

https://dspace.org/

Future business models of automotive OEMs in South Africa

Govender, Jheronisa

2023
https://hdl.handle.net/10539/37221

Downloaded from a DSpace repository. https://dspace.org/

Future Business Models of Automotive OEMs in South Africa

Jheronisa Govender

Student number (2397833)

Student email (2397833@students.wits.ac.za)

Student mobile (072 9444 952)

Supervisor: Prof. Gregory Lee

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

Johannesburg, 28 February 2022

DECLARATION

I, Jheronisa Govender, declare that this research report is my own work, except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Jheronisa Govender Signature: 

Signed at: Wits Business School

On 28 February 2022

ABSTRACT

This report considers the influence of technology on the automotive OEM business model and looks at the business model options that exist for OEMs in South Africa in the future. A qualitative research methodology was utilised, and the research found that technology has a profound impact on the business model. New technology such as electric vehicles and autonomous vehicles are rapidly entering the automotive environment. As a result, sustainability and protection of the environment is a massive topic for the industry. Additionally, the impact of new technology and disruption to the automotive world will result in new business models, new customers and new ways of operating.

DEDICATION

This research report is dedicated to my parents, Peru and Nishi Govender, for constantly pushing me to go the extra mile and for your unwavering support. The endless love and encouragement you shower me with is such a blessing.

ACKNOWLEDGEMENTS

To Kathrynne De Beer, I will forever be grateful for you because you pushed me past my limits and always made me strive for the best. I will always be appreciative of the opportunities you gave me and will always remember to light someone else's candle, as it will never dim my own light. You have played such a vital role in shaping me into a better professional. Thank you for believing in me and for all the advice, guidance and chats. You are truly appreciated.

Thank you to my sister, Serinisa Govender, for always being there for me and encouraging me to keep on going even when things got tough.

To my supervisor, Professor Greg Lee, thank you for all the guidance and wisdom imparted to me during this journey.

Key Words: Automotive; Business model; Customer experience; Electric Vehicles; Original Equipment Manufacturer; Sustainability; Technology

TABLE OF CONTENTS

Declaration 2

Abstract 3

Dedication 4

Acknowledgements 5

Table Of Contents 6

List Of Tables 11

List Of Figures 12

List Of Acronyms 13

CHAPTER ONE: INTRODUCTION 14

1.1 Purpose Of The Study 14

1.2 Background Of The Study 14

1.3 Research Problem 15

1.4 Research Objectives 16

1.5 Significance Of The Study 16

1.6 Delimitations Of The Study 17

1.7 Definitions Of Terms 18

1.8 Assumptions 18

1.9 Chapter Outline 19

CHAPTER TWO: LITERATURE REVIEW 21

2.1 Introduction 21

2.2 Business Model Definition 21

2.3 Discussion Of Business Models 23

2.4 Types Of Business Models 27

2.5 Technology Influence On Oems 31

2.6 Future Opportunities For Oems 34

2.7 Research Questions 41

2.8 Theoretical Framework 42

2.9 Conclusion 46

CHAPTER THREE: RESEARCH METHODOLOGY 47

3.1 Research Approach 47

3.2 Research Design 48

3.3 Data Collection Methods 49

3.4 Population And Sample 50

3.4.1 Population 50

3.4.2 Sample And Sampling Method 51

3.4.2 Background On Participants Of Research Conducted 52

3.5 The Research Instrument 54

3.5.1 Research Instrument Questions 56

3.5.2 Consistency Matrix 58

3.6 Procedure For Data Collection 61

3.7 Data Analysis And Interpretation 61

3.8 Limitations Of The Study 62

3.9 Transferability, Credibility And Dependability 63

3.10 Ethical Considerations 64

CHAPTER FOUR: PRESENTATION OF FINDINGS 65

4.1 Introduction 65

4.2 Thematic Analysis 65

4.3 Findings Pertaining To Research Questions 72

4.3.1 Themes linked to research question 1a 72

4.3.2 Themes linked to research question 1b 83

4.3.3 Themes linked to research question 2a 87

4.3.4 Themes linked to research question 2b 90

4.3.5 Themes linked to research question 2c 92

4.3 Conclusion 99

CHAPTER FIVE: DISCUSSION OF THE FINDINGS 100

5.1 Introduction 100

5.2 Discussion Per Research Question 100

5.2.1 Discussion pertaining to research question 1a 102

5.2.2 Discussion pertaining to research question 1b 110

5.2.3 Discussion pertaining to research question 2a 115

5.2.4 Discussion pertaining to research question 2b 119

5.2.5 Discussion pertaining to research question 2c 123

5.2.7 Conclusion..... 133

5.3 Thematic map..... 133

5.3.1 Arrow 1: Regulations ↔ Digital strategy and vision..... 134

5.3.1 Arrow 2: Digital strategy and vision ↔ Automotive architecture 135

5.3.2 Arrow 3: Digital strategy and vision ↔ Sustainability..... 135

5.3.3 Arrow 4: Digital strategy and vision → Customer experience.... 136

5.3.4 Arrow 5: Digital strategy and vision ↔ Competition and partnerships 136

5.3.5 Arrow 6: Automotive architecture ↔ Risk management 137

5.3.6 Arrow 7: Automotive architecture ↔ Infrastructure and resourcing..... 138

5.3.7 Arrow 8: Sustainability ↔ Risk management..... 138

5.3.8 Arrow 9: Infrastructure and resourcing → Customer experience138

5.3.9 Arrow 10: Risk management ↔ Infrastructure and resourcing.. 139

5.3.10 Arrow 11: Competition and partnerships ↔ infrastructure and resourcing..... 139

5.4 Implications For Practice 139

5.5 Suggestions For Future Research 141

5.6 Conclusion 143

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS 144

6.1 Introduction 144

6.2 Conclusions Regarding Research Objective 1 144

6.3 Conclusions Regarding Research Objective 2 145

6.4 Recommendations 145

6.5 Conclusion 147

APPENDIX A: PERMISSION LETTER 149

APPENDIX B: INFORMATION SHEET 150

APPENDIX C: CONSENT FORM 151

APPENDIX D: ETHICS CLEARANCE CERTIFICATE 152

REFERENCE LIST 153

LIST OF TABLES

Table 1: Definitions 18

Table 2: Strategic situations for business model change 23

Table 3: Types of business models 27

Table 4: Examples of new business models in the automotive industry 37

Table 5: Research questions 41

Table 6: Description of components of Business Model Innovation Framework 45

Table 7: Advantages and disadvantages of data collection method 49

Table 8: Participant information summary 54

Table 9: Interview schedule breakdown 56

Table 10: Research instrument 56

Table 11: Consistency Matrix 59

Table 12: Codes Summary 67

Table 13: Themes and codes summary 70

Table 14: Summary of research questions 100

Table 15: Changes in the automotive market 120

Table 16: OEM business model options 121

LIST OF FIGURES

Figure 1: The crucial triad 26

Figure 2: The Four Box Framework Source: Johnson (2018) 43

Figure 3: Business Model Innovation Framework 44

Figure 4: Themes linked to research question 1a 73

Figure 5: Themes linked to research question 1b 84

Figure 6: Themes linked to research question 2a 87

Figure 7: Theme linked to research question 2b 91

Figure 8: Themes linked to research question 2c 93

Figure 9: Illustration of thematic map 134

LIST OF ACRONYMS

C-Suite	Executive-level managers within a company
EASCY	Electrification, autonomous, shared mobility, connected, yearly updated
F2F	Face to face
GDP	Gross Domestic Product
Gen Y	Born between 1981 and 1994
Gen Z	Born between 1997 and 2012
ICE	Internal combustion engine
OEM	Original Equipment Manufacturer
SAAM	South African Automotive Masterplan
VRIO	Value, Rarity, Inimitability and Organisation

CHAPTER ONE: INTRODUCTION

1.1 PURPOSE OF THE STUDY

The purpose of this study was to explore the future of traditional automotive original equipment manufacturers (OEMs) and to identify how technological changes will transform their methods of business operations. The chapter also alludes to the importance of the automotive business in South Africa.

1.2 BACKGROUND OF THE STUDY

With the advent of technology, the automotive landscape is transforming, directly affecting automotive OEMs. In South Africa, the automotive industry contributes 7.7% to the South African gross domestic product (GDP). The industry currently employs approximately 468 502 people in manufacturing and retail spaces. The automotive industry is also the fourth largest contributor to total manufacturing sales and the third largest economy within South Africa. In addition, it is the fifth largest export sector in South Africa (Jordaan, Dinham, Fieldgate & Rolland, 2018). Therefore, the industry is critical to the South African economy. If the automotive manufacturing business had to be eliminated in South Africa, there would be no replacement industry that would be able to contribute to the South African GDP. There are six leading automotive manufacturers in South Africa,

which are BMW, Ford, Mercedes-Benz, Toyota, Volkswagen and Nissan (Jordaan et al., 2018; Deloitte, 2017).

OEMs have always been seen as traditional manufacturers of vehicles. The face to the end customer is the automotive dealerships that are either independently owned or owned by the OEM. However, with the ever-evolving environment and changing customer perspectives, OEMs need to differentiate their portfolios to remain competitive in the industry in the future. According to a study done by PWC (2018a), OEMs need to focus on the “electrification of vehicles, autonomous vehicles, shared mobility, connected vehicles, and yearly updated vehicles” (EASCY). These focus areas stem from the “changing trends related to climate change, demographic change, urbanisation, and technological change” (PWC, 2018a, pp. 12). These changes mean a shift in attention from the actual vehicle to the use of the vehicle, which poses a significant challenge to the OEMs. Furthermore, this shift in perspective means that their business models need to be modernised to remain competitive in the future, as new competitors enter the mobility space, such as Uber and Google (PWC, 2018).

