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GERMAN AUTOMOTIVE INDUSTRY AND FRUGAL INNOVATIONS IN INDIA

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PREFACE

This document highlights the results of an approximately 6 months long thesis at TU Delft, Netherlands. The focus of this thesis is to explore frugal innovations for the German automotive industry in India. This thesis has certain interesting insights for those interested in recent trends in the automotive market, technology analysts, those with an interest in frugal innovations. The end result of this project presents interesting insights for the German automotive industry by opening up the potential to explore a new emerging market in India. Additionally, the findings of the research presents insights for independent researchers in the areas of frugal innovation, by integrating frugal innovations with strategic management at the product level.

This document does not include quantitative estimates like Market analysis or financial projections. However, despite the qualitative nature of the research, the argumentative style of the report may have certain fresh insights for the readers. Additionally, this research introduces a new method named the correlative and evolutionary SWOT analysis. Readers interested in this new method are requested to proceed to chapter 5, which has a detailed explanation of the method with the analysis and inferences. For those readers, specialising in frugal innovations, chapter 2 has certain fresh insights from strategic management that might be of interest. Additionally, readers well versed with the Indian automotive market may skip chapter 3. For all other readers, I would highly recommend going through the contents of the report to gain new insights from this work. Have a happy reading!

ACKNOWLEDGEMENTS

This thesis project on the German automotive industry was one of my dream projects. Despite the challenges associated, I decided to dive into the unknown and in this process I was grateful to receive support from helping hands. I would like to use this opportunity to thank the people who were always there to do the needful.

Firstly, I would like to thank my graduation committee: first supervisor and chair, Prof. Dr. Robert Verburg and second supervisor Dr. Bert Enserink, for their timely feedback and guidance. I would like to make a special mention about Dr. Robert Verburg for his guidance throughout the period. I am indebted to Prof. Dr. ir. Bert Enserink for his support in terms of quality, in this timeframe.I would like to extend my sincere appreciation for Prof. Dr. Otto Kroesen for his continuous support through the journey. Many thanks to all the interviewees who volunteered to participate, their insights have been of great help to structure this thesis effectively.

From a personal perspective, I would like to thank my family and friends for their support and motivation especially amidst turbulent times.

Best regards and a special thanks to all,

Bharath Kumar Sridharan

EXECUTIVE SUMMARY

The German automotive industry is world renowned for its monopoly in the luxury car market. With a prominent global presence, they are well known for their technological superiority (design, engines etc.). However recent trends in the automotive industry have put their monopoly in jeopardy. Firstly, Tesla's success in the market with e-vehicles presents a threat of substitution. The German automotive industry prides in its build and petrol and diesel powered engines. However , with developed countries moving towards sustainability, e-vehicles have gradually started pushing the German cars out of the market. Secondly, given the effects of the Covid-19 pandemic, luxury cars aren't a preferred investment. However the new concept of 'frugal innovations' still provides optimistic hopes during these troubled times. This involves targeting the growing middle class population in developing countries by developing cars that are just good enough to meet basic customer needs. India is a country with a promising buying potential. Well known automakers like Ford, Suzuki, Hyundai and Tata, have successfully innovated to serve this market. However for the German automotive industry, which has always targeted affluent customers, frugal innovations would be challenging internally and externally as it calls for a different mindset. Despite the increasing importance of frugal innovations, academic sources do not provide a country and industry specific strategy for a high-tech firm to switch to frugal innovations. Given this controversy, this research attempts to explore the scope for frugal innovations for the German automotive industry in India by answering the research question: *What are the opportunities and threats concerning frugal innovations for the German automotive industry in India?*

Given the knowledge gap resulting from the lack of available sources, the research starts with the construction of a theoretical framework that would enable a firm to assess its current position in terms of frugal innovations. This framework represents a detailed overview of the internal and external factors including organisation, value chain, competitors, social, political and legal factors to name a few. This framework also forms the backbone of further research work to be embedded in. Additionally, it could also be used by a product based firm that wishes to transition to frugal innovations. The generic nature of this framework has been obtained from both strategic management and frugal innovation literature.

The research makes use of the complementarity approach to identify the internal and external opportunities and threats available. The first approach has been a thorough study of the literature from different disciplines that would have the necessary answers. Secondly, the Fiat Palio is an example of a controversial frugal innovation in India by the Italian automaker Fiat. The story of Fiat in India revolves around its very high receptivity during its inception and its eventual downfall in a few years. Having enjoyed the status of an elite automaker, a second case study of Fiat Palio in India has been performed to identify the factors that could be of influence. Thirdly, the research features insights from around 8 academic and industry experts specialized in this area. The combined insights from the three approaches were embedded in the context of the evaluated literature.

To assess a firm's current position in the market environment and make business decisions, the SWOT analysis is one of the most widely used tools. As a consequence, the combined findings were reported in the form of a SWOT analysis. However, the SWOT has certain disadvantages in taking business decisions, in a highly competitive environment. As a consequence, a new and a modified approach to SWOT known as the evolutionary and correlative SWOT has been considered as the tool for analysis to

identify the opportunities and threats. Using the evolutionary and correlative SWOT analysis qualitatively, the opportunities and threats have been identified into four categories: Real opportunities, where the internal strengths and external opportunities are in perfect synergy; Space of lost opportunities, wherein the organization has a vast potential to review itself internally to tap external opportunities; space of possible defense, wherein, the firms could use its internal strengths to combat threats; and Real threats, wherein the internal weaknesses and external threats are in perfect synergy.

The main sources of opportunities for the German automotive industry is its strong technical skill set, presence of well established suppliers, superior brand name that could give them an edge in comparison to competitors. However, with competitors like Suzuki, Tata and Hyundai skilled in local market adaptation, mass production, meeting low cost pressures including inexpensive after sales service, pose a major competitive threat. The success of the German automotive industry lies in reviewing the firms and making internal changes and exploiting opportunities to combat this. Expanding production and service networks by forming alliances and partnerships provide a ray of hope to push further in this market. A total of 15 opportunities and threats collectively were identified that if dealt with effectively could result in the success of frugal innovations for the German automotive industry.

The main contribution of this research includes the identification of a new market opportunity for the German automotive industry, with the various factors that could lead to its success and failure. Additionally, this research contributes to the academic literature by highlighting a few key limitations of the frugal innovations literature like their lack of focus on sales and service as one of the most important parameters in determining a firm's success with frugal innovations. Secondly, the research builds on the work of Vlados (2019), by using evolutionary and correlative analysis as a tool to make strategic decisions. Lastly, given the lack of technological expertise and living conditions in India, this move from the German automotive industry to frugal innovations would be a major contributor to the country's development. The research makes use of both a managerial and societal approach to identifying the factors that make it a good fit for the MOT curriculum.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 German automotive industry

The automotive industry is one of the most highly globalized and competitive industries in the world. It is involved with the manufacturing of cars, trucks, vans, and sports utility vehicles, buses, and motorcycles, in most cases powered by gasoline or diesel engines. A report from Wagner (2020) estimates that as of 2017, the automotive industry is a $5.35 trillion industry and by 2030 it is likely to grow to $9 trillion. Germany is popularly known for its automotive industry. German car companies like Volkswagen, BMW, Mercedes Benz (also known as the Big 3), and Porsche, Audi, hold a worldwide monopoly in the premium car market. In addition to their superior fossil fuel-powered Internal combustion (IC engine), these cars are known for their speed, comfort, and sturdiness. German cars are much superior in terms of safety and the placement of airbags to their foreign counterparts (Hartano, 2016). However, in the global marketplace players from Japan such as Toyota and Honda; America's General Motors and Ford, have their unique value propositions which have made the global car market highly competitive.

Heavily reliant on fossil fuel, there has been a growing trend in the automotive industry to switch to electric vehicles. With raising awareness of sustainability in the developed countries, new automotive giants like Tesla specializing in electric vehicles have posed a threat of substitution. For example, Norway announced the banning of gasoline and diesel-powered vehicles by 2025; France and Britain by 2040 (Oktav, 2018). A report from the Economist (2020) estimates that electric car sales would increase from 2.5 million units in 2020 to 3.4 million units in 2021. With German cars solely relying on the technological leadership of their IC engines, their long-held monopoly is under threat. Switching over to E- vehicles would demand 1018 newer forged parts for three major system components including engine, drivetrain, and vehicle counterparts, resulting in 83,000 employee jobs being eliminated (Schwabe, 2020). An article in Forbes highlights that initial attempt by Audi and Mercedes Benz in e-vehicles have failed to compete in the market with Tesla, as e-vehicles would call for a new way of production and marketing (Morris, 2020). Additionally, the Chinese automaker Geely (owner of Volvo and Lotus) has announced switching over to e-vehicles competing directly with Tesla. They sold over 1.32 million units of e-vehicles in 2020, further increasing the competition in the e-vehicle market (BBC, 2021). For the German automotive industry, it would also alter relationships with prominent suppliers including Bosch, Continental, etc. Given the competitiveness and uncertainty, most auto manufacturers are on the lookout for new markets and the most cost-effective strategies to maintain their positions.

However, speaking of Germany explicitly, the automotive industry has an economic significance. In 2016, the German automotive industry was responsible for one-fifth of the total industry sales in Germany, with an annual turnover of 405 billion euros (ISEAM, 2021). Therefore, the lookout for alternative strategies is undoubtedly a matter of national importance for the German automotive industry. In addition, a research report by Hofstätter, Krawina, Mühlreiter, Pöhler & Tschies (2020) indicates a 100 billion euro decline in the German automotive industry because of the Covid-19 pandemic. The result of these events would be to deploy effective strategies to counter the issue at hand.

With the advent of IT and globalization, car manufacturers are on the lookout for the most cost-effective means of production and penetrate the global market. Emerging economies have undoubtedly proved to be a lucrative market for the car industry. In addition to the availability of inexpensive labor and raw materials, it also presents a massive customer base, given the growing middle class in these regions (Prahalad &

Hammond, 2002). Therefore, automotive industries have altered their business models to design and produce cars, to meet the local requirements. From a strategic management perspective, Kim and Mouborgne (2005) suggest that in this era of cutthroat competition, identifying a "blue ocean" that is untapped market space, is an effective way for firms to position their innovative products. In an attempt to explore new markets, Western firms are turning their attention from 'high-tech innovation' to 'good enough innovations' known as "*frugal innovations"* in emerging markets. The fundamental characteristics of these innovations are bare minimum functions and low costs with minimal usage of resources (Zeschky, Widenmayer & Gassmann, 2011). Now, 65% of the world's population (around 4 billion people) has an income less than $2000 per year (Prahalad & Hammond, 2002). For instance, India has a population of 1.25 billion, approximately one out of every five persons are poor, thereby creating a market potential for 270 million people (Ananthram & Chan, 2019). Global automakers have made multiple attempts to tap this market space. Tata's Nano, Hyundai's Eon, and Fiat's Palio are all examples of frugal innovations explicitly designed for India and the emerging countries. Given the effects of the covid-19 pandemic wherein the tendency to buy premium and luxury products has been on a decline, tapping frugal markets in India presents a huge potential for the German automotive industry to retain its monopoly. Fig.1.2 shows the market from 2016-2027 for different types of cars in India. Therefore, frugal innovations in emerging markets could be a lucrative option rather than experiment with e-vehicles.

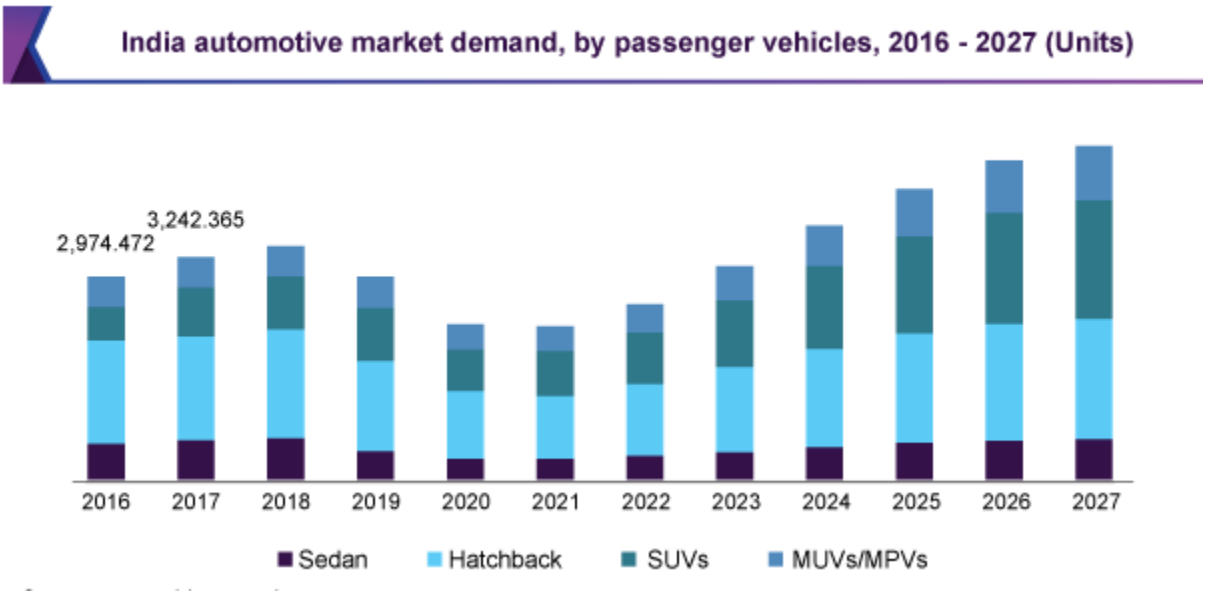

Fig. 1.1 Market growth for cars in India (Grandreviewresearch, 2019)

Despite a vast market potential, frugal innovations for the German automotive industry pose a set of constraints. At the organizational level frugal innovations call for the need to transition from a premium segment to a lower segment market. Since German firms traditionally operate with high technology, low volume mindset, it calls for a reorientation of the firm at the organizational level to tap frugal markets. Additionally, the various departments in the firm like R&D and production aren't used to operating with a frugal innovation mindset (Zeschky et al., 2011). In essence, frugal innovations would call for a different method, in which the firm performs its activities. Almost 70 % of India's market has a preference for fuel-efficient and cheap to own cars. Given the presence of congested city roads and narrow village roads, most customers prefer a small car that is easy to maneuver (The Economic Times, 2020). For example, Korean automaker Hyundai and Japanese automaker Suzuki have successfully altered their business design to fit the Indian market requirements. With an overwhelming market share of more than 50% for the two to put together, their monopoly so far has remained unchallenged. German automakers embodying features like

speed, safety and comfort are typically not the best choices for a frugal market. However Japanese automakers' intense focus on lifetime and longevity stands a better chance at frugal innovations. The success of Suzuki in India is a testament to this claim.

However, the Italian automaker Fiat made an aggressive move in India in 2001, with its new car 'Palio', a frugal car designed to target developing countries. Launched at the end of September 2001, it made history by selling 1100 cars in two days and 33000 cars in one year (Businesswireindia, 2002). Despite the overwhelming success, Gohil (2020) highlights that Fiat failed in India due to multiple business reasons. However, the initial success of Fiat (one of the most prominent automakers in Europe and the world) and the reasons that led to its failure, presents learning opportunities for its German counterparts to target the Indian frugal market.

To put it in a nutshell, the German automotive industry has enjoyed a monopoly in the luxury segment to date. However recent trends have put them under enormous pressure to alter their strategies to stay in the market. Frugal markets in India seem to be a good solution, however with certain internal and external challenges. This calls for a deeper look in this area to investigate what could be the result if they step into Indian frugal markets.

1.2 Research Objective

The purpose of this thesis would be to conduct exploratory research to identify the scope for frugal innovations in India for the German automotive industry. It can be inferred that increasing pressures on the German automotive industry due to new players in the global like Tesla and Europe's transition to electric vehicles shortly has posed a threat of substitution, forcing it to think of new strategies. In addition, the covid-19 pandemic has resulted in the decrease of customers in the luxury segment. Despite the theoretical advantage, some practical constraints, however, do exist. This project aims at developing a theoretical framework for the German automotive industry in India, to penetrate the Indian frugal market. Therefore, the following research question would be answered:

What are the opportunities and threats concerning frugal innovations for the German automotive industry in India?

Numerous scholars have worked on the current state of the art concerning the German automotive industry, trends, and challenges. In addition, there is a wide array of research as far as India-Germany business models are concerned, with case studies and examples on how various German industries strategically position themselves in the Indian market. Research on frugal innovations in India presents a multitude of opportunities and threats concerning innovations from foreign players in India. Speaking explicitly about the car industry, scholars have worked on how foreign players like Hyundai, and Suzuki have been successful in penetrating Indian frugal markets. Integrating the various sources would undoubtedly present a sound literature framework of the various factors that could play an instrumental role as far as frugal innovations for the German automotive industry are concerned in India. This leads to a sub-research question:

> **What factors can be derived from existing literature for the German automotive industry to innovate frugally in India?**

As highlighted earlier Fiat (an Italian automaker) which was highly regarded as a premium auto manufacturer in India, was successful in deploying a frugal innovation named "Palio" explicitly tailored

for the emerging markets. In India, the initial success story of the Fiat Palio and its eventual downfall has paved the way for numerous research opportunities. Fiat being a prominent European automaker, which once had a monopoly in the European market, undoubtedly presents numerous factors that could be of interest to its German counterparts. If Fiat as a European-oriented automaker could innovate and alter its business model to penetrate frugal markets in India, it also means that the German automotive industry is capable enough of doing the same thing. This leads to a sub research question:

What factors can be derived from the case of Fiat Palio (a frugal innovation) in India?

Academic and industry experts have been on the lookout for the best possible strategies for industries to flourish in today's market. Given their vast experience in terms of research and real-world experiences, their expertise undoubtedly could play an instrumental role in determining the factors that affect business models for the German automotive industry to operate in Indian frugal markets. This leads to another sub-research question:

What factors concerning frugal innovations for the German automotive industry in India can be derived from experts?

The study aims to take insights from literature, the case study of Fiat Palio and business in emerging economies, interactions with experts to construct an elaborate evolutionary and correlative SWOT analysis for the German automotive industry with India as the target market. The study would assume that if the German automotive industry is considering frugal innovations in India, how should it realign its strategy. The intent is to integrate the business, societal and institutional aspects concerning frugal innovations in India. The final deliverable of the study would be a detailed analysis with recommendations, that is to how they can use their strengths and opportunities to overcome the threats and weaknesses, to thrive in Indian frugal markets.

1.3 Research framework

A problem can always be looked at from various perspectives. In this situation, since not much research is available to find answers to the research question, it would be necessary to combine insights from multiple perspectives to arrive at a solution. In research terms, this is known as 'complementarity' (Greene Caracelli & Graham, 1989). Fig. 1.3 highlights the entire research methodology. In this method, multiple sources of data are used to evaluate overlapping phenomena while also considering the differences. This in turn gives an enriched and elaborate understanding of the phenomenon. The main advantage of using this method is that it enhances the interpretability, meaningfulness, and validity of qualitative data by capitalizing on method strengths as well as eliminating biases that may result only if a single method is used. In the context of this thesis, the complementarity method resolves one of the major issues with triangulation. Triangulation of methods focuses on the convergence of data points from different methods or sources (Schoonenboom & Johnson, 2017). Since no existing single source has all the necessary data for the analysis, a combination of insights from three different methods would be an essential part of this research. Therefore, for this research complementarity is preferred over triangulation.

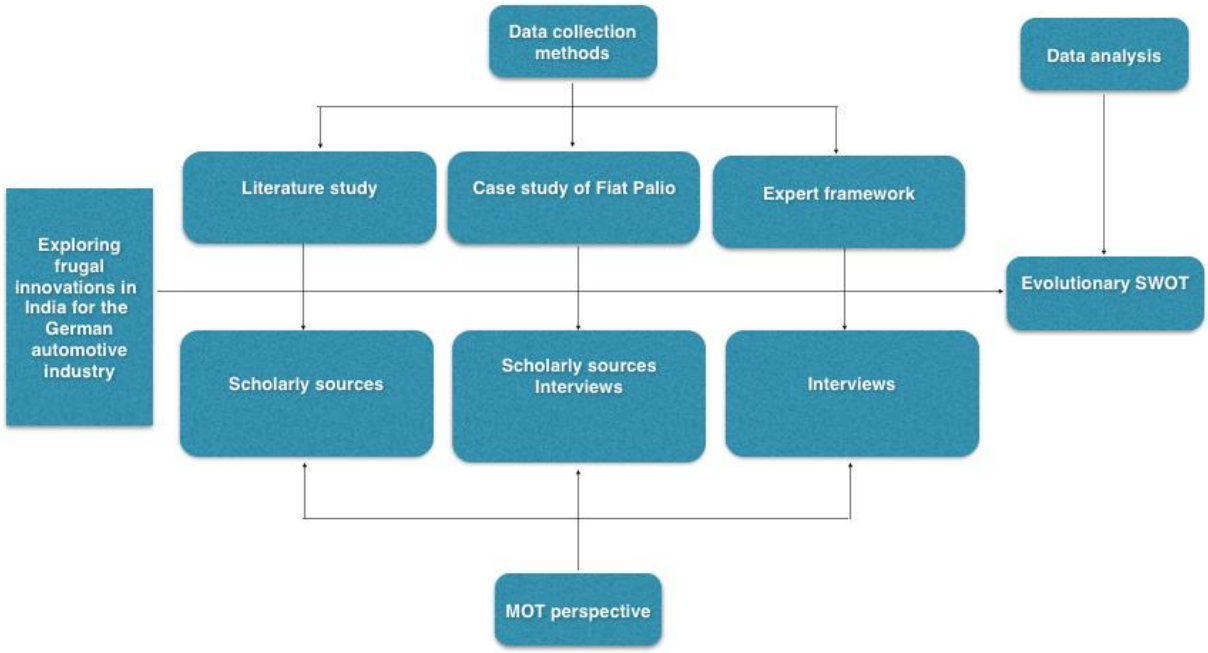

Fig. 1.2 Research methodology

1.3.1 Data collection methods

The research would involve the use of complementarity method to analyze qualitative data from the three sources. Empirical review is done in three phases as highlighted in the fig. 1.3. The following are the various stages in the method:

Phase 1: Literature study:

The first phase of the complementarity method would involve a literature study to identify the factors that are of interest for the German automotive industry to enter into the Indian frugal market. Since this is a new concept, scholarly sources do not explicitly provide answers to the questions. As a consequence, the study would involve understanding the issue from multiple scholarly schools of thought. To answer the research question both internal and external factors are of great importance. The following are the available sources of literature that could provide the necessary answers:

Phase 2: Secondary case study on Fiat Palio

One of the most interesting observations about Fiat was that it was once known as an elite brand. However, in the 1990s Fiat decided to enter the emerging country markets. Its first experiment with India was the Fiat Palio which initially was very well received but failed in a couple of years. The case of Fiat Palio presents immense learnings (in terms of opportunities and threats) for any European elite automaker. The second phase of the data collection, therefore, would be a secondary case study of Fiat Palio in India. There is a vast amount of scholarly literature that deals with the case of Fiat Palio in India. In addition, this phase would also present a potential to showcase insights from annual reports and a scholarly interview.

Phase 3: Expert framework

Academic and industry experts, in general, are renowned for their knowledge in terms of practical experience. As a consequence, the next and final phase of data collection would be to interview academic experts on the German automotive industry and frugal innovations, as well as industry experts from German automotive companies such as Mercedes Benz, Volkswagen, Audi, and their suppliers like Bosch. These interviews would be semi-structured qualitative interviews and exploratory.

1.3.2 Data analysis

One of the most widely used business methods to identify opportunities and threats, to make business decisions is the SWOT (Strengths, Weaknesses, opportunities, threats) analysis. Strengths represent the positive aspects within the boundaries of the firm (resources, assets, personnel, capabilities, etc.) while weaknesses represent the negative aspects within the boundaries of the firms. On the other hand, opportunities refer to the presence of favorable external factors that the firm could exploit to its advantage, and the threats represent the unfavorable external factors that could negatively impact the firm's decisions (Guerel & Tat, 2017). To get a holistic picture of the German automotive industry's situation, each phase in the data collection method would end with a SWOT analysis. Then using the complementarity method, the SWOTs from three different perspectives would be combined to give a holistic representation.

However, the SWOT analysis has been criticized on various grounds by scholars (Vlados, 2019). In the context of this research, one major limitation of the SWOT analysis is that it does not work well in a highly competitive market such as the Indian automotive market. The major reason for that is rooted in the fact that SWOT treats strengths, weaknesses, opportunities, and threats as absolute entities without a comparative assessment with the competitors (Vlados, 2019). This makes decisions made from the SWOT comparatively weaker. To resolve this limitation in the analysis phase, the evolutionary and correlative SWOT method has been used. The major advantage of using this method is that it highlights the elements of the SWOT in comparative terms (eg. comparative strengths, means strengths of a firm in comparison to competitors). The final deliverable of this thesis would be the identification of opportunities and threats while being sensitive to the conditions in the external market.

1.3.3 Limitations and challenges of research framework

Firstly, the complementarity process is notoriously time-consuming. Unlike triangulation, which is based on convergence, the results obtained from the complementarity method could be never-ending. Fig. 1.4 (a) highlights the sequential data collection process (Schoonenboom & Johnson, 2017). A fundamental disadvantage being that data points are too many and could not be accomplished in a 25-week thesis. Therefore, to make the most out of the given time frame a parallel complementarity method was adopted, as highlighted in fig. 1.4(b) (Schoonenboom & Johnson, 2017). The major limitation that could be overcome by doing so is to simultaneously process the three frameworks which would ensure that the most diverse set of scientifically valid data points could be gathered in the least possible time frame.

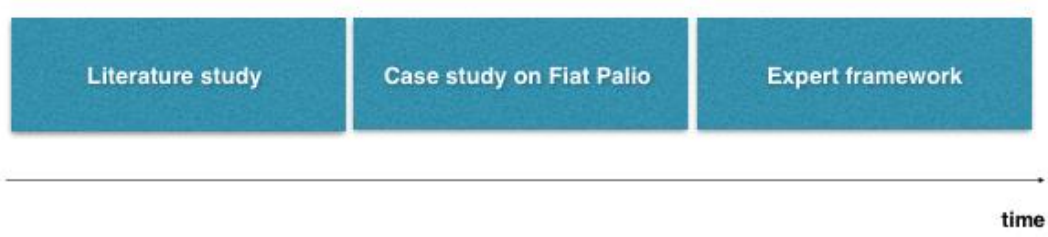

Fig. 1.3 (a) Sequential complementarity (Schoonenboom & Johnson, 2017)

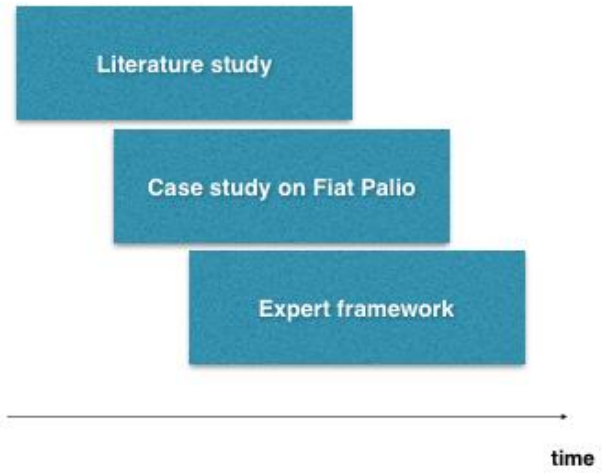

Fig. 1.3 (b) Parallel complementarity (Schoonenboom & Johnson, 2017)

Secondly, one disadvantage with complementarity is the inclusion of data even if it does not converge with the data from other methods. This poses a major challenge, as far as the scientific validity of the research is concerned. To resolve this limitation, during the data collection, only scientifically valid resources have been considered. One of the two major sources in the three phases of data collection is from scientifically valid scholarly sources. The second major source of data collection is interviews. The interview panel has been carefully chosen and priority was assigned to experts who have sufficient research and industry experience respectively, in the context of this research. In addition to the interviews, equal weightage has been assigned in the selection of experts. This thesis represents a diverse set of experts' perspectives, each of them specializing in one aspect of the area relevant to answer the research question. Therefore, the complementarity method has been applied while being sensitive to the scientific validity of the data.

Thirdly, in the analysis phase, the correlative and SWOT analysis would be used. The correlative and SWOT method only highlights the comparative parameters and often ignores other strengths, weaknesses, opportunities, and threats for its analysis. However, this research would demand integration of all the various perspectives available to make decisions, meaning that even minute details could not be ignored in the initial steps. To resolve this limitation, the correlative and evolutionary SWOT analysis have been performed in the final phase after complementarity, instead of performing it after each phase. The gist of doing so is to first construct an elaborate SWOT, integrate the perspectives, and then identify the opportunities and threats.

1.4 Research scope and boundaries

Given the exploratory and qualitative nature of the research, the research would not feature quantitative estimates like financial or market analysis. The purpose of the research is to answer the research question based on theories and concepts. Secondly, the German automotive industry is in a state of competition amongst itself. However, for this research the competitions between the German automotive firms have not been considered.

1.5 Structure

This thesis is structured into a total of 6 chapters. The first chapter (as could be inferred), introduces the problem statement and the research methods, resolving some of its limitations. The second chapter is a detailed literature review that would highlight the knowledge gap and introduce the variables of influence for this research. The third chapter gives a brief background about the German automotive industry in India, The Indian automotive market, and the case of Fiat Palio in India. The fourth chapter would describe the methodology in detail, with the findings. The fifth chapter deals with the analysis of data using the correlative and evolutionary SWOT analysis, after applying the complementarity method. This chapter would answer the main research question. The sixth chapter would be the conclusions, recommendations, and significance of the thesis.

2 LITERATURE REVIEW

This chapter deals with the construction of the framework that would, in turn, be handy in finding answers to the research framework. The research question can be split into three keywords: Opportunities, threats, and frugal innovations. This highlights the need to integrate academic sources from two different disciplines: strategic management and frugal innovations. The next few sections provide a detailed construction of the framework from these academic insights.

2.1 Frugal innovations

Globalization has made the marketplace extremely competitive and fierce. In this context, emerging economies like India and China present a huge market potential with a growing middle-class population with disposable incomes (Bhatti, Khilji & Basu, 2012). In addition, Prahalad & Hammond (2002) argue that 65% of the world's population has an income of less than $2000. As highlighted in Fig. 2.1 western technological firms are on the lookout for serving the topmost pyramid of the market (Income > $ 20,000). The bottom of the pyramid markets (roughly 4 billion people worldwide) provides a vast potential for western firms and can give them a competitive advantage in the 21st century. This new trend to capture this budding market has generated a vast interest in a field termed as '*frugal innovations*.

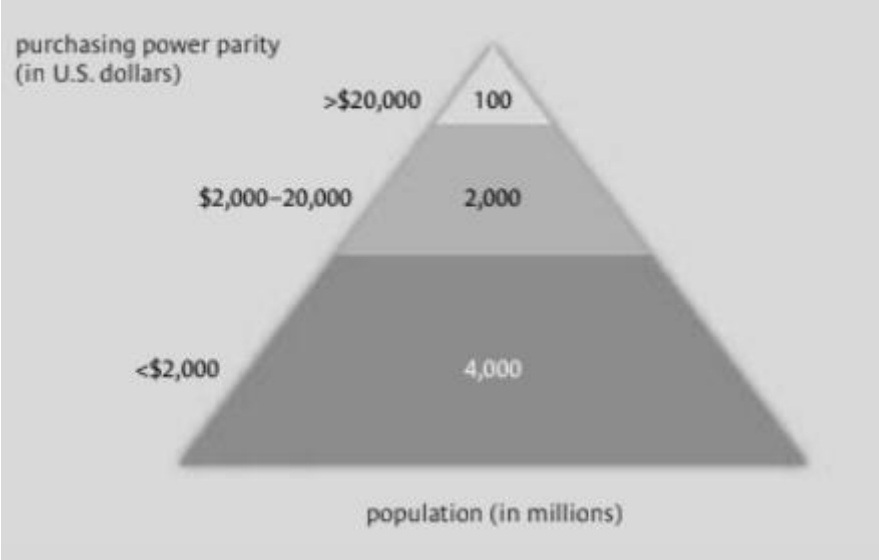

Fig. 2.1 World economic pyramid (Prahalad & Hammond, 2002)

2.1.1 What is frugal innovation?

The simplest definition of frugal innovations is characterized by low costs and minimum features that are just sufficient to meet requirements. However, the actual definition of frugal innovations runs much deeper and is highly debated amongst scholars. Hossain, Simula & Halme (2016), define frugal innovations as affordable, sustainable, usable, and developed under resource scarcity for low-income markets. Santos, Boroni & Junior (2019), however, elaborate further that such innovations could be classified as cost innovations, product innovations, and frugal innovations. product's overall application (reducing complexity), then it is termed as 'frugal innovations. It is referred to as 'cost innovations' when a product provides the same functionality as the core product. However, frugality in the manufacturing or design

process makes it less expensive and affordable to low-income customers. They could also be referred to as 'good enough innovations' when the core product is simplified to meet local needs along with process improvisations. It is referred to as a 'frugal innovation', when a new product for a specific local market need is created, along with simplifications in the design and manufacturing process. Brem & Wolfram (2014), however, provided much detailed insights on the basic definition of frugal innovations from different perspectives. Table 2.1 highlights the various approaches and ways of defining frugal innovations.

S. no	Types	Characteristics
1	Jugaad innovations	(Indian slang version) Typically focuses on product improvisations targeting low costs, creativity in a short span of time.
2	Frugal innovations	Management oriented term, focusing on development, product and production management for Bottom of the pyramid markets
3	Gandhian innovations	Adaption of technologically superior products and tailoring it to the needs of local people (localisation)
4	Catalytic innovations	Creating new market structures after a breakdown of existing social and economic market structures
5	Grassroots innovations	Local civilians innovate based on social requirements by connecting with technical networks
6	Indigenous innovations	Highlight's technology transfer from developed to developing and emerging economies
7	Reverse innovations	Highlight's technology transfer by innovating locally and then transferring it to the developed countries

Table 2.1 Types of frugal innovations (Brem & Wolfram, 2014)

Despite the ambiguity in the definitions, frugal innovations in real-life typically embody certain characteristics (Winkler, Ulz, Knobler & Lercher, 2019; Zeschky et al., 2011).

1. **Low costs:** Typically, technologically superior products are associated with high costs. However, since frugal products are targeted to attract lower-income customers, they are priced lower than their counterparts. This could be in the form of cost savings resulting from simplifying design or production processes.

2. **Basic functionality and features:** Technologically savvy products typically embody the most advanced features. However frugal products are manufactured with the intent of having the minimum basic features that could enable a customer to meet ends. For instance, a Mercedes Benz car features the best possible driving experience, speed, and durability with the best-in-class digital inbuilt features. However, an average middle-class customer would just be content with a car that enables him to take his family on a drive (like a low-price Volkswagen car).

3. **The optimal level of performance:** High technology products are manufactured with the intent of the best possible customer experience in all aspects of the product. However frugal innovations feature the minimal requirements a middle customer would ideally expect. For instance, the Apple

iPhone is known for its superior performance, however, an average middle-income person might be content with just an average performing phone with calls and the internet.

Fig. 2.2 clearly showcases the difference between a technologically superior innovation and frugal innovations.

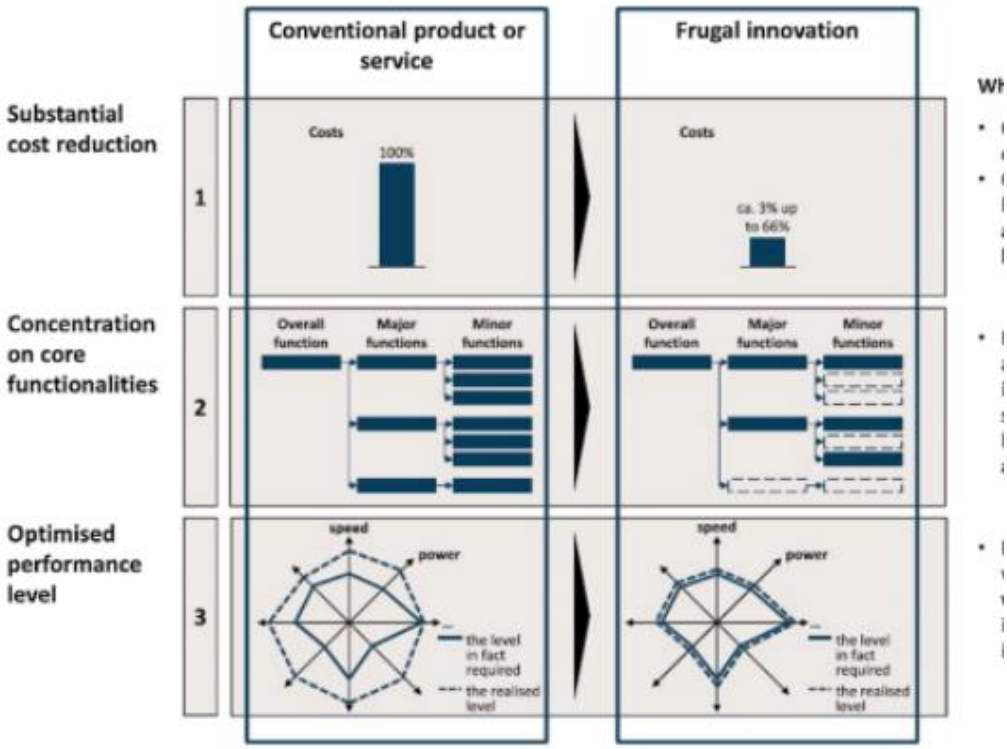

Fig. 2.2 Frugal innovation characteristics (Weyrauch & Herstatt, 2016).

Additionally, in a highly globalized market, the need for frugal innovations is triggered due to the presence of low-cost competitors in emerging markets (Zeschky et al., 2011). For example, GE developed a low-cost ultrasound machine for emerging markets out of fear from low-cost competitors in these markets. Recognizing the importance of frugal innovations, many world-renowned organizations known for their cutting-edge technological marvels, are now considering frugal innovations. For e.g., Tata's Nano, (a frugal car priced $2200 for the Indian market), Philips and Siemens have developed frugal products. However, from a firm perspective, what makes frugal innovations a challenge is something that needs a deeper understanding.

2.2 Frugal innovations and firm strategy

Although frugal innovations are easy to define, an important parameter that is to be addressed is what does it mean or what does it take for a firm to innovate frugally. In other words, if frugal innovations are really promising as mentioned, why isn't every firm innovating frugally?
Broadly speaking, Zeschky et al. (2011), highlights that frugal innovations present two major challenges for western firms:

A. Internal: Firm and strategy level

1. **The business model challenges:** In emerging countries, the major focus for western firms has been to target affluent customers (top of the pyramid) and subsequently earn high margins. However, for frugal innovations, they would have to reorganize their business models for a low profit and high-volume market, for middle-income customers (Anantharam & Chan, 2019; Rao, 2013).

2. **Localization:** To tap local markets, western firms need to incorporate local talent from these emerging countries and design their structures conducive for frugal innovations (Brem & Wolfram, 2014; Rao, 2013; Zeschky et al., 2011). The major reason for this is to understand local needs and wants in every sphere of product development.

