Social status of user increased: In rural India marriage value of a groom went up!

C Impact of Design

Quantitative study

The success of the product was gauged by the number of vehicles produced as per the SIAM report. The nearest competitor in the Light commercial vehicle segment was the Mahindra Maxximo. The parameters of good design was Looks and Comfort features for buying decision of the consumer. This researcher administered a questionnaire to users of Tata ACE and Mahindra Maxximo from June 2010 – September 2013

Tata ACE

Mahindra Maxximo
The data collected was analysed by T-test. This was done to test the Hypothesis 2: “Good Designed and Styled vehicles in the same segment are more successful than others.”

### Group Statistics

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### Independent Samples Test

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Hypothesis 2A:
There will be difference between Tata ACE customers and Mahindra Maxximo users in terms of their preference to comfort.

Result: Tata ACE users prefer comfort of Tata ACE more than Mahindra Maxximo users.

Hypothesis 2B:
There will be difference between Tata ACE users and Mahindra Maxximo users in terms of their preference to Looks of the vehicle.

Result: Tata ACE customers prefer looks more than Mahindra Maxximo users.

In conclusion:

Hypothesis 2:
There will be difference between Tata ACE customers and Mahindra Maxximo users in terms of their preference to Good Design and style of the vehicle.

Result: Tata ACE users prefer Good Design and style of the vehicle more than Mahindra Maxximo users.

C 1 User Feedbacks

Some verbatim user responses from the survey were as follows:

Mr Ganesh Naik
I am in the transport business for the last 15-16 years. I have driven many load carriers till date. Tata ACE is my best vehicle so far. Great in looks and comfort. It gives me pleasure and pride to park the vehicle infront of my house. It has made my life easier and helped me prosper.

Mr Raju Bansode
Feel like driving a car. My family was so excited when we bought this vehicle. We drove to Jejuri to take darshan on the first day. My family takes good care of this vehicle unlike my earlier transport vehicle.

C 2 Product Company

Mr Ashith Shetty, Product Manager Tata ACE, Pune explained about the success of the product
We sold about 10 lac ACE vehicles between 2005 to 2012 and the refresh version having sold 50,000 vehicles since 2012. The original ACE is also running even today. It is one of the longest running and highest selling product in this segment in India till date. We also export Tata ACEs to the neighboring countries.

Tata ACE has such tremendous response in the market that even by paying a premium of about Rs 30,000 over the Maxximo we have 72% market share in this segment of vehicles in India. Customer definitely prefers our vehicle due to its features which are unique for the segment. Looks and car like features for the cabin being the unique selling points of our vehicle in addition to performance pay load and the TATA brand, in that order of importance.

Tata ACE was the first vehicle in the goods carrier segment to use white and ivory color for its vehicle. It helped us to create a premium look to the product which helped the perceived value of the vehicle for our customer. It also has an advantage of matching the colour in case of modifications or repair of the vehicle. Customers take extra care of the vehicle due to this which adds up to our brand value. (Shetty A., 2014)

D Conclusion of the Tata ACE case study
The above responses from the buyers, users, the design professionals and the marketing executive from Tata Motors prove the success of the Tata ACE was due to the good design of the vehicle compared to its nearest competitor the Mahindra Maxximo. The hypothesis “ Good Designed & Styled vehicles in the same segment are more successful than others” is proved with the T-test analysis done for the Tata ACE and Mahindra Maxximo.

5.4.3.2B Tata MANZA
Tata Manza is the contemporary Indian sedan from Tata Motors. It is built on the Indigo platform. It was launched on 14th October 2009. Manza is available in eight variants, four each in petrol and diesel.
A. Design Audit : Study of product features

A detailed study of the product features, which the researcher refers to as a Design Audit was conducted by him. It involved analyzing the good design features as perceived by the researcher. Product images were taken and the features were explained. This was conducted to understand the finer aspects of the product styling, considered as ‘good design’ by the researcher.

Exterior Design & Styling

The overall look of the Tata Manza is elegant and sleek. It gives a contemporary look to the vehicle and is seen inline with the styling trends of that period. This is made possible due to good work on the detailing of the vehicle sections. It is explained in the following images of the vehicle features
**Interior Design**

Manza interiors has a distinct fresh look and innovative features to add more comfort to the riding experience. It has various unique details like the storage spaces, seats, driver consoles to name a few. These features are elaborated in the following images with their explanations.