1.3 RESEARCH PROBLEM

The automotive industry's transformation may require traditional automotive manufacturers to redesign their business models for sustainable operations due to the introduction of new technology. This research investigated the influence

of technology on the business model and the types of business models that OEMs can utilise in future to be sustainable.

1.4 RESEARCH OBJECTIVES

The research objectives of this study were as follows:

a) To understand the influence of technology on the automotive business model
b) To identify different business model options for the future automotive manufacturing OEMs

1.5 SIGNIFICANCE OF THE STUDY

As established earlier in this chapter, the automotive industry is a significant contributor to the South African economy. The study focused on how the automotive industry could remain sustainable by introducing new technology and considering changing customer requirements. The current literature body comprises a significant amount of academic literature on business models and their concepts (e.g. Armstrong & Lee, 2021); however, the literature on automotive business models arises from seminal literature (McKinsey & Company, 2021; PWC, 2018; Deloitte, 2017). The automotive literature focuses on developed countries and markets such as Europe, the United States of

America (USA) and China. The infrastructure and resources available in these markets differ vastly from developing countries like South Africa (Deloitte, 2017).

The findings from this research would offer information and guidance to managers and leaders in the automotive industry to inform their decision-making about the future of their businesses.

1.6 DELIMITATIONS OF THE STUDY

The boundaries of the study were the following:

a) Limited to the South African automotive manufacturing industry (i.e., Original Equipment Manufacturers); therefore, non-South African OEMs and other automotive brands were excluded.
b) The focus of the study was on the passenger vehicle segment in South Africa; therefore, this study excluded heavy commercial vehicles, medium commercial vehicles and vans.
c) The study only considered the new vehicle and aftersales segments; therefore, used vehicles were excluded from the scope.
d) The upstream component parts business including component manufacturers and complementary suppliers were excluded from the study.

1.7 DEFINITIONS OF TERMS

Table 1 depicts the definitions used in this research proposal.

Table 1: Definitions

Term	Definition
Automotive (adjective)	"Relating to vehicles that are driven by engines" (Oxford University Press, 2021)
Business model *(noun)*	"A plan for running a business, identifying where the money will come from, who the customers are. How they will be reached, etc." (Oxford University Press, 2021)
Original equipment manufacturer	The original producer of vehicle components and vehicles, e.g., BMW, Ford, and Mercedes-Benz (Investopedia, 2019).

1.8 ASSUMPTIONS

For the purposes of this research, the following assumptions were made:

a) Automotive OEM respondents would provide feedback to the best of their ability, despite business models being sensitive information.

1.9 CHAPTER OUTLINE

This research proposal is outlined in the following chapters:

Chapter 1: Introduction

This chapter provides an overview of the research topic and contains aspects such as the research problem, the research objectives and the study's significance.

Chapter 2: Literature review

Chapter 2 summarises the existing literature on business models and the automotive sector. The theoretical aspects are considered in this chapter.

Chapter 3: Research methodology

Chapter 3 looks at the research methodology used for this study. It also discusses the population, sample size and data analysis and interpretation elements.

Chapter 4: Presentation of findings

Chapter 4 summarises the findings of the research conducted per research question.

Chapter 5: Discussion of findings

Chapter 5 discusses the findings in accordance with the literature available.

Chapter 6: Conclusion and recommendations

Chapter 6 provides the conclusions per research objective as well as the recommendations for consideration.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of chapter two is to summarise the available literature on the automotive industry and future business model considerations. In addition, the chapter delves into the theoretical viewpoints relating to business models and considers transformations that are under way in developed countries with automotive OEMs. The chapter also focuses on the impact of technology on the automotive landscape.

2.2 BUSINESS MODEL DEFINITION

Johnson (2018) defines a business model as the “way it delivers value to its customers at a profit.” The Oxford dictionary defines a business model as “a plan for the successful operation of a business, identifying the sources of revenue, the intended customer base, products and details of financing” (Oxford, 2021). However, Armstrong and Lee (2021) suggest a more simplified version, stating that a business model is how an organisation does business, and creates and distributes value from the organisation.

A business model consists of four components, as identified by Johnson (2018):

1. A value proposition
2. Resources
3. Processes
4. A profit formula

When the above four components are aligned, adapting a business model into an existing marketplace results in a disruption of the business operations; however, it is necessary to maintain a competitive advantage in the marketplace (Johnson, 2018; Ovans, 2015). This disruption leads to a process called business model innovation and it is the process through which the organisation adapts and adjusts its business model to be in line with the market changes (Landry, 2020). It is said that business model innovation is becoming more important than product and service innovation for organisations to remain competitive and sustainable (Johnson, Christensen & Kagermann, 2018).

Over the last five decades, the business model lifecycle has decreased from an average of 15 years to less than five years. Hence, this innovation has become an essential consideration for all organisations to gain a competitive advantage from these adaptations (Boston Consulting Group, 2021).

2.3 DISCUSSION OF BUSINESS MODELS

A need to adapt current business models can arise from the introduction of new technology or the changing market landscape, which forces businesses to adjust the ways in which they operate to remain sustainable (Armstrong & Lee, 2021). However, it is crucial to consider that technology is not the component that can transform the business model; it merely allows for the transformation process to occur (Johnson, 2018).

Johnson (2018) proposes five strategic situations that require a business model change. Table 2 outlines these situations and provides examples.

Table 2: Strategic situations for business model change

Strategic situation	Description	Example
Disruptive innovation	This strategic situation allows large groups of potential customers to be reached due to a new product introduction. Currently, this group of customers may be excluded as the existing solutions are not within their price range.	Tata's introduction of the Nano vehicle.
Technology	This area looks at capitalising on the technology available	An example here is the introduction of the iPod by

Strategic situation	Description	Example
	and introducing a new business model around it.	Apple. They took the new technology (MP3 player) and introduced a new business model, which was successful.
Efficient operations	It identifies untapped markets and introduces products and services that can meet that market's needs.	When FedEx entered the market, they focused on an entirely different segment by delivering packages further away at faster lead times. This gave them a competitive edge over UPS at the time.
Threats from low-end disrupters	The introduction of low-end products can threaten the currently established markets.	If Tata's Nano vehicle is successful, it can threaten the sales of other automobile manufacturers by offering a vehicle at a much lower cost than other OEMs.
Agile responses to a dynamic market	Customers' preferences change over time, which requires businesses to be agile and dynamic.	Hilti, the construction tool manufacturer, had to adapt its business model as new entrants offered suitable products to their target market's requirements. As a result, Hilti subsequently introduced the fleet

Strategic situation	Description	Example
		maintenance offering to combat this threat.

Source: Johnson (2018)

One of the most disruptive examples of business model change was when Apple introduced the iPhone, which focused on technology and software, and not on the product itself. Other cell phone manufacturers concentrated solely on the product, while Apple created an ecosystem for services and applications (Hacklin, Björkdahl & Wallin, 2017).

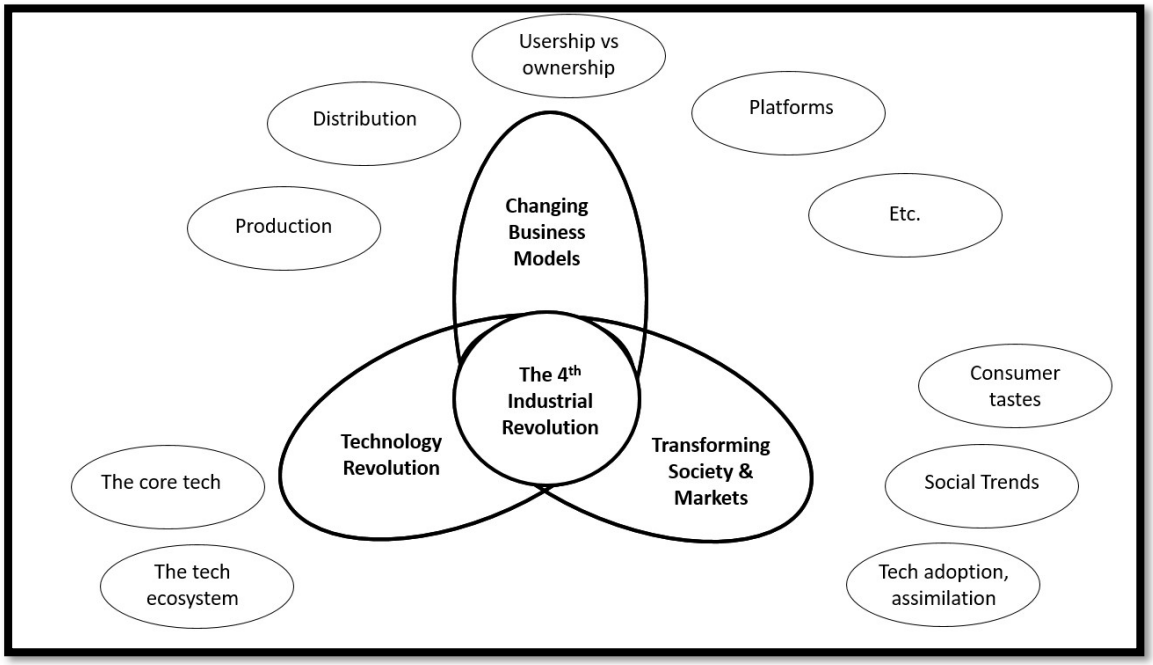
Convergence is considered one of the most critical factors in successful technological revolutions. Convergence is the combination of factors that are not usually expected and where extraordinary results are seen due to the creation of something new that can create value in the market. In addition, the convergence of the industry and technology could result in new business models that consider the requirements and changing dynamics of the customers in the industry and the sector itself (Armstrong & Lee, 2021).