B. External: Market level

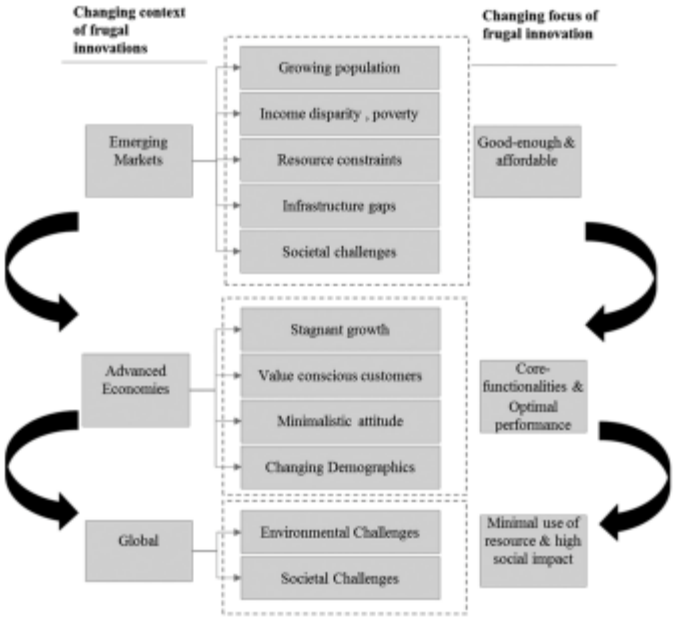

Fig. 2.3 Challenges with frugal innovations

Although these are applicable in a broad sense, frugal innovations will require a significant change in the following areas if we look at them deeply. Altering a firm's business model and localizing would mean that the firm must be sensitive to both the internal and the external environment (in strategic management terms). Additionally, strategic management in general advocates a relationship between a firm's internal practices and the external environment (Barney, 1991; Chiesa and Frattini, 2008). A successful strategy is when a firm can create maximum utility from the internal as well as external environment (Bracker, 1980). This naturally goes on to say that a vast number of internal and external factors play a role in influencing a firm's decision to innovate frugally. Therefore, the first step would be to define the variables that are of importance and how they impact frugal innovations. An additional advantage of this analysis would be to identify if the practices within a firm would support frugal innovations or not.

2.2.1 Internal factors

The traditional resource-based view on firms advocates the importance of a firm's internal practices and resources as key to sustained long-term 'competitive advantage' in competitive markets (Barney, 1991; Bracker, 1980). Competitive advantage is defined as a firm's ability to create superior value in a competitive environment. The most important parameter firstly is the need for a strategy, which is a set of actions that a firm has been performing to reach its objectives (Bracker, 1980).

A firm's internal resources typically include the organization's assets, capabilities, human resources, and processes (Barney, 1991). Tushman et al. (2010) highlight the importance of organizational structure as an important firm intrinsic resource that directly impacts the innovation performance of an organization. Theoretical research on factors affecting innovation, by Zennouche and Zhang (2014) suggests the following intra-organizational factors that influence innovation: Organisational structure, organizational culture, strategy, and resources. However, an extensive literature review by Smith, Busi, Meer, and Ball (2008) suggests that the factors influencing innovation are: Technology, innovation strategy, corporate strategy, organizational structure, organizational culture. Although scholars working on frugal innovations talk about organizational R&D, structure, and culture, the rest of the parameters often get ignored. For instance, as highlighted earlier transitioning to frugal innovations would require the presence of local talents. This means that transitioning to frugal innovations would affect corporate strategies in terms of recruitment and training. Perhaps this is one of the limitations of the frugal innovation literature, that inhibits its ability to be used in applied research situations. Therefore, it is important to look into all the organizational parameters to craft an efficient strategy.

The organizational and strategic part is one of the factors, the next variable of influence would be the list of activities that adds value to the product or service. To attain a competitive advantage, a firm must be capable enough to utilize its resources in every sphere of its internal processes (Nyarku & Agyapong, 2011). In strategic management terms, 'value chain' is a term often used to describe the set of activities that a firm uses from the beginning to the end of delivering an output (Mukherjee, n.d.). For a product-oriented firm, these activities could include R&D, design, production, marketing, and sales. Fig. 2.4 highlights the simplest form of a value chain. Nyarku & Agyapong (2011) however indicates that a typical value chain consists of design, produce, market, delivery, and support. However, Lavie (2006) adds that in addition to internal resources, a network of alliances a firm possesses with other firms is a source of competitive advantage to thrive in a highly competitive business environment. A major advantage of doing so is that if a firm possesses strong networks, it could benefit from knowledge transfer, and exchange of capabilities to support the activities in its value chain (Inkpen & Tsang, 2005; Reagans & Zuckerman, 2015). This, in turn, gives a firm an edge, as they could collaborate with other firms in the form of strategic alliances, joint ventures, licensing, and outsourcing. Another advantage of firm networks is that firms could ideally focus on the activities that are their core competencies while outsourcing the rest to their partner firms.

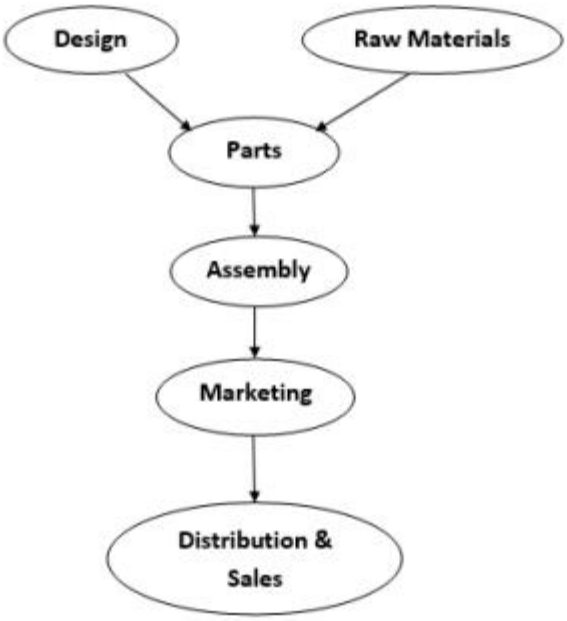

Fig. 2.4 Value chain activities (Mukehrjee, n.d.)

Now having categorized the internal variables as organizational and value chain variables in the next section, it would be addressed one by one, in detail.

2.2.1.1 Organization and frugal innovations

As highlighted earlier, frugal innovation scholars often draw attention to organizational R&D, structure, and culture which needs a strategic reorganization to incorporate frugal innovations. Now since R&D is also a value chain variable it would be addressed in the next section. However, for a good, applied research setting, it is important to be sensitive to the changes in the other organizational parameters that might come about with reorienting organizational structure and culture. Now, the impact of these two variables is covered one by one.

Organizational structure

Strategic management presents a wide variety of organizational structures like spin-offs, skunkworks, matrix, functional, ambidextrous, etc., depending on the nature of innovations. However, irrespective of the type, the reasoning behind the existence of structures qualifies to be an important element in this part. Research by Tushman, Smith, Woody, Westermanz, & O'Reilly (2010) based on interviews with 96 western firms revealed that organizational designs are directly linked with a firm's ability to balance creativity and efficiency also known as 'ambidexterity". Since the R&D output is technologically superior, product importance is given to organizational structures that assign importance to creativity. Given the scientific rigor associated with the research, the results are to a large extent generalizable for high-tech innovative firms, which would also apply to the western firms (given their R&D focus). In contrast, scholars working on organizational theories present a wide range of differences within western firms. However, scholars working on frugal innovations tend to overly generalize 'western firms' as a single entity.

Existing organizational structures in western firms provide a conducive environment for cutting-edge products meant for high-end customers. The challenge lies in determining the degree of organizational flexibility (decentralization) (Zeschky et al., 2011). Zeschky et al. (2011) highlight in their research works that, western innovative firms, in general, have local R&D subsidiaries to gain access to local talents and market needs, while the autonomy remains in the hands of the central R&D located at the headquarters. Now some scholars including Zeschky et al. (2011) simultaneously argue that certain innovative firms have established such practices, therefore a broad generalization of the former perspective is undoubtedly questionable. However, most of the scholars working on frugal innovations, consider this as the general operating structure of most western firms, which inhibits their ability to tap frugal markets.

According to Zeschky et al. (2011) firstly, frugal innovation demands organizational structures that favor exploitation from existing products rather than new product development. In short, this means that efficiency is much valued over creativity. Although Prahalad and Hart (2008) and Zeschky et al. (2011) equally emphasize that operating in a new market demands a more creative and risk-oriented approach, the former perspective stands out as the fundamental challenge in frugal innovations is cost efficiency and minimum basic features which do not necessarily need a creative side as such. Zeschky et al. (2011) further reinforce the point that the challenge with frugal innovations is deploying processes that reduce manufacturing and design costs, which demands efficiency. An extensive case study research by Anantharam and Chan (2019) has been successful in generalizing the idea that frugal products could be developed by simply mimicking superior products, thereby reducing the importance of creativity.

Secondly, organizational structures that favor a more prominent local presence and responsive to customer needs are important to tap frugal markets. Outsourcing R&D to the target country is a widely preferred way to understand local needs and tap frugal markets (Prahalad & Hart, 2008). An associated challenge would also be the distribution of R&D activities between the home country and the target country (Zescky et al., 2014). Frugal innovations would require local organizational structures that could enable R&Ds to tap local knowledge and translate them into products. Organizations must make considerable changes and divert their locus of attention to being customer-centered in emerging markets (Prahalad & Hart, 2008). In organizational terms, this is also known as a ‘locally leveraged strategy’ wherein organizations assign independent autonomy to local R&Ds to tap knowledge and resources to design products for the local market. Hossain et al. (2016) indicate this by highlighting the success of GE’s ECG machine (a frugal innovation) for Indian customers gained momentum, because of this approach. A case study research by Altman and Engberg (2016) on a Sweden-based firm further reinforces the generalizability of this concept. All scholars working on frugal innovations support this aspect and identify it as the best approach.

Despite some initial ambiguities, there is a high degree of convergence among scholars to the two structural aspects presented.

Organizational culture

A sound corporate culture is deemed important for the smooth functioning of firms. Culture in the organizational context refers to values, beliefs, perceptions within the organizational boundaries, however, it might also extend to structures and routines within the organization.

An extensive case study research of firms across the globe, each by Hofstede (1994), Hofstede (2011), and Massini, Lewin, Numgami, and Pettigrew (2002) respectively, conform to certain key cultural aspects that are common and generalizable to western firms. To foster coordination and communication, western firms have a straightforward approach to conflict resolution and decision making (Fey & Denison, 2003). Hofstede (1994) calls this a ‘low context culture’ Being individualistic nations in general, employees are

encouraged to voice their opinions irrespective of hierarchy to come up with technologically sophisticated products (Hofstede, 1994). Hofstede (1994) calls this a 'low power difference' culture, that is "honesty" is valued over "empathy". Hofstede (1994) suggests that western firms have a lower degree of 'uncertainty avoidance' and are open to risks and learn from mistakes. A good number of western MNCs have established themselves in emerging economies like India, China, and Russia (Fey & Denison, 2003). Cross-cultural communication has still been a challenge in globalized organizations (Bhatti & Ventresca, 2013). Different organizations in the west have different approaches to solve this. However, a high degree of centralization as described in the previous section inhibits their rapid adaptability to conform to these cultures and think on similar grounds.

Although western firms have a culture conducive to innovations, frugal innovations would need a fresh perspective to organizational cultures. A case study research of American firms in Russia by Fey and Denison (2013) identifies a few values which inherently form the pillars of organizational culture. Although questionnaire-based research by Hofstede (2011) on cultural aspects in organizations, suggests a different set of values and dimensions, nevertheless they can be effectively grouped under these categories (mentioned below), in the context of this research and can thereby be complementary to the findings of Fey and Denison (2013). Since the case study is based on western firms (American) in an emerging economy, these values are of relevance to the concept of frugal innovation. Hofstede (1994) identifies certain cultural commonalities between all western firms, and likewise similarities between Asian, African, and Latin American cultures (the main targets for frugal innovations). Survey-based research by Massini et al. (2002) further proves that western firms (America and Europe) share common routines compared to their Asian counterparts. This view is further reinforced in the works of Bhatti and Ventresca (2013). Hence the findings from this research could serve as a starting point for western MNCs targeting frugal innovations. The following are the categories:

***Involvement*:** Effective organizations, in general, develop teams and empower their employees, thus motivating them to have a strong sense of ownership (Fey & Denison, 2003). An organizational culture that is open to including external partners and stakeholders is an important prerequisite for success in frugal markets (Prahalad & Hart, 2008). Therefore, it is important to be responsive to the cultural needs of the locals. A case study research by Anantharam and Chan (2019) on frugal innovations seconds these findings. Although companies like GE as suggested by Hossain et al. (2016), and Unilever as suggested by Prahalad and Hart (2008) have pioneered these values, this stands as an important requirement for frugal innovations to thrive in emerging countries.

***Consistency*:** Refers to core values within the firm boundaries that are highly consistent which enables employees and leaders to conclude testing situations (Fey & Denison, 2003). Hossain et al. (2016) suggest the following factors for the success of frugal innovations are communication channels and social context. Hofstede (1994) elaborates on the communication aspects. To fully understand local customer needs, the importance of cross-cultural communication becomes significantly higher within the boundaries of the organization and stakeholders. Since a large fraction of the emerging countries is collectivistic, promoting an indirect communication approach and conflict avoidance culture is recommended (Hofstede, 2011). In short, a high context communication culture is preferred, that is "empathy is valued over "honesty". However, since a good number of multinational western firms are well established in emerging countries like India or China, it would be unfair to assume that these western companies would have to change in this regard. However, a deeper analysis by Hofstede (2011) reveals that cultural differences also exist within western countries. Consequently, the generalization of this aspect across "western firms" or "emerging country firms" is highly questionable.

***Adaptability*:** Refers to the organization's abilities to be customer-driven, take risks, make mistakes, and learn from them (Fey & Denison, 2003). This involves operating in an environment characterized by

uncertainty and volatility, demanding a culture of rapid adaptability (Anantharam & Chan, 2019). Within the organizational framework, the challenge lies in the organization's ability to embrace adversity (Zescky et al., 2011); this involves challenging the status quo. The average western firm is conditioned to operate in a routine-based culture. Zeschky et al. (2011) and Anantharam & Chan (2019) support the findings in their research. In contrast, research by Hofstede (2011) suggests that western corporate culture is in general low when it comes to uncertainty avoidance. However, the former findings are appropriate in the context of frugal innovations as highly centralized and structured western firms would lack adaptability given their well-established structures.

Consequently, despite various other possible cultural issues, these three aspects seem to be the most relevant from the organizational literature in the context of frugal innovations.

S.no	Western firm	Requirements for frugal innovations
ORGANISATIONAL STRUCTURE		
1	Greater focus on creativity	Inclination towards efficiency
2	Centralized R&D	Decentralizing R&D to target country; locally leveraged strategy
ORGANISATIONAL CULTURE		
1	External participation may or may not exist	Involvement: Accommodating stakeholder opinions
2	Cross cultural challenges and differences are addressed effectively in international western firms but depends on the firm. Honesty preferred over empathy	Consistency: Accommodating cross cultural differences to create a conducive environment tailored for local markets. Empathy preferred over honesty
3	Centralized R&Ds might limit rapid adaptability despite low uncertainty avoidance	Adaptability: Open to rapid adaptability, low uncertainty avoidance and embrace adversity, customer driven

Table 2.2 Organizational variable comparison: Western firms vs frugal firms

This goes on to say that if firms must innovate frugally, in addition to the strategic orientation of the firm a vast number of parameters within the boundaries of the firm and outside are to be considered. Academic literature on strategic management provides a detailed overview of the factors of influence. Consequently, the next step would involve an identification of the various factors and how they would differ in the context of frugal innovations. In addition, what must be done to innovate frugally could be obtained from a study on frugal innovations. However, how could the strategic objectives be achieved and calls for a deeper look in the areas of strategic management? For instance, it has been argued previously that R&D has to adopt a low-cost high-volume mindset, but high volumes do indicate that it would profoundly influence the production activities. This indicates that consulting frugal innovations literature alone isn't sufficient to understand the variables of interest.

2.2.1.2 Value chain and frugal innovations

R&D

Research by Sharma and Jha (2016) highlights a few general characteristics of the R&Ds in western developed nations. The average western organization including the executives; R&D is conditioned to operate in a high-profit market. It is widely agreed by scholars that the fundamental building block of a western innovative firm is a research laboratory carrying in size, sponsorship, goals, personnel, and facilities. Affluence and abundance are considered a part of developed western nations, given their strong economies. Therefore, projects are overwhelmingly evaluated based on the best financial return on investment, thus contributing to the development of attractive, profitable products for demanding customers. Another important aspect of the current western R&D is the heavy reliance on incremental innovations resulting in continuous up-gradation of the firm's existing successful product. Despite a reliance on outsourcing, most of the R&D takes place in the home country and only non-core or labor-intensive operations are outsourced in a typical western firm. Given the fact that this assumption is highly theoretical, it wouldn't be fair to generalize the findings of this research to all western firms specifically, as even within these firms, these characteristics might vary based on industry, type of product, and geography. However, a wide range of research including interview-based research of 13 western firms with a successful history of frugal innovations by Zeschky, Widenmayer, and Gassmann (2011), have similar findings in the context of western firms. In addition, theoretical research by Prahalad and Hart (2008) and other scholars support these arguments concerning innovations in western firms, thus generalizing the findings only if western firms are considered in a lump sum.

Sharma and Jha (2016) present three characteristics of R&Ds in frugal firms based on case studies of 5 different industries in India and China. Another point being, this only highlights the successful ways in which R&Ds organize in India and China, from an R&D perspective it could still be generalized, as an average target customer in any of the developing nations with a similar economic background would have the same attitude towards purchasing products. This in turn provides western firms a clear direction as to how they can restructure their R&D.

First, the functions included in the core product should be after a thorough understanding of the market needs (Sharma & Jha, 2016). Contradicting their assumptions Sharma and Jha (2016), acknowledge the fact that some of the western firms follow a customer-oriented approach also known as the market-pull approach, frugal innovations would require the involvement of customers and stakeholders to a much larger degree, as they are the best judges of local responsive needs. A case study of successful Swedish firms in emerging countries by Altman and Engberg (2016), and the works of Prahalad and Hart (2008) support these findings.

Second, adopting an approach often known as "value engineering" (Sharma & Jha, 2016). Instead of technologically advanced products, the focus should be rather on symmetrically increasing the function to cost ratio after a detailed understanding of the target market. The reason for such an approach is to provide the maximum functions at the lowest possible cost. The next paragraph provides a detailed explanation as to why this approach would thrive in frugal markets, along with the next point.

Third, the focus on incremental innovation is not a part of frugal innovation as customers in emerging countries prefer to keep their products for a longer period (Sharma & Jha, 2016). Typically western firms are conditioned to launch a new superior version of the same product, as soon as the market for its older version dies down. Keeping in mind abundance and affluence, customers flock to this new product while disposing of the previous ones and it slowly penetrates the market. However, in the case of frugal

innovations, the mindset of an average customer is centered around the theme "affordability" to use the product for his/ her own needs as long as its lifetime warrants. This point is reinforced by a case study research of successful frugal firms in the world, by Hossain, Simula, and Halme (2016) Hence a new version of the next product would be a waste of time and money for the organizational R&D, rather than the focus should be on developing products with a greater lifespan. Although theoretical research by Bhatti & Ventresca (2013) on frugal innovations supports the idea that incremental innovations are important, it simply implies that making incremental improvements to an existing product could result in frugal innovations. Therein it does not contradict the previous point.

Other than the exceptions mentioned, scholars working on frugal innovations, highlight the importance of these three aspects in their research works, leaving no room for ambiguity.

Production

The production process covers the procurement of raw materials and parts, along with the assembly process (Mukherjee, nd). Firms could produce these parts and raw materials in-house or procure them from suppliers (Belkadi et al., 2016). However, in most cases, parts and raw materials are procured from suppliers. At the product level, it could be inferred that their production process would be aligned to produce a few products which are highly differentiated and expensive. The fundamental focus of any high-tech firm is to be as efficient as possible in terms of production at the lowest possible costs. However, the fundamental gist of doing so is to increase product features and innovation (Un & Asakawa, 2015). Although improvements in production efficiency do not go against the requirements of frugal innovations, there are however a few key differences that need to be addressed.

Santos et al. (2019) argues that one aspect of frugal innovation is to target low-cost processes to reduce front-end investment costs. This calls for the need for a new approach to production for frugal innovations (Belkadi et al.2016; Soni & Krishnan, 2013). One of the primary aspects of frugal innovations is increased value creation while eliminating non-essential costs. Womack et al, 1991 additionally importance the need for eliminating wasteful efforts in the production process. Ford's assembly line production and Toyota's lean production are examples of frugal production systems, which enable them to produce massive volumes within a minimal period and costs (Soni & Krishnan, 2013). The primary reasons associated with the same include low costs and high volume of production. Secondly, since frugal innovations are in general adapted for local market needs, the supplier relationships and the production process might change considerably as the new product has a much simpler architecture. One approach to achieving this could be the incorporation of a *modular production system* (Belkadi et al.2016). Modular production involves subdividing a product into smaller parts or links, that could be independently altered, modified, or replaced and then assembled into a final product (Sturgeon, 2002). Fig. 2.5 highlights an example of a modular production system. An advantage of using modularity in frugal innovations is the components could be assembled in multiple ways that give out a vast multitude of product offerings. For instance, one of the important features in the production of Tata Nano (a frugal car) in India, was the incorporation of a modular production system.

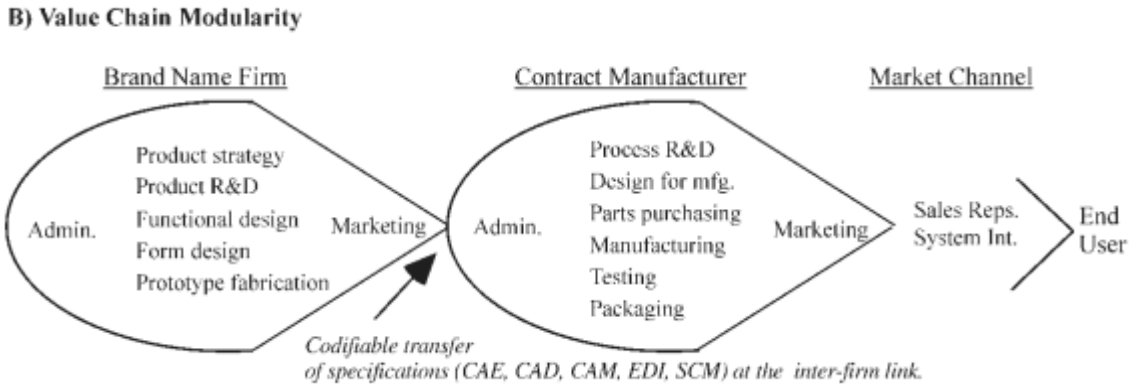

Fig. 2.5 Modular production method (Sturgeon, 2002)

Another important feature in the production of high volumes concerning frugal innovations includes the production capacity of the existing firms. To switch over to the high-volume market, another strategy could be outsourcing production to local assemblers (Athreye et al., 2011). For instance, Fiat collaborated extensively with local assemblers, for the launch of its frugal car Fiat Palio in India, as they were well aware that they would need to collaborate to cater to the high-volume market.

Products and marketing

It has been argued previously that western firms ideally focus on high technology and complex products, catering to the needs of the elite customers. Catering to affluent customers, the fundamental focal point of an average western firm is primarily centered around cutting-edge technological products, with the best-inbuilt features (Anantharam & Chan, 2014; Brem, 2014; Zeschky et al., 2014). Since their markets are primarily focused on this segment, their fundamental focus is on low volume and high profits (also known as premium pricing) (Sharma & Jha 2016). Affluent customers are mostly on the lookout for the latest versions and cutting-edge features. Frugal innovations on the other hand, requires products with minimum features and least costs. The product requirement shifts from 'value' products to requirement products (Hossain, 2018). Given the transition from a low volume to high volume market, and the larger customer base, accessibility to the products also takes a leap.

Sales and service

Now, an average western firm is conditioned to attract the rich few elite customers. Since these customers form a very small number of the total population, the sales and service networks are confined to only meet the requirements of this market. One of the most important aspects of the customer value chain is the role of spare parts and service (Nayrku & Agyapong, 2011). High tech firms designing products for the economically well off often tend to have expensive sales and services. Since very few customers could afford it, the volume of such networks is limited to only cater to the elite few customers. Frugal innovations open doors to a much larger market volume (Prahalad & Hart, 2008). Therefore, the firm has to ensure that they are capable of handling mass volume sales.

Although scholars working on frugal innovations make no direct mention regarding the role of service and spare parts, one important aspect they constantly highlight is lifetime and longevity (Prahalad & Hammond, 2002; Sharmelly & Ray, 2008; Zeschky et al, 2014). Since frugal innovations are designed for middle-income customers, who would prefer to use the products and service for a long period, the role of spare parts and service is undoubtedly mandatory. Additionally, frugal innovations are meant to cater to the needs

of the mass market, which is significantly larger than the market for elite customers (Hossain, 2018). This points out to the fact that frugal innovations would demand high volumes of service networks that are easily within the reach of customers.

Now given the knowledge on frugal innovations, table 2.3 represents the simplest version of how a value chain for frugal innovations would look like. Now since frugal innovations call for local partnerships, the presence of networks and collaborations in every sphere of the value chain would be equally beneficial.

S. No	Current practise in high tech western firms	Requirements for frugal innovations
R&D		
1	Technology, R&D driven	Market driven
2	High profits per product, high financial return; low volume	Value engineered- high function/cost ratio; low costs and high volume
3	Heavy reliance on incremental innovation	Incremental innovation to be avoided
Production		
1	High costs and low volume; supplier dependent (varies on the type of industry and country)	low cost-high volume, tailored for local market needs
2		Modular production systems
3		Outsourcing production to local partners to increase capacity
Products and Marketing		
2	Low volume and high-tech features	High volume capacity
3	Expensive and best in class features, with premium pricing	Basic features for the price, affordable, reliable and longevity, low costs- penetration pricing, appealing to mass market segment
4	Accessible enough for the elite few	Easily accessible and available
Sales and service		
1	Low volume and comparatively limited sales volume	Sales networks capable of handling mass volume sales
2		Lifetime and longevity with less expensive sparts

		Easily available service

Table 2.3 Value chain variable comparison: Western firms vs frugal firms

2.2.2 External factors

The internal factors result in superior value creation, however, to innovate frugally, it is important to be receptive to the external environment. Since a firm's internal practices are based on the requirements of the target market, the various factors that influence the external environment would undoubtedly be impactful (Barney, 1991; Guerel & Tat, 2017). From a frugal innovation's standpoint, Prahalad & Hart (2008) argue that the bottom of the pyramid market presents greater opportunities given their market size. Apart from that, frugal innovation scholars do not explicitly highlight the factors that highlight the opportunities for a specific firm. This calls for a deeper look into the areas of strategic management, to identify the external influences.

Porter's five force framework (Dobbs, 2014); draws insight into the following as the major factors in the external environment: Bargaining power of suppliers, bargaining power of consumers, intersegment rivalry, the threat of substitutes, and the threat of new entrants. Despite being a widely used method to analyze the external environment, it is often criticized for its lack of depth (Dobbs, 2014). Transitioning to frugal innovations would mean that a firm should be sensitive to the socio-political environment, to include stakeholder interests and opinions in the design process. Porter's five force analysis undoubtedly wouldn't be sufficient to analyze all the variables in the external environment. Another well-known method to analyze is the PESTLE (Political, economic, legal, social, technological, legal, and environmental) analysis (Tan et al., 2010). Although this method succeeds in scanning the socio-political environment, it fails to analyze business factors like the role of competitors and customer requirements. However, a combination of the Porter five force analysis and the PESTLE could result in providing a detailed overview of the external environment impacting frugal innovations. Guerel & Tat (2017), present a more elaborate version of the external variables impacting firm performance: Societal forces, governmental forces, economic forces, competitive forces, supplier forces, industry, and market forces. For analyzing a highly competitive industry such as the automotive industry, it would be advisable to use as many variables of influence as possible. Therefore, a holistic approach would be much more useful.

S.no	Porter's five forces (Dobbs, 2014)	PESTEL analysis (Tan et al., 2010)	External variables (Guerel and Tat, 2017)
1	Bargaining power of suppliers	Political factors	Societal forces
2	Bargaining power of consumers	Economic factors	Governmental forces
3	Intersegment rivalry	Societal factors	Economic forces
4	Threat of substitutes	Technological factors	Competitive forces
5	Threat of new entrants	Environmental factors	Supplier forces
6		Legal factors	Market forces

7			Industry forces

Table 2.4 The three frameworks of classifying external variables

Therefore, integrating the sources, we have the following variables of influences: Political factors, economic factors, societal factors, technological factors, legal factors, environmental factors, bargaining power of consumers and suppliers, intersegment rivalry, the threat of substitutes, threat of new entrants, governmental and market changes, In this list of factors, some interesting observations could be made. While Bargaining power of suppliers, technological factors are intrinsic to the firm's business model (as defined in section 2.2). One category which includes: intersegment rivalry, the threat of new entrants, bargaining power of consumers, market changes, etc. is mainly concerned with the situation in the actual market. While factors such as political factors, economic factors, legal factors, environmental factors, governmental changes are macro-variables at the national or international level. From these arguments three major classifications of factors could be identified:

1. **Business factors:** Factors such as bargaining power of suppliers, technological forces, industry forces that are intrinsic to a firm's business model.
2. **Market, customer, and competition factors:** Factors that affect the firm due to the market conditions. For example, market requirements, customers, competitors, and their roles etc.
3. **Social, political, and legal factors:** Macroeconomic variables like governmental changes, legal and political factors that could influence a firm's business.

In this section, these variables would be analyzed in a detailed fashion in the context of frugal innovations.

2.2.2.1 Business factors

In Section 2.2, it was described that the business models of western firms are not conducive enough for frugal innovations in emerging economies. From a frugal innovation perspective, this indicates transitioning from a low volume high-profit market to a high-volume low-profit market (Anantharam & Chan, 2014; Brem, 2014; Sharma & Jha, 2016; Zeschky et al., 2014). Dobbs (2014) and Guerel & Tat (2017) together highlight the following factors that could be of importance: Bargaining power of suppliers, supplier forces, technological forces, and industry forces. Table 2.2 highlights the various internal factors. From this it could be inferred that a firm is increasingly dependent on the external environment in terms of supplier relationships, availability of local talent, the local technological requirements, stimulating communication across stakeholders, etc. These are business factors, however with strong links to the external environment. Now in the next paragraphs, each of these would be addressed.

Supplier forces and bargaining power: Section 2.2.1.1 highlighted the role of production factors wherein western firms are conditioned to having premium suppliers and for a low volume market. However, transitioning to frugal innovations would mean that suppliers would not have to transition to a high volume-minimum quality market. Supplier relationships would be altered or affected in this process. Geurel & Tat (2017) refers to three major impacts that supplier forces could have on the firm's performance, that is, Changes in input costs and change in the number of suppliers. Dobbs (2014) highlights the impact on firms due to the bargaining power of suppliers. If supplier forces are in favor of the transition to frugal innovations it presents an opportunity, however, if they are not, it presents a major roadblock to frugal innovations. While moving towards a new opportunity if there are a very small number of highly differentiated suppliers, then they have superior bargaining power and vice versa (Schilling, 2019).

Technological forces: The technological forces shaping the market environment influencing organizational structures, jobs, skills, productivity, and employee stress (Nyarku & Agyapong, 2011). Frugal innovations would naturally create a difference in the mindset of a western environment. For instance, table 2.2 and table 2.3 highlight these differences. Frugal innovations would call for a new organizational structure with a new approach to employee culture (Sharma & Jha, 2016; Fey & Denison, 2003). Fey & Denison (2003), as highlighted in the organizational culture section highlight the role of accommodating stakeholders and a customer-driven approach. However, doing so demands the role of external participation and support. Furthermore, the involvement of stakeholders and local talent would call for the need to improve productivity in the organizations. These forces present different opportunities and threats for the firms stepping into frugal markets.

Industry forces: Frugal innovations for western firms in emerging markets involve two different concepts: developing a new product based on customer requirements and targeting the bottom of the pyramid market (Agarwal & Brem, 2004; Anantharam and Chan, 2019). In strategic management terms, these two factors are explained using a tool named Ansoff's matrix. In terms of Ansoff's matrix the strategies are known as product development and penetration into new markets (Nyarku & Agyapong, 2011). From a frugal innovations' perspective, firstly, product development involves products that are affordable and have minimum features. Additionally, product attributes like brand name and customer loyalty create different types of opportunities and threats (Nyarku & Agyapong, 2011). For instance, the presence of a strong brand name naturally promotes the product. Secondly, market penetration, from a frugal innovation perspective involves penetrating the bottom of the pyramids in emerging markets. Here, various additional factors like other products in the market, opportunities to grow play a vast role in determining the opportunities and threats. For instance, the availability of cheap raw materials or any other business advantage gives the firm an upper hand. On the other hand, if another successful product already exists in the market, it becomes a reason for a threat.

However, the role of new markets doesn't end here and calls for the integration of various other perspectives. These factors would be addressed in the next few sections.

2.2.2.2 Market, customer, and competition factors

Dobbs (2014) and Geurel & Tat (2017) together highlight the following factors that play a role in the external environment: inter segment rivalry, bargaining power of customers, competitive changes, and market changes. Now it is important to look at each one of them from the lens of frugal innovations.

Market: Fig. 2.3 (in the previous sections) highlights the difference between the markets for high-tech products and frugal products. Traditionally the western firms operating in developed countries serve a market that has stagnated in growth and the population highly values consciousness over price (Santos et al., 2019; Prahlad & Hart, 2008). High tech firms in emerging economies equally serve a market that has a similar value-conscious attitude as highlighted in section 2.1. However, frugal markets in emerging economies (as highlighted in fig. 2.3), are marked by a growing population and resource-constrained customers. At the macro level, infrastructural gaps and societal challenges are plaguing these markets (Agarwal & Brem, 2004; Zeschky et al., 2011). These differences between the two approaches present a vast number of opportunities and threats. For instance, societal challenges present a vast opportunity for high-tech firms to solve problems. However, on the other hand, the infrastructural gaps might inhibit customers from making use of the high-tech value proposition and thereby present a threat.

Competitors: Intersegment rivalry, the threat of new entrants, and competitive forces within the market present a vast number of opportunities and threats in the context of frugal innovations. As mentioned in figure 2.1, frugal innovations would involve transitioning from the top to the bottom of the pyramid (Prahalad & Hart, 2008). However, new markets bring new opportunities and threats (Barney, 1991; Dobbs, 2014). Firstly, well-established organizations in this sector might resist the entry of these firms. This resistance could be in the form of exploiting any of their firm assets to curb the entry (Barney, 1991). Secondly, if the target market already is highly competitive, there might be significant entry barriers to a new firm (Nyarku & Agyapong, 2011). Thirdly, however, if the entering firm has a competitive advantage over its competitors due to the presence of irreplaceable assets, it creates a splendid opportunity for the firms (Barney, 1991). Therefore, competitive forces play a major role as far as frugal innovations are concerned.

Customers: In a highly competitive market such as the automotive industry, the customers have a very high degree of bargaining power (Nyarku & Agyapong, 2011). This is primarily due to the large number of organizations trying to capture the market. Tynon & Drayton (2010) highlight that apart from the competition in the markets, a large number of factors influence customer buying behavior. These include:

1. **Geographic preferences:** Based on a country and its geography, the customer preference for products may differ (Tynon & Drayton, 2010). In the context of frugal innovations, for instance, one section of the emerging market might be more resource-constrained than the others. The affluent parts of the country might represent a lesser preference for frugal products than the rest. Therefore, different geographical units within the country might have preference for frugal products.

2. **Psychographic preferences:** These preferences include the opinions, needs, and values of customers (Tynon & Drayton, 2010). In the context of frugal innovations, the needs of customers include products with basic features and minimal costs (Anantharam & Chan, 2019; Zeschky et al., 2011). However, the typical western firms would have previously operated in a market wherein customer needs were centered around value, novelty, etc. (Prahalad & Hart, 2008; Agarwal & Brem, 2004).

3. **Behavioral preferences:** These preferences include brand loyalty, post-purchase behavior, usage, etc (Tynon & Drayton, 2010). This applies to frugal innovations as well, in the sense that lifetime and longevity are two major elements of frugal innovations (Hossain, 2018; Sharma & Jha, 2016). These aspects that influence customer buying behavior, to a great extent, are a predictor of how exactly frugal innovations could be for a western firm.

Thus, the cumulative role of market, customers and competitors create a number of opportunities and threats for frugal innovations. Any firm transitioning from a high tech to a frugal market, should in turn be sensitive to these elements.

2.2.2.3 Social, political, and legal factors

Tan et al. (2010) and Geurel & Tat (2017) together highlight the following factors that play a role in the external environment: political factors, societal factors, legal factors, environmental and governmental factors. Hofstede (1994) (highlighted in the previous sections) mentions the role of cross-cultural differences in business. This goes on to say that for any western firm to enter the merging market might pose challenges in terms of institutional, political, and cultural variables.

Political and Institutional: Soni & Krishnan (2013) highlight that in the west, the market is structured such that the firm receives access to capital support, information about the markets, and resources at arm's length. One of the reasons for this is a well-established economy. However, emerging markets are marked by a lack of transparency and adherence to legal norms. Kroesen et al. (2020) highlight the role of external relationships and framework of governance and regulations as important characteristics that would determine the success of a company in a developing country. Like, in India, there is a tendency for 'group thinking' and trust isn't easily available. This might make it difficult for customers, suppliers as it takes a significant amount of time to build and maintain relationships which might not be the case in Europe. Relationships in India even at the business levels are confined to friends and vertical networks (Kroesen et al., 2020). Consequently, western firms might struggle significantly if frugal innovations call for fostering new types of customer or supplier relationships. Secondly, despite having a robust business model, it requires a great deal of time and effort to obtain the necessary permits as the government structure in India is highly bureaucratic and calls for the need to have well-established connections. These institutional and political differences play a vast role in present opportunities and threats when a western firm must transition to frugal markets.

Governmental and Legal: A nations' s legal framework presents a significant impact on frugal innovations (Soni & Krishnan, 2013). For instance, as a foreign player, if the legal and governmental framework is in support of foreign investments, it presents a great opportunity or vice versa. There could be different motivations for legal frameworks, however, they play a major role in determining firm successes. In general, government and legal frameworks are intertwined (Nyarku, 2011), as one has the power to influence the other.

Economic: Chapter 1 highlights that globalization is one of the most important predictors for this situation. In the context of globalization, the economic environment plays a major role in determining opportunities and threats (Nyarku & Agyapong, 2011). These might include inflation, cost, and demand, hikes, etc. The result of these forces could be an important predictor in determining customer demand and behavior (Nyraku & Agyapong, 2011). Thus, it is an important factor that could influence opportunities and threats.

Environmental: The environment includes factors such as pollution, climate change, etc. Since frugal innovations are about emerging countries which in most cases lack the necessary infrastructure, the roles these variables play might be immense (Nyarku & Agyapong, 2011). For instance, in the context of automotive industries, there has been a tendency to migrate towards e-vehicles, which might create immense opportunities for some firms whereas a threat for some others.

Now having identified the internal and external factors that might play a role for western firms, it is important to identify a framework, within which a firm could define its strategy to identify the opportunities and threats using the influences of these factors and variables.

2.3 Business decisions and strategy formulation

Now in the previous sections, a vast number of factors that could play a role, in terms of frugal innovations were addressed. However, one important step while taking business decisions is to address how a firm could facilitate this transition. In this chapter, the tools and methodologies involved would be addressed.