As shown in the images above, the vehicle has modern and contemporary styling. The exterior design of the vehicle has strong curves to give it a stylish and sleek look. The vehicle has an overall sophisticated look for today's corporate look car. Interiors have a sleek and classy look. Due to the use of light grey interior colour, the overall interior gives a feeling of sufficient space. The seats and the accessories are ergonomically designed for a good vehicle experience.

**B Design Process Used**

Tata Manza is designed and developed at the Tata design studio and development center in Pune. The design process explained earlier as part of the Tata ACE study remains the same as used for the design of the Tata Manza so is not repeated again in this section.

**C Impact of Design**

**Quantitative study**

To gauge the impact of design on Tata Manza, a vehicle in the same vehicle category was to be compared with. The nearest competitor in the entry level sedan was
Mahindra Logan. The comparison was based on the number of units sold of the vehicle to decide the success of the vehicle. The Tata Manza was considered successful vehicle for this study. The parameters of good design were Looks and Comfort features for buying decision of the consumer. This researcher administered a questionnaire to users of both these vehicles in the period June 2011 – September 2013.

Tata Manza was compared against Mahindra Logan, in the compact sedan passenger car segment for this research.

Tata Manza                                                    Mahindra Logan

The data collected was analysed by T-test. This was done to test the Hypothesis 2 :
“Good Designed and Styled vehicles in the same segment are more successful than others”

T-test analysis report for Tata Manza and Mahindra Logan

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Hypothesis 2A:
There will be difference between Tata Manza customers and Mahindra Logan users in terms of their preference to comfort.

Result: Tata Manza users prefer comfort of Tata Manza more than Mahindra Logan users.

Hypothesis 2B:
There will be difference between Tata Manza users and Mahindra Logan users in terms of their preference to Looks of the vehicle.

Result: Tata Manza customers prefer looks more than Mahindra Logan users.

In conclusion:
Hypothesis 2:
There will be difference between Tata Manza customers and Mahindra Logan users in terms of their preference to Good Design and style of the vehicle.
**Result**: Tata Manza users prefer Good Design and style of the vehicle more than Mahindra Logan users.

**C 1 User Feedbacks**

**Some verbatim user responses from the survey**

**Mr Yashodhan Bhosale, Businessman in an MSME**

I liked the car for its features and gave me the best value for money. It has good sleek features which looks modern. The interior space is also good with nice fit and finish. I liked the metallic maroon colour which was not available in this range of cars.

**Dr. Nitin Jadhav, Physician**

The car has very nice looks and good interior space. I like the comfortable riding experience on rough roads which is my requirement.

**C 2 Product Company**

**Mr Aayaz Attar, Area Sales Manager, Passenger cars, Tata Motors, Pune region**

elaborated his experiences with the Tata Manza

We had a winning product after a very hard market penetration of the Indigo CS product line for seven years. The nice built of the Tata Manza was helpful to position the car in the entry level segment of the compact sedan car. With increasing models of sedan cars entering the market, Tata Manza proved to be good alternative and the best value for money car.

**D Conclusion of the Manza case study**

The above responses from the buyers, users, the design professionals and the marketing executive from Tata Motors proves the success of the Tata Manza was due to the good design of the vehicle compared to its nearest competitor the Mahindra Logan. The hypothesis “Good Designed & Styled vehicles in the same segment are more successful than others” is proved with the T-test analysis done for the Tata Manza and Mahindra Logan.
Impact on the down stream value chain of Auto OEMs

The researcher due to his association with the auto component industry for last ten years has got various insights of the companies associated with the manufacturing of the vehicles for various OEMs (Original Equipment Manufacturer) which he terms as the ‘down stream value chain’. The first link with the OEMs termed as a ‘Tier 1’ company. In the auto industry today the success or failure of a product manufactured by an OEM is largely dependent on associates or suppliers or vendors providing components and sub-assemblies. Due to the success of the Mahindra XUV 5OO, Tata ACE, and Tata Manza a strong supplier base was established and have grown. The ACMA reports have shown an year on year growth of this industry to the tune of 20-30% in the last 5-6 years.

A Sourcing Strategy:

Vehicle components are outsourced to the tune of 80%. It gives almost around 20% cost reduction to Auto OEMs. This helps to build a thriving Auto component industry. Success of any vehicle impacts the growth of the these Tier 1 suppliers. The Auto OEMs save huge money in producing & stocking of finished components as well as the infrastructure required for running the operations. The responsibility of manufacturing and supplying quality components just in time for the assembly at the OEM plant lies with the Tier 1 suppliers.