There are three forces that affect the convergence between an industry and technology, which are:

- the technology revolution
- the society/market transformation

- the business model.

When looking at digital disruption, these macro-factors must be considered (Armstrong & Lee, 2021).



Source: Armstrong and Lee (2021)

Figure 1: The crucial triad

Business models can be adapted in various ways; however, Girotra and Netessine (2014) suggest four ways in which they can be altered:

1. Changing the mix of products or services offered
2. Postponing decisions
3. Changing the decision-makers

4. Changing incentives in the value chain

These ways of transformation can result in a combination of favourable results in terms of revenue, reduction of costs and minimising risks for an organisation.

The following section looks at the most common types of business models available in the marketplace today.

2.4 TYPES OF BUSINESS MODELS

It is essential to know the types of business models when considering how the changing landscape affects your operations. Table 3 depicts the most common business models available and examples of where these business models are utilised.

Table 3: Types of business models

Type	Description	Example
Affinity Club	"Pay royalties to some large organisation for the right to sell your product exclusively to their customers."	MBNA

Type	Description	Example
Automation-enabled services	"Harness software that automates processes previously requiring human labour and cognition to reduce operating costs."	IBM Watson
Brokerage	"Bring together buyers and sellers charging a fee per transaction to one or another party."	Real estate agents
Bundling	"Package related goods and services together."	iPod and iTunes
Cell phone	"Charge different rates for discrete levels of service."	Multi-class airlines
Crowdsourcing	"Get a large group of people to contribute content for free in exchange for access to other people's content."	YouTube
Disintermediation	"Sell direct, sidestepping middlemen."	Tesla
Fractionalisation	"Sell partial use of something."	Time-shares
Freemium	"Offer basis services for free, charge for premium service."	Zoom

Type	Description	Example
Leasing	"Rent, rather than sell, high margin high priced goods."	Cars
Low-touch	"Lower prices by decreasing service."	Kulula
Negative operating cycle	"Lower pricing by receiving payment before delivering the product."	e-Commerce
Pay-as-you-go	"Charge for actual, metered usage."	Electricity
Razor Blades	"Offer expensive re-usable product below cost to attract and lock customers into high-volume, high-margin consumable complementary product."	Nespresso machines and pods
Reverse Razor Blades	"Offer high-volume consumable products at very competitive prices to attract customers to the expensive, high-margin complementary product."	Kindle
Reverse Auction	"Set a ceiling price and have participants bid as the price drops."	Elance.com

Type	Description	Example
Product to service	"Rather than sell a product, see the service the product performs."	Zipcar
Standardisation	"Standardise a previously personalised service to lower costs."	Specsavers
Subscription	"Charge a subscription fee to gain access to a service."	Netflix
User communities	"Grant members access to a network, charging both membership fees and advertising."	LinkedIn Premium
Data into assets	"Use data management and analysis processes to capture value from having access to or ownership of data."	Waze

Type	Description	Example
Digital platforms	"Enable value-creating interactions between external producers and customers through open, participative infrastructure with set governance conditions."	Airbnb

Source: Armstrong and Lee (2021), Johnson (2018)

When considering the adaptation and changes required for the evolution of the business models, managers need to make various decisions such as policy decisions, asset decisions and governance decisions (Armstrong & Lee, 2021). However, most companies do not fully understand their business models or cannot define them, which poses a challenge for potential future changes (Johnson et al., 2008).

2.5 TECHNOLOGY INFLUENCE ON OEMS

Covid-19 has rapidly accelerated the introduction and adoption of technology. A study conducted by McKinsey and Company (2020) advised that the pandemic has accelerated technology adoption by four years. With the increased need to safeguard themselves and their families against the pandemic, customers reverted to interacting via digital channels in an attempt to decrease their physical footprint. This change in customer behaviour forced businesses to focus

on their digital and technological capabilities to remain competitive in the marketplace. These changes require businesses to adapt their business models to incorporate technological innovation (Kukkamalla, Bikfallvi & Arbussa, 2020). Studies have shown that automotive OEMs need to shift their focus from automobile manufacturers to technology companies (Kukkamalla et al., 2020). This is not unheard of, as Tesla is a well-known automotive OEM but is considered a technology company and not just an automobile manufacturer (Bilbeisi & Kesse, 2017). Technologies such as artificial intelligence, deep neural networks, big data analytics, the internet of things, 3D printing and platform services are just a few areas where automotive OEMs are focusing their efforts and attention (DHL, 2021; KPMG, 2019).

These technologies directly impact customers' purchasing behaviour as customers have started to see a vehicle as more of a social commodity than a technical one (PWC, 2018). This new generation of buyers has different expectations as they have either grown up in an era where globalisation and technological progress were the focus (Gen Y), or in a fully digitalised world (Gen Z). These customers put convenience, flexibility and personalisation before vehicle ownership (Brandtner & Fredenthaler-Mayrhofer, 2020; Mcewan, 2020; PWC, 2018). The vehicle is becoming a digital extension of the customer, as customers are constantly connected (Miller, 2018). For traditional OEMs, vehicle model cycles usually run between five and eight years; however, with the

demanding customer requirements and the rapid pace of technology updates, OEMs will review these product cycles and consider yearly updated vehicles instead (PWC, 2018). A study conducted by McKinsey and Company (2020) indicated that 66% of customers would be open to changing their vehicle brands for better, up-to-date technology. An additional consideration for automotive OEMs bears cultural differences in mind, as studies have shown that Chinese customers are not brand loyal and will follow technology instead (McKinsey & Company, 2020).

Technology impacts the customer value proposition by allowing customers to have improved accessibility to data, providing platforms to connect people and allowing businesses to have a digital interface to consumers. Technology is allowing businesses to offer an enhanced value proposition to consumers via digital means (Pieppnonen, Ritala, Keränen and Mijanen, 2022).

Industry transformation is usually linked with the adoption of new technology, however the technology has to be coupled with other major factors in order to realise such transformation (Kavadias, Ladas and Loch, 2016). New entrants leverage of new technology which disrupts the traditional business model.

To leverage new technology effectively, new business models are required (Johnson et al., 2008). Technology is the enabler to the business model but the

new business model provides an interface to achieve the benefits of the technology and provide the marketplace with what it wants (Kavadias, Ladas and Loch, 2016).

2.6 FUTURE OPPORTUNITIES FOR OEMS

OEMs can diversify their business operations by adopting available technology to include trends such as “gigafactories,” connected vehicles, autonomous driving and shared mobility.

OEMs need business models with embedded digitalisation to remain sustainable in future. With this digitalisation comes the ability to have platform-based services and app-driven services to fulfil customers’ changing needs. In addition, customers want everything to be ‘on demand’ and specific to their personal requirements (KPMG, 2019).

With this adoption of new revenue streams and business avenues, automotive OEMs will no longer compete against other automotive OEMs only. Instead, they will have competition from businesses outside the automotive manufacturing industry, such as Uber and Google. These new competitors usually do not have legacy systems and traditional standards to uphold; hence, they can have lean start-ups and learn to iterate quickly to succeed in the marketplace. The core competencies of OEMs lie in lean and quality manufacturing; therefore, they

should consider strategic partnerships to assist in areas where their technical capabilities are not the strongest (Cavalcante, 2013). Examples of these partnerships are BMW, Intel, Fiat Chrysler and Google for autonomous driving (Deloitte, 2020). To attain a market space breakthrough, the OEMs can also collaborate among themselves (e.g., BMW and Daimler for car sharing) (Daimler, 2019).

Big Data are required to make informed decisions; however, the dealerships deal with the end customer and attain the customer's data in the traditional setup. In recent years, we have seen a shift from this manner of operating to an 'agent model', which allows the OEM to contract with the end customer, thereby attaining the relevant data. Furthermore, the agent acts on behalf of the OEM (KPMG, 2019). In South Africa, BMW and Mercedes-Benz have successfully rolled out this model. With South Africa being the pilot for this programme for each of the respective OEMs, the agent model will be rolled out globally (Autocar, 2020; CEO Magazine, 2020). In addition, Tesla operated a direct sale-to-customer model from its inception and showed that this concept can incur approximately 9% savings for the customer (Bilbeisi & Kesse, 2017).

Customer expectations of brands have tripled over the last ten years towards their duty to act responsibly in the environment in which they operate (Bizcommunity, 2020). This resulted in a significant focus on electric vehicles

and the eradication of the internal combustion engine. However, in South Africa, electric vehicles are attracting a high amount of tax. The import tariff is currently 25% on an electric vehicle in comparison to the 18% paid on internal combustion engine vehicles (BusinessTech, 2022). This further hinders the adoption of electric vehicles in South Africa over and above the infrastructure challenges the country already experiences. Jordaan et al. (2018) states that if South Africa does not transform and adapt to electric vehicles by 2030 there is a major risk of losing the automotive manufacturing investment in the country which would mean a high risk of unemployment, as the second employs approximately 470 000 people, and a major negative impact on the South African economy.

However, there has been some movement and considerations in the automotive industry at a relatively slow pace, as automotive OEMs are not as innovative as other companies due to their traditional operating methods. The only automotive company that features in the top ten most innovative companies globally is Tesla; however, five automotive companies feature on the top 20 list of highest research and development spending (PWC, 2018).

Table 4 summarises some of the changes we are seeing globally across the automotive industry.