To decide a strategic action, plan the SWOT (Strengths, weaknesses, opportunities, threats) analysis is the most preferred tool. Strengths include the organizational capabilities and resources intrinsic to the firm that might help in making a superior value proposition. Weaknesses include limitations that are intrinsic to the

firm that might hinder it to achieve its objectives. Opportunities include favorable factors in the external environment that might help it to achieve its strategic objectives. Threats on the other hand include hindrances in the external environment that might limit its ability to achieve the objectives (Leigh, 2010). In essence, Strengths are used to exploit opportunities and limit threats, while weaknesses are identified to diminish their ability to pose a threat. Despite the widespread popularity of SWOT as a tool in strategic planning, it has its own set of limitations. SWOT analysis considers a long list of strengths and opportunities and fails to analyze the comparative strong strengths and weaknesses in a highly competitive environment like the automotive market in India. A long list of strengths and opportunities in many cases goes unused in the strategy formulation processes (Guerel & Tat, 2017).

Vlados (2019) therefore came up with an advanced version of SWOT known as 'evolutionary and correlative SWOT analysis that addresses some of the limitations of SWOT. In this new method, the SWOT analysis is performed at a comparative level keeping in mind the external environment. It assumes that strengths and weaknesses would be impactful, only when they are comparatively stronger or weaker to the competitors. Similarly, opportunities and threats are impactful, only when the firm has certain specific characteristics that enable it to exploit opportunities or confront a threat. This analysis overcomes the limitations of the conventional SWOT analysis especially when there are a lot of quantitative estimates to support the claims. Therefore, it is a much more helpful analytics tool.

2.4 Conclusion

In this chapter, the internal and external factors that contribute to opportunities and threats have been identified. This framework would serve as the backbone for the future findings and analysis. Additionally, the tools that could be used to evaluate the opportunities and threats has also been discussed. Given the depth of the SWOT analysis in terms of identifying factors, the findings of the research would be reported in the SWOT format. For the research question, the correlative and evolutionary SWOT provides the most promising insights and would be used as an analytical tool in the analysis sections of the research.

3 BACKGROUND INFORMATION

This chapter is primarily based on desk research to deliver some insights into the automotive industry. Although it is not a part of the research methodology, this chapter has been included to introduce readers to a few aspects of the automotive industry which are important to understand the research and its deliverable. This chapter is divided into two parts. The first part gives a brief introduction to the German automotive companies in India and the Indian automotive market. In section 1.2, the case of Fiat Palio in India was introduced. The second part of this chapter covers the case of Fiat Palio in India.

3.1 Background and Overview: German automotive Industry and India

In 1991, For the German automotive industry, fearing competition from their Japanese counterparts that had pioneered 'lean production' and 'Just in time, they undoubtedly had an upper hand in terms of mass manufacturing. Given their rapid rate of localization to tap the global market, the German automotive industry was under pressure. In addition, protests from labor and trade unions in Europe, against the rising prices of labor, forced the German Big 3 to revise their strategies. Traditionally the German automotive industry was renowned for its highly centralized activities with most parts of the value chain is taken care of in Germany, along with the support of strong local in-house suppliers. However, the change of events in the 1990s prompted the traditional German Big 3 to globalize their approach. Presently, the German automotive industry has a prominent presence in India. Following the liberalization of foreign trade in the automotive sector in India in 1991, the emergence of various foreign players was observed.

Current Indian Business model: Mercedes Benz happens to be the first mover (among the German automotive industry) to have set its foot in India, in 1994. A fully owned subsidiary of the Daimler AG group, it is headquartered in Chakan, India. Of all its German counterparts and luxury automakers, Mercedes Benz has the highest overall market share of 40% in India (Autocar, 2021). Volkswagen entered the Indian market in 2007 with a fully owned subsidiary named Volkswagen India Private Limited (law aspect, n.d.). The Indian subsidiary has invested close to Rs. 57.20 billion ($780 million) for Indian operations (ETAuto, 2018). BMW entered the Indian automotive market in 2009, headquartered at Gurgaon, India. It is a 100% fully owned subsidiary without any joint ventures or collaborations (CNBC, n.d.). Explicitly meant for the luxury segment, the company has flourished well since its inception in India. The company has invested Rs. 4.9 billion ($67 million) in the Indian subsidiary (ETAuto 2016). Audi India private limited started operations in India in 2007. Being a part of the Volkswagen group globally they use the production facilities of the Volkswagen plant in Aurangabad, India. Like their German counterparts, Audi does not have an R&D center in India. Unlike their German counterparts that are high on localization, Audi in India has a very limited degree of localization. Only two models of Audi A4 and A6 are manufactured in the Indian facility (Audi, 2021). Porsche entered India in the year 2004. Porsche India is a part of Volkswagen India Pvt. Limited group. However, unlike its German counterparts, Porsche does not have an R&D or production facility in India. On the contrary, it relies on its parent company Volkswagen for importing cars from its production units (Porsche, n.d.).

R&D: Mercedes Benz is the only German automaker that has an R&D center in India named Mercedes Benz Research and Development India (MBRDI). The purpose of this center is to provide product development and IT support to the parent organization in Germany. However, this R&D center is not dedicated to tailoring and designing cars for Indian customers. Usually, the lower-ranked versions of Mercedes cars (C & S class) have greater incorporation of localized design and parts, compared to the higher-end versions (Shankar, 2021). However, even for the localization of designs, the decisions are highly centralized to the German headquarters in Stuttgart. Despite localizing assembly operations, Volkswagen

group has a heavily centralized German R&D in Berlin. India as such does not have an R&D center. However, in 2017 Volkswagen India had announced its intentions to set up an Indian R&D that would enhance its capabilities to tap frugal markets in India (Banerjee, 2017). Although cars like Vento, Jetta, and Polo have been designed for the Indian market, the Indian R&D was not involved in autonomously deciding the configurations. Just like other luxury automakers, BMW has a centralized R&D based in Bavarian Germany. BMW does not have an R&D center in India. As an attempt to attract local talent in March 2018, the Indian subsidiary provided 365 engine and transmission parts to leading technical universities in India (Wadhwa, 2018). The idea was to give budding engineers a hands-on experience of their superior cutting-edge technology.

Production: To produce E-class cars, in the year 1997, Mercedes Benz entered a joint venture with the Indian automaker Tata located in Bombay. In 2009, Mercedes Benz inaugurated its independent manufacturing unit in Chakan, India. It is a 100-acre plant with around 730 employees featuring world class production facilities like digital manufacturing and virtual reality (Daimler, 2021). The plant has the capacity to manufacture 20,000 units annually (Thakkar, 2021). Since Skoda, a subsidiary of Volkswagen, was already operating in the Indian market, the initial assembly of Volkswagen cars was at Skoda's assembly plant at Aurangabad, India. In addition, Volkswagen has a fully owned plant assembling unit in Pune. The Pune plant of Volkswagen takes care of all processes including pressing parts to the final assembly. So far Volkswagen claims a localization of 82% in India (excluding engine and transmission parts) (ETAuto, 2018). Given the lower costs of production in India (compared to Europe and North America), they intended to exploit local resources for assembling from India and export it to the other countries. In the year 2017, the plant made a record of producing 150, 150 cars with a workforce of 3600 employees (ETAuto, 2018). At present, Volkswagen has three models manufactured in India, namely Jetta, Vento, and Polo. Currently, Volkswagen exports 310,000 cars assembled at Indian plants to 35 countries including counties in North America, South America (Kuivalainen, 2018). BMW owns a plant in Chennai (Southern part of India) for production., a parts warehouse in Mumbai (India). In addition, the company also has an established training center in Gurgaon (India) (CNBC, n.d.). The plant in Chennai can produce 14, 000 cars annually (Wadhwa, 2018), and manufacturing is restricted to meet the demands of the Indian market. With the localization of about 50%, half of the parts for assembly are met from local suppliers whereas the rest are imported from their global supplier networks especially in Germany. 95% of the cars for the Indian market are produced in the Chennai plant and a very few are imported (TeamOD, 2018) from the central headquarters. As of now the following variants of BMW are produced in the Indian plant: BMW 1 series, 3 series, 3 Series Gran Turismo, 5 series, 7 series, X1, X3, and X5 (ETAuto, 2016).

Information Technology: In addition, given India's strong foothold in the IT sector, Volkswagen exploited this opportunity by developing a high-tech IT infrastructure system (called EcoEMOS) in India to control and coordinate activities amongst the various subsidiaries and suppliers worldwide, to achieve production efficiencies. This IT operation was outsourced to an Indian company named Durr located in Pune, India. As of 2016, almost 88% of Volkswagen's stakeholders have access to EcoEMOS (Kuivalainen, 2018).

Sales and service: Compared to its German counterparts Mercedes Benz enjoys an extensive network of dealers. With 89 dealers spread across 41 cities, Mercedes Benz is a well-known brand to Indian customers (Zoho, n.d.). Volkswagen has 137 sales outlets in the country and 116 service centers (HT, 2020). Since its variants are less expensive than its luxury counterparts it has more outlets and service centers. BMW has a strong dealership network throughout the country. As of 2019, it has a total of 50 dealers located in over 40 cities. Interestingly to cover tier 2 and tier 3 cities, they currently have close to 50 on the wheels (that is mobile studios) (TeamOD, 2018). In fact, as an attempt to digitalize sales, BMW India has also started an online shop, wherein customers could connect online to buy a car (Singh, 2019). Audi has a total of 38 retail outlets and service centers in India, spread across prominent cities (Cardekho, 2021). Porsche India

has 8 dealers and 5 service networks in India. However, the company has plans for ambitious expansions in India (ET, 2020).

3.2 Background and Overview: The Indian market scenario

India is currently the fourth-largest automaker in the world. As of the end of 2019, the market demand was 4,266,062 units of cars (Grandreviewresearch, 2020). With a rising population and a growing economy, the market is expected to grow at a rate of 11.3% from 2020-2027. Fig. 3.1 (a) highlights the market demand in India, for various types of cars. Fig. 3.1 (b) highlights the various categories of classifying cars in the Indian market.

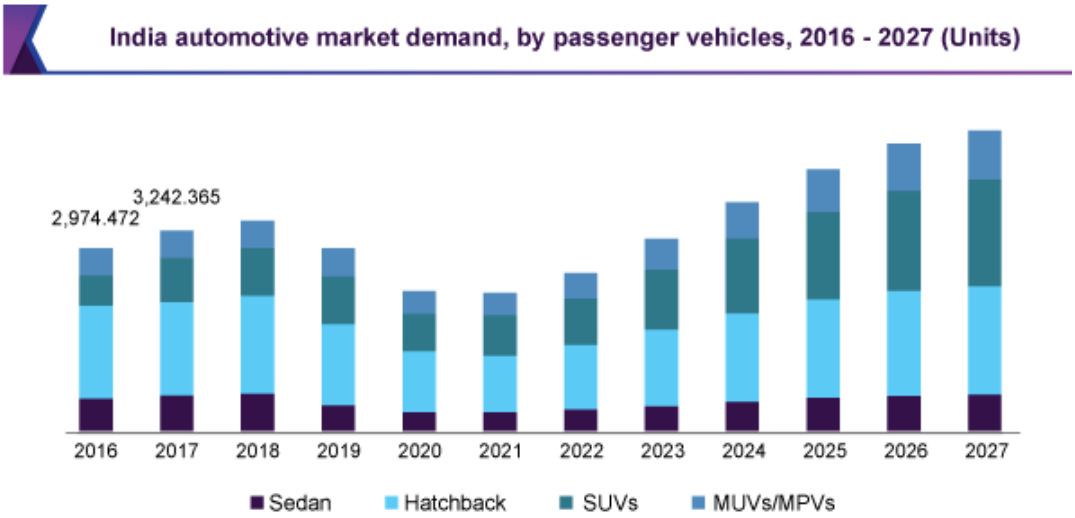

Fig. 3.1 (a) India automotive market demand (Grandreviewresearch, 2020)

Table 3: Passenger-Vehicle Segments

Segment	Description	Approximate Price Range
A	Entry-level hatchback	Under 3.5 lakhs
B1	Hatchback	3.5 to 6 lakhs
B2	Hatchback	6 to 7.5 lakhs
C1	Sedan	Under 8 lakhs
C2	Sedan	8 to 9.5 lakhs
D1	Premium sedan	Under 15 lakhs
D2	Luxury sedan	Under 25 lakhs
Utility	Sport utility vehicles and multi-utility vehicles	

Fig. 3.1 (b) Classification of passenger car segments
(Where, 10 lakh= 1 million; 1$= approx. INR70)

3.2.1 Indian market and German automotive industry

In a hierarchical status-driven country like India, brand names like Audi, BMW, Mercedes Benz, Daimler, and Porsche, are marketed as the 'elite brand' and a symbol of status. An article by Automotive news Europe (2020) reveals that these luxury brands account for approximately 1% of the total sales (in terms of

volume) but generate roughly 10% of the total automotive industry revenue, in India. In terms of volume, the luxury German automakers (Audi, BMW, and Mercedes Benz) together sell approximately 20, 000 cars a year (in a 3 million market potential country) (Financial Times, 2019). Typically, the Mercedes Benz, BMW, Audi, and Porsche operate in the D2 and utility segments whereas Volkswagen operates in the B2, C2, D2, and utility segments (using Fig. 3.2 (b)).

Research by Chauhan (2014) of 'The Economic Times' reveals that German automakers enjoy a monopoly in India's luxury market. Other cars like the Japanese Honda Accord, the Japanese Suzuki's Kizashi, serving in a similar segment withdrew from the market, as they could not compete with their German counterparts. In addition, Toyota had to abandon the plan of introducing its luxury car Lexus to the Indian market. Abdul Majeed (partner at PWC and an automotive expert) highlights that in the luxury segment, German automakers have a clear advantage over their Japanese counterparts in terms of brand and specifications (ET, 2014). Tata motors' Jaguar seems to be the only additional successful new entrant in this segment.

3.2.2 The Indian automotive market

Hatchbacks and compact sedans account for 70 % (2,500,000 in numbers) of the total sales volume in India (The Economic times, 2014). This is owing to the economic condition of the country. So far Suzuki (Japanese) dominates the Indian market with a market share of 33%, followed by Tata Motors (Indian) with a market share of 26% and Hyundai (Korean) with 15% (Womg, 2021). These car companies operate in the B1, B2, and C1 segment, which accounts for the maximum demand in India. The remaining is shared by a total of approximately 24 automakers from India and the world. An article by Thakkar and Chaliwala (2020), highlights that Volkswagen has a market share of 1% in India. It has been the only German automaker to have introduced a hatchback version (Polo) based on the Indian market needs and economy. This has increased its market share to 3% (Thakkar & Chaliwala, 2020). Now for the German automotive industry turning to frugal innovations would mean that they would have to strategically position their products for this market. Fig. 3.2 highlights the sales volumes of various automakers in India.

From an Indian market standpoint, Maruti Suzuki and Hyundai present the most lucrative options, given the income and affordability. Consequently, the competition between these two automakers is the most debated in the Indian car market. Maruti Suzuki represents a partnership between the Indian finance company Maruti and the Japanese automaker Suzuki. With cars tailor-made for the Indian market such as Wagon R, Swift, Dzire, Celerio, and Baleno targeting the B1 and B2 segment, it presents the most convenient options for an average Indian customer (Panwar, 2019). Hyundai, the Korean automaker, had spent a considerable amount of time in India since 2001, investigating the Indian market. With a fully owned subsidiary in India, with an autonomous R&D, production centers it was successful in establishing itself in the Indian market (Sharmelly & Ray, 2008). Hyundai cars such as Eon, i10, venue, and i20 operating in the B1, B2 and C1 segment present the most lucrative options for the Indian mass market. Apart from Hyundai and Suzuki, Tata, Ford, and Honda are the other automakers that are successfully well established in this segment (Panwar, 2019).

From a customer standpoint, affordability, accessibility to service, inexpensive spare parts, price, and resale value represent the most important parameters. Therefore, Suzuki, Tata, and Hyundai dealers and service networks could be found in almost every corner of the country (Panwar, 2019). To stand a chance in this competition, Tata is very competitively priced and loaded with features such as safety at an affordable price. In addition, fuel efficiency is one of the most important considerations for an average Indian customer. Both Hyundai and Suzuki design cars with a fuel efficiency of more than 20 km per liter (Panwar, 2019).

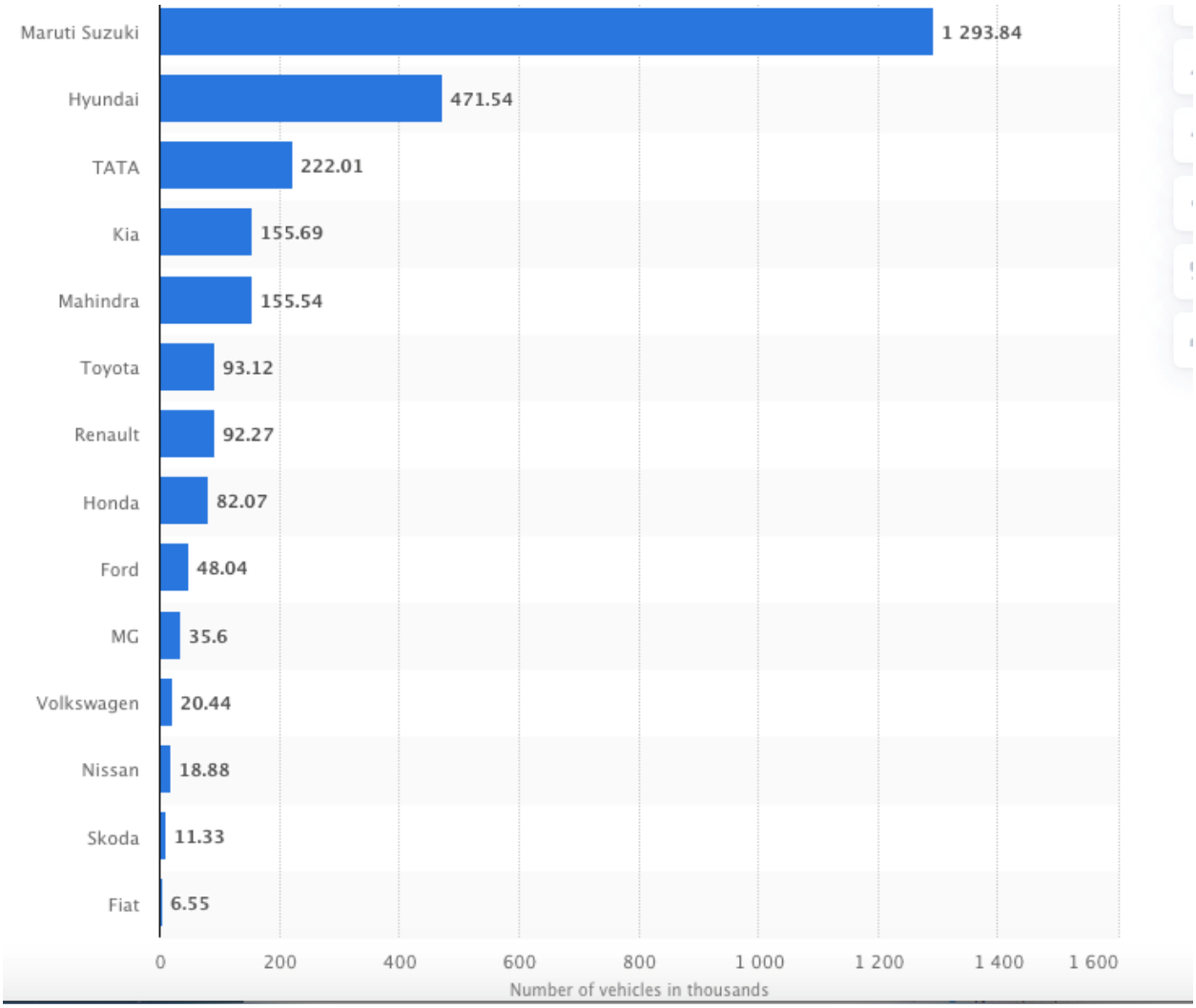

Fig. 3.2 India sales volume (2021) (statista, 2021)

3.2.3 Effects of the Covid-19 pandemic

The recent covid-19 pandemic has significantly affected the automotive market in India. With the onset of the pandemic in early 2020, the country went on a national lockdown which reduced the sales volume in the early months. However, from mid-year 2020, with no further lockdowns, the country started witnessing growth in the automotive sector. Fig. 3.3 highlights the exact figures. With a growing middle class and government schemes to promote exports from within the country, the automotive sector overall shows an upward trend (Chibber & Gupta, 2021). However, the Covid-19 pandemic has created a difficult situation for the luxury segment including the German automotive industry. From a whooping sale of more than 40, 000 cars a year in 2018, the current sales are estimated to be lesser than 35,000 units (Businessstandard, 2020). It is believed that the German automotive industry has pushed back approximately 5-7 years (in terms of sales). Since the covid situation in India is an ongoing challenge, the sales projections and forecast in the luxury segment appear to be a bit dark.

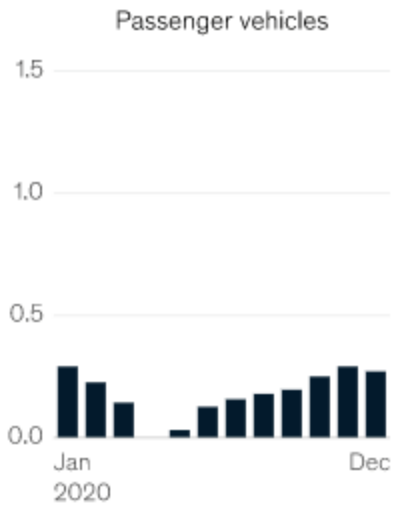

Fig. 3.3 Sales (in million units) effect due to the Covid-19 pandemic (Chibber & Gupta, 2021)

3.2.4 Sustainability and e-vehicles

E-vehicles account for less than 0.2% of India's automotive market share currently (Hindu, 2021). Although the Indian government has introduced subsidy schemes to promote e-vehicles in India to reduce air pollution, the e-vehicle market in India is faced with numerous challenges. An e-vehicle manufactured by Tata costs approximately $22740 (Hindu, 2021). In addition to being expensive, at this moment the country lacks e-vehicle infrastructure such as charging stations. For instance, New Delhi with a population of 31 million has only 72 charging stations. In addition to that, it has been reported that it takes 12 hours of charging for a 5-hour drive (Hindu, 2021). Due to lack of demand, automakers have been skeptical of the transition to e-vehicles. However, recently Tesla has made plans to expand operations in India. But the lack of e-vehicle demand has made automakers indifferent to Tesla's entry in India.

3.3 Background and Overview: Fiat Palio in India

The Fiat group was established in 1899, headquartered in Turin, Italy. The largest automaker in Italy, Fiat has played a leading role at many points of time in various countries. Within a few years, in 1908 Fiat had established itself as a luxury automaker in the United States of America and the European market. With a monopoly in the European luxury market, Fiat had produced approximately 1.4 million cars by the 1970s (cars, n.d.). In addition, the Fiat plant at Lingotto, Italy features a huge five-floor assembly line with a test track on the roof. However, in the 1980s with the emergence of Volkswagen and PSA Peugeot, Fiat's monopoly in the USA market was in jeopardy. Fiat was being criticized for its poor quality and monotonous designs. To stay grounded in the market Fiat undertook certain aggressive steps to regain its competence in the international market. From the 1980s to the 2000s new designs and models were introduced. Alongside, Fiat adopted an internationalization strategy.

In the 1990s with forces like globalization shaping the automotive industry, Fiat resorted to a new strategy of adaptive R&D to penetrate new markets and tailor products to fit the market needs. A part of this strategy was to penetrate emerging markets that lacked automotive expertise. However, these countries provided enormous buying potential. Three countries sounded promising namely: Turkey, Brazil, and India. Fiat, therefore, planned on the creation of subsidiary R&D and production centers to localize cars for these markets and gain entry. The purpose of these local R&Ds was to adopt a market-driven approach to

designing cars. Many parameters including road conditions, safety regulations, and emission standards were vastly different in these countries. Since the R&Ds were able to attract local talent, the purpose was to incorporate these parameters in the design process (Athreye et al., 2014).

3.3.1 Fiat and India

In 1991, India underwent a major policy change liberalizing foreign investment and attracting foreign firms to invest in the country. Fiat sensed this opportunity and by 1997, Fiat established its fully owned subsidiary in India under the brand name Fiat India Private limited headquartered at Kurla, India (Cardekho, n.d.) in alliance with an Indian company named 'Premier'. To offset its declining sales in Europe, Fiat decided to partner with firms in the Indian subcontinent to cater to the upcoming middle-class population. They believed that the presence of a local partner could accelerate their technological superiority while seeking market knowledge from their local partners (IESE, n.d.). It partnered with Premier to launch its first affordable car named 'Uno". In addition, they also started negotiations with Tata motors, a well-established automotive company in India for a joint venture (Bharadwaj, 2020). The production was set in stone in Premier's manufacturing facility in Kurla (BS, 2013). However, the Uno failed to meet expectations and by the early 2000s, Fiat was on a loss and needed a quick strategy to get back in the game.

3.3.2 The case of Fiat Palio in India

In 2001, Fiat came up with another model named Palio. Palio was designed to be an affordable car for the Indian masses, with a pleasing exterior and featuring classic Italian technology (Bharadwaj, 2020). In addition, the Fiat Palio offered something new externally that was a first for the Indian customers, that is colored bumper plates, which made it even more aesthetically pleasing. The Palio was positioned in the B segment of the Indian car market with a powerful 1.2-liter petrol engine, robust and safe design. It was much superior technologically and aesthetically to then known cars in the segment Maruti's Zen and WagonR, & Hyundai's Santro. In addition, the Fiat Palio was endorsed by Sachin Tendulkar (a world-renowned sports celebrity in India) to appeal to the masses (Chandran, 2020).

On the very first day of its launch, the Fiat recorded history by selling 1100 cars in the first two days. In almost one year after its launch, the Fiat Palio sold 33000 cars. These figures represented a 374% growth of sales since the previous year (Dey & Deshpande, 2002). Fiat Palio went on to win the Autocar award of the year in 2001 and was praised for its value for money. During this period Fiat's market share increased from 2% to over 10% (Jain, 2013). To meet this growing number of customers, the Fiat group extended their dealership networks from 51 to 66 featuring around 100 service points (Dey & Deshpande, 2002).

However, after a year's time sales went off the cliff and the Fiat Palio which was once regarded as a marvel collapsed in the Indian market and never reached the momentum it had previously. From approximately a sales volume of 23,000 in April 2002- March 2003, it decreased to 9000 in March 2003-2004 (Jain, 2013). In June 2002, media reports started spreading rumors discussing that Fiat might retreat from the Indian market, due to declining sales. Given this rumor, Fiat sales further declined from 4000 cars in June 2002 to 380 in September (Jain, 2013). Fiat underwent major losses during this process from selling almost 60 Palios a day, their sales volume declined heavily, stocking up their inventory (Jain, 2013). Fiat stock prices crashed and the once renowned Fiat Palio failed in the market.

4 METHODOLOGY AND FINDINGS

This chapter provides a deeper insight into how the research question and the associated sub-questions would be answered. The first part of this chapter would provide insights on the data collection methods and procedures. Then, in the end the findings from the usage of these methods in the context of the evaluated literature (Chapter 2) would be presented.

4.1 Phase 1: Literature Study

As highlighted in section 1.3, this section deals with a literature study involving five different disciplines of literature: German automotive industry literature, Germany-India business literature, frugal innovation literature in the Indian car industry literature, and sustainability literature. These five literature sources could prove answers to the research question and identify the factors of relevance for the German automotive industry to enter the Indian frugal car market.

4.1.1 Research strategy

Although very limited literature that could provide answers to the question was available, the literature study had to be altered accordingly. Literature review (Chapter 2) highlights the importance of the identification of the internal and external factors relevant for frugal innovations. To answer the research question, there are two entities involved in the context of the evaluated literature: Internal- German automotive industry' and external - Frugal markets in India. The frugal car market in India could be further classified into two key disciplines: Frugal innovation India and the car market in India. As a consequence, the first step in the literature study is to derive factors from three disciplines. However, since Germany and India are two different nations with varied cultures and institutional frameworks (Hofstede, 1994), it is important to be sensitive to the differences in institutional, legal, and business frameworks affecting trade and business relationships between the two countries. Secondly, this discipline of literature could additionally highlight the impact of globalization. In chapter 1, the role of sustainability and e-vehicle substitution was considered as one of the major factors affecting the German automotive industry. The final discipline of literature that would be a part of the study is sustainability. To put it in a nutshell, the following are the five disciplines:

German automotive industry literature: It's important to the German automotive industry and identifies its capabilities. Additionally, it also gives detailed insights about their business operations in India, the partnerships, and how cars are designed and manufactured.

Frugal innovations India literature: This would be important to identify and evaluate if their business models and activities are conducive enough to promote frugal innovations in India. Various scholars have worked on frugal innovations in India, and how international companies managed to do so. This analysis undoubtedly would help in identifying and evaluating the various opportunities and threats that would be of interest to the German automotive industry.

Analyzing target market (Indian) perspective: It has been established earlier that the Indian automotive market is highly competitive. Through this review, it would be helpful to understand the needs of Indian customers and what makes them flock to certain car brands and models. It would also be instrumental in identifying the competitors in the market and their unique value propositions.

Indo- German business literature: To identify the opportunities and threats in India, first, it's important to understand the situation in the Indian market, and where exactly do the opportunities and threats lie. Secondly, India and Germany represent two different countries with totally different cultures and belief systems at the business level. Therefore, from an international business perspective, it would make sense to look at the various opportunities and threats involved. This calls for a deeper understanding of culture, value systems, and institutional aspects of the country. For instance, the bottlenecks, legal framework, institutional, societal, networking, relationship building, and cross-cultural aspects that would be of advantage/ disadvantage.

Sustainability*:* Sustainability is an important parameter to be addressed as the entire debate on the automotive industry has been triggered by this one force. With talks about sustainability and e-vehicles on the pipeline, a firm understanding of the opportunities and threats concerning sustainability and e-vehicle transition effects from an Indian perspective would be an equally important factor to address.

The purpose of the literature study is to combine the findings from the five disciplines and fit it in the context of the evaluated literature in Chapter 2. Fig. 4.1 highlights the entire strategy.

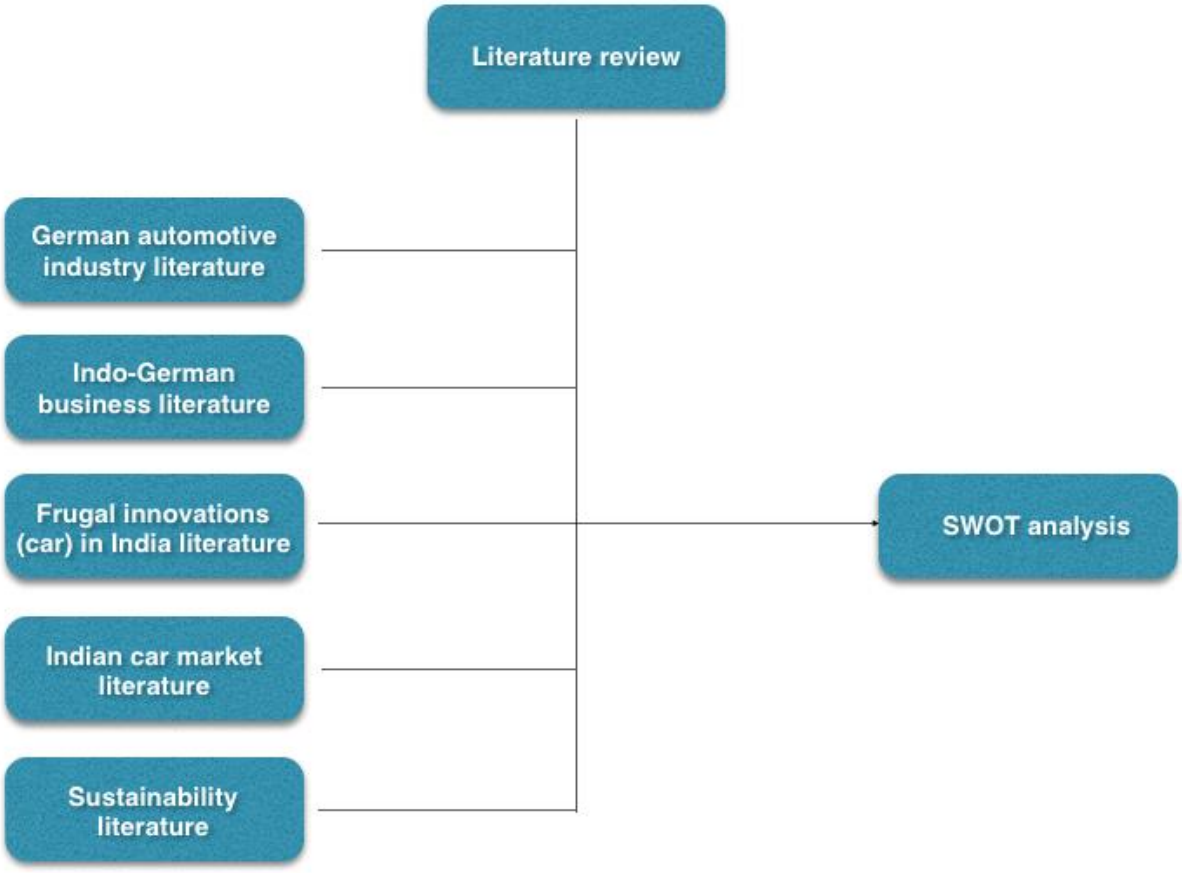

Fig. 4.1 Phase 1: Literature framework: Research strategy

4.1.2 Search criteria and selection

The starting point of the research was with sensitiveness to the findings from the literature review (Chapter 2). The priority was to get a deeper understanding of the German automotive industry, its strengths, and weaknesses. The second priority was to get a deeper understanding of the car market in India. The intent was to identify the strengths, weaknesses, opportunities, and threats to answer the research question. As a consequence, the first stage of the literature study was on the disciplines 'German automotive industry, 'Frugal innovations in India', 'Indian car market'. The second stage of the literature study was on understanding the external impacts of globalization, cross-cultural business, and sustainability to supplement the SWOT analysis. Despite two distinct stages, the literature study was conducted iteratively, to get the insights relating to the literature review (Chapter 2). The main search engines used were google scholar, Scopus, and web of sciences.

For the first discipline, the following keywords were used "German automotive industry", "German automotive industry AND "value chain", "German automotive industry" AND "R&D", "German automotive industry" AND "production", "German automotive industry" AND "technology", "German automotive industry" AND "Sales and service", "German automotive industry AND advantages", "German automotive industry" AND "disadvantages". Many academic sources could be found relevant to the contents, however since the purpose of the research was on frugal innovations, priority was assigned to relevance to the research topic. Equal priority was assigned to the latest sources (after 2015), as the automotive industry is highly dynamic and is marked with a lot of changes in years. A total of 12 quality peer-reviewed articles were shortlisted, which had the most relevant data concerning the research question. A total of 56 articles were reviewed based on the criteria mentioned.

For the second discipline, the search criteria used were "Frugal innovation", "Frugal innovations" AND "India", "Frugal cars" AND "India". Since frugal innovations are a relatively unexplored area especially in the car industry, priority was set to open to including as many perspectives as possible. However, to obtain scientifically best data, articles with generalizable research methods were assigned priority. A total of 15 articles were shortlisted covering Indian frugal innovations, customers, and Indian frugal cars such as Tata Nano, Hyundai, Eon, etc.

For the third discipline, the search criteria used were "India car market", "India car market" AND "Competition", "India car market" AND "customer", "India car market" and "Covid-19". Many articles could be found, however here the priority was assigned to the latest articles, as consumer behavior changes with time and circumstances. Additionally, it was important to understand the car market due to the covid-19 pandemic situation, for such articles the scope was only after 2020, however for the rest the scope was open from 2015. A total of 8 articles were shortlisted.

For the fourth discipline, the search criteria used were "Indo-German business", ``Cross-cultural business", "globalization" AND "automotive industry", "Germany industries" AND "emerging economies". Since many articles could be found, the highest priority assigned in this case was relevance to the research topic based on abstract readings. A total of 14 such articles including working papers could be found.

For the fifth discipline, sustainability, since it does not form a very important part to answer the research question, it was a brief phase. The search terms used were "sustainability", "e-vehicles", "India", AND "e-vehicles. Priority was assigned to the latest articles to understand their impact in the automotive industry. A total of 5 such articles could be found.

Discipline	Criteria for selection	Articles

German automotive industry literature	Relevance, after 2015, generalizability	12
Frugal innovations literature	Generalizability of findings	15
Indian car market literature	After 2015, after 2019 (Covid-19 pandemic), research methods used, generalizability	8
Indo-German business literature	Relevance	14
Sustainability literature	After 2018	5

Table 4.1 Selection criteria

4.1.3 Data reduction

The data obtained from the 56 articles were used to prepare a SWOT analysis. Data reduction involves two major steps: categorization and coding. Chapter 2 highlights the major categories of data that are of relevance to frugal innovations. The obtained data was split into the categories identified in Chapter 2. The obtained data were compared to the internal and external factors (Chapter 2). The obtained internal factors were compared to the findings in (Chapter 2) to account for if they contributed positively to frugal innovations or not. If the identified factor contributed positively to frugal innovation, it was recorded as a strength and vice versa (weaknesses). Similarly, externally if the identified factor contributed positively to frugal innovations, it was recorded as an opportunity or vice versa (threats).

4.2 Phase 2: Secondary case study

As mentioned in section 3.3, the Fiat Palio in India is an example of a frugal car from a European automaker that was once known for its elite brand status. However, the Fiat Palio had a very interesting story in India, with very high customer reception initially. However, in a span of 2-3 years, the Palio failed massively in the Indian market. The purpose of this secondary case study is to identify the factors that could be learned from the Fiat case for an elite automaker to enter the Indian frugal market.

4.2.1 Scope and relevance

The Fiat Palio case has a splendid potential to present opportunities and threats for the German automotive industry in India. There are a few reasons for the motivation:

1. Fiat enjoyed the elite brand status when it launched the Palio. Therefore, it has a great deal of commonality with an elite brand name trying to enter the Indian frugal market, such as the German automotive industry. Their initial success with Palio presents a lot of learning and insights for any elite automaker to successfully adapt to the Indian market.

2. Fiat was well established in the European luxury automotive market before switching to frugal innovations. The German automotive industry presently is in the same situation as Fiat previously was.

3. Both the German automotive industry and Fiat rely excessively on their technological superiority.

4. India has a history of frugal cars such as Hyundai's Eon, Tata's Nano. However, Hyundai and Tata operate in a different segment, and their cases have very little to offer for the German automotive industry.

5. Even though the Palio case happened 20 years back in history, the Indian market and its buying behavior revolve around the same segment and mindset. Therefore, the Fiat Palio case has a lot to offer for any elite European automaker to enter the Indian frugal market.

4.2.2 Research strategy

A wide range of academic scholars has analyzed Fiat as a company (with its frugal car strategy) and Fiat Palio in India. This phase would involve a second case study analysis by reviewing previous case studies of Fiat, Fiat Palio, and its role in India. Additionally, this section also showcases an interview with one of the academic experts, who had the opportunity to visit multiple Fiat units worldwide and analyze the role of Fiat, in the context of internalization and frugal car development. This phase attempts to combine insights from literature and specific insights from the interview. The findings would then be evaluated in the context of the literature review (Chapter 2). Fig. 4.2 highlights the entire research methodology involved in this phase.