The researcher interacted with Mr Gagandeep Singh, CEO and Mr Prashant Shrawak, GM Business development Bright Autoplast Pune to understand the dynamics of this autocomponent business. Bright Autoplast is a major supplier of plastic molded parts to various OEMs. They supply components like inner trim panels, driver console to XUV 5OO and the door inner panels to Tata Manza. With the increase in sales of the vehicles, Bright Autoplast business increases and helps them to grow. (Singh G., 2014)

Mr Sajal Ghosh, Head, Business Development and R&D, Tata Composites part of the TACO (Tata Auto Component division) Pune explained the how the success of Tata ACE helped their company to grow. His company has developed and sale the biggest body panel required for the Tata ACE called the front panel. This single component is 6 kgs in weight and made of Sheet Molding compound. The company sales for
financial year 2013 was around Rs 100 Crores. The ACE front panel business share in this sales is about 25%. The sale of this component has seen an year on year growth of 20% since 2007. It has helped the company to establish as a major composites manufacturer in India.

Tata ACE front panel made of SMC composites manufactured by Tata Composites

The above study shows how the entire value stream of any successful product impacts various stake holders. It helps everybody associated with the successful product to grow. This in a way impacts the society at large, the people involved and the allied industries systematically shows progress.

5.4.4 Conclusion of Automobile sector

This section dealt with case studies of design processes of in-house designers of the auto makers in the Pune – Mumbai region. The researcher selected two leading companies having their design centers in the area of research – Mahindra & Mahindra – Kandivali, Mumbai and Tata Motors – Pune. These companies constitute major market share in number of units manufactured in the Pune-Mumbai region. The Utility vehicles, Passenger and the Light Commercial Vehicles segment were selected for this study. Methodology adopted for this study was Quantitative and Qualitative.

The basis for success of the vehicle was the number of units produced for a certain vehicle based upon the data available from SIAM. With this background the following successful vehicles were selected for study and compared with a competition vehicle from the same segment.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Successful Vehicle : Considered successful on basis of number of units sold than the comparison vehicle in the same segment</th>
<th>Comparison vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SUV</td>
<td>Mahindra XUV 500</td>
<td>Tata Sumo Grande</td>
</tr>
<tr>
<td>2 Light Commercial Vehicle</td>
<td>Tata Ace</td>
<td>Mahindra Maximo</td>
</tr>
<tr>
<td>3 Passenger Car - Sedan</td>
<td>Tata Manza</td>
<td>Mahindra Logan</td>
</tr>
</tbody>
</table>
The study of these successful vehicles involved the following steps:
Vehicle Segment understanding, Product details, design audit, design process used for the development, interaction with senior design team to understand the evolution of the product, factors affecting buying decision, user survey through a questionnaire, T-test on the data collected, verbatim user feedbacks, interaction with the senior marketing executives of the company to know the impact on the market and the effect of the success of the product on the associated component manufacturing sector.

The analysis of the data collected from the above study led to the following conclusions

1. Design process for development of a vehicle is very critical and important parameter to launch a successful product.
2. The core of any design process for having success is ‘User Centricity’. To satisfy your user – the customer is the driving factor to achieve commercial success.
3. Every successful vehicle company has a defined and very robust design process.
4. Good looks and user comfort are equally important factors for the buying decision of a vehicle for the customer in addition to the performance and safety of the vehicle.
5. The efforts of the marketing and sales team becomes easier if it has a better designed product to sale.
6. The brand value of the company increases with a satisfied user which is possible when the company takes efforts to fulfill the emotional needs and the experience of using the product. This is achieved by a better designed product in addition to the performance of the vehicle.
7. As per the T-test analysis, one of the major factors affecting the success of the Mahindra XUV 5OO was due to the good design of the vehicle compared to its nearest competitor the Tata Safari.
8. As per the T-test analysis, one of the major factors affecting the success of the Tata ACE was due to the good design of the vehicle compared to its nearest competitor the Mahindra Maxximo.
9. As per the T-test analysis, one of the major factors affecting the success of the Tata Manza was due to the good design of the vehicle compared to its nearest competitor the Mahindra Logan.

10. The entire value stream of any successful vehicle impacts various stakeholders. It helps everybody associated with the successful product to grow. The Tier 1 component manufacturing industry grows with the success of a vehicle model. This in a way impacts the society at large, the people involved and the allied industries systematically shows progress.