Table 4: Examples of new business models in the automotive industry

Type	A current example in automotive
Automation-enabled services	The use of robotics to build vehicles at a lower cost. Tesla currently has automated gigafactories and utilises renewable energy to facilitate operations (Tesla, 2021).
Bundling	The automotive industry currently bundles their base car with certain extras for their customers. Additionally, the vehicles also come bundled with a maintenance/service plan. However, with the introduction of the Right to Repair regulation, this can no longer be forced onto customers. The OEMs have to unbundle the maintenance plan from the vehicle's base price (Right to Repair South Africa, 2021).
Crowdsourcing	Local Motors and Automotive Grade is currently administering this for vehicle design and software applications (Digital Innovation and Transformation, 2015).
Disintermediation	BMW and Mercedes-Benz South Africa have piloted this successfully in the South African market by contracting directly with the end customer and using the dealerships as agents (Autocar, 2020). Tesla has done this successfully from its inception.

Type	A current example in automotive
Leasing	Rental companies such as Avis have had this concept at the core of their business models for numerous years.
Reverse auction	Elance.com
Product to service	Zipcar is a business unit of the Avis group of companies that renders a car-sharing service to its customers in the USA and (Zipcar, 2021).
Subscription	FlexClub is a proudly South African vehicle subscription service that provides users access to a pool of vehicles on a subscription basis (BusinessTech, 2021).

From the information provided in table 4, it can be determined that not all avenues available to the automotive industry have been explored. Numerous studies have been conducted on the future use of platforms by automotive OEMs and the integration of infotainment services and applications for customers (Kukkamalla et al. 2020; McKinsey & Company, 2020; KPMG, 2019). However, the industry is yet to see the introduction of such services.

With all the opportunities available to OEMs with the advent of technology, risks still need to be mitigated, such as technology glitches and insufficient regulation. One of these areas where there is inadequate regulation is in the field of autonomous vehicles at the top end of the spectrum. The lack of regulation

hinders the implementation and release of further autonomous vehicle technology to the marketplace.

Additionally, due to the introduction of environmental sustainability regulations, the automotive industry is under immense pressure to reduce their carbon footprint globally. This ensured that the focus shifted to electric or alternate-powered vehicles (Dieguez et al., 2020). Governments are already rewarding customers with incentives for purchasing carbon-free vehicles, and these reward programmes are set to increase in future. By 2030, it is said that 55% of vehicle sales in the European market will be electric vehicles (PWC, 2018). In addition, the State of California released a statement advising that by 2030, they would ban all internal combustion engine (ICE) vehicles (McKinsey & Company, 2020).

The future of the automotive industry may also include multiple business models and not just a one-size-fits-all model. Wang, Jaring and Wallin (2009) indicate that there were three variations, which were: expand and adapt the existing business model, multiple business models within the organisation, and the co-existence of old and new business models.

Partnerships for car-sharing services are critical for success in attaining the right expertise and infrastructure to contribute to the zero-emission goals and targets of each OEM and the countries in which they operate, which is seen as a more environmentally friendly option (DHL, 2021; Ke, Chai & Cheng, 2019). Fiat in

Italy has partnered with e-commerce giant Amazon to sell three of their models online via the Amazon platform. This collaboration includes the dealerships of Fiat to deliver to their end customers (Oliver Wyman, 2017).

The automotive industry is highly reliant on China to supply parts and components. However, the Covid-19 pandemic revealed the severe repercussions of relying heavily on one country to manufacture vehicles. Data indicate that the automotive industry globally has an 80% reliance on China; hence, localisation has become such a big focus in the industry (Naamsa, 2020; Deloitte, 2019). The South African Automotive Masterplan (SAAM) set a target of 60% for the localisation of vehicles manufactured in South Africa. This will allow for enterprise supplier development and control over the supply of manufacturing materials. However, the target has not yet been met since its inception (Deloitte, 2019).

Prior to any changes, an in-depth environmental assessment needs to be done whereby the drivers of change in that environment are considered. These drivers can include the impact of society, technology, economics, environmental and political changes on the business models (Deloitte, 2020).

The following section proposes a theoretical framework for these considerations to ensure that this is carried out.

2.7 RESEARCH QUESTIONS

The future automotive industry will look very different from what we know today. There has to be a change in the focus from vehicle manufacturers to technologists, from factories and raw materials to a digital mind-set, and from production volume to subscription models and mobility services (Deloitte, 2020; Miller, 2018). In order to remain sustainable in the market, vehicle manufacturers have to converge their manufacturing expertise with technological capabilities. This will create faster production cycles with more advanced features in the vehicles (Choudhary, 2020). (Table 5 summarises the research questions of this research.

Table 5: Research questions

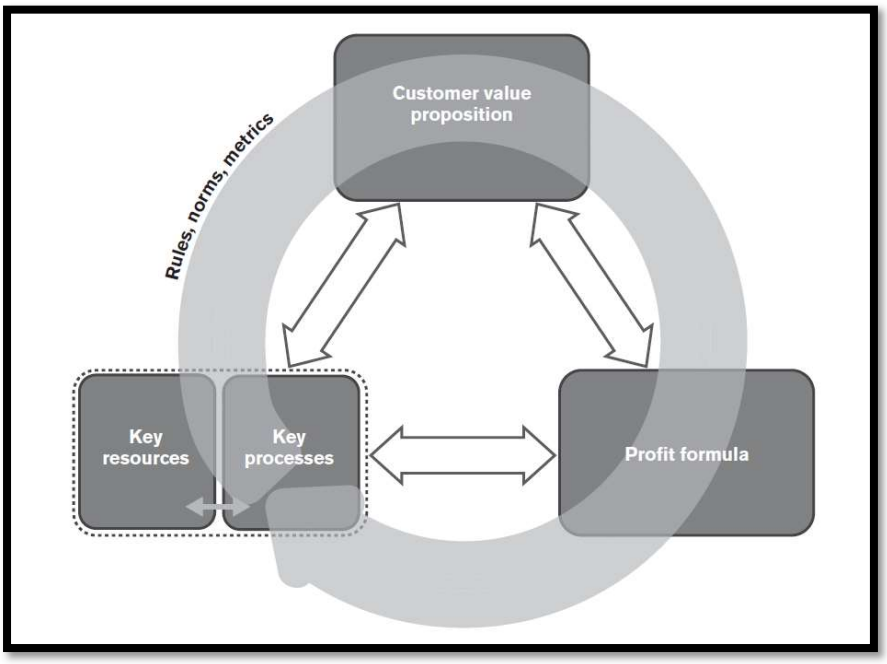
#	Research Objective	Research Question #	Research Question
1	To understand the influence of technology on the automotive business model	1a	How does technology influence the business model today?
		1b	What are the risks of adopting new technology on the business model of automotive OEMs?
2	To identify different business model options for the future	2a	What do the future revenue streams of automotive OEMs look like?

#	Research Objective	Research Question #	Research Question
	automotive manufacturing OEMs	2b	What business model options exist for automotive OEMs?
		2c	What will the automotive landscape look like in the future (in terms of customers, dealerships, partnerships, etc.)?

2.8 THEORETICAL FRAMEWORK

Business model innovation has become a significant consideration for businesses as new opportunities may arise from the introduction of new technology, changing customer preferences and new regulations (Wirtz & Daiser, 2017). However, businesses tend to shy away from unknown territories where opportunities exist due to the fear of the unfamiliar. In order to reduce this risk and uncertainty of the unknown, a framework is required to assist in the process. The framework will also help businesses to better understand their business models and to adapt and be flexible in an ever-changing marketplace (Johnson, 2018).

Johnson (2018) proposes the four-box business model, looking at four core components: the customer value proposition, the profit formula, key resources and key processes. Figure 2 is a diagrammatic representation of the model.

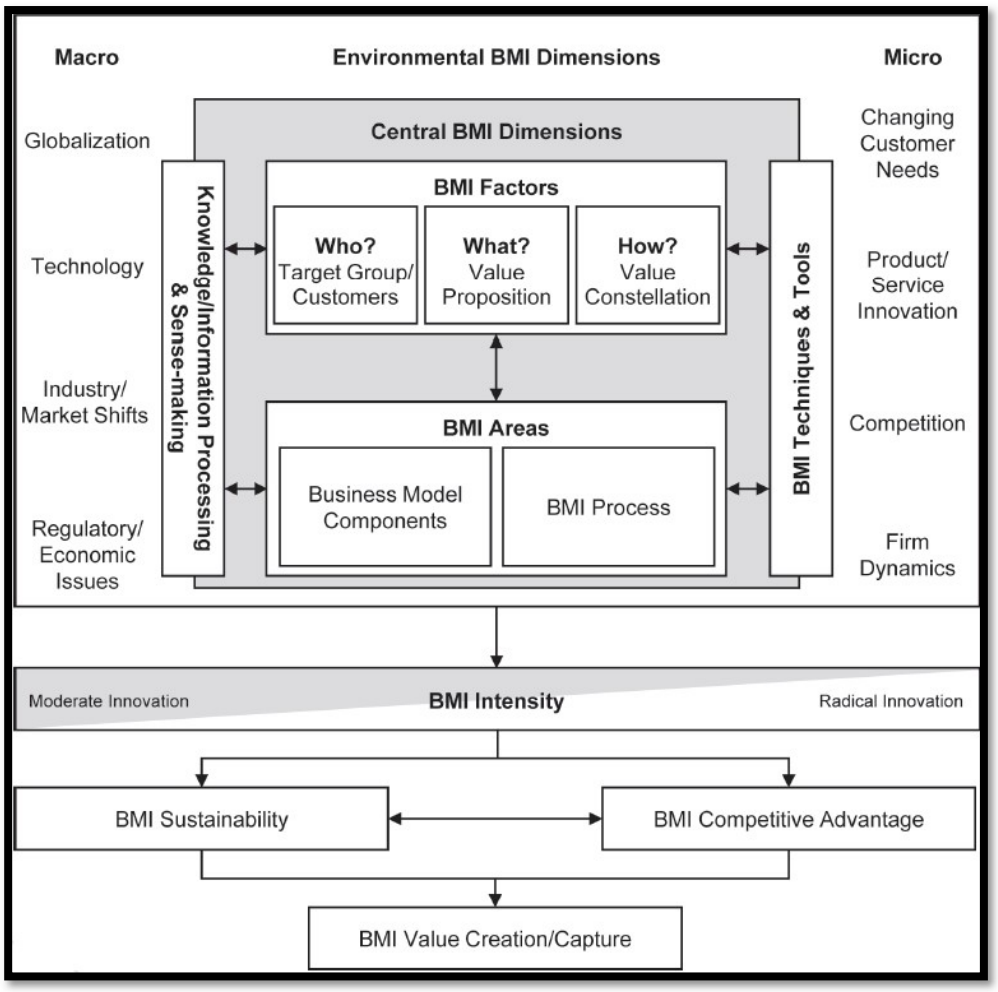


Source: Johnson (2018)

Figure 2: The Four Box Framework

From the above model, it can be seen that the focus is more on the internal environment of the business operations and the external environment's influence on its business model is not included.