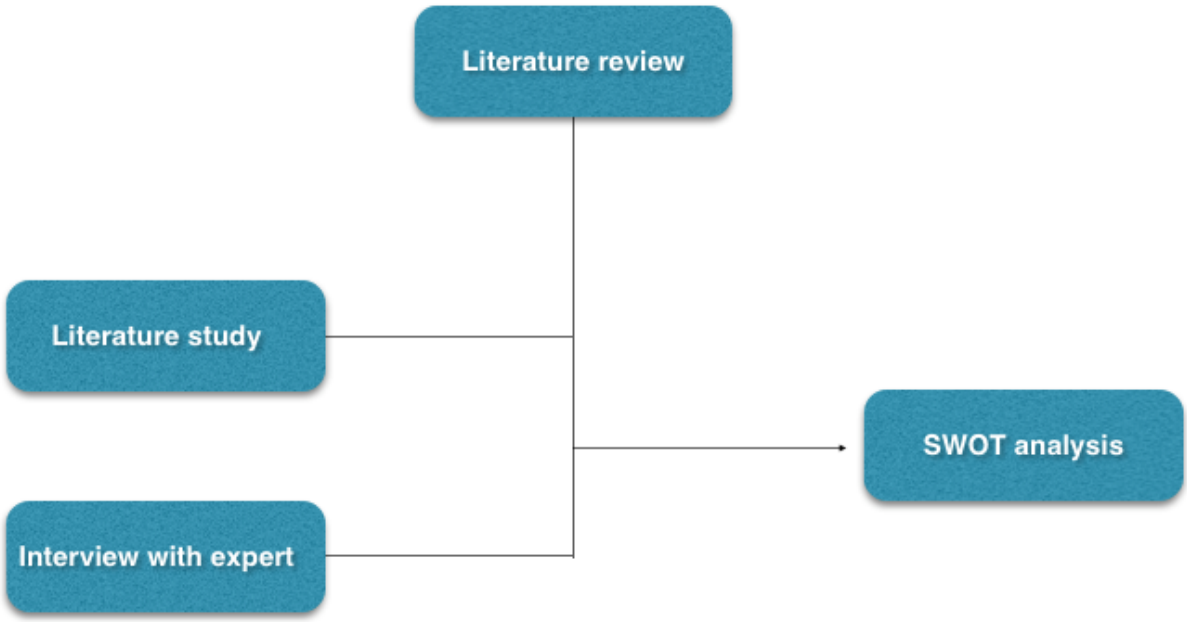

Fig. 4.2 Research strategy: Phase 2: Secondary case study framework

4.2.3 Search criteria and selection

The starting point of this research is using four articles representing the role of Fiat as far as internalization is concerned: Athreye, Celikel & Ujjual (2014); Cummafo (2004); Mullick & Tripathi (2015); Prabhkar (2010). The articles sufficiently described the internationalization strategy used by Fiat and its role in India,

in the years during the launch of Fiat Palio and after. However, to get a deeper insight into the case of Fiat Palio in India, additional research was done. The main search engine used was google scholar, web of sciences and Scopus.

One part of the selection involved shortlisting articles, from the references of the four articles mentioned above. Secondly, it was using search engines. The search terms involved “Fiat Palio”, “Fiat Palio” AND “India”, “Fiat” AND “India”. Here the main criteria for alteration were the quality of research methods used through abstract reading to select relevant articles. A total of 12 relevant high-quality articles were shortlisted. However, to get a clearer insight on all aspects an interview was also conducted with the authors of Athreye et al., (2014). The interview protocols and guidelines are the same as mentioned in sections 4.3.1 and 4.3.2. The transcripts of the interview along with questions are enclosed in Appendix G.

4.2.4 Interpretation of findings

The data obtained from the 12 articles were then evaluated in the context of the literature review (Chapter 2). This was done in two phases: Firstly, SWOT analysis of Fiat was performed (Appendix C1) using the same method as in section 4.1.3. Thereafter, it was necessary to evaluate the findings in the context of the German automotive industry and frugal innovations in India. This was done using the following method:

Internal analysis: All the strengths of Fiat Palio which contributed to its success, were also considered as strengths for the German automotive industry if it was one of their strengths (obtained from 4.1.3). If it was not their strength, it was considered a weakness of the German automotive industry (obtained from 4.1.3). Similarly, all weaknesses of Fiat Palio, which are also weaknesses of the German automotive industry (obtained from section 4.1.3), were considered weaknesses. On the other hand, if it was a strength for the German automotive industry, it was considered a strength. To have the best results, the process was repeated once again with phase 3 to avoid errors and biases in the previous literature study.

External analysis: Empirical conclusions in terms of opportunities and threats, obtained from the inferences of Fiat Palio, except for local situations (like law and policy changes around the year 2000s extra) were considered for the opportunities and threats for the German automotive industry.

The results of the analysis of Fiat Palio and India is in appendix C2.

4.3 Phase 3: Expert Interviews

The interviews conducted were semi-structured in nature. It has been conducted with strict conformity to the guidelines used in research (Sekaran & Bougie, 2016) . Following are a few guidelines that has been used in the process:

1. The purpose of the interview should be clearly communicated.
2. Confidential and personal data should be anonymous until permitted to reveal so.
3. Interview questions should be kept open ended.
4. Interview questions should be easy to understand.
5. Interviewees should be guided for a better response in the case of a difficult question
6. Avoiding double barreled questions
7. Avoiding loaded questions (avoiding questions that already conveys the gist of what is to be expected)

4.3.1 Interview structure

Given the nature of the research and the combination of insights from different perspectives, the interview structure has been adapted according to the expertise of the interviewees. Firstly, the interview process showcases insights from both academic and industry experts. The Academic experts are from three different schools of thought. Firstly, experts with research expertise on frugal innovations for the German automotive industry, secondly experts with expertise in cross-cultural businesses. The industry experts have vast amounts of experience with the German automotive industry in different spheres of the value chain. The interviewees were approached through professional connections and networking. The interviewees were formally invited for the interview through email, in which the purpose of the research was communicated. The interviewees were sufficiently informed about the duration and the nature of questions to be prepared for the interview. The expected duration of the interview was 45 minutes. To fit in the 45 minutes time, frame the questions were designed accordingly, to cover all the insights within the specified timeframe.

The interviews were divided into three phases: The first phase consisted of an explanation of the research topic and asking their consent for using their insights in the thesis work. The second phase consisted of their experience and expertise in their respective fields. The third phase consisted of questions to identify the factors concerning frugal innovations for the German automotive industry in India. While the first and second phases were intended to be finished within the 10-15 minutes timespan, and the additional thirty minutes to seek answers to the research questions. The final phase of the interview was to understand the strengths, weaknesses, opportunities, and threats that could impact frugal innovations for the German automotive industry in India. In addition, in this phase, the gist was also to identify the trends and challenges in the automotive industry shaped due to factors such as the covid-19 pandemic and e-vehicle substitution. The interview questions could be referred to in Appendix D1.

4.3.2 Selection of participants

The research aimed to gather 7 experts from industry and academia with a priority for industry experts. Trying to venture into an unexplored area, the selection of participants was done to accommodate as many perspectives as possible. The purpose of involving academic experts was to understand recent research findings and trends concerning frugal innovations. German universities such as TU Hamburg and the University of Cologne, are the major universities wherein research is centered around exploring frugal innovations for the German automotive industry and frugal innovations (in general). Consequently, priority was assigned to one academic expert each from these two universities. However, to understand their impact in the Indian market and the role of cross-cultural differences, priority was assigned to contacting an expert specializing in international business in TU Delft. From the industry front, since the research topic deals with all aspects of the value chain for the German automotive industry, it was important to select experts from a range of industries and value chains such that all necessary data could be collected. To gain insights into Indian R&D and products, experts representing Mercedes Benz (R&D), India was chosen. Secondly, to understand automotive industry trends, production and supplier relationships executives from Bosch India was assigned priority. Thirdly, to understand innovations from a marketing perspective and marketing trends, Volkswagen-Audi group, India was chosen as the point of contact. Fourthly, to understand trends in sales and service Mercedes Benz (retail) India was assigned priority. In the interviewees, some questions were covered for a longer time than the others, as the interview had profound expertise and knowledge in a few specific niches than the others. Additionally, to gain deeper insights into the case of Fiat Palio in India, an academic expert who worked hands-on investigating the Fiat case was interviewed. Table 4.2 summarizes the selection criteria.

S.no	Industry	Interviewee	Expertise
1	University of Hamburg, Germany	AFI1, 2021	Frugal innovations in Germany; car industry
2	University of Cologne, Germany	AFI2, 2021	Frugal innovations in Germany; car industry
3	TU Delft	AFI3, 2021	Cross-cultural business
4	Volkswagen-Audi India	IFI1, 2021	Product and Marketing, Market, competitors and customers, social, political, and legal factors
5	Mercedes- Benz, India	IFI2, 2021	R&D, business factors
6	Bosch, India	IFI3, 2021	R&D, production, supplier relationships, market, and competitor analysis
7	Mercedes-Benz, India	IFI4, 2021	Retail, sales, and service
8	Isik University, Turkey	AFI4, 2021	Fiat internationalization, case of Fiat Palio

Table 4.2 Selection criteria- Expert interviews

4.3.3 Analyzing the interviews

The research is exploratory, however, the insights obtained from the interview was an in-depth understanding of the German automotive industry and the frugal markets in India. The insights from experts were used to inductively derive the factors that could give a plausible answer to the research question and help in further analysis. Firstly, the insights from the experts were evaluated based on the literature review (Chapter 2) and categorized into the aspects they contributed to. The internal factors were categorized into strengths and weaknesses based on the categories assigned in the literature review (Chapter 2); similarly, the external factors were categorized into opportunities and threats, placed in the respective categories. Based on these insights a SWOT analysis was constructed (Appendix D2 and D3).

4.4 Findings

Using the three methods three SWOT frameworks were obtained (Appendix B, C, D). The three frameworks were then combined using the complementarity method as mentioned in section 1.2. The findings after complementarity are listed as follows:

4.4.1 Strengths

Organizational factors

Business model in India: Proven and well-established business model internationally for IC engine-powered cars and current market to remain stable at least till 2025 (Schwabe, 2020). Major German automotive car companies have established businesses in India. A high degree of business model adaptation in developing countries (India) as German automakers rely extensively on emerging markets to offset sales decline in developed nations (Landau et al., 2016; Raj et al., 2019).

Business partnerships: They have a rich history of local partnerships. This presents opportunities to tap local markets. For instance, Tata and Mercedes Benz; Volkswagen and Maruti-Suzuki; Bharat Benz (Indian partner of Daimler) for commercial trucks in India (Kainth & Mathur, 2016). This was also one of the features that contributed to the success of Fiat Palio in India. For instance, Fiat formed a joint venture with Premier that enabled it to share certain risks in a totally new market (Athreye et al., 2014).

Organizational management: The presence of value-based management commitment which can solve organizational issues such as principal-agent problems within organizational boundaries, which generally leads to lower productivity (Raj et al., 2019). For instance, in the case of Fiat, use of sophisticated virtual platforms and ICT between subsidiaries and home centers enabled communication and coordination internationally, and could produce fastest to the market cars (approx. 15 months) (Athreye et al., 2014).

Technological expertise: They have all the technology, skills and reasons needed to understand frugal markets in India and tailor their products accordingly (AFI2, 2021; IFI1, 2021; IFI4, 2021). The Fiat brand name in India additionally featured a strong technology edge with a tested and advanced R&D team (Roy et al., 2014), which led to its widespread popularity.

R&D factors

Sustainability oriented: Their R&D focus on sustainability can result in superior social value creation in terms of frugal products (Malte et al., 2020). This can give them an upper hand when it comes to tapping support from environmentalists and governmental institutions.

Experience with Local market adaptation: Their R&D's ability to tailor product requirements by region. Although their R&Ds are not fully market driven, they still are in the game. For instance, Daimler- Benz has an R&D hub model, thereby acquiring a research center in India for local R&D development (Calabrese, 2001). For instance, Mercedes Benz, alters its design for Indian market, based on the safety and emission regulations (as they differ from Germany) (IFI2, 2021). Similarly, Volkswagen was successful in developing an executive luxury sedan for India, Volkswagen Vento. German industries have some experience with successful frugal innovations such as in automotive the adjustable Volkswagen Polo (Tiwari et al., 2017). Fiat had a Tier 2 subsidy in India and was assigned autonomy in certain R&D activities including changes based on fuel quality, mileage, road conditions and Indian policy regulations (Athreye et al., 2014). These features enabled Fiat to have an edge in the Indian market. The German automotive industry has a similar capability. Fig.4.3, highlights the following:

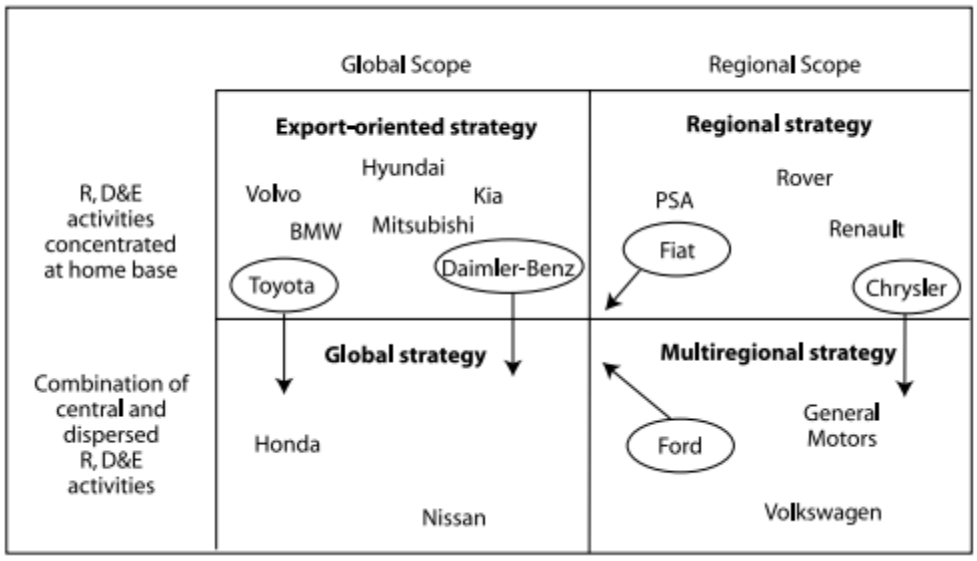

Fig.4.3 Global strategies of major automotive companies (Calabrese, 2001)

Technologically advanced R&D: German firms typically have a very superior R&D ability and technological superiority and solve technical problems. Since frugal innovations are also technical, they have all that is needed to solve the technical challenges with respect to frugal innovations (AFI1, 2021; AFI2, 2021).

Production factors

Supplier relationships: Automotive OEMs have a very high degree of reliance on external suppliers. E-vehicle substitution might demand newer forged parts (1018 parts for IC, drivetrain, and vehicle counterparts), resulting in 83,000 employee jobs being eliminated. This would mean prominent existing suppliers would be happy if IC powered vehicles are still manufactured (Schwabe, 2020). Supply networks provide jobs to around 1 million which in turn has resulted in stabilizing the economy (Raj et al., 2019). Tier 2 suppliers in India also gain benefits in terms of learning and experience, enabling them to compete locally in a better fashion (Sturgeon & Biesebroeck, 2011). They are well networked with suppliers globally which gives them an edge (AFI1, 2021).

Supplier support: Sudden migration to e-vehicles might have to make them renew their client relationships which are highly impractical in a short time to compete with Tesla etc., meaning they must be open to options favoring IC engines as they have a well-established global value chain and global production network in this domain (Schwabe, 2020).

Production networks and infrastructure: Very high production networks and capabilities in emerging countries and higher demand needs (Raj et al., 2019; Rese et al., 2015; Sturgeon & Biesebroeck, 2011; Tiwari et al., 2017). Around 120 German automotive component manufacturers are well established in India (Wadhwa, 2020). For instance, Fiat featured extensive networking and collaboration, with the ability to exploit contacts. Fiat had around 1500 collaborations in Europe alone, which includes Universities and research centers (Athreye et al., 2014). In India, they had a Joint venture with Tata motors in 1997, under the name Fiat India limited (Mullick & Tripathi, 2013). Tata motors had the best networks in India right from spare parts suppliers to car dealers (Athreye et al., 2014). The German automotive industry's similarity with Fiat guarantees its success with frugal innovations.

Products and marketing factors

Customer involvement: Customer integration methods like Lead user and Voice of the customer (open innovation techniques) already in emerging economies which would work great for frugal innovations (Rese et al., 2015).

Brand name: Known for their premium brand names and are often regarded as status enablers (Tiwari et al., 2017). This was also one of the factors that gave the Fiat Palio an initial advantage in the Indian market (Prabhakar, 2018).

Technological edge: Products are technologically superior, and any offering from their ends, would be much more advanced than their competitors (IFI3, 2021). For instance, technically the Palio was much superior technologically and aesthetically in comparison to its competitors like Suzuki's Zen and Hyundai's Santro (Chandran, 2020). This gave it an advantage in the Indian market.

4.4.2 Weaknesses

Organizational factors

Market transition: A market transition towards electric vehicles and market for IC engines is on a decline and is expected to be pushed out of the developed countries market by 2030 (ING predicts a 50% market share for e-vehicles), German firms forced to revise strategies concerning their main specialty IC (Schwabe, 2020).

Low volume to high volume switching: Switching from high margin- low volume to low margin high volume is a challenge for them as it's a totally different ball game in terms of networks, value proposition and sales (Buse & Tiwari, 2014; Malte et al., 2020; Zeschky et al, 2014). Volkswagen is the only German car company that has a mass production capability in India.

Lack of a tailor-made strategy for India: One of the most important features of the success of Fiat Palio was a globalization strategy by adapting activities in the value chain conducive for frugal cars in emerging countries including India. Activities were highly market driven with the end customer as the focal point of concern (Athreye et al., 2014). The Fiat Palio manufactured for India was very different from that in Brazil (Prabhakar, 2018). The German automotive industry does not have such a strategy leading to a weakness.

Organizational structure: Rigid organizations with a lack of flexibility. Additionally, lack of management support and entrepreneurial orientation (Malte et al., 2020). With codified best practices, KPI reports might not favor frugal innovations (Malte et al., 2020).

Conflicting firm strategy: Frugal innovations are not in line with the strategic intent of these firms (to deliver a world class experience) (IFI1, 2021).

Firm mindset: They tend to develop the best irrespective of the prices; however, a frugal mindset involves delivering the best for a nominal given price. The price always precedes the best technical features (AFI1, 2021; AFI2, 2021). AFI3 (2021) indicates that the cultural mindset of an average citizen in Germany is to value efficiency and best products.

Resistance from employees: There would undoubtedly be a lot of resistance as frugal innovations would alter the entire organizational behavior. It would take a great deal of initiative to push it forward (AFI1, 2021).

R&D factors

Technology driven: High tech-driven and complexity in R&D innovation are highly preferred (Tiwari et al., 2017). A great cultural challenge as German management and engineering education is not equipped with a cost reduction mentality (Malte et al., 2020; Tiwari et al., 2017).

R&D structure: Have a traditional approach to business (Schwabe, 2020). The strategic orientation of German firms is not aligned with frugal innovations so far (Malte et al., 2020). 80% of German R&D takes place in the home country with a very little involvement of local stakeholders (Buse & Tiwari, 2014). They have highly centralized R&Ds instead of decentralizing to India. This has something to do with the cultural mindset (AFI1, 2021; AFI3, 2021). For instance, in the 1990s, there was an incident when one of the prominent automakers tried to sell German made cars in China, which wasn't well received (AFI1, 2021; AFI2, 2021). For instance, the Volkswagen-Audi group does not even have a dedicated R&D facility in India, and most of the R&D decisions are communicated from the German headquarters (IFI1, 2021). Fig. highlights the percentage of R&D centralization. For instance, strategic R&D was heavily centralized in Italy using home knowledge and local subsidiaries had just enough autonomy to adapt to local conditions (Athreye et al., 2014), was one major roadblock in the analysis of Fiat Palio. Additionally, fig. 4.4 highlights the R&D distribution.

Product Developer	*Premium Segment*		*Medium price-performance Segment*		*Low price-performance Segment*	
	China	*India*	*China*	*India*	*China*	*India*
Headquarters (HQ) in Germany	75%	80%	38.7%	62.4%	16.7%	14.3%
HQ + Local subsidiary	17.5%	11.4%	38.7%	18.8%	50%	57.1%
Local subsidiary	0%	0%	3.2%	0%	33.3%	14.3%
Other countries	7.5%	8.6%	19.4%	18.8%	0%	14.3%

Fig. 4.4 R&D outsourcing for German carmakers (Buse & Tiwari, 2014)

Production factors

Supplier bargaining power: Heavy reliance is on well-established premium suppliers like Bosch, Conti, Hella, VDO, ZF, or domestic suppliers somehow linked to western Europe (Pries, 2004). Although current partnerships in India do exist, it is all intended to serve the luxury market. Frugal innovations would require the cooperation of these premium suppliers to innovate frugally. Since they are routinely used to operating in the premium segment and their supplier networks are in general premium. However, frugal innovations would demand a different kind of partnering in terms of spare parts supply (AFI1, 2021).

Incapable of high-volume production: Since they have been operating in the premium segment (high price, low volume), their production units in India are not conducive for high volume production. For

instance, Audi has only a production plant in Aurangabad (India), which is just sufficient to meet the Indian premium market requirements (IFI1, 2021). Additionally, given the country's geography (huge country), production from a single plant would not be enough to cater to a high-volume market (IFI1, 2021). IFI4 (2021) believes that Mercedes Benz currently does not possess the infrastructure to produce on mass volumes in India.

Lack of Modularity: One of the features that led to Fiat's success was its ability to implement modular production with the same components that could be assembled into 5 different types of bodies (Athreye et al., 2014). This paved the way of adaptive R&D, enabling decentralization of activities to subsidiaries (Athreye et al., 2014). However, the German automotive industry's lack of modular approach could result in slower production efficiency.

Manufacturing mindset: They also make small-scale product adjustments in the product while trying to tap emerging economies meaning frugal innovations would be harder as it requires massive changes. Motivating tech-driven engineers and managers to adopt a frugal mindset, is a challenge yet to be resolved (Tiwari et al., 2017). In the case of doubt, German engineers would add a new feature than delete it (Malte et al., 2020; Tiwari et al., 2017). This calls for the need for local partnerships (Buse & Tiwari, 2014; Tiwari et al., 2017).

Price vs performance pressures: Supply parts demand roughly 30% of the global price with 95% performance to operate successfully (Buse & Tiwari, 2014) for successful frugal innovations.

Lifetime of supply parts: Lifetime of parts is very low and local consumers in most cases cannot afford it (AFI1, 2021).

Factory life cycle: They have a very long factory life cycle, whereas in India the factory life cycle should be lowered to become capable of mass production (AFI1, 2021).

Products and marketing factors

Premium segment operation: Strong focus on premium cars holding a market share of 73.1 % worldwide in this niche. (Landau et al., 2016; Raj et al., 2019). Typical German products are complex and high-end) and are pioneers in the premium segment. These are generally not preferred in emerging countries (Malte et al., 2020; Tiwari et al., 2017 For instance, German luxury manufacturers like Audi, Mercedes Benz, BMW are primarily focused on luxury and sporty performance, hence are often fuel-inefficient and expensive (Kainth & Mathur, 2016). They are fuel inefficient (9.6-12.6 km/ litre) as they are designed for superior performance than cars which ideally qualify to be called frugal cars (IFI2, 2021; IFI3, 2021). One of the reasons for the downfall of Fiat Palio was that it was fuel inefficient (9.8 km/litre for petrol, 13.8 km/litre for diesel) (Gohil, 2020). This presents a major concern for the German automotive industry.

Price vs quality: The German automotive industry is not used to meeting cost pressures (that is producing the most for the least costs) and their cars are much more expensive (AFI2,2021; IFI2, 2021).

High regulatory standards: German regulatory standards and requirements are very high compared to the need for frugal innovations (Malte et al., 2020).

Product differences: One reason for the failure of Palio was design threats as European designed air conditioning systems were not capable enough of handling Indian temperatures of 40+ degrees along with

high levels of humidity (Athreye et al., 2014). Since the German automotive industry similarly has a very low degree of local market adaptation, issues like these might pose a concern.

Lack of customer-oriented marketing: The Fiat Palio was endorsed by a very popular and renowned cricket celebrity Sachin Tendulkar (amongst the Indian masses), which led to its widespread early popularity (Chandran, 2020). Fiat in essence had a way with marketing, for instance the Palio had a Turkish name (Egea) in Turkey and the same car was in turn marketed with different names which would make the product more appealing to customers (AFI4, 2021). The German automotive industry does not feature such a marketing tactic which puts it a disadvantage.

Sales and service

Dealership networks: Dealership networks in India for sales are not sufficient to handle a low-price, high-volume market (IFI1, 2021). Both sales and service networks are just sufficient to meet the requirements of the premium segment (low volume market) in India (IFI4, 2021). For instance, Fiat did not have many individual dealerships. Even prominent large and populated cities like Mumbai had exactly one dealer for the entire city (Gohil, 2020). This created major issues in terms of accessibility.

Spare parts: Spare parts in most cases are imported which makes it expensive (IFI2, 2021; IFI4, 2021). For instance, due to limited networks, Fiat had limited support in terms of after sales service with expensive parts (Gohil, 2020). These issues might not go well with frugal innovations.

4.4.3 Opportunities

Business factors

India mass production advantages: Bibliometric analysis suggests frugal innovations having close links with India (Tiwari et al., 2017). India is a highly preferred offshoring destination with less expensive labor (Westner & Strahringer, 2010). Relocation to India has proven reduction in costs as labor costs are much lesser (Kinkel & Zanker, 2013). For instance, Ford has invested $1 billion to ramp up production in India; Mercedes $71million to produce compact cars (Tybout & Fahey, 2017). Fig.4.4 (a) provides the wage rate/ hour comparison across different countries. The success of Hyundai, gives optimistic hopes as they say material savings, cutting down unnecessary costs (R&D, design, and manufacturing) are the most effective engines to manufacture low-cost cars, they saved close to USD 33000 by doing so (Sharmelly & Ray, 2018). India is an attractive destination for investment given the rapid growth of the middle classes, availability of raw materials and skilled labor, and easy financing (Tybout & Fahey, 2017). For instance, Fiat made sure that modular parts could be assembled at plants with a capacity of mass producing 200 vehicles a day (Camuffo, 2004). Given the low cost of labor, most of the assembly process was manual with little to minimal automation of about 8% (compared to almost 100% for standard European Fiat cars) (Camuffo, 2004). Roy et al. (2014) estimates a 10-25% savings in operations costs in India. This presents a huge opportunity for the German automotive industry to expand production in India. Fig. 4.4 (b) and (c) additionally highlight statistics that support the same.

Country	Rate
Germany	32.53
UK	24.71
USA	23.17
Australia	23.09
Japan	21.90
Canada	21.42
South Korea	11.52
Mexico	2.50
China	0.61

India not listed, but thought to be at or below the wage rate shown for China).

Fig. 4.5 (a) Wage rate/hour (dollars/hour) country wise comparison (Tybout & Fahey, 2017)

Main motives for production relocations	Production relocation mid 2004 to mid 2006	Production relocation 2007 to mid 2009	Production relocation 2010 to mid 2012	Trend
Labour costs	80 %	77 %	71 %	↘
Access to new markets	27 %	28 %	28 %	→
Vicinity to key customers	21 %	29 %	26 %	→
Vicinity to to relocated production capacities	n.a.	16 %	23 %	↗
Access to raw materials	n.a.	n.a.	15 %	n.a.
Import restrictions	n.a.	n.a.	11 %	n.a.
Lack of skilled workers	n.a.	8 %	9 %	→
Taxes, levies, subsidies	11%	12%	5%	↘
Access to new knowledge/ technologies/ clusters	4%	2%	1%	(↘)

Fig. 4.5 (b) Outsourcing to India motivations (Kinkel & Zanker, 2013)

Production Cost-based Price Comparison of Compact Cars in India (unit: Rs, dollar)

Company	Car Model	Indian Rupee	USD
Suzuki Maruti	Maruti	2,00.000	4,200
Hyundai (HMI)	i10	3,70.446	6,900
	Santro	3,58.354	5,500
	EON	2,74.821	5,700
Tata	Tata Nano	1,00.000	2,100
Toyota	Etios Liva	4,33.368	9,000
GM (Chevrolet)	Beat	3,72.761	7,800
Ford	Figo	3,81.800	8,000
Volkswagen	UP	3,50.000	7,000
Honda	Brio	3,99.000	8,200
Bajaj (Renault)	Bajaj RE60	1,00.000	3,000

Fig. 4.5 (c) Cost of manufacturing comparison between car companies in India (Park & Rhee, 2015)

Costs of Manufacturing of HMI (unit: euro, %)

Nation	Compact car's total production cost	Wage cost	Ratio of wage cost
India	4,000	150	3.8
Korea	4,600	750	16.3
East Europe	5,000	1,150	23.0

Fig. 4.5 (d) Cost of manufacturing (Euros) comparison between countries (Park & Rhee, 2015)

Supplier presence: Presence of German automotive component suppliers who have been successful in targeting the medium and lower markets in India (Buse & Tiwari, 2014). For instance, Bosch was one of the suppliers for Tata Nano. A few premium suppliers like Bosch have supplied for Tata Nano, indicating they can supply frugal parts (AFI1, 2021). IFI3 (2021) additionally highlights that Bosch is already experienced with supplying localized parts for Volkswagen's Indian customized cars Vento and Polo. This also applies to another major automotive supplier 'Continental'. Additionally, Bosch would prefer supplying parts for IC engine powered vehicles over e-vehicles as their core expertise lies in IC engine components (IFI3, 2021).

Strategic locations: Fiat India was strategically located in Pune where two other important Indian automakers namely Tata and Mahindra were located, to benefit from knowledge spillovers (Athreye et al., 2014). This benefit of Fiat Palio, presents a lucrative opportunity for the German automotive industry to strategically position itself in places with knowledge spillover advantages.

Market understanding: The German team could conduct a short visit to India, by themselves to figure out the Indian market conditions and then take business decisions. This would help them understand the Indian market needs and tailoring business models accordingly for instance, decentralizing R&D to local subsidiaries (AFI1, 2021).

Risk with e-vehicles: The automotive industry has been more successful in incremental innovations (e.g., frugal innovations) than experimenting with disruptive technology like electric vehicles (Rese et al., 2015; Schwabe, 2020). Given the well-established and massive organizational structures with established routines, disruptive innovations are far riskier, than an incremental innovation.

Organizational learnings: Frugal innovations offer organizational learning by introducing cost-efficient business processes (Malte et al., 2020). As the basic definition of frugal innovations revolve around reducing production costs, German automotive firms undoubtedly could become much more efficient.

No need for training programs: To cater to the premium car industry German automotive suppliers in India must invest heavily in training programs (6-12 months) owing to the technological superiority. However, frugal products would require far less as they can better understand customer needs (Pilz, 2016).

Raw material providers support: 50% of foundry producers are skeptical about e-vehicles as their businesses which were so far relying on IC-powered vehicles, may get disturbed (Schwabe, 2020). Migration to new trends comes at a very high risk/ cost.

Availability of IT infrastructure: Improvements in IT and India having rich access to IT professionals presents the best opportunities for global coordination with networked R&D, value chain activities.

Reverse innovation advantages: The emerging idea within Germany to prefer simplified products cutting down expenses for day-to-day living, amongst few groups in the German society (Malte et al., 2020; Tiwari et al., 2017). Two major motivations: environmental concerns and moderation. Thus, frugal innovations in India could serve as reverse innovations in Germany (Zeschky et al, 2014). Seen as a measure to cut down unnecessary usage of resources thus promoting sustainable living (Tiwari et al., 2017). Estimated that two-third of the global middle class by 2030 would be from Asia-Pacific indicating the creation of a new market with frugal needs and wants. In addition, 43% of global customers have highlighted the need for frugal products, thereby reversing innovation advantages (Malte et al., 2020).

Luxury first mover benefit: Any of the German automotive firms that would enter the frugal markets in India, would clearly have a first mover advantage as other premium segment competitors wouldn't have even thought about it (IFI1, 2021).

Shifting plants from Germany: Factories in Germany which are capable of assembling IC powered vehicles can be shifted to India (as developed countries might switch to e-vehicles) instead of shutting down. This could increase their production capacities without any additional investments (IFI3, 2021).

Market, competitors, and customer orientation factors

Low-cost competition pressures from China: Theoretically, frugal innovations in the German automotive industry are highly supported due to competition from low-end products from China (Tiwari et al., 2017). If not for frugal innovations, Chinese competitors might offer the same value proposition at a very low price and capture the market. The case of Land rover's Chinese duplication in China is an example of this. This duplicate version offers the same product as Land Rover at approximately one-fifth the price of Land Rover, thereby massively hampering Land rover's market.

Customer demand in India: Shifting/ increasing global production and supplier base to India has clear advantages as firms benefit from sales growth in these areas (Häntsch & Huchzermeier, 2013; Sturgeon & Biesebroeck, 2011). Frugal innovations are important for long-term competitive advantage in emerging countries (Tiwari et al., 2017). Growing economies like India and the emergence of a robust middle class have proven a profitable target market (Zeschky et al., 2014). Nordcliffe (2012) predicts that the BRIC countries are a much more potential market than Europe and the USA (Häntsch & Huchzermeier, 2013). At the corporate level, adopting strategies for the Bottom of the Pyramid markets has been overwhelmingly accepted and recognized (Wells, 2010). Specifically for India, given the promising growth in per capita GDP has indicated a growth in disposable incomes (Tybout & Fahey, 2017). With a population of around 1.2 billion and car consumption of 13 for every 1000 persons, the market presents a lucrative opportunity. With the growing number of nuclear families, the compact car industry presents a lot of opportunities. The Indian middle class is estimated to grow to 41% by 2025. The car purchasing capacity in the compact segment is expected to increase to 20% of total spending in 2025 (Buse & Tiwari, 2014; Kainth & Mathur, 2016). Given their local needs and lack of infrastructure, German MNCs in India (like Siemens) are being forced to tailor frugal products to survive in that market. If not for frugal innovations competing against local players in emerging markets becomes a challenge (Agarwal & Brem, 2012).

Lack of technological expertise in India: Developing countries like India, do not have a significant number of local prominent automakers with technological expertise paving the way for foreign companies (Sturgeon & Biesebroeck, 2011). India lacks technical expertise, and German engineering has quite a lot to

offer. For instance, local automakers like Tata, Mahindra are technologically much inferior to their German counterparts. For example, Siemens came up with frugal innovations in India. Since local players lack the technical expertise to compete (AFI1, 2021).

Brand conscious customers: Brand name is one of the most important parameters for customer buying behavior in India (Dhanabalan et al., 2018). Indian customers are extremely brand conscious, and cars are in general status enablers. Korean, Indian manufacturers are perceived as of lower quality by Indian customers; whereas Japanese and German cars have a greater brand value, meaning that any car in competition with their foreign counterparts would be a gain for the Germans (Tybout & Fahey, 2017). As a person moves up the income ladder, it becomes more of a status symbol to own a car (even more than needs) (Mathur et al., 2018). The Indian customer mindset is such that bigger the brand name, more a product is valued (IFI2, 2021). IFI2 (2021) believes that if Mercedes Benz produces a frugal car, initial customer reception would be very high. Additionally, AFI3 (2021) highlights that India is a hierarchical nation, greater the brand value, the more it dominates the society.

Covid-19 pandemic: Crisis situations discourage customers from investing in high-end products (Zeschky et al, 2014). The Covid-19 pandemic exactly fits this criterion. This creates a lucrative opportunity for German automakers to move to the lower economy market. German automotive industry's business in the luxury segment has slowed down due to the covid 19 pandemic. Audi sales have been on a decline with the onset of the pandemic due to customer aversion in investing for a luxury car during crisis time periods (IFI1, 2021).

Proven Market adaptation opportunities: Fiat's success in the Brazilian market is owed to the higher degree of autonomy assigned to the local R&D subsidiary, which suggests that replicating Fiat's Brazilian business model in India could pave way for successful frugal innovations and Palio could have become a hit (AFI4, 2021; Athreye et al., 2014). Additionally, emerging markets present German high-end makers a vast potential if they actively work, on four levels: *international extension, local emergence, local extension, and local consolidation* (Landau et al., 2016) (empirically derived from the case of Autolux in India).

- **International extension:** adapt to local markets by creating a unique value proposition (at the firm level) for the market needs
- **Local emergence:** localize value creation (at the product level) and delivery
- **Local extension**: establish local players in the entire value chain
- **local consolidation**: optimize components to fit in new business model

Legal, institutional, and political factors

Support from Indo-German business center: Mr. Wolfgang Höltgen, Director of German-India Business center (Hannover, Germany) has suggested constructing a frugal innovation guide for German engineers (Tiwari et al., 2017). This guide would give the German firms a clear direction to tailor their business models and train engineers to design for frugal needs.

Managing cross-cultural differences: The German automotive industry is already well established in India as far as the premium segment is concerned. This is a clear indication that they can manage the institutional differences between Germany and India. In India, institutions are driven by hierarchy, corruption and it calls for support from a prominent member in the institutional network to influence decisions and win permits (and permissions to operate), in their favor (AFI3, 2021). Although this is not how institutions work in Germany, their establishment in the Indian market, is a testament to the fact that

they can navigate through these challenges to obtain the necessary permits to tailor their operations for frugal markets.

Pressures to explore emerging markets: Developed countries like the USA, Japan, Germany have special quotas for e-vehicles. E-vehicles already touched 1.98 million as of 2018, with a predicted growth rate of 68% annually. Tesla and Chinese counterparts like BYD and BAIC are already well established in the market, forcing German counterparts to explore in emerging markets (Raj et al., 2019; Schwabe, 2020). In India E-vehicle substitution is not a threat, due to the preferences of Indian customers, as shown in fig. 4.6.

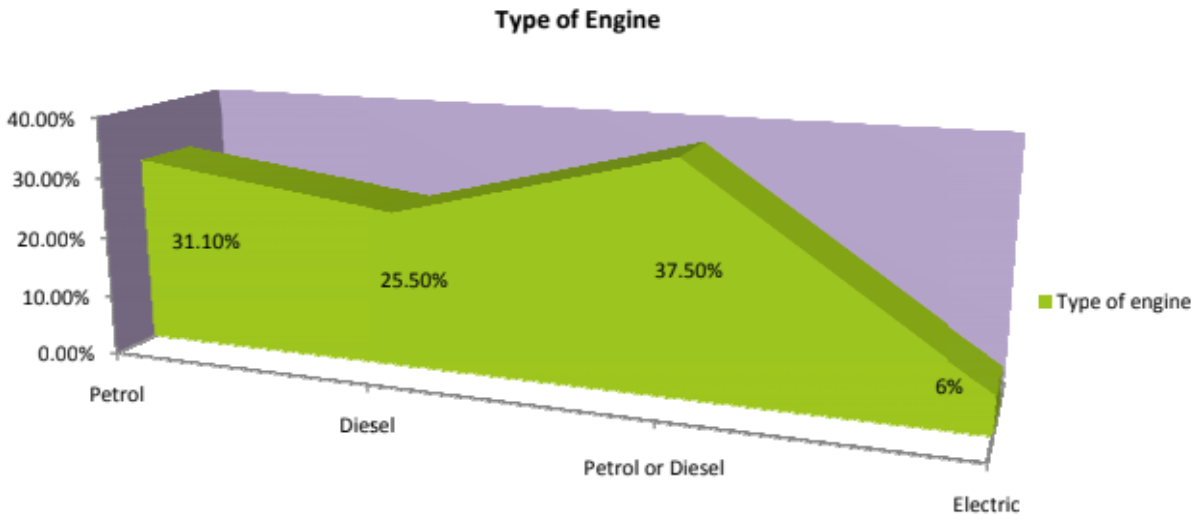

Fig. 4.6 Passenger car type (by fuel) preference in India (Mathur et al., 2018)

Lower import duty for small cars: Indian market's overwhelming reliance on foreign automakers. The excise duty (tax) for smaller cars is 12% (roughly half of the premium cars) meaning the German industry has the potential to develop a cheaply priced car without affecting its profit margin (Tybout & Fahey, 2017). Fig. 4.7 below shows export capabilities of various countries from home.