This proves the hypothesis

**H2 : Good Designed & Styled vehicles in the same segment are more successful than others.**
5.4.5 Design for Craft

Many groups are active in India to create value through ‘Craft.’ This has helped establish prominent brands in the ‘Craft’ industry. Organizations like FABINDIA have created benchmarks of developing successful brands and taking the corporate route to success. Many successful brands have been established today centered around craft-based products, ‘design’ being the key for setting the standards for its success.

6.4.5.1 Commercial ventures using design

A part of this research was on impact of design, particularly craft-based enterprises. This researcher was interested in understanding utility and effect of design particularly on bamboo craft. To get idea about this, he collected data from designers, and design activist-academics listed below:

Prof. A G Rao, Prof. M.P. Ranjan Ms. Rebecca Reuben, Mr Sunil Joshi, Mr Sanjiv Karpe, Mr Uttam Bannerji, Mr. Ashish Deshpande, Siddharth Kabara, Mr Satish Gokhale, Mr. Prakash Khazode, Mr. Bala Mahajan, Ms. Rashmi Ranade, Ms. Neelam Chibber and Ms. Gita Ram, Mr. Rajendra Sapkal, Mr. Sandeep Sangaru, Mr. Sanjeev Karpe, Mr. Sunil Joshi, Mr. Uttam Banerjee, Mr. Abhay Karde

Primary data from them were collected from them through face-to-face interviews and through email. Secondary data was collected from websites and brochures of the following enterprises: INTACH, Fabindia, Mother earth, Industree, and bamboo-related production centres Bamboo Masters, Lavasa Bamboo Center, Sangaru Designs, Rhizome, Konbac, Vedha India, Bamboooed. Main focus of the study was how design helped the product designers and their enterprises helped them grow.

These individuals and the organizations were selected for this study on the basis of their reputations in the field of crafts, in academics, and their availability to the researcher in the design field of Pune and Mumbai, which were the main centers of this research. The researcher wanted to understand how design interventions had led to evolution of these enterprises into successful ‘brands.’
1. INTACH Pune

COPPER range of products along with the craftsman

2. FabIndia

3. Mother Earth & Industree
5.4.5.2 Bamboo Craft

Traditional Bamboo craft is being practiced primarily in the North Eastern states, some parts of Maharashtra, and Kerala in India. The country is the second largest grower of bamboo after China. India is had a rich source of bamboo material, and the Indian artisans had a practice to produce stunning utility articles. These items are meant for household uses. In modern days, various forms of decorative items are also made out of bamboo.

Baskets of different kinds have significant place. The ordinary work baskets of day labours are made of bamboo. There is a great demand of decorated travel basket in modern days. It forms an important feature in the indigenous economy of a rural India.

The decorative value of Bamboo craft items is huge. The utilitarian aspect of these bamboo articles serves as an added attraction. The range of bamboo products is wide from boxes, chairs, teapots, baskets, hand bags, etc. Carving work on bamboo is also seen in some cases.

The fancy bamboo products are largely destined for city markets. The centers of production of traditional and fancy products are also different. While the traditional artisans are found in the villages, the production unit for fancy bamboo items revolves around the cities. The craft of Bamboo is full time employment of thousands of people in India.

A judicious mix of design thought and understanding of these properties listed below helps in the success of the designed products:

- Composite nature of bamboo, the distribution of fibres, its density and orientation, linear arrangement in the internodes and cross-linking at the nodes and in branching.
- Physical strengths and weaknesses, tensile strength, rigidity, flexibility and resilience of culm and a variety of splits such as half-rounds, quarters, radial and tangential.
• Surface quality of culm and splits, impermeability and porosity of particular parts and their response to aging, to smoking and mechanical and chemical finishes.

• Morphology of culm parts and use by virtue of shape and structure such as roundness of culm, hollowness of culm, and shape advantage of branches, nodes, and diaphragm.

5.4.5.3 Product innovation for different needs:
One can also notice the need for the craft to be more consumer based. The output can be more when there are faster methods of splitting of bamboos and design of such products that can be produced in large quantities with consistent quality. Unfortunately, in recent times, the youth are opting for other professions, which would provide them greater financial security. Daily wages received as a rickshaw puller or a wage laborer is more than what they would get in a day producing bamboo baskets. As a result more and more craftsmen are turning away from this craft.

Existing traditional products can be categorized into four categories:
- Loom-based products
- Interlaced products
- Constructed products and
- Fine Handicrafts

Institutes like the Bamboo and Cane Development Institute (BCDI) have been set up to promote this age old craft. It provides training to students interested in taking up this craft as a profession and admits those with a prior basic knowledge in this material. It is a Central Government Training Centre and offers training to interested students from all over the country.