Therefore, a more comprehensive model was proposed by Wirtz and Daiser (2017). Figure 3 provides a graphical representation of the model.



Source: Wirtz and Daiser (2017)

Figure 3: Business Model Innovation Framework

This model's architecture comprises six main elements: the environment, central dimensions of the business model, techniques and tools, knowledge and information management, the intensity of the business model innovation, and the outcome and impact of the innovation. Table 6 provides a brief description of each of these components.

Table 6: Description of components of Business Model Innovation Framework

Framework Element	Description
The environment	This element looks at the entire business operations and how they act in their environment. It considers the macro and micro factors that impact a business model.
Central dimensions of the business model	This element looks at who (target customers), what (value propositions) and how (value delivery method) of the business model.
Techniques and tools	This element outlines the techniques and tools required to transform the data on hand to make informed decisions.
Knowledge and information management	The availability of internal and external information and the management of the data gathered.
The intensity of the business model innovation	This element looks at the degree of innovation within the business model.
Outcome and impact of the innovation	This element focuses on sustainability, competitive advantage and value creation and capturing.

Source: Wirtz and Daiser (2017)

The above framework can be used as a structured manner of understanding business models and the elements that impact a business model.

2.9 CONCLUSION

Decisions for the future (post-2030) will be made between 2020 and 2025; hence, this time is critical for automotive OEMs' decision-making (PWC, 2018). As a result, OEMs may need to have dynamic business models that are able to adapt and incorporate flexibility quickly. One of the primary considerations is the culture shift required and how that can be adapted and changed to be prepared for the future (Miller, 2018). The business model change will be determined by the type of transformation required (Athanasopoulou et al., , 2019).

The next frontier for automotive OEMs is digital convergence and the creation of digital ecosystems (Shipilov, 2016). Therefore, the automotive OEMs should carefully consider the changes to their business by determining what their customers actually want and not just what technology is available in the market (Oliver Wyman, 2017).

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter describes the methodology utilised to carry out the research. It considers aspects such as the research design, data collection methods, population and sampling size. Information regarding the research instrument is also provided.

3.1 RESEARCH APPROACH

The literature review conducted discussed various business model types and their possible impact on the automotive industry. However, to gain insight into the future of the automotive industry, a qualitative study was conducted. This qualitative study aimed to meet the research objectives outlined in Chapter One. For ease of reference, the objectives are highlighted below:

a) To understand the influence of technology on the automotive business model
b) To identify different business model options for the future automotive manufacturing OEMs

The purpose of this study was to explore the future of traditional automotive original equipment manufacturers and identify how technological advances would transform their methods of business operations. Therefore, a qualitative

study was selected as the how (process) and the why (meaning) needed to be established and understood (Schindler, 2019). The primary data collected from the qualitative research were analysed in conjunction with the secondary data available from the literature review conducted.

The assumption made for this study was that all interviews conducted would lead to a better understanding of the direction of automotive OEMs in South Africa, in line with the research objectives.

3.2 RESEARCH DESIGN

Virtual interviews were conducted with a set of interview questions, which resulted in unstructured and narrative insights from the participants. This method of gathering the data allowed the researcher to ask clarifying or probing questions to understand the insights given. As the study was exploratory in nature, this type of research approach worked well to understand what was said by the participants. The research focused on building an understanding of how and why business models in the automotive industry were impacted and what was required from automotive OEMs to remain sustainable in the future marketplace.

3.3 DATA COLLECTION METHODS

Information was gathered from the research participants through interview questions. These interview questions were structured as all participants were asked a specific list of questions on the topic, resulting in free-form narrative answers. This interview method allowed for in-depth information to be gathered about the topic at hand (Sekaran & Bougie, 2016). With the advent of the Covid-19 pandemic, the interviews took place virtually.

Table 7 below summarises the advantages and disadvantages of this data collection method for this study.

Table 7: Advantages and disadvantages of data collection method

Advantages of Approach	Disadvantages of Approach
Doubts can be clarified to ensure the responses are well understood.	Interview bias.
The interviewer can pick up non-verbal cues.	Respondents could become uncomfortable regarding the anonymity and confidentiality of information shared during F2F interviews.
Assists in building rapport between the respondent and the interviewer	Time is required from respondents.

Advantages of Approach	Disadvantages of Approach
Rich data can be obtained, including historical data	

Source: Creswell and Creswell, (2018); Sekaran and Bougie (2016)

As the topic under research was still an emerging one, interviews were the best option to source the data and insights. The actual research instrument was discussed in section 3.5 of this chapter.

3.4 POPULATION AND SAMPLE

This section focuses on the population and sampling methods used for this research.

3.4.1 Population

The population for this study was the automotive sector, which included the management of automotive OEMs and of other auto mobility service providers. South Africa is seen as a comparable emerging market for OEMs to try pilot projects before implementing them worldwide; therefore, a broader population could possibly utilise the findings of this research outside South Africa.

3.4.2 Sample and sampling method

For the purposes of this study, purposive sampling was utilised, specifically judgement sampling. The research required C-Suite executives, directors, senior managers and dealer principals with extensive knowledge of the automotive operations within their company and the industry.

The sample participants were found by means of contact with the appropriate auto-mobility organisation's head offices via email and telephone, requesting permission to contact specific individuals for the research to be conducted.

The estimated number of interviews that had to be conducted was 14 with C-Suite and senior managers from the automotive sector in South Africa.

C-Suite and senior managers/executives had to be interviewed for their expert knowledge of their own companies and the industry. These managers often have a vision for the future already. The adapting of business models in the automotive sector was still an emerging concept, hence the vision and knowledge from such experts was required.

From the C-Suite pool of experts, the targeted managers were the chief executive officer and the sales managers. These managers usually have the

knowledge of what was happening in their operations and where they were heading in the future.

3.4.2 Background on participants of research conducted

The overall population, as discussed above, was the entire automotive sector. However, the target population was the OEMs with operations in South Africa and auto-mobility players in the market.

The target sample was C-Suite executives, directors, senior managers and dealer principals with extensive knowledge of the automotive operations within their company and the industry. This sample was achieved, and the details are set out below.

Fourteen participants participated in the interview process for this research. The participants were selected according to the sampling method outlined in this chapter, which was purposive sampling. Participants were contacted via email, and due to the Covid-19 pandemic, all interviews were conducted via MS Teams.

In terms of the designation of the participants, 43% were C-suite executives, 36% were senior managers and 21% were dealer principals. Therefore, it could be determined from this information that all participants were knowledgeable

about, and well versed in, the automotive industry and were able to influence the company's strategic vision.

The average tenure in the automotive industry among the participants was 19 years, which was testament to the participants' valuable insights and strong industry knowledge. The median of the tenure was 20, the interquartile range was seven and the standard deviation was eight.

In line with the ethical requirements, every participant was asked if they would like to remain anonymous or be quoted as themselves. Eight participants gave consent to be quoted as themselves, while six participants preferred to remain anonymous for this research.

Table 8 provides a summary of the participant information.

Table 8: Participant information summary

Code	Name	Tenure (In Years)	Current Designation
P1	Participant 1	6	Chief executive officer
P2	Participant 2	25	Divisional head
P3	Participant 3	21	Chief executive officer
P4	Selvin Govender	33	Director
P5	Jamie Broom	17	Chief commercial officer
P6	Mark Raine	20	Chief executive officer
P7	Participant 7	20	Senior manager
P8	Kai Schlickum	25	Senior manager
P9	Participant 9	18	Dealer principal
P10	Ashveer Mohadeo	6	Senior manager
P11	Edmin Naidoo	26	Vice-president
P12	Alex Boavida	9	Dealer principal
P13	Wendy Matai	20	Senior manager
P14	Participant 14	22	Dealer principal

3.5 THE RESEARCH INSTRUMENT

The findings from the literature review spoke about developed countries focusing on electric vehicles, robotaxis and autonomous vehicles. However, in South Africa, there was constrained infrastructure, poverty and high crime rates, which did not contribute positively to the implementation of such technologies. With regard to the implementation of electric vehicles, South Africa lagged far behind

due to infrastructure constraints arising from the unstable provision of electricity in the country.

The questions were derived from findings in the literature review conducted and were deemed relevant to answer this study's research objectives. To ensure that the questions created were clear and concise, a small focus group of automotive industry experts was asked to join a focus group to provide feedback on the content and grammatical elements of the questionnaire. This ensured that all questions were validated.