Exporter	*World rank 1993*	*World rank 2008*	*2008 Exports $M*
China*	21	4	42,463
Mexico	8	6	27,516
Poland	39	8	19,767
Republic of Korea	16	9	18,355
Czech Republic	31	11	17,807
Thailand	20	18	9,551
Brazil	13	19	8,927
Slovakia	40	21	6,107
Romania	46	22	6,060
China (Taiwan)	14	23	5,663
Singapore	19	26	5,085
Indonesia	36	27	3,457
Philippines	27	28	3,438
India	35	29	3,064

Fig. 4.7 Exporters of automobiles and related parts country comparison (Sturgeon & Biesebroeck, 2011)

Governmental investment: In 2013-2014 the Indian government allocated $2.7 billion for promoting the production of small and medium commercial vehicles in India (Roy et al, 2014).

Positive governmental intervention: Very low entry barriers for foreign firms as the Government intends to promote competition in the automotive sector to stimulate quality. For instance, Hyundai produces around 90 % of its parts in India (for the Indian market) compared to 70% for other prominent players (Tybout & Fahey, 2017). As presented earlier, this in turn has given Hyundai an enormous cost advantage.

4.4.4 Threats

Business factors

Loss of brand name: Despite having the necessary skills and resources, frugal innovations come at a very high cost of loss of the 'elite brand status' (IFI1, 2021). For instance, IFI3 (2021) highlights the example of Honda's attempt to enter the lower segment market with its car 'Amaze", which turned out to be a failure and loss of reputation for Honda.

Low local supplier standards: Despite supplier networks in India, they find it hard to meet the standards set by the German counterparts as highlighted in fig. 4.8 (Sturgeon & Biesebroeck, 2011).

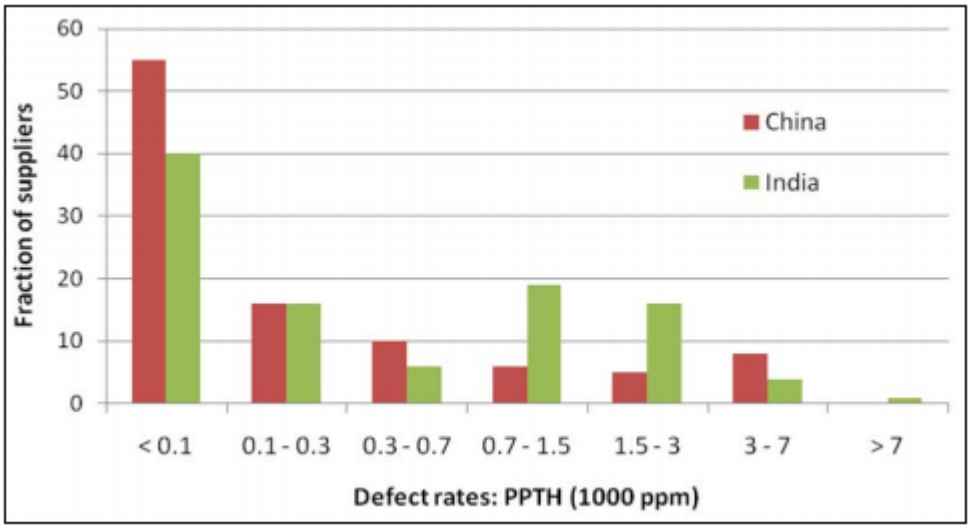

Fig. 4.8 Automotive supplier defect rates in China and India (Sturgeon & Biesebroeck, 2011)

Pressures from business groups: Some business and social groups within Germany still have a high preference for high-end technological products (Malte et al., 2020; Tiwari et al., 2017).

Market, competitors, and customer orientation factors

Cost pressures from competitors: Competitors like Suzuki, Tata are already well established in the market (AFI1, 2021). IFI3 (2021) believes that Suzuki employs a 'value for money' approach, meaning that they provide the best promise and deliver the best service for the costs. German counterparts may struggle to compete in this segment. Fuel efficiency of Suzuki, Hyundai cars is in the order of 20-25 km/liter.

Mass production threat: Major Japanese counterparts have mastered lean production giving them an advantage in large-scale mass production (Pries, 1999). Ideally, German car companies are not proficient in high volume mass production and Japanese competitors would have an upper hand.

Competition from well-established local players: Competition from local players in India for market share (Agarwal & Brem, 2012; Kroll & Gabriel, 2020). Presence of heavy competitors in India (Sharmelly & Ray, 2018). Companies like Hyundai (with two assembly plants in India) have been overwhelmingly successful in targeting the middle class with its Santro, Eon, i10, etc (Sharmelly & Ray, 2018) (Fig. 4.9). The average current brand preference in India is a major threat as shown in the figure. Additionally, competitors like Hyundai have been successful in balancing luxury and affordability, successfully positioning itself in the Indian market (Tybout & Fahey, 2017). Competitors like Suzuki, have a well-established network in every aspect of the value chain that makes them capable of serving the mass market (IFI1, 2021). IFI3 (2021) indicated that Suzuki and Tata have one of the best dealership networks in India, and German counterparts might struggle in this regard. For instance, Maruti Suzuki's Zen and Hyundai presented a very tough market for Fiat Palio, making it highly competitive (Mullick & Tripathi, 2013). Despite the technological edge, the downfall of Fiat Palio presents a huge issue for the German counterparts.

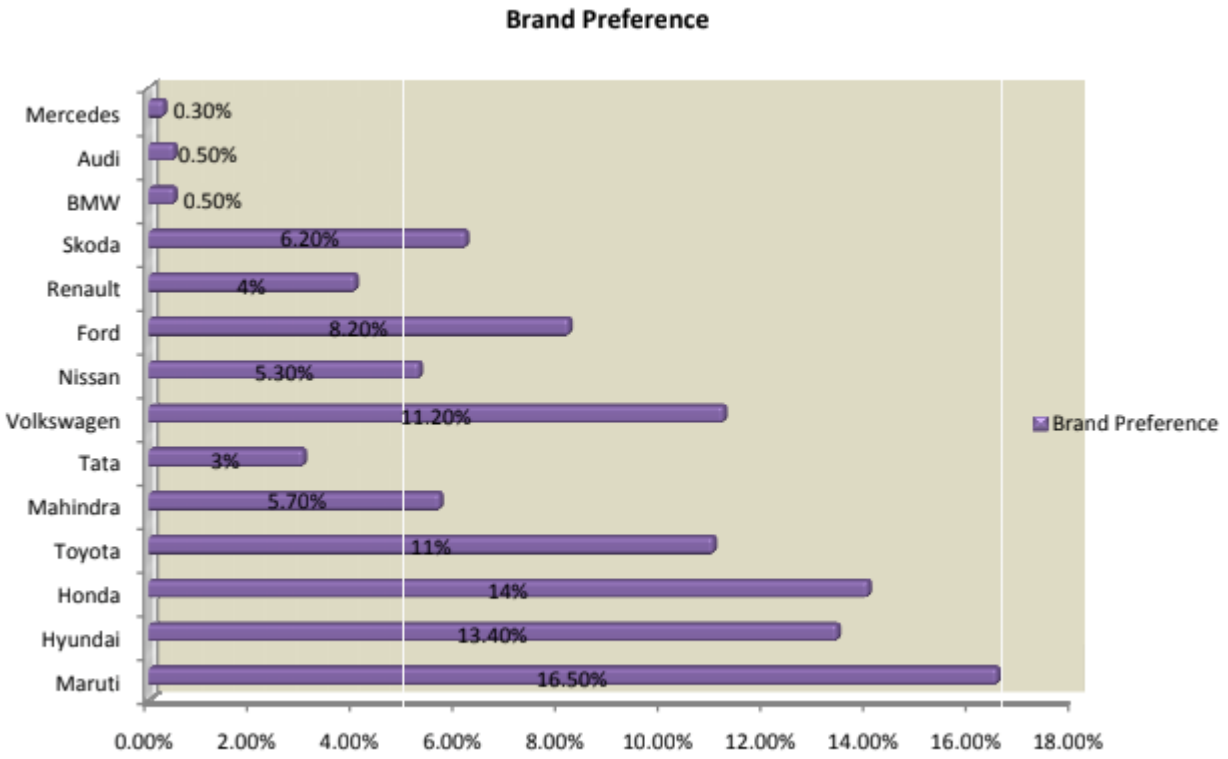

Fig. 4.9 Customer brand preference in India (Mathur et al., 2018)

Competitors' experience with market driven approach: Frugal innovations involve a long-term commitment, understanding customer needs is a highly tedious and cumbersome process. Competitors like Ford, Nissan, and Honda have been aggressive, in addition to setting up local R&D centers, they also have local production and manufacturing of specific machines to enhance manufacturing for the local market (Calabrese, 2001). Competitors like Hyundai have been successful in adapting to the Indian requirements, for example, Hyundai has developed a 3-cylinder engine with less fuel and frictional losses to deliver better results (Wells, 2010), thereby decreasing fuel consumption and increasing reliability.

Competitors' expertise in modularity and large-scale production: Ford, Renault, Fiat, and Toyota, have already invested heavily in setting up low-cost car mass production units in India for the domestic market and global distribution (Wells, 2010). Competitors like Hyundai have been using the concept of modular design and production to ensure cost-cutting to the highest order (Sharmelly & Ray, 2018). Therefore, currently the Hyundai plant in Chennai, India can produce approximately 300,000 vehicles annually (Park & Rhee, 2015).

Uncertainty in customer preferences: Extreme uncertainty in customer preferences. From a survey of 30, 000 consumers in 60 countries, 66% were willing to pay more for sustainability products but, not even half of them did (Kroll & Gabriel, 2020). In short, there is an inconsistency between stated and actual preferences.

Reduced car buying behavior with hikes: Indian customers are highly sensitive to fuel prices, and since India imports fossil fuels, inflation and changes in oil prices profoundly influence the car buying behavior of consumers (Tybout & Fahey, 2017; Shende, 2014). For instance, in 2012-2013, due to a weak economy

and increasing fuel prices demand decreased by 7% with car companies having to scale down production (Tybout & Fahey, 2017).

Indian customer requirements: The Indian market conditions are something to be looked upon. India is marked with poor road infrastructure, monsoon rains resulting in water flooding and overflows. This demands a chassis with water resistance. Given the traffic congestion and poorly regulated traffic, Indians prefer cars to travel short distances at relatively low speeds. The poorly regulated traffic and lack of lane discipline demand louder horns. Preference is for higher body heights as Indians prefer to wear turbans. German automotive companies might not be conducive for such conditions (Park & Rhee, 2015).

E-vehicle market forecast: ING predicts a 100% market share for e-vehicles by 2035 (Schwabe, 2020).

Competitive pressures: Pressures from competitors and government forcing them to migrate to the e-vehicles industry e.g., Volkswagen has decided to launch 30 e-vehicles models by 2025 (Schwabe, 2020).

Relationship building threat from competitors: Additionally, Hyundai and Suzuki (being Asians), have a cultural similarity with forming relationships with networks. On the other hand, the European mindset involves forming networks with a business mindset (give and take) which might not work well in India (AFI3, 2021). For at least this reason, frugal innovations from the German automotive industry might fail like Fiat Palio (IFI2, 2021), as their networks might not cooperate if purely dealt with from a business perspective.

Competitors and their sales/service networks: IFI4 (2021) additionally, highlights that competitor like Suzuki, have a service station and access to spare parts in potentially every small town in the country which is not the same with Mercedes Benz, Audi, or luxury segment cars. Additionally, Suzuki has a service named the touch points, wherein even if a customer owning a car, gets a minor technical issue on the roads (even in outskirts), they always have a service center close to their vicinity that would enable them to reach the customer and service their car, in a very short span of time. IFI3 (2021) additionally indicated that the cost of servicing a Suzuki's service centers is much less expensive compared to the German counterparts. For instance, Lack of sufficient dealers in cities frustrated customers, as they had to travel long distances every time (Gohil, 2020). In comparison, Suzuki and Hyundai had well established dealership networks in every city and town, indicating customers need not have to spend much time travelling to showrooms.

Legal, institutional, and political factors

German governmental pressure: Governments in developed countries provide incentives for E-vehicle production (Schwabe, 2020). German governmental institutions are driven by the fear that policy measures favoring frugal innovations could reduce the national GDP. Government and support schemes target high-tech innovations (Tiwari et al., 2017).

Heavy import duty: Due to heavy reliance on German-made/ imported parts, costs double due to import duty (Landau et al., 2016).

Policies favoring Indian automakers: High levels of corruption, pirating and bureaucracy might prove to be a hindrance. Fear of cannibalization (Malte et al., 2020). The country is marked with political instability that affects the market conditions adversely. For instance, at one point, the government abruptly removed gasoline subsidies as a measure to favor Tata to promote its diesel-based cars (Park & Rhee, 2015).

Indian cross-cultural challenges: India's local cultural and heritage understanding is important for success in tapping their markets. A case study on Hyundai reveals that extending operations in India and building a rapport with the locals might be a tough task. In a country divided by hierarchy, casteism, and strong local culture, employees might need further technical training and a great deal of effort must come from the management side to understand and blend in with the Indian tradition and norms to include their perspectives and formulate a successful business model. For example, around 1500 personnel went on strike after Toyota fired 3 employees from their Bangalore plant in Karnataka (Park & Rhee, 2015). Within India, influence, networks, and positions are needed compared to a better technology while influencing institutions and governments. In this competition, Korean and Japanese competitors like Suzuki and Hyundai have a better hand as they are culturally similar and are equipped to handle such dealings (AFI3, 2021). In this regard, fig. 4.10 highlights the characteristics of Indian workforce.

Characteristics and Appearances of India's People

Division	Characteristics	Appearances	Efforts
Physical Features	Weak physical constitution	High absentee rate, lack of time awareness	Clear orders, consistent training of goal awareness
Caste System	Focuses on influences of caste system	Closed to other classes, low unity	Emphasize corporate image with fair treatment
Religious Influences	Strong awareness for world of transmigration	Sincere but lacks will for goal achievement	Educate awareness for responsibilities and goals through various awards
Task Management	Coexistence of obedience and disobedience due to long-term colonial lifestyle	Obeys authority but has strong tendency to avoid responsibilities	Thorough mid-inspections
Communication	Poor English for most workers	Direct communication through local managers	Gather opinions through suggesting systems and discussions
Emotional Characteristics	Traditional society surrounding agriculture	Emotionally sensitive and easily offended	Emotional consideration

Fig. 4.10 Personnel in India (Kainth & Mathur, 2016)

Indian autonomy: India as a country is gradually gaining independence and autonomy which might make it harder for the German counterparts (Sturgeon & Biesebroeck, 2011; Wadhwa, 2020). Indian industrial policy promoted local lead suppliers thus they have a two-thirds market share. Some even went ahead to acquire foreign companies such as Tata- Jaguar (Sturgeon & Biesebroeck, 2011). The growing sense of nationalism in India with strong customer preferences for Indian cars might give Indian competitors like Tata, Mahindra an edge (Wells, 2010).

Governmental intervention: E-vehicles preferred as Indian government is oil importing and would prefer to reduce dependency for oil (IFI1, 2021).

European legislation intervention: European legislation would make sure that German automotive industries are in the game with Tesla (at least in Europe) and pressurize them to enter the electric vehicle market in favor of sustainability (IFI3, 2021).

5 ANALYSIS

5.1 Introduction

This chapter deals with the application of the correlative and evolutionary SWOT analysis to answer the main research question concerning opportunities and threats. The previous chapter concluded with a detailed SWOT analysis highlighting many internal and external factors. This chapter would however make use of this information to be used as an input to perform the correlative and evolutionary SWOT method. The first part of this chapter would involve an explanation of the various parameters involved in the analysis and the application of this technique to the findings. The second part of this chapter would involve an explanation of the findings and the results of the analysis. The final and third part of this chapter would end with a discussion of the findings.

5.2 Analysis: Evolutionary and correlative SWOT analysis

In section 2.4 the merits and demerits of the traditional SWOT analysis was mentioned. Undoubtedly the traditional SWOT analysis is a widely used tool to take business decisions after a thorough analysis of the internal and external factors. However, one major disadvantage of the SWOT in the context of this research is that the automotive industry in India is highly competitive and cutthroat. Additionally, this research analyses the situation from a highly qualitative perspective. Fig. 5.1 presents a bird's eye view of the correlative and evolutionary SWOT method (Vlados, 2019).

5.2.1 Identification of parameters for analysis

The traditional SWOT analysis considers the strengths, weaknesses as absolute entities. However, in a competitive environment, like the automotive industry in India, to qualitatively define a strategy, a relative assessment of factors is important to determine if the risk could be worth pursuing. In other words, the correlative and evolutionary version of the SWOT approaches the internal factors from a relative perspective. The fundamental focal point of the analysis shifts from the absolute strengths, weaknesses of the German automotive industry to the strengths and weaknesses, relative to the competitors and the external environmental factors. For instance, the SWOT analysis considers 'Tailoring of products for Indian market conditions" a strength. But according to the correlative and evolutionary SWOT it could be considered a comparative strength if it could perform better than the competitors, as far as this point is concerned.

Similarly, as far as the external environment is concerned, the traditional SWOT analysis considers the opportunities and threats as absolute quantities that the German automotive industry could just exploit or take a few steps back. However, what it fails to address is that in most cases opportunities and threats are also the same for the other industries operating in the market. The presence of an opportunity or threat isn't specifically meant for the German automotive industry in isolation. The correlative and evolutionary SWOT claims to eradicate this by only considering opportunities and threats are intrinsic and specific for the organization. In other words, it is a specific opportunity or threat in India, which the German automotive industry could exploit or retaliate to, based on its strengths and weaknesses. For instance, the SWOT analysis regards 'customer sensitivity to fuel prices as a threat'. However, from the correlative and evolutionary SWOT perspective it isn't a specific threat, as all cars in India (which predominantly run-on fossil fuels), would be facing a similar kind of threat, and therefore, the German automotive industry does not have to deal with this threat in isolation.

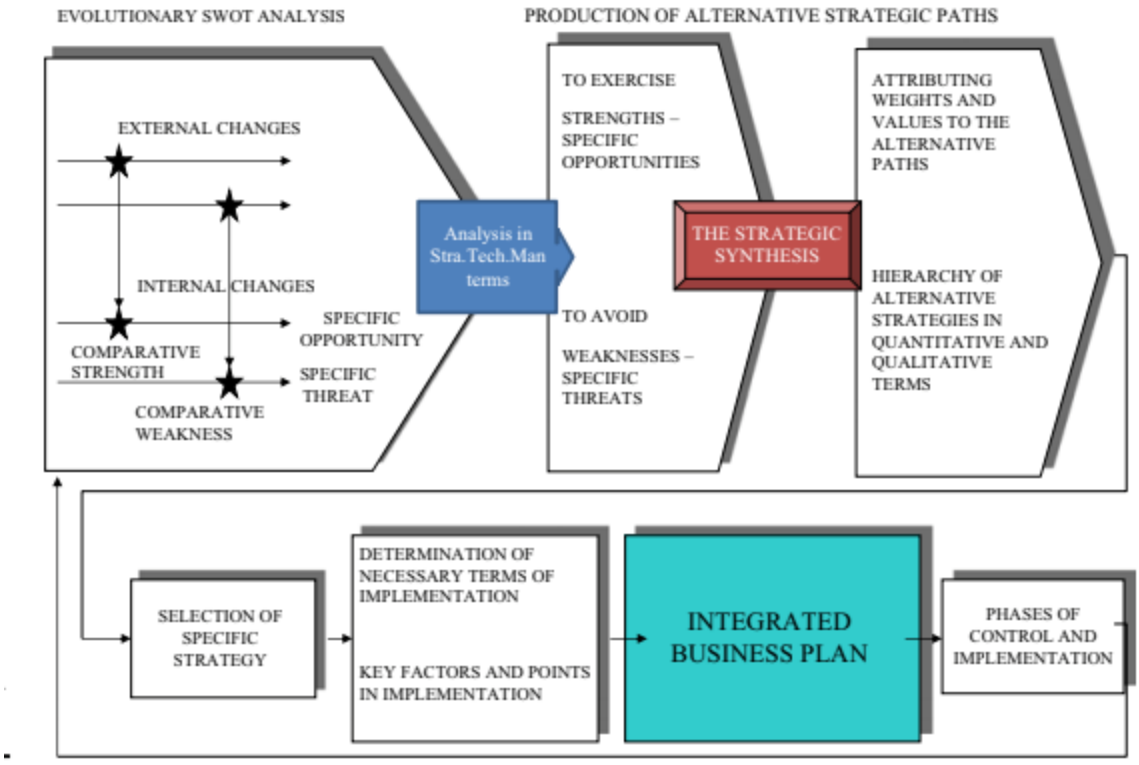

Fig. 5.1 Evolutionary and correlative SWOT methodology (Vlados, 2019)

As far as its application is concerned, the method first starts with the understanding of internal and external factors affecting the organization of concern. In this research section 4.4 highlights this phase. However, after that the analysis shifts to looking at the internal and external factors in terms of comparative strengths, comparative weaknesses &; specific/ potential opportunities, specific/ potential threats (Vlados, 2019).

S.no	Conventional SWOT	Evolutionary and correlative SWOT
1	Strengths	Comparative strengths
2	Weaknesses	Comparative weaknesses
3	Opportunities	Specific opportunities
4	Threats	Specific threats
5	Strengths -opportunities	Real opportunities
6	Weaknesses-opportunities	Space of lost opportunities
7	Strengths-threats	Space of possible defense
8	Weaknesses-Threats	Real threats

Table 5.1 Differences between conventional and evolutionary and correlative SWOT (Vlados, 2019)

5.2.2 Analysis parameters

Having identified the internal and external factors, this section would be about analyzing the outcomes based on the analysis. The internal factors in this method represent the comparative strengths and weaknesses of the firm (relative to competitors and external factors). The external factors include the opportunities and threats that specifically put the firm under study at an advantage or disadvantage (in comparison to competitors). The interaction between these internal and external factors showcases the opportunities and threats. The following four frontiers (Fig. 5.2) have been put forth by Vlados (2019).

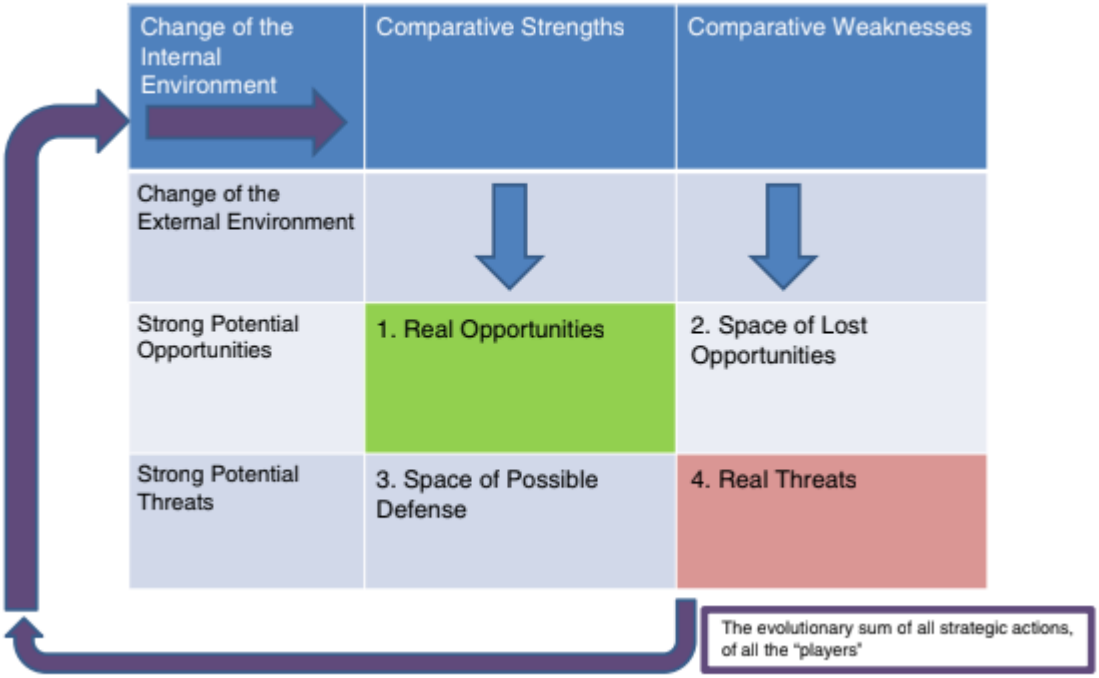

Fig. 5.2 Correlative and evolutionary SWOT matrix (Vlados, 2019)

Real opportunities: As per Vlados (2019), the combined effects of comparative strengths and specific opportunities is called the frontier of 'real opportunities. Ideally it is in this frontier that an efficient strategy could be articulated that highlights the most differentiated aspects of what the firm could deliver in comparison to other competitors and factors.

Space of lost opportunities: The combined effects of the comparative weaknesses and potential or specific strengths presents the frontier of 'space of lost opportunities. Ideally it is in this frontier that the firm could design strategies to utilize the opportunities and heal its weaknesses (Vlados, 2019).

Space of possible defense: This frontier highlights the combined effects of comparative strengths and potential/ specific threats. Ideally it is within this frontier that the firm must identify strategies to counter its threats by mobilizing their stronger internal points (Vlados, 2019).

Real threats: The final combination involves the combined effects of comparative weaknesses and specific/potential threats. This frontier highlights the weakest areas of the firm, and it must formulate escape strategies to combat the combined effects (Vlados, 2019).

In the next sections, the identification of the four frontiers has been carried out one by one.

5.3 Application and inference using evolutionary and correlative SWOT

Section 4.4 gives a detailed overview of the internal and external factors in SWOT format. However, from fig. 5.1, it could be interpreted that the first step towards evolutionary and correlative SWOT would be to identify the comparative parameters. Appendix E reflects the entire evolutionary and correlative SWOT methodology applied, which involves identifying the comparative strengths/ weaknesses and specific opportunities/ threats. Now from the findings in Appendix E, the four frontiers (as discussed in section 5.2.2) would be analyzed and discussed one by one. Each frontier would represent multiple opportunities or threats based on interactions of a few specific internal and external factors. This section would enlist all such possible combinations with a detailed explanation supported by the identified factors from appendix E that has in turn created such an opportunity or threat. Additionally, chapter 3 presents some insights about the German automotive industry and the Indian market. The inferences from the analysis would also be defended with insights from chapter 3 and section 4.4.

5.3.1 Real opportunities

This section highlights the strong areas of the German automotive industry in comparison to its competitors to exploit frugal markets in India. These opportunities presented in this section are based on the German automotive industry's current capabilities and needs no additional alteration (Appendix E1).

Inferences (Potential to directly exploit)

Designing for frugal innovations:

Table 5.2 highlights the comparative strengths and specific opportunities from Appendix E1, which correspond to this inference. The main challenge associated with frugal innovations in the car market is designing based on customer needs. The German automotive industry has a great potential to first let their R&D team understand the Indian market conditions. In section 3.3, it was highlighted that the German companies have been tailoring their cars to Indian conditions (for safety and governmental regulations). However, local market adaptation would involve treating the design process from a totally customer-oriented perspective. For instance, Hyundai spent over a year (when they first entered India) to understand the Indian customer needs and wants, which played a very important role for their success in the long run (Sharmelly & Ray, 2018). Secondly, it is well-known that German cars are much superior in terms of technological expertise and design than their Indian counterparts. For instance, Audi stands out for its innovative technologies and BMW for its sporty design (section 3.1). Their technical abilities would enable them to design a frugal car which could outperform any of their competitors'. Thirdly, the support from the Indo-German business center could be exploited as they have been developing a manual that could guide the central R&D to understand frugal market needs in India (section 4.4.3). To put it in a nutshell, **they have all the resources and opportunities that would help them design a frugal car in a technical sense.**

	Comparative strengths	Specific opportunities

S.no		
1	Possess best in class resources, technical skills to solve any challenge.	German team could conduct a visit to India to understand market needs
2	Superior R&D and technical knowledge to design.	Competitors in this segment like Suzuki, Hyundai are technologically much inferior
3	Unparalleled technological superiority and brand name	Support from Indo-German business center to push for frugal innovations

Table 5.2 Real opportunity: designing for frugal innovations

Entering the mass volume market

Table 5.3 highlights the comparative strengths and specific opportunities from Appendix E1, which correspond to this inference. So far only Volkswagen, India has the capacity to operate in the mass market with a maximum annual production capacity of 150, 150 cars (section 3.1). To promote frugal innovations, the German automotive industry has ample opportunity to ramp up production and enter the mass volume market. Firstly, they already have well established production units and relationships with premium suppliers like Bosch, Conti, ZF etc. For instance, Mercedes Benz was in a joint venture with Tata from 1997-2009 (section 3.1). Additionally, suppliers are already experienced with supplying parts for Indian frugal cars. For instance, Bosch was one of the suppliers for a frugal car in India named Tata Nano (section 4.4.3). Secondly, with a very low cost for labor and resources, mass production in India presents immense opportunities (section 4.4.3, fig. 4.5 d). Thirdly, they also have a vast potential to form alliances to ramp up production with local suppliers. Given their superior brand names, it presents a win-win situation for its local partner firms by gaining an edge. Fourthly, since a significant number of German masses also prefer frugal cars (section 4.4.3), they could also be exported to Germany (until the IC engine market exists in Germany). Fifth, instead of shutting down a plant in Germany due to e-vehicle transition, they could ship the plant to India, and increase their production capacities. To sum it up, **they have all the opportunities in place to enter the high-volume market.**

S.no	Comparative strengths	Specific opportunities
1	Established production units and strong supplier network in India	Ramping up production in India is cost effective and profitable decision
2	Production units and supplier relationships favor frugal cars over E-vehicles	Excess IC engine plants in Europe can be dismantled and brought to India
3	Unparalleled technological superiority and brand name	German automotive industry suppliers (for eg. Bosch) are also suppliers for low-cost cars in India
		Growing trend in Germany for simple products, thereby having reverse innovation market in Germany

Table 5.3 Real opportunity: Entering the mass volume market

Enabling stakeholder and business communication

Table 5.4 highlights the comparative strengths and specific opportunities from Appendix E1, which correspond to this inference. Since the German automotive industry is much superior with IT infrastructure, the presence of IT support could give an edge to coordinate and communicate across all divisions. For instance, Volkswagen uses the EcoEmos software for global coordination (section 3.1). The German companies have also pioneered the use of customer integration IT systems (section 4.4.1). They have already experimented with open innovations in IT, indicating that they have all the resources necessary to enable communication across their extended business units (if they enter the mass volume market. Coincidentally, India is known for the abundant availability of local IT talent. To expand operations in India, the presence of a strong and inexpensive IT talent in India, is handy. To put it in a nutshell, **they have first-hand communication and coordination infrastructure to exchange information and involve stakeholders.**

S.no	Comparative strengths	Specific opportunities
1	Superior management systems and IT support, enabling better organizational performance internationally	Presence of local IT talent in India to resolve communication and coordination issues
2	Use of open innovation techniques in software systems involving local talent.	

Table 5.4 Real opportunity: Enabling stakeholder and business communication

Branding to get market entry

Table 5.5 highlights the comparative strengths and specific opportunities from Appendix E1, which correspond to this inference. The Indian customers have a knack for brand names. In section 4.4.3 it was established that being a hierarchical status driven nation, the presence of a superior brand name is an indicator of greater customer reception. In addition to their superior designs the presence of a strong brand name could give them a huge reception in the Indian market. Since the covid-19 pandemic has been discouraging customers to invest in high end cars (section 3.2.3), luxury oriented and sporty German cars aren't a priority. However, frugal cars that are designed for meeting basic requirements could be well received. For instance, one of the reasons for Palio's success in India was Fiat's brand reputation as an elite European automaker. Thirdly, E-vehicles haven't entered the Indian market as such, indicating that Tesla and e-mobility makers from China aren't a serious threat (section 3.2.4). This gives the German automotive industry a great opportunity to win the masses by entering the Indian frugal market. To put it a nutshell, **their frugal cars would be met with a high customer reception.**

S.no	Comparative strengths	Specific opportunities
1	Unparalleled technological superiority and brand name	Indian customers' have an affinity for premium brand names as the country is status driven

2	Sustainability focused, creating a superior value proposition.	Customer aversion to luxury cars due to covid-19 pandemic

Table 5.5 Real opportunity: Thriving in the Indian frugal car market

New business opportunity

Table 5.6 highlights the comparative strengths and specific opportunities from Appendix E1, which correspond to this inference. Given their technical skills and resources, frugal innovations present a lot more opportunities from a business sense than e-vehicles in India. One primary reason for this is that e-vehicles account for hardly 0.2% of India's automotive industry (Hindu, 2021) and the country lacks the necessary infrastructure to support e-vehicles (section 3.2.4). Additionally, given the dop in sales due to the covid-19 pandemic (section 3.2.3), their resources and skills can be applied in the frugal markets in India, to offset their declining sales in the luxury segment. From a technical standpoint, their competitors are much less inferior, which gives the German car companies a massive advantage. To put it in a nutshell, **frugal cars present a new market for the German automotive industry with optimistic hopes.**

S.no	Comparative strengths	Specific opportunities
1	Possess best in class resources, technical skills to solve any challenge.	Frugal innovations can offset declining sales volume in the luxury market due to covid pandemic
2		First mover advantages amongst other luxury automakers
3		Competitors in this segment like Suzuki, Hyundai are technologically much inferior
		Disruptive innovations like e-vehicles is a high risk game compared to frugal innovations for the German automotive industry including foundries and suppliers

Table 5.6 Real opportunity: new market opportunity

5.3.2 Space of lost opportunities

The opportunities presented in this section highlights the opportunities in the external environment that it could use to its advantage to exploit frugal markets in India (Appendix E2). However, exploiting these opportunities would be at the cost of overcoming a few weaknesses in the context of frugal innovations in India. In short, the German automotive industry must undergo internal changes to make use of the opportunities.

Inferences (Potential to improve internally)

Opportunity for business model transition

Table 5.7 highlights the comparative weaknesses and specific opportunities from Appendix E2, which correspond to this inference. One of the major roadblocks for the German automotive industry is that its current business model and organizational structure isn't supportive of frugal innovations. However,

transition to e-vehicles completely in the presence of automotive giants like Tesla, is a much riskier ball game that again calls for a business model restructuring. Therefore, in this complex situation frugal markets in India provide a comparatively safer opportunity to restructure their business models to meet a growing customer demand in India. Knowing that change is inevitable, the German automotive industry has a lot of potential to establish itself in this market by adopting a market driven approach. As indicated in section 4.4.3, this adaptation could be achieved using four steps: International extension, local emergence, local extension, and local consolidation (Landau et al., 2016). In short, **altering their business models to fit Indian frugal markets is a promising opportunity.**

S.no	Comparative weaknesses	Specific opportunities
1	Present business model is not suitable for high volume low profit market	Disruptive innovations like e-vehicles is a high risk game compared to frugal innovations for the German automotive industry including foundries and suppliers
2	Established rigid organizational structure with lack of adaptability	Frugal innovations can offset declining sales volume in the luxury market due to covid pandemic
3	Lack of tailor-made strategies for Indian mass markets	German team could conduct a visit to India to understand market needs
4	Centralized decision making (Germany)	Growing trend in Germany for simple products, thereby having reverse innovation market in Germany
5	Traditional organizational minded employees might be resistant to frugal innovations	

Table 5.7 Space of lost opportunities: Potential for business model transition

Opportunity for transitioning from tech driven to market driven R&D

Table 5.8 highlights the comparative weaknesses and specific opportunities from Appendix E2, which correspond to this inference. One of the most important weaknesses of the German automotive industry in the context of Indian frugal innovations is its technology centered R&D. The importance of a market driven approach in the context of frugal innovations has been discussed in section 2.1. However, the German automotive industry has a vast potential to overcome this weakness by understanding that their technological capabilities are far more superior than their competitors and could solve any challenge. All it needs is a firm understanding of the customer markets. Then they could use their technical skills to produce the optimum car based on customer challenges and constraints. Additionally, the Indo-German business center, has been developing a manual for frugal innovations for German engineers. This could be very helpful in offsetting their technology driven mindset. To put it in a nutshell, **opportunities provide an immense potential to transition to a market led approach**.

S.no	Comparative weaknesses	Specific opportunities

1	Complex high-tech R&D preferring quality over price	German engineering has lot to offer in India as there is a lack of technical expertise in India
2	Lack of understanding of Indian customer buying behavior	German team could conduct a visit to India to understand market needs
3	Not capable of manufacturing, tailored to Indian requirements	Support from Indo-German business centre to push for frugal innovations

Table 5.8 Space of lost opportunities: Tech driven to market driven

Opportunity to improve supplier networks and production efficiency

Table 5.9 highlights the comparative weaknesses and specific opportunities from Appendix E2, which correspond to this inference. With an intense focus on quality over price, frugal innovations would demand a new approach to meet increasing cost pressures and forge appropriate supplier relationships. This involves transitioning from premium and luxury segments (D1 and D2 segments) to hatchbacks (B1 and B2 segments) (section 3.1). However, the German automotive industry's core suppliers are already experienced with supplying parts for frugal cars such as Tata Nano. Therefore, they have a splendid opportunity to meet cost pressures without renewing major relationships. In addition, their lack of mass production ability could be offset by either forming relationships with Indian assemblers (as it is comparatively inexpensive) or shifting a used plant from Germany. In either case, there is a huge opportunity to meet the production volume capacity. In short, there is **opportunity available to enhance supplier relationships and production efficiency.**

S.no	Comparative weaknesses	Specific opportunities
1	Supply parts must be 30% the price and provide 95% the performance, which is a very hard target	German automotive industry suppliers (for eg. Bosch) are also suppliers for low-cost cars in India
2	Low production speed, incapable of mass production and catering to high volume market	Ramping up production in India is cost effective and profitable decision
3	Might need a renewal of supplier relationships	Excess IC engine plants in Europe can be dismantled and brought to India

Table 5.9 Space of lost opportunities: Potential for production efficiency

Opportunity to offset product weaknesses by exploiting market conditions

Table 5.10 highlights the comparative weaknesses and specific opportunities from Appendix E2, which correspond to this inference. For the German automotive industry, frugal innovations would be an entirely new ball game. At the product level, the hardest thing for them would be to design cars based on Indian market requirements and meet cost pressures, as has been highlighted previously. For instance, Indian customers prefer fuel efficient cars over sporty and luxurious designs. One way to offset these weaknesses could be by massively promoting its brand name and technological prowess (compared to its competitors), in a brand conscious country like India. As argued in the earlier case, the importance of brand name as a

status enabler has the possibility to yield positive returns. Given the society, even frugal cars could offset cost pressures by promoting brand name and technological superiority. In short, **the society and customer mindset in India provides opportunities for the German automotive industry**.