5.4.5.4 Bamboo craft based organizations
The researcher studied the organizations working in the field of bamboo craft which used design to their advantage. The way they design their products and its impact on their organizations success was evaluated.
1. National Institute of Design
The NID systems model was taken as the basis for understanding the design process utility and impact on design of products

Various projects in bamboo craft are run through NID based on this system design model was studied
5.4.6 Conclusion of Bamboo craft sector

The craft based industries have benefited with the use of design in its operations. The use of good design practices in the craft sector has helped develop contemporary designs using traditional skills. The importance of design has been acknowledged in the revival of many craft form in India. Dedicated efforts have been done by commercial organizations to develop products with modern products with contemporary designs.

Organizations like INTACH has worked with traditional copper (Tambat) ware benefiting the revival of the dying craft. With the modern products getting designed by trained designers, INTACH was able to popularize these traditional crafted products globally. Fabindia is one of India’s very successful brands built on the unique combination of co-operative societies of artisans and modern designs using traditional crafts. Industree works on the principle of empowering the rural artisans using design as the focus of livelihood development.

The projects worked on by NID (National Institute of Design) students and faculty utilizes the design thinking and design processes to develop unique products for the modern day urban user. In these efforts, design opens up the possibility of getting instant market for the bamboo products. The unique approach of involving the rural artisan, working with him in their own local setting and deploying modern design process helps create products which have success in the urban market.

Commercial organizations like VEDHA, KONBAC, Bamboo Masters, Bambooed, Sangaru Designs, and Rhizomes have used ‘design’ to their advantage to develop and sell contemporary products in the commercial market. The success of these organizations have shown how design helps in creating commercial success out of products made out of bamboo.

This proves the Hypothesis:

H3: Adoption of New Design processes in developing new products in Bamboo craft sector has a positive impact on the success of the artisan entrepreneur.
5.4.7 Action Research

Several attributes separate action research from other types of research. Primary is its focus on turning the people involved into researchers, too - people learn best, and more willingly apply what they have learned, when they do it themselves. It also has a social dimension - the research takes place in real-world situations, and aims to solve real problems. Finally, the initiating researcher, unlike in other disciplines, makes no attempt to remain objective, but openly acknowledges their bias to the other participants. (O’Brien, 2001).

This researcher has evolved a design process called ICAN Design, for designing of products. He believed that this process will suite any kind of design – automotive, industrial product, craft – just about anything.

5.4.7.1 I-CAN Design Process

Many practicing designers, academicians & experts have come up with different Design processes for development of new products. Design Thinking or Design Process has been an integral part of many product successes. The experience of handling different design projects, analyzing different types of design process and this researcher’s understanding led to the evolution of a design process, which he calls ‘I-CAN Design’.

I-CAN Design, a design process was formulated for evolving any product design. Inspiration, Conceptualization, Adaption and Nurture are the four pillars of this Design Process. Each phase is subdivided into activities which helps in coming out with the optimized solution for the given product problem. I-CAN Design suites product development for any industry or field. This universal design thinking approach optimizes the development time and the intended solution.

Design Thinking or Design Process is a multi-disciplinary activity. Nobody can work in isolation. It has to be a team work. Every member of the team is equally important. Every individual in the design process has to be well equipped, passionate about his/her work and should have the confidence within. The philosophy of ‘I-CAN Design’ is that the activity starts with ‘Individual’ who is expert in a particular field. The input is pooled in for the common goal and at the end that ‘Individual’ is responsible for the delivery of the product aspect which the individual is expert of.
Thus a group along with an individual’s identity works for the bigger and common goal of problem solving.

**I-CAN Design process map**

![I-CAN Design Process Diagram](image)

*Figure : : I-CAN Design Process*

The present study included two projects of action research as follows:

3. ICAN design process for small tractor
4. ICAN design process for bamboo product

**6.4.7.2 Action Research for redesign of the small Orchard Tractor**

This researcher has evolved the I-CAN design process as explained in Chapter 5. He had demonstrated from the qualitative data that this process achieved a good success in respect of products designed earlier by him as part of his professional career. It has been demonstrated that the corporate leaders, product designers, marketing personnel and other stakeholders consider design as an important ingredient of the product success. The present study attempted to find if the *I-CAN Design Process*, can lead to similar results in the tractor industry. Tractors are considered an off road segment in the automotive industry and is tracked as a separate entity. This researcher got an opportunity of working for this industry as part of his professional commitment and
was in line with this research. He was encouraged to treat this experience as an Action Research as part of the present study.