An interview schedule outlining the questions was presented to the interviewees. The research instrument had four sections which comprised the following categories: introductory questions, technology questions, business model questions and concluding questions. The questions were semi-structured as the aim was to obtain insights from the participants. However, in cases where there was a need for clarifying and probing questions, the interviewer could ask such questions.

Table 9 contains a breakdown of the number of questions in each category.

Table 9: Interview schedule breakdown

Category	Description	No. of Questions
Introductory	Questions about the interviewee (name, designation, tenure, etc.)	4
Technology	Questions regarding the impact of technology on the automotive sector	3
Business model	Questions on the current and possible future automotive business model	7
Concluding	Open-ended question to end the interview	1

3.5.1 Research instrument questions

This section provides the research instrument in a tabular format.

Table 10: Research instrument

Introductory Questions
1. Do you mind being quoted as yourself (designation, company), or do you want to remain anonymous for the purposes of the research report? 2. What is your name and designation at the said company?

3. What are your responsibilities in your current role in the company?
4. How many years of automotive experience do you have?

Technology Questions

5. Robotaxis refer to driverless taxis and are as a result of autonomous vehicles which are known as self-driving cars. Electric vehicles refer to non-combustion engine vehicles. With this in mind, what would the impact of electric vehicles, robotaxis and autonomous vehicles be on the South African market? What are your thoughts?
6. What are the risks involved with new business segments for OEMs (e.g. mobility, connected services, etc.)
7. What would be the impact of technological trends on vehicle sales and aftersales segments in the future?

Business Model Questions

For this section, the definition of a business model was as follows: “A plan for running a business, identifying where the money will come from, who the customers are. How they will be reached, etc.” (Oxford University Press, 2021). In addition, OEMs refer to original equipment manufacturers such as Mercedes-Benz, BMW, Ford, Toyota, etc.

8. Can you describe the company’s/industry’s current business model for vehicle sales/revenue streams?
9. Is the current business model described in the previous question changing? If yes, how is it changing?
10. Do big tech companies such as Uber, Apple, Google, etc., impact the automotive market? If yes, how? What are the implications?
11. Where would automotive OEMs revenues come from by 2025/2030? (short and medium-term outlook)
12. What would be the role of the current dealerships in the future?
13. What do you think customers would want from an automotive OEM in the future?

14. What do you think customer expectations would be from the automotive industry in the future?
Concluding Questions
15. Do you have any additional insights or comments to make regarding automotive OEMs in the future in South Africa as an emerging market?

3.5.2 Consistency matrix

The research objectives of this study were to understand the influence of technology on the automotive business model and the various options available to automotive OEMs in the future. Hence, the majority of the questions from the interview schedule focused on the technology and business model aspect.

Table 11 below summarises the findings from the literature review to validate the questions asked in the research instrument to conduct this study.

Table 11: Consistency Matrix

Research Objective	Literature Review Reference	Key Findings	Research Questions	Research Instrument Questions
To understand the influence of technology on the automotive business model	Armstrong and Lee (2021), Kukkamalla et al., (2020), McKinsey and Company (2020), PWC (2018)	Technology is the exogenous factor that allows for the transformation to occur. The Covid-19 pandemic accelerated technology adoption among customers, resulting in changing customer behaviour. Risk and adherence to regulations (Environmental standards, the POPI Act, etc.) must be considered.	1. How does technology influence the business model today? 2. What are the risks of adopting new technology on the business model of automotive OEMs?	Q 5,6 and 7

Research Objective	Literature Review Reference	Key Findings	Research Questions	Research Instrument Questions
To identify different business model options for the future automotive manufacturing OEMs	Armstrong and Lee (2021), Johnson (2018), Deloitte (2020), Johnson et al., (2008)	The literature proposes various business model options. However, businesses currently struggle to understand their own business models. The future automotive landscape will consider shared mobility solutions and autonomous vehicles, but emerging countries' infrastructure and resources need to be considered. Companies can have more than one business model.	1. What do the future revenue streams of automotive OEMs look like? 2. What business model options exist for automotive OEMs? 3. What will the automotive landscape look like in the future (in terms of customers, dealerships, partnerships, etc.?)	Q 8, 9, 10, 11, 12 and 13

3.6 PROCEDURE FOR DATA COLLECTION

Participants were contacted telephonically and via email for the purposes of the study. When they agreed to participate, a face-to-face or virtual session was scheduled to carry out the interview. The interview allowed for clarification and probing questions to be asked (Sekaran & Bougie, 2016).

The interview started with a brief contextual setting explaining the purpose of the research and informing participants of the necessary ethical clearances obtained for the research. The questions were asked conversationally in chronological order. All interviewees were asked permission to record the interview and were advised that no recordings would be published. However, the interview was recorded for transcription after the interview and notes were made as necessary during the interview.

3.7 DATA ANALYSIS AND INTERPRETATION

The data gathered were analysed using the approach suggested by Miles and Huberman (1994), as cited in Sekaran and Bougie (2016). The approach has three steps as outlined below:

1. Data reduction (the process of coding and categorising the data)

2. Data display (method of presenting the data)
3. Drawing conclusions (answers to the research)

Before analysing the data, all interviews were transcribed into a written format using Otter. AI. Thereafter, Atlas T.I. was utilised to create the codes, and themes were derived from those codes.

The thematic content analysis method was used to interpret the data received, which analyses the frequency of concepts from the text (Sekaran & Bougie, 2016). For the purposes of this research, the data collected were analysed and considered; however, whenever the opportunity arose, concepts not arising from the interview responses were considered in cases where it added value to the study.

3.8 LIMITATIONS OF THE STUDY

Some of the limitations of the study are as follows:

- Qualitative studies are subjective and susceptible to human error, including interviewer prejudices (Schindler, 2019).
- Qualitative results often have limited generalisability due to the highly contextual nature of the subject and may, therefore, apply only to the immediate automotive industry. However, as the automotive industry is

global and changes occur worldwide, other emerging markets may add value to their businesses.

- The sample size may be limited due to the nature of the information required, meaning that information will be obtained from the management team with future visions of the company.
- Data are obtained from individuals (speak for the industry) and those individual answers carry opinions and positional perspective.

3.9 TRANSFERABILITY, CREDIBILITY AND DEPENDABILITY

The study may be helpful to other automotive OEMs from other emerging or even developed economies in terms of transferability. The research looks at an emerging phenomenon in the automotive industry, and valuable insights may be taken into other environments to change the automotive business model. The two criteria to account for transferability are as follows: a clear and concise context description and the use of purposive sampling (Anney, 2014). Both of these criteria have been met in this study.

In terms of credibility, the study is guided by the Wits Business School research committee, and a supervisor has been allocated to oversee the study. In addition, peer reviews were used to ensure that the questionnaire is clear and concise. By completing the above, the credibility of the study was upheld.

All interview responses were documented and kept safely for a period of five years. In addition, the research process was documented, which ensured the study's dependability. Any participants who have being named have given their explicit consent in the interviews conducted.

3.10 Ethical considerations

The research conducted adhered to all ethical standards, as prescribed by the Wits Business School, and the research had to be approved by the ethics board of Wits Business School. To reiterate the importance of the ethical considerations, each participant was informed of the purpose of the research, and their consent to participate acquired. However, they were at liberty to withdraw from the study at any time they wanted to. The research was based on business operations and did not focus on respondents' personal information and demographics.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.1 INTRODUCTION

This chapter outlines the findings from the qualitative research that was conducted. The results are analysed according to the methodology set out in Chapter Three of this report. The chapter begins with the thematic analysis process. The findings reflected in this chapter show the emerging themes from the valuable insights shared by the participants during the interview process. The analysis method selected for this research was a thematic qualitative approach, as outlined in Chapter Three. The findings are shown in correlation to the research questions, as outlined in Chapter Two. All named participants have given their explicit consent to be named in this research study.

4.2 THEMATIC ANALYSIS

The analysis of the research was conducted using the process of thematic analysis. The transcripts from the interviews were used to generate the associated codes and themes. Because the phenomena had not been widely researched in the academic field, no pre-identified codes were used during the analysis; hence, open coding was applied. Key words were highlighted in each

transcript and grouped together in excel to determine the basis of the below coding.

Atlas.ti provides a groundedness score for each code generated. Groundedness refers to the number of times a code is utilised in the analysis process (Friese, 2017). Table 12 provides a summary, indicating the groundedness scores for each code per research question. In total, 60 open codes were derived from the analysis.

Table 12: Codes Summary

Code Name	Groundedness	Code Name	Groundedness
OEM Revenues	34	Transition	2
New business model	26	Regulation	2
Aftersales	23	Popup dealerships	2
Risks	23	Support	2
Future of dealerships	22	Connected	2
Emerging market	21	Affordability	2
Customer expectations – OEMs	19	Competition	2
Electric vehicles	18	Electric vehicle challenge	2
Customer expectations – industry	18	Robotaxis	2
Business model	13	Autonomous vehicles	2
Online sales	12	Big data analytics	2
Autonomous challenges	11	Sustainability of EVs	1
Big tech companies	11	Maintenance	1
Impact of technology	10	Cost structure	1
Partnerships with OEMs and Tech companies	9	Access to all	1
Risk of technology	8	New players	1

Code Name	Groundedness	Code Name	Groundedness
Infrastructure in SA	7	Differences between luxury and mass OEMs	1
Impact on the environment	6	e-commerce	1
Electric vehicle challenges	5	Retail theatre	1
Disruption	5	Quality	1
Subscription	4	Community	1
Changing customer behaviour	4	Alignment on standards	1
Silos in the industry	4	Asset purchase	1
Benefits of autonomous	3	Expansion in SA Market	1
Service-oriented	3	Ownership	1
Dealers will be fulfilment centres	3	Unemployment	1
Customer experience	3	Threats	1
Data analytics	3	Data protection	1
Mobility	3	Digital services	1
Challenges in SA	3	Impact of Covid-19	1

The 60 codes generated from table 12 were then matched to their related research question.