S.no	Comparative weaknesses	Specific opportunities
1	Fuel inefficient and expensive due to sporty performance	German team could conduct a visit to India to understand market needs
2	High regulatory standard makes them incapable to go for frugal innovations	Competitors in this segment like Suzuki, Hyundai are technologically much inferior
3	European designs incapable of handling Indian road conditions	Indian customers' have an affinity for premium brand names as the country is status driven
4	Inexperienced with meeting low-cost pressures in products	German engineering has lot to offer in India as there is a lack of technical expertise in India
5	Expensive supply parts and frequent servicing needed	
	Lack of Indian market-oriented customer marketing tactics	

Table 5.10 Space of lost opportunities: Opportunity to offset product weaknesses by exploiting market conditions

5.3.3 Space of possible defense

This section addresses the external threats in the environment, however with the possibility that the German automotive industry has the potential to counter these threats by using its strengths, in the context of Indian frugal markets (Appendix E3).

Inferences (Potential to overcome)

Threat of brand dilution

Table 5.11 highlights the comparative strengths and specific threats from Appendix E3, which correspond to this inference. One major threat with frugal innovations could be the loss of brand name as luxury automakers. However, the German automotive industry could use its strengths against this happening. Since their R&Ds are used to focusing on sustainability and superior technical skills, they could differentiate themselves as sustainable and technologically superior automakers in the same segment compared to their competitors. These technical abilities could result in a superior value creation for its customers, for example sustainable fossil fuel powered cars. In short, **loss of brand name poses a threat, but the German automotive industry has potential to overcome it**.

S.no	Comparative strengths	Specific threats

1	Superior R&D and technical knowledge to design.	Loss of brand name and brand dilution
2	Sustainability focused, creating a superior value proposition.	

Table 5.11 Space of possible defense: Threat of brand dilution

Competition from experienced mass producers

Table 5.12 highlights the comparative weaknesses and specific opportunities from Appendix E3, which correspond to this inference. Major automotive industries like Hyundai, Tata and Suzuki are very well established in mass production capabilities and networks. For instance, Hyundai has enabled modularity in production within India and ensures an annual cost cutting of USD33000 along with very high-volume production capacities (Sharmelly & Ray, 2018). This undoubtedly poses a competitive threat in the mass volume market in terms of meeting cost pressures. However, as argued previously, one of the major strengths of the German automotive industry is that it is very well established in India, with supplier and production networks. It therefore could make use of these networks and relationships to procure parts and expand its production network. Additionally, it would be easy to win their cooperation as it's a much better opportunity for suppliers to be frugal parts suppliers than e-vehicle suppliers (as it is a totally different architecture). However, despite their possibility to enter the mass volume market, the German automotive industry must determine measures to meet the pressures given the nature of competitors. In short, **pressures that might result from skilled mass producers in this segment presents a major threat which might need an immediate internal restructuring.**

S.no	Comparative strengths	Specific threats
1	Established production units and strong supplier network in India	Japanese competitors have an advantage in mass production
2	Production units and supplier relationships favor frugal cars over E-vehicles	Hyundai and Suzuki well established in the mass volume market with low cost- and fuel-efficient cars
		Tata, Suzuki, and Hyundai have well established networks in every sphere of the value chain

Table 5.12 Space of possible defense: Competition from experienced mass producers

5.3.4 Real threats

This frontier represents the interactions between the comparative weaknesses and specific threats as highlighted in Appendix E4. This frontier represents the gravest threats, as these are the areas represent the greatest weaknesses of the German automotive industry and external factors like competition or other pressures might further aggravate to the disadvantage.

Inferences

Local market adaptation threat

Table 5.13 highlights the comparative weaknesses and specific threats from Appendix E4, which correspond to this inference. Although the German automotive industry can manufacture a frugal car in a technical sense, the threat comes from the fact that the German automotive industry's R&D activities are highly centralized, and market led approach is limited. For instance, Volkswagen, BMW, Mercedes Benz and Audi, despite being well established in India have a strictly centralized R&D at Germany (section 3.1). However externally competitors like Hyundai, Ford, Suzuki, and Nissan have spent years exploring the Indian car market, and their products are to a very high degree marketed and sold by altering it to customer requirements. In short, **this poses a serious threat to the German automotive industry as these competitors could outperform them in this regard.**

S.no	Comparative weaknesses	Specific threats
1	80% of R&D activities centralized in Germany	Hyundai, Ford, Suzuki, Nissan are highly capable of designing Indian market-oriented cars
2	Lack of understanding of Indian customer buying behavior	
3	Not capable of manufacturing, tailored to Indian requirements	
4	Complex high-tech R&D preferring quality over price	

Table 5.13 Real threats: Local market adaptation threat

Resistance from stakeholders

Table 5.14 highlights the comparative weaknesses and specific threats from Appendix E4, which correspond to this inference. Rigidly traditional structures, routines and employees could pose a threat. The fear of brand dilution, which was also the reason for the failure of Fiat Palio in India, could add fuel to the fire by organizational resistance within the firm to resist moving into the frugal car segment. Furthermore, scaling down standards to meet cost pressures might invoke resistance within the firm. Apart from the internal challenges, frugal innovations would be a time expensive affair. Firstly, both the German and Indian governments pose a threat as it is not in line with their demands (to switch to e-vehicles). Negotiations with the Indian government to switch to a new market would invoke complications. In comparison to its competitors the German way of business might not be conducive to deal with institutions in India, which is built on networks and relationships. Additionally, since they would have to alter every activity in its value chain including renewing relationships, the resistance from employees might be very hard to manage. The result could be an unstable organization which would split the firm into distinct schools of thoughts: one, which would favor to stand with their brand name and push for e-vehicles, and perhaps a very few, who could support the idea of entering frugal markets. to put it in a nutshell, **firm internal and external institutional pressures pose the greatest threat to enter frugal markets.**

S.no	Comparative weaknesses	Specific threats

1	Traditional organizational minded employees might be resistant to frugal innovations	Loss of brand name and brand dilution
2	Established rigid organizational structure with lack of adaptability	German government skeptical of frugal innovations due to fear of decrease of GDP
3	Unparalleled technological superiority and brand name	Indian Government pressures to push for e-vehicles to reduce dependency on foreign countries for oil.
4		European legislation favors for German automotive industry to compete against Tesla in Europe
5		Asian competitors are better at exploiting networks due to cultural similarities

Table 5.14 Real threats: Resistance from stakeholders

Competitive threat: production efficiency and product pricing

Table 5.15 highlights the comparative weaknesses and specific threats from Appendix E4, which correspond to this inference. Firstly, competitors in the frugal car market in India are very well established in all spheres ranging from R&D, mass production to spare parts. For example, this includes a market driven R&D such as Hyundai; modularity and cost savings in production by Hyundai; and value for money approach by Suzuki. Even if a frugal car is produced by their German counterparts, competitors understand their German counterparts are inexperienced in the areas of fuel efficiency, meeting low-cost pressures and economical spare parts. These three weaknesses would undoubtedly be exploited by competitors as this is the only way that they could position their products against a strong brand name. Meeting these kinds of cost pressure-oriented competition might be a very hard challenge for the German automotive industry which has so far prioritized quality over price. Additionally, in the long run, their brand dilution would give them no big advantage. To sum it up, **competitors are much more experienced in meeting cost pressures to challenge the German entry.**

S.no	Comparative weaknesses	Specific threats
1	Low production speed, incapable of mass production and catering to high volume market	Japanese competitors have an advantage in mass production
2	Fuel inefficient and expensive due to sporty performance	Hyundai and Suzuki well established in the mass volume market with low cost- and fuel-efficient cars
3	Inexperienced with meeting low-cost pressures in products	Indian mass volume market conditions might be very new for the German automotive industry

4		Tata, Suzuki, and Hyundai have well established networks in every sphere of the value chain

Table 5.15 Real threats: Competitive threat (capabilities vs experience)

Longevity threat

Table 5.16 highlights the comparative weaknesses and specific threats from Appendix E4, which correspond to this inference. One of the strongest points the competitors have is their ability to provide service and ensure longevity. Knowing that the German automotive industry has limited-service networks, would give competitors a very strong edge. Hyundai and Suzuki have gone great lengths to fulfill the basic Indian market requirement of longevity by providing round the clock inexpensive service at almost any corner of the country. The German cars are designed for affluent customers, who aren't averse to pay a premium for regular service and maintenance checks. For instance, one of the reasons that led to the downfall of Fiat Palio was that their service and spare parts were far more expensive compared to established competitors (Appendix C1). To put in a nutshell, **competitors are experienced with superior value creation in terms of service, maintenance, and long-term use of cars.**

S.no	Comparative weaknesses	Specific threats
1	Expensive supply parts and frequent servicing needed	Expensive spare parts compared to competitors may put off customers
2	Lack of sufficient dealership and service networks in India	Tata, Suzuki, and Hyundai have well established networks in every sphere of the value chain

Table 5.16 Real threats: Longevity threat

5.4 Discussion

The exploratory and qualitative study on the German automotive industry has some interesting insights. One of the differentiating aspects about this research is that it tries to bridge the gap between two known innovation approaches: The high technology approach (German automotive industry) and on the other end of the spectrum is frugal innovations in the car industry. This differentiates the research from traditional exploratory studies, which seeks to explore a totally unknown phenomenon. To analyze the contents of the research in a detailed manner, the first part would be the analysis of the results followed by the Evolutionary & Correlative SWOT analysis.

5.4.1 Interpretations of findings

Given the limits and boundaries of the research, the results obtained using the correlative and evolutionary SWOT analysis could be interpreted as follows:

The real opportunities represent the greenlight for the German automotive industry to tap frugal markets in India. This represents the frontier wherein their current strengths are perfectly in sync with the external market opportunities. These opportunities could be exploited without any kinds of threats from competitors or external pressures. They already possess all the necessary skills and resources that give them some

specific advantages in the external environment. These strengths are in perfect alliance with the state of the external environment which includes Indian customers' affinity for brand names; Indian competitors' lack of technological expertise; low cost of labor and resources to scale up production and the availability of IT talent in India; support from Indo-German business center (section 5.3). From a firm internal perspective these strengths are in perfect alliance with the Indian frugal market conditions, that is, their brand reputation; technical abilities of their R&D; their business and supplier networks in India; production units in Germany; and ICT enabled international management to present the strongest assets they have (section 5.3). These resources are special and intrinsic to the firm and therefore lead to sustainable competitive advantage (Barney, 1991; Lavie, 2006). Additionally, the role of business networks as an important determinant of competitive advantage reinforces the works of Lavie (2006) and highlights the demerits of the traditional resource-based view on firms of Barney (1991). The result of the intersection of these strengths and opportunities gives them their strongest advantages as far as entering the Indian frugal car market is concerned.

The space of lost opportunities represents the external opportunities available in the Indian frugal markets however the German automotive industry must undergo certain internal changes to tap these opportunities. This frontier could be represented as the orange light, in which they must review their organization internally. This is also the frontier that competitors might try to exploit, being aware of their internal weaknesses from a frugal innovation perspective. These factors include organizational parameters like a high degree of centralization and a technically oriented mindset. From a value chain perspective, it includes inexperience with mass production, expensive cars, and a lack of inexpensive sales and service networks. However, their superior technical capabilities, support from Indo-German business groups, and strong relationships in India could enable them to offset these internal weaknesses.

The space of possible defense yet again presents an orange light situation. However, in this situation, certain external situations present unfavorable situations. Nevertheless, they could very effectively use their strengths to eliminate these threats. In this regard, the external circumstances are that frugal innovations can destroy their brand image (section 5.3). This was also something that could be observed in the case of Fiat Palio in India (section 4.2; Appendix C1). Additionally, certain Indian competitors are very efficient in mass production. However, the German automotive industry has a vast potential to combat these threats using superior technical propositions. Secondly, shifting a plant from Germany or making use of their local networks could help them combat these threats.

The real threats present the most dangerous situation for the German automotive industry (red light). This is the frontier wherein competitors pose the most challenges as it represents their strongest areas and the German automotive industry's weakest areas. The German automotive industry is not used to a high degree of market adaptation, whereas Suzuki and Hyundai have already done it successfully. Along with employee resistance internally, legislative, and legal pressures from both India and Germany do not present positive hopes. Even if high-volume production gets enabled, the competitors are very well pioneered in that area. Sales and service networks are a major challenge for the German automotive industry, whereas Suzuki leads in it (section 5.3).

5.4.2 Generalizability

The research overcomes the limitations of the conventional SWOT analysis by using the evolutionary and correlative SWOT analysis. Therefore, the findings of this research to a very high degree are practically applicable compared to the findings of SWOT. However, this research derives insights using a complementarity framework. Given the qualitative and exploratory nature of the research, the fundamental research methods employed were from literature sources and interviews. Thus, this research does not

advocate the generalizability of the findings. Despite presenting the opportunities and threats, it needs a market and financial analysis to understand if frugal innovations in India would be a profitable decision.

5.4.3 Conventional SWOT vs Evolutionary and correlative SWOT analysis

One of the important features of this research is the usage of the correlative and evolutionary SWOT for the analysis part. Now this analysis in comparison to the SWOT analysis has certain inferences.

Firstly, for this case the SWOT analysis presented 16 strengths, 25 weaknesses, 28 opportunities, and 25 threats (Appendix E). However, in terms of the evolutionary and correlative SWOT analysis, there were 8 comparative strengths, 18 comparative weaknesses, 16 specific opportunities and 15 specific threats. The inference from this is that out of all the parameters identified, only a few contributed to the actual analysis. These findings highlight one of the limitations of the SWOT which is nothing but a huge list of factors that might not have much of an impact (Vlados, 2019). This makes the correlative and evolutionary SWOT a much more reliable tool, especially when the analysis lacks quantitative estimates.

The correlative and evolutionary SWOT holds good in the short term. The reason behind this is that this analysis performs a comparative analysis of strengths and weaknesses. Now the external environment in a highly competitive industry might change drastically and dynamically. This would mean that the comparative strengths and weaknesses are extremely sensitive to external changes like competitive and market changes. Additionally, in a dynamic and highly competitive environment, this new SWOT technique may be a tedious process as the comparative parameters get altered continuously. This makes the SWOT strategies more efficient for the long run.

In terms of complexity the evolutionary and correlative SWOT is a much more complex technique for two reasons. First, a comparative analysis is performed which needs a thorough understanding of the external environment and the firm's standing with respect to its competitors. Second, splitting opportunities and threats into four frontiers (based on internal and external factor interactions) is extremely time consuming and an iterative process. On the other hand, the conventional SWOT analysis is much simpler and less complex. The only disadvantage might be the large number of internal and external factors. But, considering in lump sum, the conventional SWOT still qualifies to be much simpler than the correlative and evolutionary SWOT.

6 CONCLUSIONS

This chapter sums up the contents of the research. The first section would be a conclusion of the findings. This section would highlight the answers to the main research question, including the inferences that could be drawn from the sub-research questions. The second section would highlight the recommendations to the German automotive industry from this research and the limitations of the research work that could lead to future research. The third section would highlight the significance of this research from four perspectives: Academic, managerial, societal, and its link with the MOT curriculum.

6.1 Conclusion

The purpose of this research was to identify opportunities and threats for the renowned German automotive industry to switch to the frugal markets in India. The motivation for this research was based on two reasons: First, from a business perspective, e-vehicle substitution and Tesla's entry in the automotive market has posed a major threat to the monopoly of the German automotive industry. Globalization in the automotive industry has made the market extremely competitive with well-established companies such as Fiat, Hyundai and Toyota trying to leverage benefits from middle income customers in emerging economies. The covid-19 pandemic has further posed an additional constraint with customers averse to investing in luxury cars. The result of these three forces is that the monopoly of the German automotive industry is in deep threat, forcing them to explore emerging markets. In addition, the research addressed one of the major gaps in academic literature, that does not provide a holistic view for the western firms to evaluate if their business models are conducive enough to tap frugal markets in the emerging countries. Although in the era of sustainability, IC engine-based cars might be quite controversial, however for a developing country like India, the priority lies in providing affordable means of transportation for all.

The research identifies the important factors for frugal innovations in India, by integrating technology, management, and social aspects. The main research question that was answered through this research was "What are the opportunities and threats concerning frugal innovations for the German automotive industry in India?". The research made use of available scientific literature from strategic management and frugal innovations to construct a framework for evaluating the German automotive industry internally and externally. This in-depth analysis features a variety of variables: Internally, it focuses on the organizational and value chain parameters; externally, it focuses on business, macro-variables (PESTEL/ societal) and market factors. The unique aspect of this literature review is a combination of perspectives that could be utilized by any product- based firm to assess its current standing with respect to frugal innovations. The addition of strategic management perspectives was equally important as frugal innovation literature could not provide a holistic perspective to analyze the internal and external factors affecting frugal innovations. For instance, the role of 'sales and service' as an important internal variable was derived from the strategic management literature.

The data collection was addressed in three phases: first a literature study from five different disciples of literature; second a secondary case study of Fiat Palio in India; third semi-structured interviews with 7 experts (academic and industry) to identify the various factors that could impact frugal innovations for the German automotive industry in India. Following the method of complementarity, the empirical findings were integrated for the final analysis. Given the limited time frame, additional measures like parallel complementarity technique were adopted to gather the most diverse set of scientifically valid data in a short period of time. The final analysis was carried out using a newly developed methodology named 'Correlative and evolutionary SWOT analysis', which overcomes the many limitations of SWOT and gives a precise overview of business decisions in the absence of quantitative estimates. Despite being a reliable method,

the complexity involved with this method in analyzing the comparative strengths and weaknesses in a highly dynamic environment makes it a rather tedious process. However, the method proves to be beneficial, in the short run when there is a lack of quantitative estimates (section 5.4.2).

The answer to the main research question is that the German automotive industry has numerous opportunities and threats when it comes to frugal innovations in India. Their greatest opportunity lies in their technological superiority. However, their greatest threat hails from well-established competitors in the low-price and high-volume market. This research splits opportunities and threats into four frontiers. The first category included a set of strengths that give the German automotive industry a green signal to proceed with frugal innovations. Its strong technical capabilities coupled with a need for technical expertise in the Indian car market represent the strongest possibilities. Secondly, the German automotive industry has a vast opportunity to overcome its internal weaknesses, from the frugal environment in India. This includes its inability to mass produce could be eclipsed by its production networks and excess plant facilities in Germany. Thirdly, they have a considerable number of internal opportunities to combat external threats. This could be in the form of using its superior R&D skills to evade threats from well-established Indian players. Lastly, the largest threats stem from the competitors' strong areas which are a significant weakness for them. The greatest of this include the customers' desire for lifetime and longevity, which the German automotive industry can't deliver for now. In the entire context of frugal innovations in India (automotive), the role of local networks and partnerships was recognized throughout as an important factor for success. Fiat's decision to collaborate with Premier, Suzuki with the Indian company Maruti, Mercedes-Benz with Tata, eventually led to its widespread success. This result validates the work of Lavie (2006) by identifying the role of networks as a key part of a firm's internal assets to have a competitive benefit. The German automotive industry's success with frugal innovations lies in its ability to use partnerships for expansion in terms of local market adaptation, mass production, sales, and service etc.

Sub-research question 1: The first phase of the findings involved a literature study of 56 articles from five different literature disciplines: German automotive industry, German-India business model, Indian car market, Frugal innovations in India, and sustainability literature. The literature study presented a very deep insight into the various organizational and value chain parameters in the context of the evaluated literature. Additionally, it also provided detailed insights on the Indian side of the case. Internally, the literature study highlighted the role of R&D, organizational and technological superiority of the German automotive industry. Externally, the role of customer requirements and the presence of strong competitors in the domain could be well noted. However, one of the gaps in this study was the lack of recognition of sales and service as important parameters in determining the success of frugal innovations in India.

Sub-research question 2: The second phase of the analysis involved a literature study of 12 articles and an expert interview to understand the factors that contributed to the rise and fall of Fiat Palio (a frugal car) in India. Having certain similarities with the German automotive industry, the insights from this were used to further support the analysis. The case analysis was instrumental in highlighting all the value chain and organizational parameters. Additionally, the importance of modularity in production, sales, and service was identified as distinct parameters that were implicit requirements to be successful in the Indian frugal market. External factors like legal, political factors were much less significant, given the fact that it represented a totally different timeframe (early 2000s) the customer reception and competitive responses of various Indian players like Suzuki, Hyundai could be identified and observed. These insights further reinforced the competitive dynamics of the analysis.

Sub-research question 3: The third phase of the analysis involved an interview with 7 experts from academia and industry. One of the major advantages of involving these experts was their knowledge in terms of practicalities that could be of immense importance in predicting the success of frugal innovations in India. The interviews with experts opened the doors to a few important factors that weren't a part of the literature.

These interviews presented additional insights like the exact strengths and weaknesses of the Indian value chain and the degree of autonomy awarded to each unit. Externally, the interviews provided a fresher perspective based on the present covid-19 pandemic that was key in identifying a new set of factors that could be of impact.

6.2 Limitations and future research

The research showcases an in-depth analysis of the German automotive industry in India. However, the research poses certain limitations which pave the way for future work. The research showcases a new method "correlative and evolutionary SWOT analyses. Given the exploratory nature of the research it does not test and validate the findings. This paves way for future research to validate or perform a comparative study to determine the validity of the new SWOT technique. The inputs from chapter 4 could be used and solved through other available methods like SWOT analysis or Cost-benefit analysis etc. and be compared with the findings.

Despite similarities, within the German automotive industry, a certain deal of variation exists. For instance, Volkswagen cars are affordable compared to Mercedes-Benz and Audi. Additionally, the research treats the German automotive industry as a single entity. However, the German automotive industry consists of multiple players including Volkswagen, Mercedes Benz, and BMW, which also compete against each other in the market. This research does not consider the competition between these entities. This paves way for future case study research in these firms individually, to analyze their success when it comes to frugal innovations in India. Consequently, to get best possible insights future research could be within the boundaries of the company to evaluate their individual stands in the context of the evaluated literature (Chapter 2).

Secondly, the research is purely qualitative. Although this research highlights the opportunities and threats for the German automotive industry, the lack of quantitative estimates inhibits from stating if the decision would be profitable or loss-making. This paves the way for future research to conduct a market and financial analysis to make concrete suggestions to the German automotive industry. This research assumes that 70% of Indian customers prefer lower segment cars. However, given the number of competitors in the domain, a more detailed market research based on region and customer buying behavior could be conducted to forecast the actual sales that could be expected if they produce a frugal car. Additionally, since it's a huge investment and time expensive decision it is equally important to carry out a financial analysis to predict as to what would be the expected rate of return or if this would lead to profits in the long run (a net present value analysis)

6.3 Significance and contribution

6.3.1 Academic contribution

The findings and methodology covered under this research have a significant contribution to academia. Firstly, the findings in the literature review in the chapter feature an empirical framework to conduct case studies in any product-based western firm to define its strategic intent to promote frugal innovations in emerging economies. This literature review could be used by frugal innovation scholars to conduct case studies in firms to decide a firm's capabilities for frugal innovations in any emerging economy. Secondly, one of the most important findings of this research is the role of firm alliances and partners as an important predictor for frugal innovations in India. These finding highlights one of the major limitations of the Resource-based view on firms (Barney, 1991) thus validating the research works of Lavie (2006). Thirdly, the literature review (Chapter 2) highlights one of the biggest limitations of the current literature on frugal

innovations. As presented in chapter 2, literature on frugal innovations ends with covering the organizational aspects, R&D, production, product, and marketing. Despite emphasizing the role of lifetime and longevity, the role of sales and service as an important value chain parameter to predict a firm's success in frugal innovations gets ignored. The findings from the second case study on Fiat Palio, validates the importance of sales and service, citing that it is one of the reasons that led to the downfall of Fiat Palio. Fourthly, the data analysis phase of the research makes a significant contribution and builds on the works of Vlados (2019), by using the evolutionary and correlative SWOT analysis for the first time (or one of the first) as a tool to make business decisions, overcoming some of the limitations of the conventional SWOT analysis.

6.3.2 Managerial contribution

The findings of this research open new doors for the German automotive industry in India. Although this idea might seem quite bizarre for any luxury automaker, given the market environment with e-vehicles about to dominate the world market, the findings of this research expose the German automotive industry to penetrate an unexplored market. India presents a growing middle-class economy with a huge population, however with a lack of automotive expertise. Given the rise of Tesla, developed countries transitioning to e-vehicles, and effects of the covid-19 in developing countries making them averse to investing in high tech products, the research proves that the German automotive industry provides optimistic hopes to alter its business strategy and remain in the market. Secondly, the findings of the research present insights into every sphere of the value chain. Even if not for frugal innovations, the findings from this research gives the German automotive industry a vast scope to alter its business models and value chains to explore emerging markets. Thirdly, the literature review (Chapter 2) could be used by any product-based firm (that wishes to enter the frugal market) to perform an internal and external analysis, and craft a strategy.

6.3.3 Societal contribution

This research features certain specific social contributions in terms of economic development in India. A developing nation, the country faces a multitude of challenges in the transportation sector. One out of every five persons is poor, and families do not have access to cars (section 1.1). The German automotive industry has a vast potential to stimulate economic development by innovating in the frugal car market sector. The findings from this research open doors for them to address the societal challenges in India's transportation sector. The findings of this research, highlight the idea of innovations in gasoline and diesel cars (instead of e-vehicles), in a country like India. However, one must understand from the perspective of a developing country, where a significant fraction of the population doesn't even have access to basic transportation facilities, a frugal car could be a game-changer. Furthermore, their unique focus on sustainability makes a very important contribution by balancing economic development as well as society, side by side. Additionally, the findings in this research advocate production and IT expansion in India. This, in turn, has the potential to generate employment in the production and IT sector, thus boosting the society and economy.

6.3.4 MOT perspective

The aspect that fundamentally differentiates the MOT program is its ability to analyze technologies as a corporate resource. In addition to the business aspects, the socio-technical construction of technologies is given equal importance. Likewise, the elements of this research derive inspiration from both business and social sciences perspectives. From a business sense, the research is linked to the fundamentals covered under Technology, innovation, and commercialization. This includes the concept of frugal innovations and value chain analysis, the threat of substitution (Technology, strategy, and entrepreneurship). Further, the

usage of the SWOT analysis and market, competitor analysis (High-tech marketing) The fundamental theme of this research (section 1.1) focuses on the following forces affecting the German automotive industry: Globalization, e-vehicle substitution, and sustainability. The globalization aspects of this research derive inspiration from Technology, innovation, and organization, which extensively highlights the role of ICT, stakeholders, and globalization (Leadership and Technology management) in the context of technologies. Furthermore, this research features globalization from a cross-cultural global development perspective (Technology entrepreneurship and global development course MOT). These aspects were instrumental in contributing to the organizational, institutional, and cultural aspects of the research analysis. Lastly, one of the most important aspects of this research focuses on sustainability covering insights from (Research and reflection: Social and scientific values). The entire research could be conducted with insights from Research and reflection (Research methods). The problem formulation to the conclusions phase, to put it in a nutshell, has been from the integration of different perspectives from the MOT curriculum.

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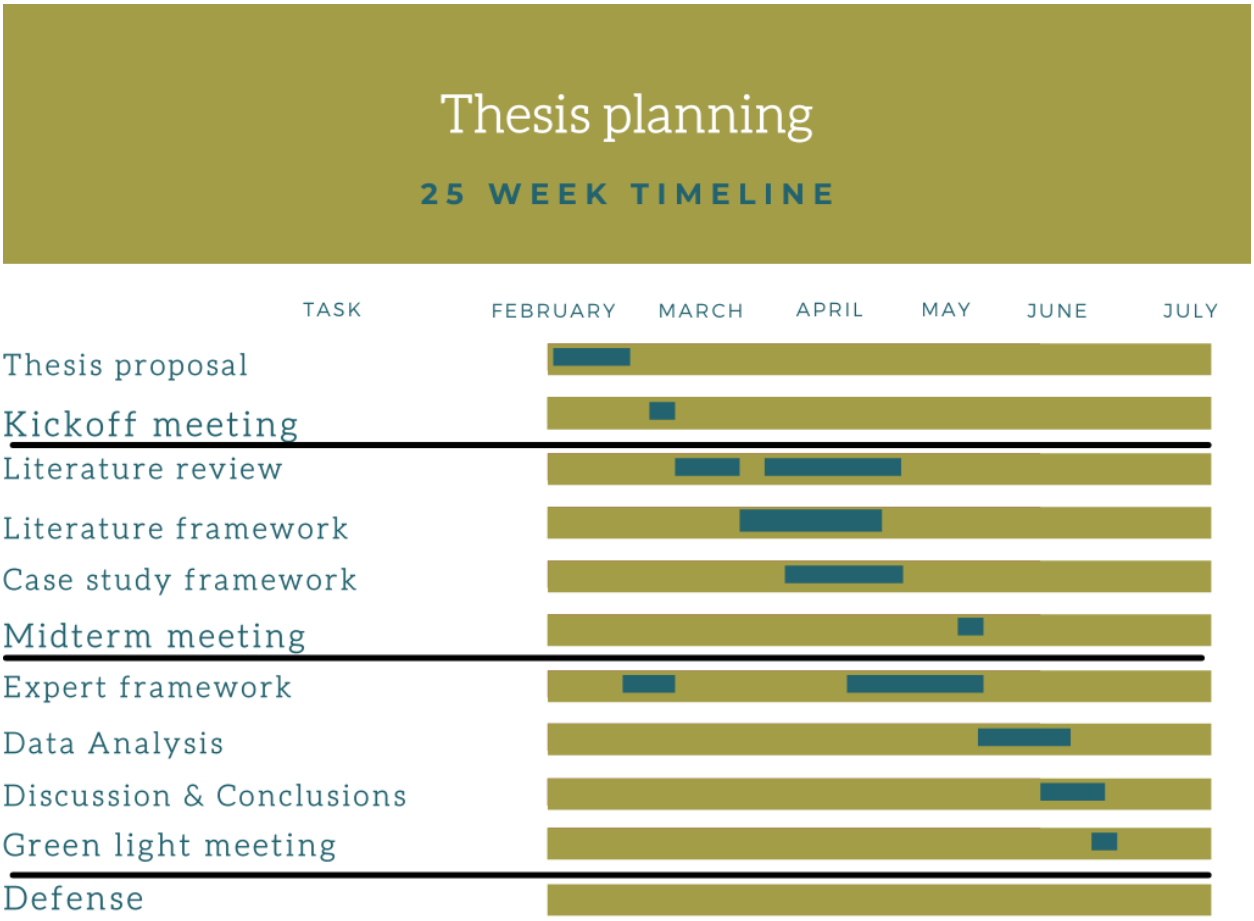
APPENDICES

Appendix A: Project plan



Appendix B1: Phase 1: Literature framework

Strengths

Organizational factors

Business model in India: Proven and well-established business model internationally for IC engine-powered cars and current market to remain stable at least till 2025 (Schwabe, 2020). Major German automotive car companies have established businesses in India. A high degree of business model adaptation in developing countries (India) as German automakers rely extensively on emerging markets to offset sales decline in developed nations (Landau et al., 2016; Raj et al., 2019).

Business partnerships: They have a rich history of local partnerships. This presents opportunities to tap local markets. For instance, Tata and Mercedes Benz; Volkswagen and Maruti-Suzuki; Bharat Benz (Indian partner of Daimler) for commercial trucks in India (Kainth & Mathur, 2016).

Organizational management: The presence of value-based management commitment which can solve organizational issues such as principal-agent problems within organizational boundaries, which generally leads to lower productivity (Raj et al., 2019).

R&D factors

Sustainability oriented: Their R&D focus on sustainability can result in superior social value creation in terms of frugal products (Malte et al., 2020). This can give them an upper hand when it comes to tapping support from environmentalists and governmental institutions.

Local market adaptation capability: Their R&D's ability to tailor product requirements by region. Although their R&Ds are not fully market driven, they still are in the game. For instance, Daimler- Benz has an R&D hub model, thereby acquiring a research center in India for local R&D development (Calabrese, 2001). Similarly, Volkswagen was successful in developing an executive luxury sedan for India, Volkswagen Vento. German industries have some experience with successful frugal innovations such as in automotive the adjustable Volkswagen Polo (Tiwari et al., 2017). Fig.1 highlights the following:

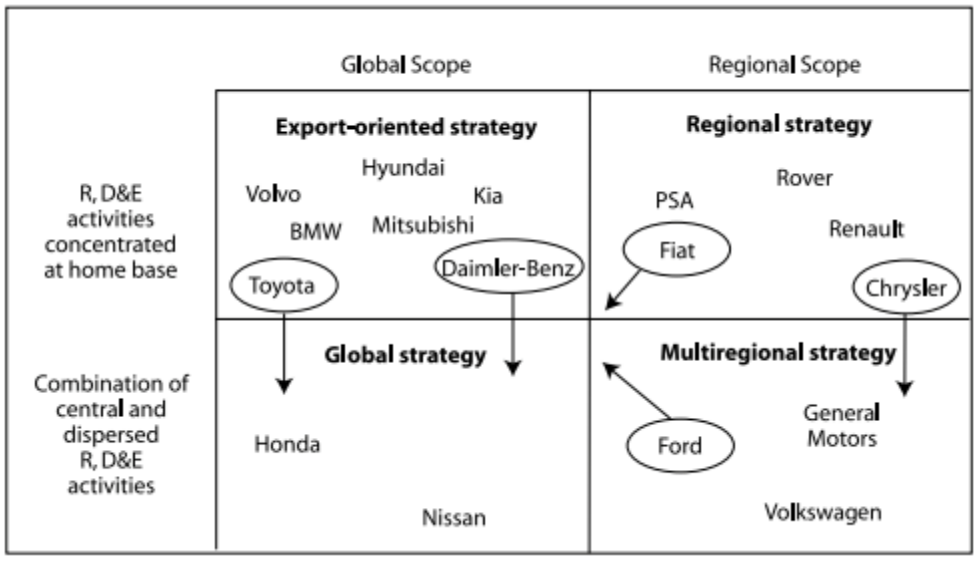


Fig. 1 Global strategies of major automotive companies (Calabrese, 2001)

Production factors

Supplier relationships: Automotive OEMs have a very high degree of reliance on external suppliers. E-vehicle substitution might demand newer forged parts (1018 parts for IC, drivetrain, and vehicle counterparts), resulting in 83,000 employee jobs being eliminated. This would mean prominent existing suppliers would be happy if IC powered vehicles are still manufactured (Schwabe, 2020). Supply networks provide jobs to around 1 million which in turn has resulted in stabilizing the economy (Raj et al., 2019). Tier 2 suppliers in India also gain benefits in terms of learning and experience, enabling them to compete locally in a better fashion (Sturgeon & Biesebroeck, 2011).

Supplier support: Sudden migration to e-vehicles might have to make them renew their client relationships which are highly impractical in a short time to compete with Tesla etc, meaning they have to be open to options favoring IC engines as they have a well-established global value chain and global production network in this domain (Schwabe, 2020).

Production networks and infrastructure: Very high production networks and capabilities in emerging countries and also higher demand needs (Raj et al., 2019; Rese et al., 2015; Sturgeon & Biesebroeck, 2011; Tiwari et al., 2017). Around 120 German automotive component manufacturers are well established in India (Wadhwa, 2020).

Products and marketing factors

Customer involvement: Customer integration methods like Lead user and Voice of the customer (open innovation techniques) already in emerging economies which would work great for frugal innovations (Rese et al., 2015).

Brand name: Known for their premium brand names and are often regarded as status enablers (Tiwari et al., 2017).

Weaknesses

Organizational factors

Market transition: A market transition towards electric vehicles and market for IC engines is on a decline and is expected to be pushed out of the developed countries market by 2030 (ING predicts a 50% market share for e-vehicles), German firms forced to revise strategies concerning their main specialty IC (Schwabe, 2020).

Low volume to high volume switching: Switching from high margin- low volume to low margin high volume is a challenge for them as its a totally different ball game in terms of networks, value proposition and sales (Buse & Tiwari, 2014; Malte et al., 2020; Zeschky et al, 2014). Volkswagen is the only German car company that has a mass production capability in India.

Organisational structure: Rigid organizations with a lack of flexibility. Additionally lack of management support and entrepreneurial orientation (Malte et al., 2020). With codified best practices, KPI reports might not favor frugal innovations (Malte et al., 2020).

R&D factors

Technology driven: High tech-driven and complexity in R&D innovation are highly preferred (Tiwari et al., 2017). A great cultural challenge as German management and engineering education is not equipped with a cost reduction mentality (Malte et al., 2020; Tiwari et al., 2017).

R&D structure: Have a traditional approach to business (Schwabe, 2020). The strategic orientation of German firms is not aligned with frugal innovations so far (Malte et al., 2020). 80% of German R&D (Fig. 2) takes place in the home country with a very little involvement of local stakeholders (Buse & Tiwari, 2014).

Product Developer	*Premium Segment*		*Medium price-performance Segment*		*Low price-performance Segment*	
	China	*India*	*China*	*India*	*China*	*India*
Headquarters (HQ) in Germany	75%	80%	38.7%	62.4%	16.7%	14.3%
HQ + Local subsidiary	17.5%	11.4%	38.7%	18.8%	50%	57.1%
Local subsidiary	0%	0%	3.2%	0%	33.3%	14.3%
Other countries	7.5%	8.6%	19.4%	18.8%	0%	14.3%

Fig. 2 R&D outsourcing for German carmakers (Buse & Tiwari, 2014)

Production factors

Supplier bargaining power: Heavy reliance is on well-established premium suppliers like Bosch, Conti, Hella, VDO, ZF, or domestic suppliers somehow linked to western Europe (Pries, 2004). Although current partnerships in India do exist, it is all intended to serve the luxury market. Frugal innovations would require the cooperation of these premium suppliers to innovate frugally.

Manufacturing mindset: They also make small-scale product adjustments in the product while trying to tap emerging economies meaning frugal innovations would be harder as it requires massive changes. Motivating tech-driven engineers and managers to adopt a frugal mindset, is a challenge yet to be resolved (Tiwari et al., 2017). In the case of doubt, German engineers would add a new feature than delete it (Malte et al., 2020; Tiwari et al., 2017). This calls for the need for local partnerships (Buse & Tiwari, 2014; Tiwari et al., 2017).

Price vs performance pressures: Supply parts demand roughly 30% of the global price with 95% performance to operate successfully (Buse & Tiwari, 2014) for successful frugal innovations.

Products and marketing factors

Premium segment operation: Strong focus on premium cars holding a market share of 73.1 % worldwide in this niche. (Landau et al., 2016; Raj et al., 2019). Typical German products are complex and high-end) and are pioneers in the premium segment. These are generally not preferred in emerging countries (Malte et al., 2020; Tiwari et al., 2017 For instance, German luxury manufacturers like Audi, Mercedes Benz, BMW are primarily focused on luxury and sporty performance, hence are often fuel-inefficient and expensive (Kainth & Mathur, 2016).

High regulatory standards: German regulatory standards and requirements are very high compared to the need for frugal innovations (Malte et al., 2020).

Opportunities

Business factors

India mass production advantages: Bibliometric analysis suggests frugal innovations having close links with India (Tiwari et al., 2017). India is a highly preferred offshoring destination with less expensive labor (Westner & Strahringer, 2010). Relocation to India has proven reduction in costs as labor costs are much lesser (Kinkel & Zanker, 2013). For instance, Ford has invested $1 billion to ramp up production in India; Mercedes $71million to produce compact cars (Tybout & Fahey, 2017). Fig 3a highlights the wage rate/ hour. The success of Hyundai, gives optimistic hopes as they say material savings, cutting down unnecessary costs (R&D, design, and manufacturing) are the most effective engines to manufacture low-cost cars, they saved close to USD 33000 by doing so (Sharmelly & Ray, 2018). India is an attractive destination for investment given the rapid growth of the middle classes, availability of raw materials and skilled labor, and easy financing (Tybout & Fahey, 2017).

Country	Rate
Germany	32.53
UK	24.71
USA	23.17
Australia	23.09
Japan	21.90
Canada	21.42
South Korea	11.52
Mexico	2.50
China	0.61

India not listed, but thought to be at or below the wage rate shown for China).