**Objective of the Action Research**

The researcher and his team were assigned to evolve the re-design of its existing Orchard tractor body that would compete the contemporary leaders in the market, such as Japanese Kobota. The ultimate objective was to increase sale of the Orchard tractor in the Indian market.

**Research Questions**

For the team, the research questions were:

9. Will *ICAN design process* be successful in the design & styling of a small tractor?
10. Will this process be profitable to the product company?
11. Will it help the product company as a brand developing contemporary products?
12. Will it help the design & manufacturing company of the styling components get to establish itself as a design led organization and increase the value addition for its customers?

**Plan of the study**

The plan of the Action Research was as follows:

- The author participated in this activity along with his team of Industrial designers, process engineers, material experts and production engineers – as part of the Design, styling and manufacturing team of the tractor body.
- A team of engineers and product planners from the product company – Mahindra Gujrat Tractors were also on board as part of the cross functional team for the project.
- The activities were carried out at the Mahindra Composites facility in Pune and Mahindra Gujarat Tractors facility in Baroda.
- Market study of the products sold in the market.
Hereafter the following steps were carried out:

- User research of farmers and users of the product
- Conceptualization of the tractor body styling
- Product design ideation
- Product detailing, manufacturing process design, assembly design
- Surface treatment and graphics

The researcher and his team followed the ICAN process in the following manner:

**INSPIRATION**

1. *Study of the existing competition products was conducted*
2. *Study of Mahindra’s existing Orchard product:*
   A detailed study of the Orchard tractor was undertaken.
   
   ![Orchard Tractor Image]

   *The* data on the team’s observations about the existing Orchard tractor was documented

   The user profile was studied jointly by the customer service staff and the design team. The aspirations and wishes of the user were captured by administering a questionnaire to the users of a similar product and to those who aspired to use or own such a product. For secrecy reasons the details cannot be shared here.

**CONCEPTUALIZE**

The conceptualize phase deals with creating product concepts based on the design brief and the related research carried out so far. A major part for the concept was that the product should give a sense of Strength, Pride, and Muscle Power.
ADOPT

Unique to this tractor body concept is a waist line feature throughout the body vanishing at both ends to give it a contemporary look.

The Front grill is the symbol of masculinity with the basic shape of the male torso – horizontal grill representing abs. Along with the signature Mahindra DNA.
NURTURE
The Nurture phase dealt with the product detailing, components assemblies, hardware accessories selection, development of the mould, fixtures for better fit and finish of the product.

*Final styled and designed Orchard Tractor*

**Impact of Design**

**Product Company : Mahindra Gujrat Tractor**

**Chief Operating Officer, Mr. O. STyagi**

Great styling. Beats any tractor styling in the market today. Even better than the Kobota, which was a Japanese brand recently launched in India. (That was an internal benchmark for the design team). The young farmer will definitely feel that he is riding a modern tractor. The team is enthusiastic and happy at the outcome. Everybody is convinced about the utility of a better designed product using the correct steps of development. They have been aligned to the fact that styling and design is of equal importance in the development than just making a good engine and working of the tractor. The marketing team is upbeat about the prospects of the product. The product definitely has a bright future.
D. **Dealer** (name withheld on request)

The tractor is launched only in north India, as a strategy of the company. The email feedback received from a dealer from Haryana echoes the sentiments of the ultimate user as well as the dealer himself. It was as follows:

“The farmer is enthusiastic about the new product from the Mahindra Gujarat Tractors. It is becoming easier to convince the buyer about the product compared to the earlier situation. This tractor has become the prestige point for the young orchard farmer who looks at it to be a modern day product.”

**Conclusion of the action research of ICAN process used for Orchard Tractor:**

The above responses show the positive impact of a better designed product. It has benefited the entire value chain associated with the product. It is only its initial market establishing phase of last one year. The sale is picking up and is definitely poised to be a successful product in the years to come.

The sale and profitability are the ultimate indicators of success of the product after redesigning and the re-launch. In case of the Orchard Tractor, the Mahindra management executives were euphoric about the redesign process because the sale and the market response. That also spoke highly about the success of the ICAN process, even though the sale and profitability figures were not disclosed for confidentiality and secrecy clauses the company.