The themes were then derived from the codes associated with each research question and a summary is depicted in table 13.

Table 13: Themes and codes summary

Automotive Architecture		
• Big data analytics • Maintenance • Cost structure • Access to all • Differences between luxury and mass OEMs • e-commerce • Retail theatre • Asset purchase • Expansion in SA Market • Ownership • Unemployment • Digital services • Impact of covid-19 • Silos in the industry	• OEM revenues • New business model • Aftersales • Future of dealerships • Emerging market • Electric vehicles • Business model • Online sales • Impact of technology • Risk of technology • Changing customer behaviour • Infrastructure in SA	• Service-oriented • Dealers will be fulfilment centres • Data analytics • Mobility • Transition • Popup dealerships • Support • Connected • Robotaxis • Subscription • Disruption • Impact on the environment
Infrastructure and Resource Availability		
• Benefits of autonomous	• Electric vehicle challenge	• Challenges in SA

Competition and Partnerships		
• Big tech companies • Partnerships with OEMs and Tech companies • Affordability • Impact of technology	• Partnerships with OEMs and Tech companies • Disruption • Mobility • Affordability • Competition • New players	
Customer Experience		
• Future of dealerships • Customer expectations-OEMs • Customer expectations-industry • Online sales • Impact of technology • Risk of technology	• Transition • Popup dealerships • Connected • Access to all • Retail theatre • Quality • Community • Digital services	• Changing customer behaviour • Benefits of autonomous • Service-oriented • Customer experience
Digital Strategy and Vision		
• New business model • Online sales • Subscription	• Access to all • Expansion in SA Market • Digital services	• Data analytics • Mobility

		• Dealers will be fulfilment centres
Regulations and Standards		
• Maintenance • Alignment on standards • Data protection	• Data analytics • Regulation • Big data analytics	• Aftersales • Autonomous challenges • Risk of technology
Risk Management		
• Autonomous vehicles • Unemployment • Threats • Data protection	• Electric vehicle challenges • Challenges in SA • Electric vehicle challenge • Robotaxis	• Risks • Autonomous challenges • Risk of technology • Infrastructure in SA
Sustainability		
• Electric vehicle challenges • Sustainability of EVs	• Electric vehicles • Impact on the environment	• Emerging market

4.3 FINDINGS PERTAINING TO RESEARCH QUESTIONS

These research questions were derived and explained in chapter 2 of this report. The themes are supported with quotes from the interviews conducted.

4.3.1 Themes linked to research question 1a

As discussed in chapter 2 of this report, research question 1a was “How does technology influence the business model today?”

Figure 4 depicts the themes associated with research question 1a.

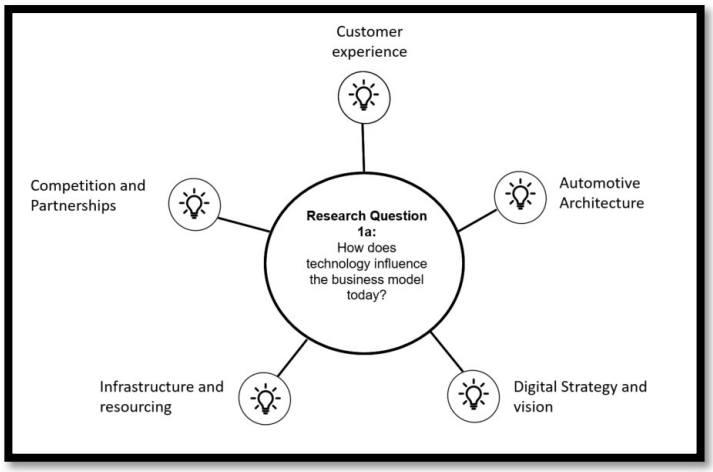


Figure 4: Themes linked to research question 1a

The following section discusses the themes linked to research question 1a, as depicted in figure 4.

(a) Automotive architecture

The research found that the digitisation of the world brought about a change to the automotive industry, where, traditionally, everything was done via face-to-

face interactions at the dealerships. From the data collected, one can determine that the automotive landscape is changing due to technology.

Selvin Govender, director of sales and marketing at Mercedes-Benz Cars, said: “With digitisation, all of the above (sales process) was done on an online platform using Google search, using all the tools you have at hand to look at videos, what's on offer, get an expert opinion and then assessing the offers from the various retailers and wholesalers in terms of campaigns and then narrowing down the choice to two or three different products you would be interested in.”

The automotive landscape is changing to include add-on services via subscription-based offerings or one-off digital purchases. Traditionally, automotive OEMs focused mainly on generating revenue from the sale of a vehicle, aftersales parts, and maintenance and financial products through their in-house financial institutions.

The feedback below from one of the participants corroborates the above finding: “Vehicles, connected services, subscription-based services, any additional add-on revenue streams, which technology is a huge part of, which we can obviously generate on.”

The automotive operating model is changing due to the direct impact of technology; however, this will be discussed more in detail in the sub-section pertaining to research question 2(b).

(b) Customer experience

Several participants indicated the importance of customer experience in the digital world. Customer experience is becoming the differentiating factor in the industry to retain existing customers and attain new ones. In addition, customers are looking for convenience and instant gratification. There are no longer eight-hour workdays, as customers want information and feedback at their fingertips.

One of the participants of the study said, “All OEMs will go down the direction of selling vehicles online, so this entire topic of online to offline journey and a seamless journey for the customer will become a very critical component so customer experience will have to be done very differently in that your online to offline processes will need to be seamless for the customer.”

This is further reiterated by Participant 3 who indicated, “Customers want a seamless online to offline approach, resulting in a seamless journey. They don’t want to start their journey online and then go into a dealership and start it all over again. If you go into a dealership, they should know this customer has been

online and is interested in a GLA; he qualified for X amount of finance. Customers expect you to have a better level of intelligence and information and utilise this to give them a better customer experience and to give them the right product and services that are necessary for them."

The research found that OEMs have to cater for a hybrid model while customers transition to the new modus operandi, especially for those customers who have not yet bought into the online shopping experience. An OEM cannot just switch off the traditional offline business; it will always exist in some format.

"I think the older customers will have an expectation that we can manage a balance between old and new, that means the traditional model and the new model." - Participant 3

A theme that emerged from the research conducted is the consideration of the changing expectations of the customer from the industry and the OEMs. Many of the expectations will remain, and some will increase due to the influence of technology and digitisation. They expect the processes to be simplified and enhanced according to the changing industry. There is also a high expectation that information should reach the market speedily, as well as access to the said information based on all the technology available.

This is supported by feedback from participant 3, who said, “I also think they want our processes and systems to be more streamlined, much easier, much more efficient, and that is something we will have to work on. We are still a bit too complicated in the industry. For example, you are going to the dealership and still signing a contract on a piece of paper. So they would expect a degree of digitisation in terms of our processes also.”

In addition, another participant further supported this finding by advising, “Majority of customers always complain that the processes are so complex in the industry and many people in the industry have the mind-set that this is how it has always being done so why do we need to change it, and for me, I believe that’s an absolute wrong mentality to have because right now, the industry is changing and so are customer expectations.”

Furthermore, one of the senior managers interviewed, Wendy Matai, alluded to the luxury experience customers want with exceptional service delivery.

“From an expectation perspective, they will want speed to market, efficiency, a good quality vehicle with very few take-backs, and they will want a luxury experience with complete connected services where you would be able to work from your vehicle, which is very classy and top end, similar to a Louis Vuitton experience and status. They also want an exceptional service delivery from the OEM.” - Wendy Matai

The OEMs are slowly adopting changes to their business models that are more centred on being a service-oriented business and not a product-oriented business. This is because the customer journey in a service environment is critical to its success. Selvin Govender mentioned that this change was already occurring in South Africa with the luxury manufacturers.

“Mercedes-Benz in South Africa have adopted our model to one that really follows the customer journey. In the old model, each retailer bought the vehicle from us via the wholesaler, meaning they owned the product and could set the price. The retailer can decide what the transaction price was and be more competitive to get ahead of its competition, but in the online world, you have a lot of aggregators.” - Selvin Govender

(c) Digital strategy and vision

From the interviews conducted, it can be seen that technology impacted the traditional automotive business model by pushing the sales and customer interactions to an online platform.

Selvin Govender alluded to the reigning business model landscape, which was further supported by the feedback from participant 3, who indicated the possible future of automotive business models.

“For the industry as a whole you have a model which is a three-tier model for sales which is we are the manufacturer or OEM building the cars, so designing, producing and delivering the cars, then at the market or wholesale level we have the marketing centres such as the corporate head offices of automotives like we are here in Pretoria, we are the wholesaler, so we get supplied with the vehicles from our parent company that has built it and then we wholesale this product to the retailer who then retails it to the end customer. So the three tiers are manufacturer, wholesaler and retailer, and then the product is released to the end customer, which is a very traditional model. This is a model that we have known for the past 100 years.” - Selvin Govender

“Majority of the industry is still stuck in the traditional retail model. The traditional retail model is OEM, dealer and customer, which means the dealers own the relationships with the end customers and are responsible end to end for the entire transaction. In the future, to be quite honest, I see this changing quite drastically. I see a lot of OEMs transitioning to want to have a direct sales model with the end customer and your traditional dealerships are becoming product distributors of the product range.” - Participant 3

(d) Competition and partnerships

The trend that the automotive landscape was definitely changing could be seen from the interviews. Traditionally, OEMs competed against other OEMs on engineering excellence; however, that is not the only competition anymore. Due to the increased technology available, the barriers to entry to the automotive industry have been reduced.