Fig. 3a Wage rate/hour (dollars/hour) country wise comparison (Tybout & Fahey, 2017)

Main motives for production relocations	Production relocation mid 2004 to mid 2006	Production relocation 2007 to mid 2009	Production relocation 2010 to mid 2012	Trend
Labour costs	80 %	77 %	71 %	↘
Access to new markets	27 %	28 %	28 %	→
Vicinity to key customers	21 %	29 %	26 %	→
Vicinity to to relocated production capacities	n.a.	16 %	23 %	↗
Access to raw materials	n.a.	n.a.	15 %	n.a.
Import restrictions	n.a.	n.a.	11 %	n.a.
Lack of skilled workers	n.a.	8 %	9 %	→
Taxes, levies, subsidies	11%	12%	5%	↘
Access to new knowledge/ technologies/ clusters	4%	2%	1%	(↘)

Fig. 3b Outsourcing to India motivations (Kinkel & Zanker, 2013)

Production Cost-based Price Comparison of Compact Cars in India (unit: Rs, dollar)

Company	Car Model	Indian Rupee	USD
Suzuki Maruti	Maruti	2,00.000	4,200
Hyundai (HMI)	i10	3,70.446	6,900
	Santro	3,58.354	5,500
	EON	2,74.821	5,700
Tata	Tata Nano	1,00.000	2,100
Toyota	Etios Liva	4,33.368	9,000
GM (Chevrolet)	Beat	3,72.761	7,800
Ford	Figo	3,81.800	8,000
Volkswagen	UP	3,50.000	7,000
Honda	Brio	3,99.000	8,200
Bajaj (Renault)	Bajaj RE60	1,00.000	3,000

Fig. 3c Cost of manufacturing comparison between car companies in India (Park & Rhee, 2015)

Costs of Manufacturing of HMI (unit: euro, %)

Nation	Compact car's total production cost	Wage cost	Ratio of wage cost
India	4,000	150	3.8
Korea	4,600	750	16.3
East Europe	5,000	1,150	23.0

Fig. 3d Cost of manufacturing (Euros) comparison between countries (Park & Rhee, 2015)

Supplier presence: Presence of German automotive component suppliers who have been successful in targeting the medium and lower markets in India (Buse & Tiwari, 2014). For instance, Bosch was one of the suppliers for Tata Nano.

Risk with e-vehicles: The automotive industry has been more successful in incremental innovations (e.g., frugal innovations) than experimenting with disruptive technology like electric vehicles (Rese et al., 2015; Schwabe, 2020). Given the well-established and massive organizational structures with established routines, disruptive innovations are far riskier, than an incremental innovation.

Organizational learnings: Frugal innovations offer organizational learning by introducing cost-efficient business processes (Malte et al., 2020). As the basic definition of frugal innovations revolve around reducing production costs, German automotive firms undoubtedly could become much more efficient.

No need for training programs: To cater to the premium car industry German automotive suppliers in India must invest heavily in training programs (6-12 months) owing to the technological superiority. However, frugal products would require far less as they can better understand customer needs (Pilz, 2016).

Raw material providers support: 50% of foundry producers are skeptical about e-vehicles as their businesses which were so far relying on IC-powered vehicles, may get disturbed (Schwabe, 2020). Migration to new trends comes at a very high risk/ cost.

Availability of IT infrastructure: Improvements in IT and India having rich access to IT professionals presents the best opportunities for global coordination with networked R&D, value chain activities.

Reverse innovation advantages: The emerging idea within Germany to prefer simplified products cutting down expenses for day-to-day living, amongst few groups in the German society (Malte et al., 2020; Tiwari et al., 2017). Two major motivations: environmental concerns and moderation. Thus, frugal innovations in India could serve as reverse innovations in Germany (Zeschky et al, 2014). Seen as a measure to cut down unnecessary usage of resources thus promoting sustainable living (Tiwari et al., 2017). Estimated that two-third of the global middle class by 2030 would be from Asia-Pacific indicating the creation of a new market with frugal needs and wants. In addition, 43% of global customers have highlighted the need for frugal products, thereby reversing innovation advantages (Malte et al., 2020).

Market, competitors, and customer orientation factors

Low-cost competition pressures from China: Theoretically, frugal innovations in the German automotive industry are highly supported due to competition from low-end products from China (Tiwari et al., 2017). If not for frugal innovations, Chinese competitors might offer the same value proposition at a very low price and capture the market. The case of Land rover's Chinese duplication in China is an example of this. This duplicate version offers the same product as Land Rover at approximately one-fifth the price of Land Rover, thereby massively hampering Land rover's market.

Customer demand in India: Shifting/ increasing global production and supplier base to India has clear advantages as firms benefit from sales growth in these areas (Häntsch & Huchzermeier, 2013; Sturgeon & Biesebroeck, 2011). Frugal innovations are important for long-term competitive advantage in emerging countries (Tiwari et al., 2017). Growing economies like India and the emergence of a robust middle class have proven a profitable target market (Zeschky et al, 2014). Nordcliffe(2012) predicts that the BRIC countries are a much more potential market than Europe and the USA (Häntsch & Huchzermeier, 2013). At the corporate level, adopting strategies for the Bottom of the Pyramid markets has been overwhelmingly accepted and recognized (Wells, 2010). Specifically for India, given the promising growth in per capita

GDP has indicated a growth in disposable incomes (Tybout & Fahey, 2017). With a population of around 1.2 billion and car consumption of 13 for every 1000 persons, the market presents a lucrative opportunity. With the growing number of nuclear families, the compact car industry presents a lot of opportunities. The Indian middle class is estimated to grow to 41% by 2025. The car purchasing capacity in the compact segment is expected to increase to 20% of total spending in 2025 (Buse & Tiwari, 2014; Kainth & Mathur, 2016). Given their local needs and lack of infrastructure, German MNCs in India (like Siemens) are being forced to tailor frugal products to survive in that market. If not for frugal innovations competing against local players in emerging markets becomes a challenge (Agarwal & Brem, 2012).

Lack of technological expertise in India: Developing countries like India, do not have a significant number of local prominent automakers with technological expertise paving the way for foreign companies (Sturgeon & Biesebroeck, 2011). For instance, local automakers like Tata, Mahindra are technologically much inferior to their German counterparts.

Brand conscious customers: Brand name is one of the most important parameters for customer buying behavior in India (Dhanabalan et al., 2018). Indian customers are extremely brand conscious, and cars are in general status enablers. Korean, Indian manufacturers are perceived as of lower quality by Indian customers; whereas Japanese and German cars have a greater brand value, meaning that any car in competition with their foreign counterparts would be a gain for the Germans (Tybout & Fahey, 2017). As a person moves up the income ladder, it becomes more of a status symbol to own a car (even more than needs) (Mathur et al., 2018).

Proven Market adaptation opportunities: Emerging markets, presents German high-end makers a vast potential if they actively work, on four levels: *international extension, local emergence, local extension, and local consolidation* (Landau et al., 2016) (empirically derived from the case of Autolux in India).

- **International extension:** adapt to local markets by creating a unique value proposition (at the firm level) for the market needs
- **Local emergence:** localize value creation (at the product level) and delivery
- **Local extension**: establish local players in the entire value chain
- **local consolidation**: optimize components to fit in new business model

Legal, institutional, and political factors

Support from Indo-German business center: Mr. Wolfgang Höltgen, Director of German-India Business center (Hannover, Germany) has suggested constructing a frugal innovation guide for German engineers (Tiwari et al., 2017). This guide would give the German firms a clear direction to tailor their business models and train engineers to design for frugal needs.

Pressures to explore emerging markets: Developed countries like the USA, Japan, Germany have special quotas for e-vehicles. E-vehicles already touched 1.98 million as of 2018, with a predicted growth rate of 68% annually. Tesla and Chinese counterparts like BYD and BAIC are already well established in the market, forcing German counterparts to explore in emerging markets (Raj et al., 2019; Schwabe, 2020). In India E-vehicle substitution is not a threat, due to the preferences of Indian customers, as shown in the figure.

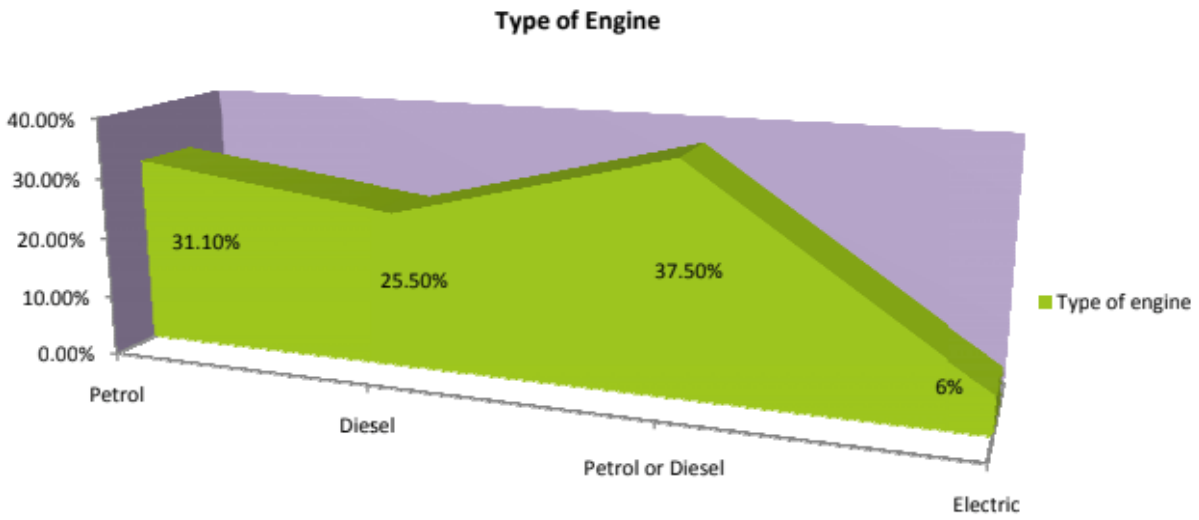


Fig. 4 Passenger car type (by fuel) preference in India: (Mathur et al., 2018)

Lower import duty for small cars: Indian market's overwhelming reliance on foreign automakers (figure). The excise duty (tax) for smaller cars is 12% (roughly half of the premium cars) meaning the German industry has the potential to develop a cheaply priced car without affecting its profit margin (Tybout & Fahey, 2017). Fig below shows export capabilities of various countries from home.

Exporter	*World rank 1993*	*World rank 2008*	*2008 Exports $M*
China*	21	4	42,463
Mexico	8	6	27,516
Poland	39	8	19,767
Republic of Korea	16	9	18,355
Czech Republic	31	11	17,807
Thailand	20	18	9,551
Brazil	13	19	8,927
Slovakia	40	21	6,107
Romania	46	22	6,060
China (Taiwan)	14	23	5,663
Singapore	19	26	5,085
Indonesia	36	27	3,457
Philippines	27	28	3,438
India	35	29	3,064

Fig. 5 Exporters of automobiles and related parts country comparison: (Sturgeon & Biesebroeck, 2011)

Governmental investment: In 2013-2014 the Indian government allocated $2.7 billion for promoting the production of small and medium commercial vehicles in India (Roy et al, 2014).

Positive governmental intervention: Very low entry barriers for foreign firms as the Government intends to promote competition in the automotive sector to stimulate quality. For instance, Hyundai produces

around 90 % of its parts in India (for the Indian market) compared to 70% for other prominent players (Tybout & Fahey, 2017). As presented earlier, this in turn has given Hyundai an enormous cost advantage.

Covid and aversion for luxury products: Crisis situations discourage customers from investing in high-end products (Zeschky et al, 2014). The Covid-19 pandemic exactly fits this criterion. This creates a lucrative opportunity for German automakers to move to the lower economy market.

Threats

Business factors

Low local supplier standards: Despite supplier networks in India, they find it hard to meet the standards set by the German counterparts as indicated in Fig. 6 (Sturgeon & Biesebroeck, 2011).

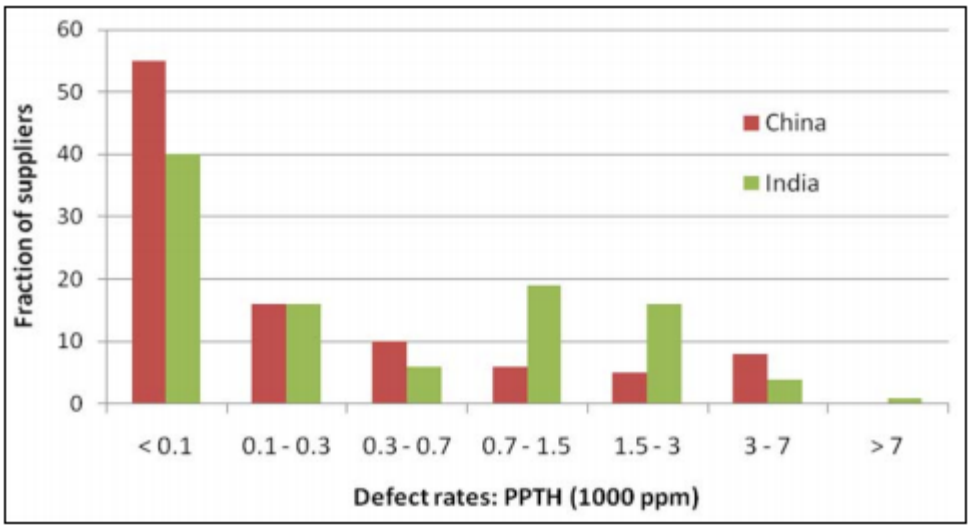


Fig. 6 Automotive supplier defect rates in China and India: (Sturgeon & Biesebroeck, 2011)

Pressures from business groups: Some business and social groups within Germany still have a high preference for high-end technological products (Malte et al., 2020; Tiwari et al., 2017).

Market, competitors, and customer orientation factors

Mass production threat: Major Japanese counterparts have mastered lean production giving them an advantage in large-scale mass production (Pries,1999). Ideally, German car companies are not proficient in high volume mass production and Japanese competitors would have an upper hand.

Competition from well-established local players: Competition from local players in India for market share (Agarwal & Brem, 2012; Kroll & Gabriel, 2020). Presence of heavy competitors in India (Sharmelly & Ray, 2018). Companies like Hyundai (with two assembly plants in India) have been overwhelmingly successful in targeting the middle class with its Santro, Eon, i10, etc (Sharmelly & Ray, 2018). The average current brand preference in India is a major threat as shown in figure 7. Additionally, competitors like Hyundai have been successful in balancing luxury and affordability, successfully positioning itself in the Indian market (Tybout & Fahey, 2017).

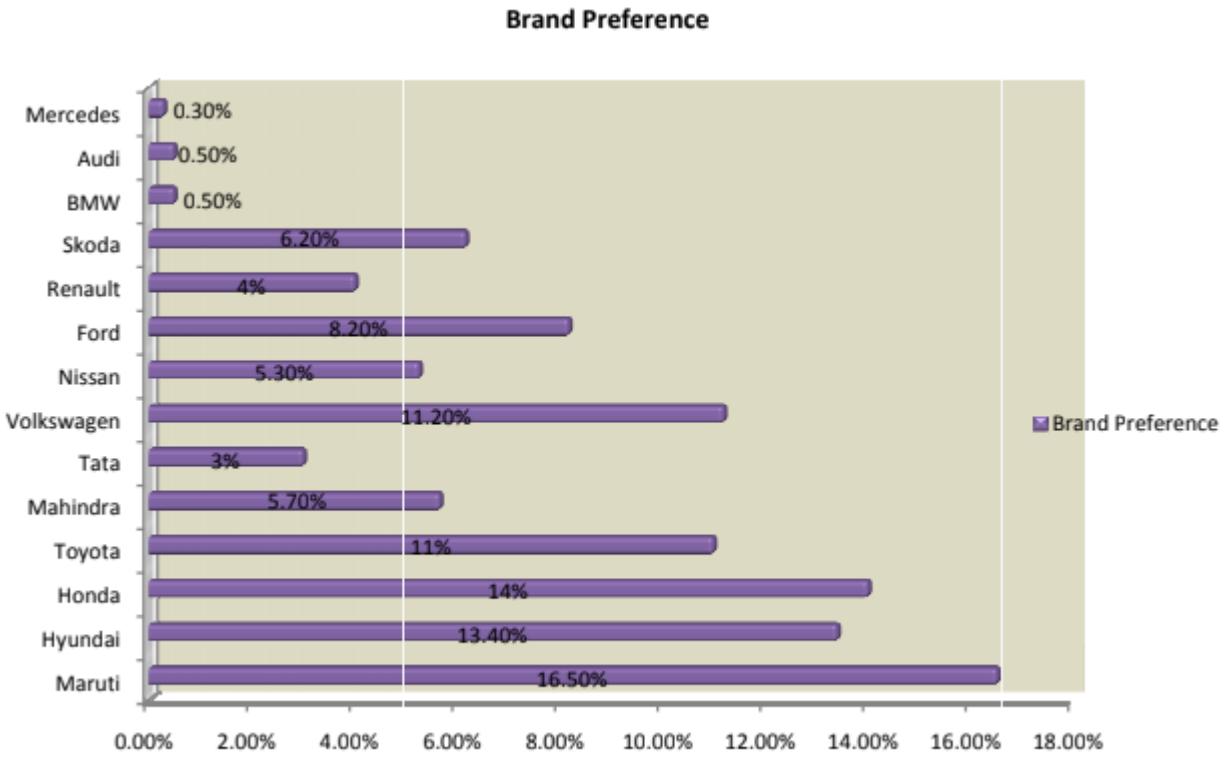


Fig. 7 Customer brand preference in India (Mathur et al., 2018)

Competitors' experience with market driven approach: Frugal innovations involve a long-term commitment, understanding customer needs is a highly tedious and cumbersome process. Competitors like Ford, Nissan, and Honda have been aggressive, in addition to setting up local R&D centers, they also have local production and manufacturing of specific machines to enhance manufacturing for the local market (Calabrese, 2001). Competitors like Hyundai have been successful in adapting to the Indian requirements, for example, Hyundai has developed a 3-cylinder engine with less fuel and frictional losses to deliver better results (Wells, 2010), thereby decreasing fuel consumption and increasing reliability.

Competitors' expertise in modularity and large-scale production: Ford, Renault, Fiat, and Toyota, have already invested heavily in setting up low-cost car mass production units in India for the domestic market and global distribution (Wells, 2010). Competitors like Hyundai have been using the concept of modular design and production to ensure cost-cutting to the highest order (Sharmelly & Ray, 2018). Therefore, currently the Hyundai plant in Chennai, India can produce approximately 300,000 vehicles annually (Park & Rhee, 2015).

Uncertainty in customer preferences: Extreme uncertainty in customer preferences. From a survey of 30, 000 consumers in 60 countries, 66% were willing to pay more for sustainability products but, not even half of them did (Kroll & Gabriel, 2020). In short, there is an inconsistency between stated and actual preferences.

Reduced car buying behavior with hikes: Indian customers are highly sensitive to fuel prices, and since India imports fossil fuels, inflation and changes in oil prices profoundly influence the car buying behavior of consumers (Tybout & Fahey, 2017; Shende, 2014). For instance, in 2012-2013, due to a weak economy and increasing fuel prices demand decreased by 7% with car companies having to scale down production (Tybout & Fahey, 2017).

Indian customer requirements: The Indian market conditions are something to be looked upon. India is marked with poor road infrastructure, monsoon rains resulting in water flooding and overflows. This demands a chassis with water resistance. Given the traffic congestion and poorly regulated traffic, Indians prefer cars to travel short distances at relatively low speeds. The poorly regulated traffic and lack of lane discipline demand louder horns. Preference is for higher body heights as Indians prefer to wear turbans. German automotive companies might not be conducive for such conditions (Park & Rhee, 2015).

E-vehicle market forecast: ING predicts a 100% market share for e-vehicles by 2035 (Schwabe, 2020).

Competitive pressures: Pressures from competitors and government forcing them to migrate to the e-vehicles industry eg. Volkswagen has decided to launch 30 e-vehicles models by 2025 (Schwabe, 2020).

Legal, institutional, and political factors

German governmental pressure: Governments in developed countries provide incentives for E-vehicle production (Schwabe, 2020). German governmental institutions are driven by the fear that policy measures favoring frugal innovations could reduce the national GDP. Government and support schemes target high-tech innovations (Tiwari et al., 2017).

Heavy import duty: Due to heavy reliance on German-made/ imported parts, costs double due to import duty (Landau et al., 2016).

Policies favoring Indian automakers: High levels of corruption, pirating and bureaucracy might prove to be a hindrance. Fear of cannibalization (Malte et al., 2020). The country is marked with political instability that affects the market conditions adversely. For instance, at one point, the government abruptly removed gasoline subsidies as a measure to favor Tata to promote its diesel-based cars (Park & Rhee, 2015).

Indian cross-cultural challenges: India's local cultural and heritage understanding is important for success in tapping their markets. A case study on Hyundai reveals that extending operations in India and building a rapport with the locals might be a tough task. In a country divided by hierarchy, casteism, and strong local culture, employees might need further technical training and a great deal of effort has to come from the management side to understand and blend in with the Indian tradition and norms to include their perspectives and formulate a successful business model. For example, around 1500 personnel went on strike after Toyota fired 3 employees from their Bangalore plant in Karnataka (Park & Rhee, 2015).

Characteristics and Appearances of India's People

Division	Characteristics	Appearances	Efforts
Physical Features	Weak physical constitution	High absentee rate, lack of time awareness	Clear orders, consistent training of goal awareness
Caste System	Focuses on influences of caste system	Closed to other classes, low unity	Emphasize corporate image with fair treatment
Religious Influences	Strong awareness for world of transmigration	Sincere but lacks will for goal achievement	Educate awareness for responsibilities and goals through various awards
Task Management	Coexistence of obedience and disobedience due to long-term colonial lifestyle	Obeys authority but has strong tendency to avoid responsibilities	Thorough mid-inspections
Communication	Poor English for most workers	Direct communication through local managers	Gather opinions through suggesting systems and discussions
Emotional Characteristics	Traditional society surrounding agriculture	Emotionally sensitive and easily offended	Emotional consideration

Fig. 8 Personnel in India (Kainth & Mathur, 2016)

Indian autonomy: India as a country is gradually gaining independence and autonomy which might make it harder for the German counterparts (Sturgeon & Biesebroeck, 2011; Wadhwa, 2020). Indian industrial policy promoted local lead suppliers thus they have a two-thirds market share. Some even went ahead to acquire foreign companies such as Tata- Jaguar (Sturgeon & Biesebroeck, 2011). The growing sense of nationalism in India with strong customer preferences for Indian cars might give Indian competitors like Tata, Mahindra an edge (Wells, 2010).

Appendix B2: Literature framework- SWOT table

INTERNAL ANALYSIS		
S.no	**STRENGTHS**	**WEAKNESSES**
Organizational		
1	Well established business models in India with a high degree of adaptation.	Pressures to migrate to e-vehicles from developed countries
2	Presence of local partnerships in the form of alliances or joint ventures.	Business model not suitable for handling low profit high volume businesses.
3	Management systems to solve organisational issues	Rigid organisational structures with a lack of adaptability and flexibility
4	Presence of a brand name	
Value chain factors		
R&D factors		
1	Sustainability focused even in IC engine cars	Technology driven and complex R&D, and does not operate with a a cost reduction mentality
2	Capable of tailoring products to local market requirements although very low	80% of R&D takes place in the home country (Germany) with little room for stakeholder involvement.
Production factors		
1	External suppliers would favour IC engine vehicles than e-vehicles	Frugal innovations would require the cooperation of premium suppliers like Bosch, Conti etc.
2	Established production units and large network of supplier relationships (around 120) in India	Not capable of massive local market adaptations for frugal innovations as German cars are not used to cutting features
3	E-vehicle transition would not be preferred as they would have to renew supplier relationships	Supply parts demand 30% price with 95% performance, which is hard

Products and marketing factors		
1	Software open innovations techniques available in emerging countries which makes use of local talent	Primary focus on sporty performance and luxury making it fuel inefficient and expensive
2	Known for its premium brand name	Very high regulatory standards in cars making them too good for frugal innovations
EXTERNAL ANALYSIS		
S.no	**Opportunities**	**Threats**
Business factors		
1	Ramping up production in India, is much more profit making due to low cost of labor and materials, increasing profits	Indian suppliers are inefficient, and parts are defective
2	Established suppliers have capabilities to innovate frugally in India	Pressures from business groups within Germany prefer to only operate in the high technological front
3	Disruptive innovations like e-vehicles are risky for an established German automotive industry	
4	Frugal innovations present organizational learning and makes production cost efficient	
5	Frugal innovations would not require expensive training programs	
6	50% foundries supplying parts are skeptical about transitioning to e-vehicles as it’s not their core expertise	
7	IT infrastructure in India, presents an opportunity to reduce communication and coordination issues	
8	Growing trend in Germany to go for simple products (resource saving) and Indian frugal innovations could provide reverse innovation opportunities	

Market, competitors, and customer orientation factors		
1	Duplicated and inexpensive cars from China pose a threat for the German automotive industry and they have to innovate frugally to compete with them	Japanese competitors like Toyota are much superior is mass production
2	Indian middle class is expected to grow by 41% in 2025 and the car buying potential to 20%, creating a potential in the lower segment car market	Hyundai and Suzuki are very well positioned in the mass volume market and hold a monopoly with a wide range of offerings
3	Competitors like Suzuki and Hyundai are technologically much inferior	Competitors like Hyundai, Ford and Nissan, have R&D, production explicitly tailored for the Indian market needs
4	India being a status-oriented country, German cars have superior brand recognition compared to Hyundai, Tata or Suzuki, which is an advantage	Ford, Renault, and Toyota have already ramped up mass production in India to serve the high-volume market. Hyundai in addition has also started modular production.
5	The case of Autolux presents a set of local adaptation strategies which could help the luxury oriented German players tap the Indian mass market	Extreme uncertainty in customer preferences, making local market adaptation a threat
6		Customer sensitivity to fuel prices heavily influences their buying behavior, a hike decreases their purchase decision
7		Indian car requirements might be a new thing for the Germans- small cars to navigate through lanes, handle poor infrastructure and monsoon conditions
8		ING predicts 100% transition to e-vehicles by 2035
9		Pressures from the government to switch to e-vehicles
Legal, institutional, and political factors		
1	Support from Indo-German business center to innovate frugally in India	German government skeptical of frugal innovations as they might decrease national GDP and pressures to switch to e-vehicles
2	Developed countries regulations to transition to e-vehicles, means German counterparts	Very high import duties meaning for low-cost market, a high degree of localization is needed which might be very time expensive to do

	have to experiment with IC engine cars in developing and emerging economies	
3	Exercise (Import duty) in India is half (12%) for small cars/ parts than for premium and high-end cars	High levels of corruption and bureaucracy in India, with governmental favors to promote Indian car companies
4	Indian government is investing heavily ($2.7 billion) to promote small and medium segment since 2013-2014	Building a rapport with a culture that is fundamentally different, is highly chaotic and leads to agitations hampering quality
5	Very low entry barriers for foreign firms in the Indian automotive market	Growing sense of autonomy and Indian nationalism to favour Indian made cars
6	The Covid-19 pandemic is discouraging customers to invest in premium segment creating an opportunity in the low cost-high volume market	
7	E- vehicle substitution is not a threat in India due to customer preference for gasoline and diesel vehicles	

Appendix C1: Secondary case study framework

Strengths

Organizational factors

Business model in India: Tailor made a globalization strategy by adapting activities in the value chain conducive for frugal cars in emerging countries including India. Activities were highly market driven with the end customer as the focal point of concern (Athreye et al., 2014). The Fiat Palio manufactured for India was very different from that in Brazil (Prabhakar, 2018).

Business partnerships: Strategic move by forming Joint ventures instead of subsidiaries in India, enabled Fiat to take risks as the risks were shared (Athreye et al., 2014).

Organizational management: Use of sophisticated virtual platforms and ICT between subsidiaries and home centers that enabled communication and coordination internationally and could produce fastest to the market cars (approx. 15 months) (Athreye et al., 2014).

R&D factors

Technology driven: Strong technology edge with a tested and advanced R&D team (Roy et al., 2014)

R&D structure: Tier 2 subsidy in India was assigned autonomy in certain R&D activities including changes based on fuel quality, mileage, road conditions and Indian policy regulations (Athreye et al., 2014).

Localization: Localization of components by Fiat in India reached a record of 90%, which helped in superior value addition at lower costs (Athreye et al., 2014).

Production factors

Production networks and infrastructure: Extensive networking and collaboration, with the ability to exploit from contacts. Fiat had around 1500 collaborations in Europe alone, which includes Universities and research centers (Athreye et al., 2014). In India, they had a Joint venture with Tata motors in 1997, under the name Fiat India limited (Mullick & Tripathi, 2013). Tata motors had the best networks in India right from spare parts suppliers to car dealers (Athreye et al., 2014). Fig. 9 gives brief insights about the same.

	SUPPLIER AND LOGISTIC MANAGEMENT				
PLANT	**BETIM BRAZIL**	**CORDOBA ARGENTINA**	**BIELSKO BIALA POLAND**	**BURSA TURKEY**	**KURLA INDIA**
SUPPLIER AREA	YES	YES	YES (Tychy)	NO	NO
CONSOLIDATION CENTRE	NO	YES (Cargo)	YES (TNT)	NO	NO
EXTERNAL LOGISTICS OPERATOR	TNT (transport and packaging of outgoing materials)	Cargo (transport and handling of line materials)	TNT (External transport and handling of line materials)	NO	NO
UTE LEVEL MANAGEMENT OF SUPPLIERS	NO	YES	NO	NO	NO
NUMBER OF SUPPLIERS	174	140	346	196	125
DEGREE OF NATIONALIZATION (% supplies value)	96%	55% (85% from Mercosur)	60%	70%	60%
OUTSOURCED ACTIVITY	ACCOUNTING PLANT MAINTENANCE	ACCOUNTING PLANT MAINTENANCE LOGISTICS PAINT CENTRE	ACCOUNTING PLANT MAINTENANCE LOGISTICS PAINT CENTRE SHEET METAL WORKING	NONE	BODY WELDING SHOP

Fig. 9 Fiat networks and relationships for Palio (Camuffo,2004)

Modularity: Successfully able to implement modular production with the same components that could be assembled into 5 different types of bodies (Athreye et al., 2014). This paved the way of adaptive R&D, enabling decentralization of activities to subsidiaries (Athreye et al., 2014).

Low cost of labor: Typically, Fiat made sure that modular parts could be assembled at plants with a capacity of mass producing 200 vehicles a day (Camuffo, 2004). Given the low cost of labor, most of the assembly process was manual with little to minimal automation of about 8% (compared to almost 100% for standard European Fiat cars) (Camuffo, 2004). Roy et al. (2014) estimates a 10-25% savings in operations costs in India. Fig. 10 gives a brief insight regarding this.

	Body welding operating units					
Plant	**MELFI ITALY**	**BETIM BRAZIL**	**CORDOBA ARGENTINA**	**BIELSKO BIALA POLAND**	**BURSA TURKEY**	**KURLA INDIA**
Degree of automation* = number of automatic welding points as a percentage of the total**	100%	1%	5.7%	0%	7.7%	0%

Fig. 10a (Camuffo, 2004)

	FINAL ASSEMBLY OPERATING UNIT					
Final assembly direct operation*	**MELFI ITALY**	**BETIM BRAZIL**	**CORDOBA ARGENTINA**	**KURLA INDIA**	**BIELSKO BIALA POLAND**	**BURSA TURKEY**
Installation of front windscreen and sealer	**Robot (6 axle)**	**Robot (6 axle)**	**Rigid Automation**	**Manual**	**Manual Assisted by automation**	**Rigid Automation**
Installation of rear windscreen and sealer	**Robot (6 axle)**	**Robot (6 axle)**	**Rigid Automation**	**Manual Assisted by automation**	**Manual Assisted by automation**	**Rigid Automation**
Fitting of wheel to axle shaft	**Manual Assisted by automation**	**Manual**	**Manual**	**Manual**	**Manual**	**Manual Assisted by automation**
Inserting of suspension	**Manual Assisted by automation**	**Manual**	**Manual**	**Manual Assisted by automation**	**Manual**	**Manual Assisted by automation**
Fitting of engine to body	**Robot (6 axle)**	**Manual**	**Manual**	**Manual**	**Manual**	**Manual Assisted by automation**
Inserting of spare wheel	**Manual Assisted by automation**	**Manual**	**Manual**	**Manual**	**Manual**	**Manual**

Fig. 10b Fiat Palio Assembly process (Camuffo, 2004)

Manufacturing savings: Modularity in design created a competition amongst Fiat subsidiaries, thereby giving Fiat enormous cost advantage (Athreye et al., 2014). This was done by creating a robust worldwide supply chain with components produced from 7 different countries with 12 module-based teams, based on resource availability and expenses, thereby exploiting the most at the least possible costs (Camuffo, 2004). This accounted for 80% of the total design costs (Camuffo, 2004).

Products and marketing factors

Brand name: By the time Fiat launched the Palio, it was a well-known and established brand in India (Prabhakar, 2018).

Technological superiority: Fiat Palio as a product was regarded as a technology marvel and was very reliable (Gohil, 2020). The Palio engine was purchased and used by other automakers like Tata, Chevrolet and Suzuki. Approximately 8,00,000 cars had this engine (Gohil, 2020).

Customer oriented marketing: Marketing: Fiat Palio was endorsed by a very popular and renowned cricket celebrity Sachin Tendulkar (amongst the Indian masses), which led to its widespread early popularity (Chandran, 2020). Fiat in essence had a way with marketing, for instance the Palio had a Turkish name (Egea) in Turkey and the same car was in turn marketed with different names which would make the product more appealing to customers (AFI4, 2021).

Reverse innovation: Palio was reverse innovated in Europe and proved to be very successful, despite Europe being a saturated market with very high standards of expectations (Prabhakar, 2018).

Weaknesses

Organizational factors

Investment loss: Fiat invested close to $620 million in India, to keep all factors in place to introduce Palio in the market (Prabhakar, 2018).

Collaboration issues: Despite having centralized decision-making structure, Fiat went for a Joint venture in India with Premier (which requires a lot more flexibility and autonomy) rather than having its fully owned subsidiary (Athreye et al., 2014). Failure to handle joint ventures with Premier as Fiat's spare parts from Italy posed a sense of unhappiness amongst customers (Athreye et al., 2014).

Poor Communication: Lack of communication between Fiat India limited and the central headquarters regarding major issues, and governmental norms (Prabhakar, 2018). There were severe coordination issues with subsidiary centers despite having close to 116 subsidiaries. Fiat headquarters in Italy often held a hierarchical relationship with its subsidiaries, inhibiting their decision-making ability (AFI4, 2021).

Insufficient market information: Fiat's success in the Latin market was far greater than the Indian market and overall Fiat's globalization endeavor in the Indian market was a disaster (Athreye et al., 2014). This was owing to insufficient market information (due to lack of Tier 1 R&D subsidiary), and the lack of contingency plans on Palio's failure (Athreye et al., 2014).

R&D factors

Inappropriate expectations: Fiat had overestimated their success in India. Therefore, they bypassed a few key areas such as totally immersing themselves in the Indian culture and understanding their needs and wants (Prabhakar, 2018).

Centralized decisions: Strategic R&D was heavily centralized in Italy using home knowledge and local subsidiaries had just enough autonomy to adapt to local conditions (Athreye et al., 2014). Fig. 1 highlights the distribution.

Flawed internationalization: Lack of Tier 1 subsidiary (innovation R&D subsidiary, as they were in Brazil, Turkey and Argentina) and only the presence of Tier 2 (production) subsidiaries in India (Athreye et al., 2014). In fact, Fiat used to dictate customer specifications from the Italian headquarters and were never open to well-developed customer solutions by the subsidiary team in India. Additionally, since Fiat was in a joint venture in the Indian market, there was not much of a say from the Indian team, despite having had the capabilities to communicate the loopholes. Fiat's only dependency on Fiat India limited was to tailor the needs of Palio, based on Indian emission and safety regulations (AFI4, 2021).

Production factors

Limited mass production: Vehicle capacity of 200 vehicles a day was still far lesser than 400 per day in other emerging countries, due to lesser use of automation in India (Camuffo, 2004).

Products and marketing factors

Quality issues: Italian quality was still inferior to its Japanese counterparts in the eyes of citizens (Chandran, 2020).

Fuel inefficient: Fiat Palio had one issue that it was fuel inefficient (9.8 km/litre for petrol, 13.8 km/litre for diesel) (Gohil, 2020).

Faulty localization: Design threats as European designed air conditioning systems were not capable enough of handling Indian temperatures of 40+ degrees along with high levels of humidity (Athreye et al., 2014).

Sales and service factors

Limited dealership networks: Fiat did not have many individual dealerships. Even prominent large and populated cities like Mumbai had exactly one dealer for the entire city (Gohil, 2020).

Limited-service networks: Due to limited networks, Fiat had limited support in terms of after sales service (Gohil, 2020).

Salient characteristics of Fiat's emerging market subsidiaries

	Turkey	Brazil	India
Innovation Inputs, 2010			
R&D spend	€100 million	€ 270 million	€ 30 million
R&D Staff	391	857	80
Engineers % of total staff	65%	73%	85%
Education level of R&D staff (count)			
PhD	5	9	0
Post Graduates	67	197	28
Graduates	184	423	40
Vocational	135	228	12
Innovation Outputs (Count of patents filed), 2012			
Total	71	47	0
National patent office[a]	38	37	0
EPO[a]	33	5	0
USPTO[b]	0	5	0
Collaborative patents filed involving HQ inventors	0	0	0
Collaborative patents with other affiliates			
Total	0	5	0
European Patent Office	0	2	0
US Patent Office	0	3	0

Fig.11 Fiat international operations (Athreye et al., 2014)

Opportunities

Business factors

Knowledge spillovers: Fiat India was strategically located in Pune where two other important Indian automakers namely Tata and Mahindra were located, to benefit from knowledge spillovers (Athreye et al., 2014).

Replicating Brazilian model: Fiat's success in the Brazilian market is owed to the higher degree of autonomy assigned to the local R&D subsidiary, which suggests that replicating Fiat's Brazilian business model in India could pave way for successful frugal innovations and Palio could have become a hit (Athreye et al., 2014; AFI4, 2021).

Market, competitors, and customer orientation factors

High buying potential: India as a country has all the internal resources in place, and the huge population presents a great trade market (Prabhakar, 2018). In addition, India presents a growing economy with high buyer potential.

Promising market: Market forecast predicted that Palio was compatible to cater the needs of 85% of the automobile demand market (Prabhakar, 2018).

Superior design: Technically the Palio was much superior technologically and aesthetically in comparison to its competitors like Suzuki's Zen and Hyundai's Santro (Chandran, 2020).

Threats

Business factors

Negative branding: Too much autonomy to Fiat India limited, gave out negative impressions to the customers that deprived it the prestige of a high-tech European Multinational (Prabhakar, 2018).

Market, competitors, and customer orientation factors

Suzuki's increasing success: Japanese Suzuki's successful joint venture with Maruti, posed a threat to Fiat's market share (Athreye et al., 2014).

Strong Competitors: Maruti Suzuki's Zen and Hyundai presented a very tough market for Fiat Palio, making it highly competitive (Mullick & Tripathi, 2013).

Labor issues: Fiat received 300000 bookings during its launch, however due to labor issues at the plant, it could deliver only 617 orders (Gohil, 2020). This led to widespread customer agitation. Customers were skeptical about spare parts and service in the future, as they expected that Fiat might not continue to stay grounded in the Indian market (Prabhakar, 2018).