However, the response from the top executives of the Mahindra Gujarat Tractors Ltd., its dealer and statistics of Society of Indian Automobile Manufacturers (SIAM), indicate that the ICAN design process was successful in the design and styling of the company’s tractor. These responses offer answers to the research questions as follows:

4. The **ICAN** process was profitable to the product company.

5. It helped the product company as a brand developing contemporary products

6. It helped the design and manufacturing company of the styling components get to establish itself as a design led organization increase the value addition for its customers.
5.4.7.3 Action Research for design of bamboo product

The present study attempted to find if the *I-CAN Design Process*, can lead to similar results in a bamboo craft industry in the unorganized sector. This cottage industry has negligible capital investment and low working capital and unskilled labor and is without marketing and sales personnel in its employment.

Following were the members of the team who participated in the action research:

5. Nachiket Thakur: This researcher who is an industrial product designer
6. Rajendra Sakpal: A core team of four semi-skilled and unskilled artisans were included as members of the action research.
7. Abhay Karde: Marketing consultant Karwak

Learning from the success of high technology and high worth products, the low tech and high skill-based industries like craft is destined to benefit the most. However, there are no studies to decide if this presumption is true. The present case study was an attempt to find how the principles of design processes can be exploited for the benefit of an entrepreneur in the bamboo craft cottage unit, its workers, marketing and sales personnel, and ultimately the consumer.

**Questions for the Action Research**

He therefore set the following research questions for the study:

9. Will *ICAN design process* be successful in a small cottage unit of bamboo products?
10. Will this process be profitable to the entrepreneur and will it improve the skills of the artisans in making bamboo products?
11. Will it improve efficiency of the artisans?
12. Will it increase earnings of the artisans and the profitability of the entrepreneur?

He used the *I-CAN Design Process* to prove that design is essential for the success of products. He got involved in designing and developing products in bamboo using this process.
The study was planned as follows:

- The author participated in this activity along with people from the bamboo community under and an NGO, BURUD (Bamboo Utilities, Research and Development) at Hadapsar, on the Eastern outskirts of Pune city from 2004.
- An independent brand was created as a business enterprise named ‘Bamboo Masters’ which was spearheaded by the entrepreneur Mr. Rajendra Sakpal.
- The activities were carried out under the team of ‘Bamboo Masters’ at every stage of the development and marketing of the products.

These stages were as follows:

- Conceptualization of a bamboo product
- Market study for need assessment, Profile of the potential consumer
- Product design ideation
- Production design, survey of the potential customers

The process for development of a bamboo product was initiated at ‘Bamboo Masters’

**Product: Terrabambu Pendant**

The Bamboo Masters had already developed and sold Bamboo products without deploying the ICAN process. These were well-received but the production, productivity and quality had limitations. It was also difficult to scale up the activities for replication and higher production volumes. Several product variants were developed during this ICAN process.

The **Terrabamboo pendant**, an Indoor Lamp, is a contemporary product designed using hand-woven bamboo matt, hand crafted terra cotta (baked clay) and bamboo beads.
I-CAN Design Process adopted

This time the Bamboo Masters team decided to adopt I-CAN process under the guidance and involvement of this author. It was carried out as per the following steps:

A. Inspiration

Traditional crafted product in bamboo

h. Market Demand :

- There was a constant quest of the urban consumers to have something different and new, using traditional artistry with eco-friendly material. Different product applications in demand.
- Outlets like Fab India are instrumental in fuelling the growth of this market.
- Competition: competition to such products made by machines and other mass-manufacturing methods

i. User Need :

User profile of the buyer was identified by the team

j. Understanding the Craft - method of manufacturing

k. Product Integrator :

The establishment or group of facilitators who would be instrumental in integrating the product was identified.

l. Marketing and Sales team was put in place
m. Design Brief:
With these user expectations, a design brief was created for an indoor LAMP as follows:

6. Product for the urban household
7. Modular construction
8. Easy to install and maintain
9. Unique / different from competition
10. Should have terracotta (baked clay) and woven bamboo as a material of construction

n. Technology:
Manufacturing process considered was the traditional potter’s wheel for the clay component and bamboo sliver (thin strips of bamboo to make matt) making and weaving for the bamboo component.

B. Conceptualize
Ideate:
Multiple concepts were evolved for the product. Concepts for the method of construction of the main body of the lamp were created. The interdependence of the baked clay component, the diameter of the bulb and the end caps were ideated with different construction. Various shapes, sizes were explored as follows.

Concept sketches of the product under design
C. Adaptation
Quick prototypes were created using the available material, namely the paper. Various permutations and combinations were tried out to confirm the thought process.