Customer agitation (Fuel): Despite superior performance and design the Fiat Palio was highly fuel inefficient. Competitors like Maruti (Zen, 12.6 km/liter for petrol), Hyundai (Santro, 20.3 km/liter for petrol) and Tata, had an advantage in these areas.

Customer agitation (dealership): Lack of sufficient dealers in cities frustrated customers, as they had to travel long distances every time (Gohil, 2020). In comparison, Suzuki and Hyundai had well established dealership networks in every city and town, indicating customers need not have to spend much time travelling to showrooms.

Customer agitation (service and use): Despite high reliability, there were small issues in the Palio like panels and electronics system issues. Local garages (which are far less expensive and are preferred by the average Indian customer) were not familiar in dealing with Fiat products (Gohil, 2020). Fiat Palio's ancillaries were very expensive and led to customer agitation and the rapid decline of Fiat Palio (Mullick & Tripathi, 2013). In addition, customers reported poor service quality, and thereby its hard-earned brand image took a beating (Gohil, 2020). In India, where customer buying behavior is closely linked to longevity

and proper service, customers grew skeptical towards Palio (Prabhakar, 2018). Competitors like Tata, Hyundai and Suzuki fared well in this arena.

Appendix C2: Secondary case study: SWOT table

INTERNAL ANALYSIS		
S.no	**STRENGTHS**	**WEAKNESSES**
Organizational factors		
1	Ability to form joint ventures and alliances (For e.g., supplier alliances and Mercedes Benz' s joint ventures in India)	Lack of a tailor-made market driven globalization strategy to penetrate Indian mass market
2	Presence of strong IT communication support	High degree of centralization with the headquarters
3		Autonomy with central headquarters
4		Minimal local joint ventures or alliances in India
5	Presence of a fully owned subsidiary	
Value chain factors		
R&D factors		
1	Strong technical skills and R&D	Lack of understanding of average Indian car buying mindset
2	Presence of local autonomy to tailor to Indian regulatory requirements	Heavily centralised R&D and lack of an independent Indian R&D
Production factors		
1	Presence of local collaborations	Lack of modular production
2	High degree of localisation	Lack of high-volume production capacities in India
Products and marketing factors		
1	Well established premium brand name	Lack of local marketing tactics

2	Known for its technological superiority	No evidence of successful reverse innovations
3		Fuel inefficient cars
4		European designs may not be conducive for Indian climate
Sales and service factors		
1		Lack of sufficient dealership networks
2		Limited sales and service due to low volume market
EXTERNAL ANALYSIS		
S.no	**Opportunities**	**Threats**
Business factors		
1	Setting up business units strategically to benefit from knowledge spillovers	Assigning autonomy to subsidiaries could be perceived as brand dilution
2	Fiat's Brazilian model could provide insights to replicate	
Market, competitors and customer orientation factors		
1	Growing Indian economy with buying potential	Competitors like Suzuki and Hyundai are the biggest competitive threats as they are very well established and have large network of dealers
2	German designs are much superior, giving them an edge over competitors	Expensive spare parts may put off customers
3		Suzuki and Hyundai cars are very fuel efficient compared to German cars

Appendix D1: Expert Interview questions

Q1. Insights about your experience?

Q2. Some insights about the specific research/ organisation?

Q3. Frugal cars and German automotive industry (from the point of Research/Organization and domain), what do you think could be the strengths, weaknesses, opportunities and threats? (General insights)

Q4. Frugal cars and India (from the point of Research/Organization and domain), what do you think could be the opportunities and threats? (General insights)

Q5. Follow up from previous insights into domain specific insights?

Q6. Any other relevant points concerning the research from your experience?

Appendix D2: Expert framework

Strengths

Organizational factors

Brand name: Their biggest asset that can give them an upper hand in the Indian market is the presence of a brand name (IFI1, 2021; IFI2, 2021; IFI4, 2021). In a hierarchical country like India, brand names play a very important role in giving a company an upper hand (AFI3, 2021).

Technological expertise: They have all the technology, skills and reasons needed to understand frugal markets in India and tailor their products accordingly (AFI2, 2021; IFI1, 2021; IFI4, 2021).

R&D factors

Technologically advanced R&D: German firms typically have a very superior R&D ability and technological superiority and solve technical problems. Since frugal innovations are also technical, they have all that is needed to solve the technical challenges with respect to frugal innovations (AFI1, 2021; AFI2, 2021).

Experience with a small degree of localization: Despite having a centralized R&D, their cars are to some degree localized for the Indian market. This indicates that they are experienced and have the skills to localize products. For instance, Mercedes Benz, alters its design for Indian market, based on the safety and emission regulations (as they differ from Germany) (IFI2, 2021).

Production factors

Supplier networks: They are well networked with suppliers globally which gives them an edge (AFI1, 2021).

Products and marketing factors

Technological edge: Products are technologically superior, and any offering from their ends, would be much more advanced than their competitors (IFI3, 2021).

Weaknesses

Organizational factors

Conflicting firm strategy: Frugal innovations are not in line with the strategic intent of these firms (to deliver a world class experience) (IFI1, 2021).

Firm mindset: They tend to develop the best irrespective of the prices, however a frugal mindset involves delivering the best for a nominal given price. The price always precedes the best technical features (AFI1, 2021; AFI2, 2021). AFI3 (2021) indicates that the cultural mindset of an average citizen in Germany is to value efficiency and best products.

Resistance from employees: There would undoubtedly be a lot of resistance as frugal innovations would alter the entire organizational behavior. It would take a great deal of initiative to push it forward (AFI1, 2021).

R&D factors

Centralized R&D: They have highly centralized R&Ds instead of decentralizing to India. This has something to do with the cultural mindset (AFI1, 2021; AFI3, 2021). For instance, in the 1990s, there was an incident when one of the prominent automakers tried to sell German made cars in China, which wasn't well received (AFI1, 2021; AFI2, 2021). For instance, the Volkswagen-Audi group does not even have a dedicated R&D facility in India, and most of the R&D decisions are communicated from the German headquarters (IFI1, 2021).

Production factors

Incapable of high-volume production: Since they have been operating in the premium segment (high price, low volume), their production units in India are not conducive for high volume production. For instance, Audi has only a production plant in Aurangabad (India), which is just sufficient to meet the Indian premium market requirements (IFI1, 2021). Additionally given the country's geography (huge country), production from a single plant would not be enough to cater to a high-volume market (IFI1, 2021). IFI4 (2021) believes that Mercedes Benz currently does not possess the infrastructure to produce on mass volumes in India.

Premium supplier networks: Since they are routinely used to operating in the premium segment and their supplier networks are in general premium. However, frugal innovations would demand a different kind of partnering in terms of spare parts supply (AFI1, 2021).

Lifetime of supply parts: Lifetime of parts is very low and local consumers in most cases cannot afford it (AFI1, 2021).

Factory life cycle: They have a very long factory life cycle, whereas in India the factory life cycle should be lowered to become capable of mass production (AFI1, 2021).

Products and marketing factors

Fuel efficiency: They are fuel inefficient (9.6-12.6 km/ litre) as they are designed for superior performance than cars which ideally qualify to be called frugal cars (IFI2, 2021; IFI3, 2021).

Price vs quality: The German automotive industry is not used to meeting cost pressures (that is producing the most for the least costs) and their cars are much more expensive (AFI2, 2021; IFI2, 2021).

Sales and service factors

Dealership networks: Dealership networks in India for sales are not sufficient to handle a low-price, high-volume market (IFI1, 2021). Both sales and service networks are just sufficient to meet the requirements of the premium segment (low volume market) in India (IFI4, 2021).

Spare parts: Spare parts in most cases are imported which makes it expensive (IFI2, 2021; IFI4, 2021).

Opportunities

Business factors

Supplier availability: A few premium suppliers like Bosch have supplied for Tata Nano, indicating they can supply frugal parts (AFI1, 2021). IFI3 (2021) additionally highlights that Bosch is already experienced with supplying localized parts for Volkswagen's Indian customized cars Vento and Polo. This also applies to another major automotive supplier 'Continental'. Additionally, Bosch would prefer supplying parts for IC engine powered vehicles over e-vehicles as their core expertise lies in IC engine components (IFI3, 2021).

Market understanding: The German team could conduct a short visit to India, by themselves to figure out the Indian market conditions and then take business decisions. This would help them understand the Indian market needs and tailoring business models accordingly for instance, decentralizing R&D to local subsidiaries (AFI1, 2021).

Lack of technical expertise in India: India lacks technical expertise, and German engineering has quite a lot to offer. For example, Siemens came up with frugal innovations in India. Since local players lack the technical expertise to compete (AFI1, 2021).

Luxury first mover benefit: Any of the German automotive firms that would enter the frugal markets in India, would clearly have a first mover advantage as other premium segment competitors wouldn't have even thought about it (IFI1, 2021).

Shifting plants from Germany: Factories in Germany which are capable of assembling IC powered vehicles can be shifted to India (as developed countries might switch to e-vehicles) instead of shutting down. This could increase their production capacities without any additional investments (IFI3, 2021).

Market, competitors, and customer orientation factors

Brand conscious customers: The Indian customer mindset is such that bigger the brand name, more a product is valued (IFI2, 2021). IFI2 (2021) believes that if Mercedes Benz produces a frugal car, initial customer reception would be very high. Additionally, AFI3 (2021) highlights that India is a hierarchical nation, greater the brand value, the more it dominates the society.

Covid-19 pandemic: German automotive industry's business in the luxury segment has slowed down due to the covid 19 pandemic. Audi sales have been on a decline with the onset of the pandemic due to customer aversion in investing for a luxury car during crisis time periods (IFI1, 2021).

Legal, institutional, and political factors

Managing cross-cultural differences: The German automotive industry is already well established in India as far as the premium segment is concerned. This is a clear indication that they can manage the institutional differences between Germany and India. In India, institutions are driven by hierarchy, corruption and it calls for support from a prominent member in the institutional network to influence decisions and win permits (and permissions to operate), in their favor (AFI3, 2021). Although this is not how institutions work in Germany, their establishment in the Indian market, is a testament to the fact that they can navigate through these challenges to obtain the necessary permits to tailor their operations for frugal markets.

Threats

Business factors

Loss of brand name: Despite having the necessary skills and resources, frugal innovations come at a very high cost of loss of the 'elite brand status' (IFI1, 2021). For instance, IFI3 (2021) highlights the example of Honda's attempt to enter the lower segment market with its car 'Amaze", which turned out to be a failure and loss of reputation for Honda.

Market, competitors, and customer orientation factors

Cost pressures from competitors: Competitors like Suzuki, Tata are already well established in the market (AFI1, 2021). IFI3 (2021) believes that Suzuki employs a 'value for money' approach, meaning that they provide the best promise and deliver the best service for the costs. German counterparts may struggle to compete in this segment. Fuel efficiency of Suzuki, Hyundai cars is in the order of 20-25 km/liter.

Well established competitors: Competitors like Suzuki, have a well-established network in every aspect of the value chain that makes them capable of serving the mass market (IFI1, 2021). IFI3 (2021) indicated that Suzuki and Tata have one of the best dealership networks in India, and German counterparts might struggle in this regard.

Relationship building threat from competitors: Additionally, Hyundai and Suzuki (being Asians), have a cultural similarity with forming relationships with networks. On the other hand, the European mindset involves forming networks with a business mindset (give and take) which might not work well in India (AFI3, 2021). For at least this reason, frugal innovations from the German automotive industry might fail like Fiat Palio (IFI2, 2021), as their networks might not cooperate if purely dealt with from a business perspective.

Competitors and their service networks: IFI4 (2021) additionally, highlights that competitor like Suzuki, have a service station and access to spare parts in potentially every small town in the country which is not the same with Mercedes Benz, Audi, or luxury segment cars. Additionally, Suzuki has a service named the touch points, wherein even if a customer owning a car, gets a minor technical issue on the roads (even in outskirts), they always have a service center close to their vicinity that would enable them to reach the customer and service their car, in a very short span of time. IFI3 (2021) additionally indicated that cost of servicing a Suzuki's service centers is much less expensive compared to the German counterparts

Legal, institutional, and political factors

Governmental intervention: E-vehicles preferred as Indian government is oil importing and would prefer to reduce dependency for oil (IFI1, 2021).

European legislation intervention: European legislation would make sure that German automotive industries are in the game with Tesla (at least in Europe) and pressurize them to enter the electric vehicle market in favor of sustainability (IFI3, 2021).

Indian business culture: Within India, influence, networks, and positions are needed compared to a better technology while influencing institutions and governments. In this competition, Korean and Japanese competitors like Suzuki and Hyundai have a better hand as they are culturally similar and are equipped to handle such dealings (AFI3, 2021).

Appendix D3: Expert framework: SWOT table

INTERNAL ANALYSIS		
S.no	**STRENGTHS**	**WEAKNESSES**
Organizational factors		
1	Presence of a brand name	Frugal innovations are not in line with the firm's traditional strategy
2	Have the technology, skills and resources for frugal innovations	Resistance to frugal innovations by traditional thinkers in the organization
Value chain factors		
R&D factors		
1	Superior R&D capable of solving technical innovation challenges	High degree of centralized R&D (Germany) with very little room for local involvement
2	Have a certain degree of localization based on safety and emission requirements	Mindset to go for the best features irrespective of price and cost
Production factors		
1	Well networked with suppliers in India and globally	Not capable of mass production as their focus has been on low volume market
2		Presence of only premium supplier networks
3		Long factory life cycle, which slows down production speed and might lead to delays if capacity is not expanded
Products and marketing factors		
1	Products are technologically superior	Highly fuel inefficient cars
2		Inexperienced with meeting low-cost pressures
3		Low lifetime of supply parts and expensive

Sales and service factors		
1		Lack of dealership networks in India to handle high volume sales
2		Frequent servicing and spare parts are very expensive

EXTERNAL ANALYSIS

S.no	Opportunities	Threats
Business factors		
1	Suppliers like Bosch have experience with frugal innovation parts e.g., Tata Nano, Volkswagen Vento	Frugal innovations in India would come at the cost of loss of brand name
2	German team could conduct a short visit to India to understand local requirements and plan adaptability	
3	German engineering has quite a lot to offer as Indian lacks technological expertise	
4	Can enjoy first mover advantages	
5	Excess IC engine car factories in Germany could be dismantled and used in India	
Market, competitors, and customer orientation factors		
1	Indian customer affinity for brand names could give them a high initial reception	Competitors (Tata and Suzuki) well established in the segment with extremely low and competitive pricing
2	Luxury segment in India is chaotic, given the pandemic and German players have ample opportunity to tap frugal markets	Competitors (Tata, Suzuki, Hyundai) have very well-established networks in every sphere of the value chain
3		Asian and Japanese enjoy cultural similarity in forming business relationship which might not be the case in Germany

4		Suzuki has on the road service in any corner of the country
Legal, institutional, and political factors		
1	Their presence in India indicates their ability to deal with bureaucracy and institutional frameworks in India	Governmental pressure to push for e-vehicles to reduce oil dependency from foreign countries
2		European legislation would make attempts to safeguard German automotive industries to compete with Tesla
3		Asian players like Koreans and Japanese could easily influence institutions in their favor due to cultural similarities

Appendix E: Performing correlative and evolutionary SWOT

INTERNAL ANALYSIS		
S.no	**STRENGTHS**	**WEAKNESSES**
Business factors		
1	Well established business models in India with a high degree of organizational adaptation, including fully owned subsidiaries. Despite being a strength, it does not qualify to be a comparative strength as competitors and allies operating in frugal car markets in India, are also very successfully established in this area and therefore does not give it any kind of comparative advantage.	Pressures to migrate to e-vehicles from developed countries. These weaknesses apply to the automotive industry in general and do not qualify to be a comparative weakness.
2	Presence of local partnerships in the form of alliances or joint ventures. Hyundai, Ford, Suzuki and other competitors have all these networks too thereby giving it no significant gain in the market. Therefore, this is not a comparative strength.	Business model not suitable for handling low profit high volume businesses. This qualifies to be a comparative weakness as German automotive industry is exceptionally renowned for its premium operations, while competitors like Hyundai and Suzuki are well established in the high-volume market.
3	Have the technology, skills and resources for frugal innovations. This qualifies to be a comparative strength as German automotive industry is known for its technological abilities that other competitors do not match.	Rigid organizational structures with a lack of adaptability and flexibility. Suzuki, Hyundai, and a few competitors have gone great lengths to adapt business models to Indian market needs, thereby this is a comparative weakness for the German automotive industry.
4	Management systems to solve organizational issues, including strong IT support. This qualifies to be a comparative strength as German automotive industry is exceptionally well in these areas that other competitors do not possess.	Lack of tailor-made strategy to penetrate Indian markets. Again, in this domain, Suzuki, Hyundai, and Tata are quite well set, indicating that this is a very strong comparative weakness for the German automotive industry.
5		Autonomy with central headquarters. Hyundai and Suzuki have a fully decentralized establishment in India, making the German counterpart significantly weaker in this area. Therefore, this qualifies to be a comparative weakness.

6		Frugal innovations are not in line with the firm's traditional strategy. This cannot qualify as a comparative weakness, because if the organization decides to innovate frugally, then this weakness does not give it any kind of a comparative disadvantage.
7		Resistance to frugal innovations by traditional thinkers in the organization. This could be a potential comparative disadvantage as Indian car manufacturers' entire organization is solely devoted to manufacturing low-cost cars.
Value chain factors		
R&D factors		
1	Sustainability focused even in IC engine cars. This qualifies to be a comparative strength as this might result in a superior value creation compared to its competitors.	Technology driven and complex R&D and does not operate with a cost reduction mentality; Mindset to go for the best features irrespective of price and cost. This is a competitive disadvantage as it is much needed to operate under cost pressures which other competitors have mastered.
2	Capable of tailoring products to local market requirements although very low. This is not a comparative strength as in order to innovate frugally, other auto manufacturers are doing it quite effectively. This capability might be a good strength but not a comparative strength.	80% of R&D takes place in the home country (Germany) with little room for stakeholder involvement, lack of independent Indian R&D. This is a major disadvantage in the context of frugal innovations as Hyundai and Suzuki, pose a major threat in this domain. Hence this is a comparative weakness.
3	Strong technical skills and R&D. Although a few Japanese counterparts are equally good, in the frugal domain, the German automotive industry undoubtedly has the upper hand compared to low-cost competitors. Therefore, this qualifies to be a comparative strength	Lack of understanding of Indian customer buying behavior. One of the most important determinants of frugal innovations, this is a major disadvantage of the German R&D, whereas competitors in the segment have already mastered the needs of the Indian masses.
Production factors		
1	External suppliers would favor IC engine vehicles over e-vehicles. This is not a comparative strength as this trend is uniform for all competitors in the domain, giving it no amount of advantage.	Frugal innovations would require the cooperation of premium suppliers like Bosch, Conti etc. This is not a major comparative weakness as these premium suppliers have also supplied for Tata Nano, which means they

		are most likely to cooperate and given their age-old partnership this shouldn't put the German automotive industry at a disadvantage. Additionally, they could also renew their supplier relationships if that's not the case.
2	Established production units and a large network of supplier relationships (around 120) in India, some of which can supply frugal parts. This is a major strength comparatively as these already established relationships could promote frugal innovations effectively.	Not capable of massive local market adaptations for frugal innovations as German cars are not used to cutting features. This is a major comparative weakness as Korean and Japanese counterparts are quite proficient in these areas.
3	E-vehicle transition would not be preferred as they would have to renew supplier relationships. This is not a comparative advantage in the context of innovating frugally as this only gives them an internal advantage to consider frugal innovations.	Supply parts demand 30% price with 95% performance, which is hard. This is a comparative weakness as their counterparts are used to using such parts effectively. However, for the Germans this might be a totally unexplored arena.
4	High degree of localization. This is an advantage but definitely not a comparative strength as competitors is already localized effectively, giving the Germans no additional competitive advantage to innovate frugally.	Long factory life cycle, which slows down production speed and might lead to delays if capacity is not expanded. This is a major comparative weakness as Japanese competitors are skilled in mass production to target the high-volume frugal segment.
5		Local partnerships are present only for premium parts and products. This is a comparative weakness as it might either involve a new set of suppliers or a huge restructuring of their relationships with existing suppliers with rounds of negotiations to convey tacit information concerning frugal parts.
Products and marketing factors		
1	Software open innovations techniques available in emerging countries which make use of local talent. The German automotive industry clearly stands out in this area giving it an upper hand over its competitors. This is a comparative strength	Primary focus on sporty performance and luxury making it fuel inefficient and expensive. High fuel efficiency and low costs are an important part of frugal innovations, which competitors have taken advantage of. Therefore, this is a comparative weakness of the German automotive industry.
2	Well established premium brand name known for its technological superiority. This is one of the major comparative strengths	Very high regulatory standards in cars making them too good for frugal innovations. Therefore, this is a comparative weakness of

	which undoubtedly none of the automakers operating in frugal markets possess.	the German automotive industry, as frugal innovations demand just good enough requirements and competitors have successfully exploited this.
3		Lack of local marketing tactics. Frugal innovations would require marketing that appeals to their needs instead of technological superiority. This is undoubtedly a major comparative threat.
4		No evidence of successful reverse innovations from India. Lack of reverse innovations, cannot be definitely cited as a comparative weakness as the context of discussion is only about Indian markets.
5		European designs are not conducive for Indian climate. Suzuki and Hyundai have been very successful in understanding and delivering based on Indian market conditions, which puts Germans at a disadvantage. This is undoubtedly a comparative weakness.
6		Inexperienced with meeting low-cost pressures. Suzuki stands out in this arena of meeting cost pressures, which means the German automotive industry is clearly at a major competitive disadvantage making it a comparative weakness.
7		Low lifetime of supply parts and expensive. This is a comparative weakness as competitors like Suzuki offer a value for money approach, with their parts being significantly low cost.
Sales and service factors		
1		Lack of sufficient dealership networks to handle high volume sales. This is a comparative weakness as high volume sales would demand additional networks, low cost competitors have a much wider established network in India, making it a comparative weakness
2		Limited sales and service due to low volume market. This is a comparative weakness as high volume sales would demand additional networks, low cost competitors have a much

		wider established network in India, making it a comparative weakness
3		Frequent servicing and spare parts are very expensive. Frugal cars demand longer lifetime with lowest possible maintenance costs, which Suzuki and Hyundai have been promising dearly. This is a comparative weakness undoubtedly.
EXTERNAL ANALYSIS		
S.no	**Opportunities**	**Threats**
Business factors		
1	Ramping up production in India, is much more profit making due to low cost of labor and materials, increasing profit. Assuming that the German automotive companies are the first movers (first luxury automaker to ramp up frugal production), this is a specific opportunity that they could capitalise on, as this would enhance their ability to manufacture frugally and have an advantage with their competitors.	Indian suppliers are inefficient, and parts are defective. This does not necessarily pose a specific threat as competitors are relying on Indian suppliers too however have still managed to produce good cars without any specific customer issues.
2	Established suppliers have capabilities to innovate frugally in India. Since the German automotive industry has a good relationship with suppliers, this qualifies to be a specific opportunity to strengthen their relationship and push for high volume market parts.	Pressures from business groups within Germany prefer to only operate in the high technological front. This is a specific threat as the German automotive industry might have to cooperate with these business groups that would reduce its autonomy to compete freely in the Indian market.
3	Disruptive innovations like e-vehicles are risky for an established German automotive industry. This is a specific opportunity as it only favours business decisions in favour of frugal innovations in India, without much resistance.	Assigning autonomy to subsidiaries could be perceived as brand dilution. This is a specific threat as this might affect one of their strongest points in their value proposition ‘brand name’ which might give established competitors an advantage.
4	Frugal innovations present organizational learning and make production cost efficient. This is a business opportunity, however, does not contribute to an effective strategy	Frugal innovations in India would come at the cost of loss of brand name. This is a specific threat as this might affect one of their strongest points in their value proposition ‘brand name’

	and does not qualify to be a specific opportunity that would ensure its success in innovating frugally.	which might give established competitors an advantage.
5	Frugal innovations would not require expensive training programs. This is a specific opportunity as it clearly gives the German automotive industry a cost advantage which could enhance its ability to make a low-cost value proposition.	
6	50% foundries supplying parts are skeptical about transitioning to e-vehicles as it's not their core expertise. This is a specific opportunity as it only favors business decisions in favor of frugal innovations in India, without much resistance.	
7	IT infrastructure in India, presents an opportunity to reduce communication and coordination issues. Since the German automotive has this one of the differentiated strengths in IT, it could be a specific opportunity to exploit.	
8	Growing trend in Germany to go for simple products (resource saving) and Indian frugal innovations could provide reverse innovation opportunities. This is a specific opportunity for the German automotive industry as they can win two markets in one shot.	
9	Setting up business units strategically to benefit from knowledge spillovers. This is not a specific opportunity as competitors in the cluster could also benefit from spillovers and therefore, there is no case of a differentiated specific opportunity.	
10	Fiat's Brazilian model could provide insights to replicate. This model could be replicated by any of the competitors or well-established automakers, hence this is not a specific opportunity for the German automotive industry.	
11	German team could conduct a short visit to India to understand local requirements and plan adaptability. This is a specific opportunity, given their superior technical	

	skills, correctly identifying the competitors could give them an enormous advantage.	
12	German engineering has quite a lot to offer as Indian lacks technological expertise. This is definitely a specific opportunity as their technical skillset is unparalleled and gives them a unique advantage over competitors.	
13	Can enjoy first mover advantages. Assuming they are the first luxury automaker to produce frugally, they have a specific opportunity to exploit the strength of their brand name.	
14	Excess IC engine car factories in Germany could be dismantled and used in India. This is a very specific opportunity as it gives them a very important cost advantage.	
Market, competitors, and customer orientation factors		
1	Duplicated and inexpensive cars from China pose a threat for the German automotive industry and they have to innovate frugally to compete with them. This applies to all the automakers worldwide and does not give any specific advantage for the German automotive industry.	Japanese competitors like Toyota are much superior in mass production. This is a specific threat as it would pose a great challenge for the German automotive industry to produce high volumes at the speed of its competitors.
2	Indian middle class is expected to grow by 41% in 2025 and the car buying potential to 20%, creating a potential in the lower segment car market. This again is a joint opportunity for all the automakers to review their strategies and has no clear specific opportunity for the Germans.	Hyundai and Suzuki are very well positioned in the mass volume market and hold a monopoly with a wide range of offerings; cars are very fuel efficient compared to German cars with competitive pricing. This a specific threat as it would directly affect the performance of German cars (if frugally innovated) in India.
3	Competitors like Suzuki and Hyundai are technologically much inferior. This is a very clear specific opportunity as the strength of brand name is something which clearly puts them at an advantage.	Competitors like Hyundai, Ford and Nissan, have R&D, production explicitly tailored for the Indian market needs. This again poses a specific threat as German automotive industry would be at a loss due to its inferior abilities in understanding customer needs.
4	India being a status-oriented country, German cars have superior brand recognition compared to Hyundai, Tata or Suzuki, which is an advantage. This undoubtedly	Ford, Renault and Toyota have already ramped up mass production in India to serve the high-volume market. Hyundai in addition has also started modular production.This is a specific

	differentiates German automotive industry making this a specific opportunity.	threat as competitors are well set for mass production at the lowest costs putting the German automotive industry at a disadvantage.
5	The case of Autolux presents a set of local adaptation strategies which could help the luxury oriented German players tap the Indian mass market. These opportunities are something which every automaker can capitalise on, and is not restricted just to the German automotive industry and hence it cannot be called a specific opportunity.	Extreme uncertainty in customer preferences, making local market adaptation a threat. This is a uniform threat for all automakers; hence this does not pose a specific threat for the German automotive industry.
6	Luxury segment in India is chaotic, given the pandemic and German players have ample opportunity to tap frugal markets. This is a specific opportunity as frugal innovations present an opportunity to offset their declining sales in the luxury segment.	Customer sensitivity to fuel prices heavily influences their buying behavior, a hike decreases their purchase decision. This applies to any car which runs on fossil fuels and does not pose a specific threat to the German automotive industry.
7		Indian car requirements might be a new thing for the Germans- small cars to navigate through lanes, handle poor infrastructure and monsoon conditions. This is a specific threat as German cars are rarely custom made for average Indian road conditions, compared to its competitors.
8		ING predicts 100% transition to e-vehicles by 2035. This is not a specific threat as all automakers would have a fair share to play in this.
9		Pressures from the government to switch to e-vehicles. This is not a specific threat as all automakers in India, and customers are reliant on gasoline and diesel engines, meaning these pressures aren't necessarily going to pose a specific threat. Even if it does, all the automakers would have to deal with it.
10		Expensive spare parts may put off customers. This is a major specific threat as this might give them a major disadvantage in comparison to well established competitors.
11		Competitors (Tata, Suzuki, Hyundai) have very well-established networks in every sphere of the value chain. This is a major specific threat as this would directly affect every sphere of their value chain.

12		Asian and Japanese enjoy a cultural similarity in forming business relationships which might not be the case in Germany. This might pose a specific threat as Suzuki and Hyundai might pose additional challenges in the future.
13		Suzuki has on the road service in any corner of the country. The lack of limited service from the German automotive industry is undoubtedly a specific threat which would put it in a position of disadvantage against Suzuki or Hyundai.
Legal, institutional and political factors		
1	Support from Indo-German business centres to innovate frugally in India. This is a specific opportunity if we look at the German automotive industry, as they have full support to push for frugal innovations compared to others.	German government is skeptical of frugal innovations as they might decrease national GDP and pressures to switch to e-vehicles. This is a specific threat as the top management might not receive the support of the Government to push for frugal innovations.
2	Developed countries' regulations to transition to e-vehicles, means German counterparts have to experiment with IC engine cars in developing and emerging economies, however this trend applies to other luxury automakers including Volvo or Jaguar, therefore this does not qualify to be a specific opportunity.	Very high import duties mean, for a low-cost market, a high degree of R&D localisation is needed which might be very time expensive to do. In the context of frugal innovations this is undoubtedly a specific threat as this a very important parameter to meet low-cost pressures in India.
3	Exercise (Import duty) in India is half (12%) for small cars/ parts than for premium and high-end cars. This also applies to other prominent foreign centered automakers that are operating in India, and this isn't a specific opportunity.	High levels of corruption and bureaucracy in India, with governmental favors to promote Indian car companies. This is a universal threat for all foreign automakers. Since the Indian automotive market is dominated by foreign players, this does not necessarily pose a specific threat.
4	Indian government is investing heavily ($2.7 billion) to promote the small and medium segment since 2013-2014. This applies to stimulate innovations from all foreign players and hence it is not a specific opportunity for the German automotive industry.	Building a rapport with a culture that is fundamentally different, is highly chaotic and leads to agitations hampering quality. This is a specific threat as Japanese and Korean players would have an edge in this domain.
5	Very low entry barriers for foreign firms in the Indian automotive market. This again applies to all foreign players in the	Growing sense of autonomy and Indian nationalism to favor India made cars. The only companies Tata and Mahindra are prominent

	automotive industry indicating this is not a specific opportunity.	local players with a significantly smaller market share. As a consequence, this does not pose a specific threat to the German automotive industry.
6	The Covid-19 pandemic is discouraging customers to invest in the premium segment creating an opportunity in the low cost-high volume market. This is an opportunity for all foreign players, however assuming that the German automotive industry is the first mover it is a specific opportunity for them to reorient their business models to this segment.	Governmental pressure to push for e-vehicles to reduce oil dependency from foreign countries. This might be a specific threat as the government might be skeptical towards this.
7	Their presence in India indicates their ability to deal with bureaucracy and institutional frameworks in India. However other players like Suzuki, Hyundai and Tata are much well established in India and this necessarily isn't a specific opportunity.	European legislation would make attempts to safeguard German automotive industries to compete with Tesla. This is a specific threat in the context of frugal innovations, as the German automotive industry has the incentive to dodge the whole.
8		Asian players like Koreans and Japanese could easily influence institutions in their favour due to cultural similarities. This is a specific threat as Hyundai and Suzuki might fare better in this arena.

Appendix E1: Real opportunities

S.no	Comparative strengths	S.no	Specific opportunities
Organizational			**Business factors**
1	Possess best in class resources, technical skills to solve any challenge.	1	Ramping up production in India is cost effective and profitable decision
2	Superior management systems and IT support, enabling better organizational performance internationally	2	German automotive industry suppliers (for eg. Bosch) are also suppliers for low-cost cars in India
Value Chain		3	Disruptive innovations like e-vehicles is a high risk game compared to frugal innovations for the German automotive industry including foundries and suppliers

R&D		4	Promotes local involvement with no investment in training programs
3	Superior R&D and technical knowledge to design.	5	Presence of local IT talent in India to resolve communication and coordination issues
4	Sustainability focused, creating a superior value proposition.	6	Growing trend in Germany for simple products, thereby having reverse innovation market in Germany
Production		7	German team could conduct a visit to India to understand market needs
5	Established production units and strong supplier network in India	8	German engineering has lot to offer in India as there is a lack of technical expertise in India
6	Production units and supplier relationships favor frugal cars over E-vehicles	9	First mover advantages amongst other luxury automakers
Products and marketing		10	Excess IC engine plants in Europe can be dismantled and brought to India
7	Use of open innovation techniques in software systems involving local talent.	**Market, competitors, and customer orientation factors**	
8	Unparalleled technological superiority and brand name	11	Competitors in this segment like Suzuki, Hyundai are technologically much inferior
		12	Indian customers' have an affinity for premium brand names as the country is status driven
		13	Frugal innovations can offset declining sales volume in the luxury market due to covid pandemic
		Legal, institutional and political factors	
		14	Support from Indo-German business center to push for frugal innovations
		15	Customer aversion to luxury cars due to covid-19 pandemic

Appendix E2: Space of lost opportunities

S.no	Comparative weaknesses		Specific opportunities

Organizational			Business factors
1	Present business model is not suitable for high volume low profit market	1	Ramping up production in India is cost effective and profitable decision
2	Established rigid organizational structure with lack of adaptability	2	German automotive industry suppliers (for eg. Bosch) are also suppliers for low-cost cars in India
3	Lack of tailor-made strategies for Indian mass markets	3	Disruptive innovations like e-vehicles are a high risk game compared to frugal innovations for the German automotive industry including foundries and suppliers
4	Centralised decision making (Germany)	4	Promotes local involvement with no investment in training programs
5	Traditional organizational minded employees might be resistant to frugal innovations	5	Presence of local IT talent in India to resolve communication and coordination issues
Value Chain		6	Growing trend in Germany for simple products, thereby having reverse innovation market in Germany
R&D		7	German team could conduct a visit to India to understand market needs
6	Complex high-tech R&D preferring quality over price	8	German engineering has lot to offer in India as there is a lack of technical expertise in India
7	80% of R&D activities centralized in Germany	9	First mover advantages amongst other luxury automakers
8	Lack of understanding of Indian customer buying behavior	10	Excess IC engine plants in Europe can be dismantled and brought to India
Production		**Market, competitors, and customer orientation factors**	
9	Not capable of manufacturing, tailored to Indian requirements	11	Competitors in this segment like Suzuki, Hyundai are technologically much inferior
10	Supply parts must be 30% the price and provide 95% the performance, which is a very hard target	12	Indian customers' have an affinity for premium brand names as the country is status driven
11	Low production speed, incapable of mass production and catering to high volume market	13	Frugal innovations can offset declining sales volume in the luxury market due to covid pandemic

12	Might need a renewal of supplier relationships	**Legal, institutional and political factors**	
Products and marketing		14	Support from Indo-German business centre to push for frugal innovations
13	Fuel inefficient and expensive due to sporty performance	15	Customer aversion to luxury cars due to covid-19 pandemic
14	High regulatory standard makes them incapable to go for frugal innovations		
15	European designs incapable of handling Indian road conditions		
16	Inexperienced with meeting low-cost pressures in products		
17	Expensive supply parts and frequent servicing needed		
18	Lack of Indian market-oriented customer marketing tactics		
Sales and service			
19	Lack of sufficient dealership and service networks in India		

Appendix E3: Space of possible defense

S.no	Comparative strengths	S.no	Specific threats
Organizational			**Business factors**
1	Possess best in class resources, technical skills to solve any challenge.	1	Pressures from business groups within Germany to promote high tech products
2	Superior management systems and IT support, enabling better organizational performance internationally	2	Loss of brand name and brand dilution
Value Chain		**Market, competitors, and customer orientation factors**	
R&D		3	Japanese competitors have an advantage in mass production

3	Superior R&D and technical knowledge to design.	4	Hyundai and Suzuki well established in the mass volume market with low cost- and fuel-efficient cars
4	Sustainability focused, creating a superior value proposition.	5	Hyundai, Ford, Suzuki, Nissan are highly capable of designing Indian market-oriented cars
Production		6	Indian mass volume market conditions might be very new for the German automotive industry
5	Established production units and strong supplier network in India	7	Expensive spare parts compared to competitors may put off customers
6	Production units and supplier relationships favor frugal cars over E-vehicles	8	Tata, Suzuki, and Hyundai have well established networks in every sphere of the value chain
Products and marketing		9	Asian competitors are better at exploiting networks due to cultural similarities
7	Use of open innovation techniques in software systems involving local talent.	**Legal, institutional and political factors**	
8	Unparalleled technological superiority and brand name	10	German government skeptical of frugal innovations due to fear of decrease of GDP
		11	Indian Government pressures to push for e-vehicles to reduce dependency on foreign countries for oil.
		12	European legislation favors for German automotive industry to compete against Tesla in Europe

Appendix E4: Real threats

S.no	Comparative weaknesses		Specific threats
Organizational			**Business factors**
1	Present business model is not suitable for high volume low profit market	1	Pressures from business groups within Germany to promote high tech products

2	Established rigid organizational structure with lack of adaptability	2	Loss of brand name and brand dilution
3	Lack of tailor-made strategies for Indian mass markets	**Market, competitors, and customer orientation factors**	
4	Centralized decision making (Germany)	3	Japanese competitors have an advantage in mass production
5	Traditional organizational minded employees might be resistant to frugal innovations	4	Hyundai and Suzuki well established in the mass volume market with low cost- and fuel-efficient cars
Value Chain		5	Hyundai, Ford, Suzuki, Nissan are highly capable of designing Indian market-oriented cars
R&D		6	Indian mass volume market conditions might be very new for the German automotive industry
6	Complex high-tech R&D preferring quality over price	7	Expensive spare parts compared to competitors may put off customers
7	80% of R&D activities centralized in Germany	8	Tata, Suzuki, and Hyundai have well established networks in every sphere of the value chain
8	Lack of understanding of Indian customer buying behavior	9	Asian competitors are better at exploiting networks due to cultural similarities
Production		**Legal, institutional and political factors**	
9	Not capable of manufacturing, tailored to Indian requirements	10	German government skeptical of frugal innovations due to fear of decrease of GDP
10	Supply parts have to be 30% the price and provide 95% the performance, which is a very hard target	11	Indian Government pressures to push for e-vehicles to reduce dependency on freign countries for oil.
11	Low production speed, incapable of mass production and catering to high volume market	12	European legislation favors for German automotive industry to compete against Tesla in Europe
12	Might need a renewal of supplier relationships		
Products and marketing			

13	Fuel inefficient and expensive due to sporty performance	
14	High regulatory standard makes them incapable to go for frugal innovations	
15	European designs incapable of handling Indian road conditions	
16	Inexperienced with meeting low-cost pressures in products	
17	Expensive supply parts and frequent servicing needed	
18	Lack of Indian market-oriented customer marketing tactics	
Sales and service		
19	Lack of sufficient dealership and service networks in India	