Prototypes of concepts made to evaluate the development

D. Nurture
The crucial stage of the development process is Nurturing the ‘design’ which gets created to achieve the task at hand. The design was refined with all the considerations and various modular versions were created.

Final Product components

Launch in the market
The product was introduced in the market in 2009, through Karwak, the marketing consultancy, in Pune

Product Economics of Terrabamboo pendant
The economics of one of the orders of 1500 numbers for corporate gifting for the Diwali of that year worked out as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Production:</td>
<td>Rs. 210 per unit</td>
</tr>
<tr>
<td>Selling Price :</td>
<td>Rs. 400 per unit</td>
</tr>
<tr>
<td>Profit</td>
<td>Rs. 190 per unit</td>
</tr>
</tbody>
</table>
The present action research project, thus, demonstrated that the ICAN design process can be successful in a small cottage unit of bamboo products. This design process was profitable to the entrepreneur. He and his four semi-skilled craftspeople categorically stated that the process helped them improve their productivity besides improving their design skills, creativity, and efficiency. As a result, earnings of the artisans improved. The marketing consultant and sales staff said
the design process improved the product in terms of aesthetics and utility. This attracted the potential customers and increased the sale without loss of time.

The entrepreneur and his team of artisans continued to work on the lines they learned in the ICAN Design Process after the action research project was over and the researcher was not required to be associated with them. They thereafter produced the following products successfully proving that design and design process can profitably develop even a cottage bamboo industry.

5.4.8 Conclusion of Bamboo Case Study

The I-CAN design process proved to be successful in a small cottage unit. The success could be measured in terms of profitability for the entrepreneur, Mr. Rajendra Sakpal, who was in the business for over two decades. For him it was the first systematic approach to design, develop and produce a bamboo product. The artisans were able to earn better and could improve their skills. That they were happy with the approach was proved by their continued participation during the production process of subsequent products,

The confidence level of the sales and marketing team to take in such challenging orders increased. Corporate gifting requirements at KARWAK saw an upward trend.

The I-CAN Design process proves to be applicable to low tech high human skill products similar to the high technology – machine manufactured products.

The design became the key differentiator to establish a social entrepreneurship model.
5.4.9 Conclusion of Action Research

The action research on design of the *TerraBambu* pendant, a bamboo product shows how the ‘design process’ – ICAN Design is effectively used to develop a successful product. This product has helped the artisan – entrepreneur to succeed and has positively impacted him. He is able to demonstrate how he can effectively manage a group of artisans for livelihood development for him as well as for the fellow artisans through a good designed product.

The outcome of this research helps to prove the hypothesis

**H3**: Adoption of New Design processes in developing new products in Bamboo craft sector has a positive impact on the success of the artisan entrepreneur.

The case studies of Orchard Tractor and the *TerraBambu* pendant shows how the ICAN design process is effectively used to create the products. It also demonstrates in a sequential manner how the different stages in the design process help the development of a product.

It is concluded that the ICAN design process can be successfully used for the design of the Orchard Tractor which is an example of an automobile as well as the *TerraBambu* pendant a bamboo product. This shows that the design processes for developing any product is similar and can be used to create successful products.

This proves the hypothesis

**H4**: New Product Design Processes are common and can be effectively used for the Automobile and the Bamboo Sector for commercial success.
5.5 Conclusion of the Research

The output of the above study on design processes used in the industry gave the researcher the confidence and proof that the new product design processes have a positive impact on automobile and bamboo sector. To substantiate the research a study of product designs from the consumer goods sector was also conducted along with automobile and bamboo craft sectors. The positive impact of good designed products was seen in all the cases studied. The impact on the user, manufacturer and the entire value chain of the product was clearly visible and was proved.

The research proved the following hypothesis

H1 : A good designed product positively impacts directly as well as indirectly on the society.

H2 : Good Designed & Styled vehicles in the same segment are more successful than others.

H3 : Adoption of New Design processes in developing new products in Bamboo craft sector has a positive impact on the success of the artisan entrepreneur.

H4 : New Product Design Processes are common and can be effectively used for the Automobile and the Bamboo Sector for commercial success.

The analysis of the design processes used by the three sectors studied in this research confirmed that the design processes are similar and can be adopted to design any products. The researcher concludes the research with the following analysis about commonality of design processes for any product to be designed and the importance of the ‘user’ in the design activity.
‘User’ centric
A good designed product is considered to be commercially successful if it satisfies the user needs. The users of the product have multiple profiles. All these users become the focal point of the universal design processes of Discover, Define, Develop and Deliver, which has to ultimately help to produce a successful product of any sector.