Participant 3 said the following when asked about the competitive landscape in the industry, “I think you would be fooled if you didn’t think that they were disruptors to our market. Our competitors are no longer the traditional OEMs, our competitors are tech companies, and if you look at that and Google trying to come up with their car and trying to utilise their technological platforms, they have access at the end of the day to lots of customer data and trends.”

Edmin Naidoo, Vice-President of Customer Services at an OEM, supported participant 3’s comments by saying, “It's got to be some good clean competition as a way forward, I would say with the likes of one of Apple and Google. They are one of our key competitors over and above the metal competitors, which means the likes of luxury brands such as BMW and Audi.”

Another theme that emerged from the research was the notion of partnerships in the industry.

Jamie Broom, Chief Commercial Officer of one of the significant auto-mobility players in the market, said, “The OEMs could have a hybrid business relationship with the likes of Uber and Google, and it would be a combination of a supplier, customer and competitor all in one.”

This is further substantiated by feedback from Participant 3 regarding partnerships, “Google is a good example; they partner with an OEM at the end of the day, they bring the technology, and the OEM brings the vehicle, so they don’t have, and they don’t need to have the investment cost that we are having, they are much more competitive, their margins are remaining so we really still have a tough job to do with having the core asset which is the vehicle which is quite expensive.”

(e) Infrastructure and resource availability

Several participants alluded to the specific infrastructure required to ensure that technology such as electric vehicles and autonomous vehicles can be implemented. This technology exists; however, the infrastructure needed to succeed might hinder the adoption in South Africa.

Participant 2 highlighted the electricity challenges South Africa is plagued with, “SA cannot produce enough electricity for consumption for industry and households today and if we add another form of requirements in terms of EVs, we just adding more pressure to the grid.”

To further highlight the challenge with the infrastructure in South Africa, Selvin Govender said, “Urban infrastructure has not been developed. The grid in SA is being developed between mobility between major cities example, JHB to DBN and JHB to CT, etc. you find that your major national routes are being covered, but if you are someone who lives and works in JHB, if you don’t have either office or home infrastructure you are going to struggle to charge your electric vehicle. So the impact on that industry to bring those three technologies together is going to take a bit of time.”

Technology is changing how we interact in the world today; however, we need to also consider the technology that is incorporated into a vehicle these days. The technology is becoming more sophisticated, and vehicles are labelled as computers on wheels. The data gathered in the interviews reflect the need for re-training and re-skilling of staff due to the introduction of technology in the automotive industry.

Edmin Naidoo focused on the importance of training for staff by saying, “Digital transformation that will continue to accelerate talent management for the skill set requirements that will also have to move at the same proportion. Otherwise, you will find that the automotive has advanced, and the people in the country are not able to manage this advancement. So this is very important, talent management and skillset management. So coming back to the basic training and education, this will become key elements to sustainability within the automotive environment for an emerging market.”

This is further substantiated by feedback received from participant 2 on the same topic, “OEMs will have to re-train their staff, re-look at business models that they have today that is geared towards an ICE vehicle and change that model to make it relevant to the EV.”

4.3.2 Themes linked to research question 1b

Research question 1b, as outlined in chapter 2, was “What are the risks of adopting new technology on the business model of automotive OEMs?”

Figure 5 shows a visual representation of the themes linked to research question 1b.

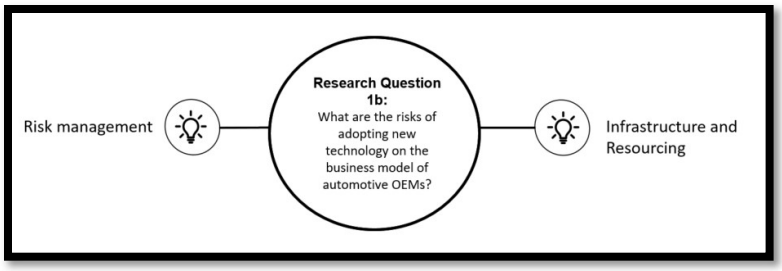


Figure 5: Themes linked to research question 1b

Many opportunities exist with the availability of technology in the industry; however, we need to also consider the risks associated with technology. This section discusses the findings pertaining to research question 1b and its associated themes, as shown in figure 5.

(a) Risk management

The research found that OEMs were at risk of becoming obsolete. Mark Raine, Co-CEO of Mercedes-Benz, alluded to this risk in the following statement, “If you compare the Tesla model to traditional OEMs, it shows why there's such a strong push from Mercedes and BMW and all the manufacturers nowadays to ensure the transformation of our industry because they are scared that they will end up being the next Nokia or Kodak.”

This research provides insights into the semi-conductor shortage globally, which puts a significant strain on the OEMs, as there is not enough stock available for sale. If the OEMs do not adapt their business models and ensure they can be agile and adaptable, there will be severe repercussions like the stock shortage they are faced with. A senior manager at Daimler, Kai Schlickum, provided insight on the topic, “Companies such as Tesla, Rivian, and Lynk are already hugely impacting the industry. When it comes to the semiconductor topic, they are just able to manage something like that a lot better than we are. If you think about E class, a pretty standard E class has about 85 chips in it, and a Tesla Model S has probably three or four chips, and the software that they've developed for their cars is developed in-house. So they can make adaptations that if one of the four chips is not available, then three chips just manage the whole car instead of four chips. We need 85 chips to make our car even start. If we don't have all 85, we're building a crippled vehicle, which we can’t sell to an end customer. So you can already see now these start-ups because they don't have the legacy that we have; they have just engineered their cars in a more flexible way.”

Another theme that emerged strongly from the research is the re-skilling of employees in the automotive sector.

Jamie Broom said, “One of the risks that does sit there, and this is outside of the businesses remaining relevant as relevancy is going to be critical for survival, that is employment. If you look at self-driving vehicles and certainly from a logistics segment perspective, long term I think there will be an adverse impact on jobs and the South African education system as a whole, especially public schools, needs to rapidly re-think its current offering to ensure that students are appropriately skilled for the digital era. What I mean by that is that I think we have a current situation where we have a potential for large amounts of people to become obsolete, and that is certainly is not going to assist us with economic growth and bridging the inequality gaps we have in South Africa.”

(b) Infrastructure and resourcing

The research found that the existing dealership facilities had to be reconsidered. The automotive industry is known for having these huge brick and mortar outlets with exquisite shop fittings and furniture to attract customers. However, the scope and needs of these dealerships are changing. With most processes being pushed onto online platforms, significant investments will still exist with possibly no return, as everything can be done online for most of the customer base.

One of the participants in the study advised, “Moving to the virtual space makes these big buildings just irrelevant. You got a question when there's a need for

such a large footprint for any OEM to be in the country when you could have anything and everything on a virtual space online."

4.3.3 Themes linked to research question 2a

As discussed in chapter 2, research question 2a was "What do the future revenue streams of automotive OEMs look like?"

Figure 6 portrays the themes linked to research question 2a.

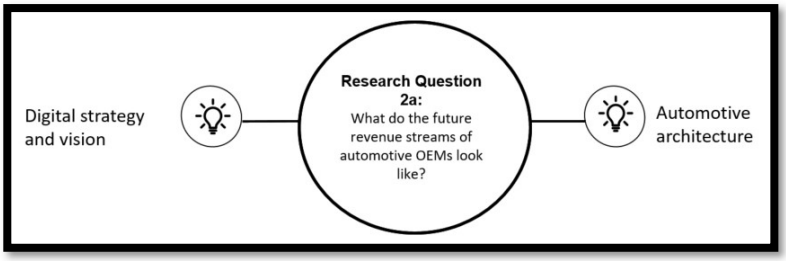


Figure 6: Themes linked to research question 2a

The following section discusses the themes found concerning research question 2a, as depicted in figure 6.

(a) Digital vision and strategy

The research found that OEMs typically have made revenues from traditional revenue streams, including the sale of the vehicle, aftersales parts, and maintenance and financial products.

Selvin Govender supports this by saying, “Currently, your main revenue comes from the product you are selling, the financing of the product, insurance, servicing and the sale of parts and accessories. Those are the traditional revenue streams.”

However, from the interviews conducted, there is change on the horizon regarding how OEMs generate revenue.

Selvin Govender further states, “Looking forward; you would be adding to those revenue streams; some of them would decline because of the nature of the product that is coming (EVs), which has fewer moving parts and requires less servicing. There are additional streams such as recurring revenue through the connectivity of car and services, allowing for features like we do at the moment, like in-office eco-systems that allows a businessman to move seamlessly from his home office to his work office to his car office and to continue transacting and conducting meetings in that space. Then, if you look at products and services on demand, for example, if you require 4x4 capability in your vehicle but it is not something you use on a daily basis, then you should be able to order it and utilise

it and pay for it, and when you don't need it, you don't pay for it anymore. Another example would be over the air updates that would allow your car to unlock certain features at certain times. These recurring revenues for tracking, safety and monitoring, etc., will become a new revenue stream for automotive manufacturers providing Wi-Fi connectivity and a whole range and host of services, some of which are already in the market and some which we haven't yet thought of."

For new revenue streams to be generated, the automotive landscape must change.

(b) Automotive architecture

The landscape for services is changing in the industry. This is substantiated by quotes from the interviews conducted. With new revenue streams comes a change in the landscape as we know it.

In this instance, one of the participants stated, "In terms of revenue streams, I think that what we have to do is we have to think in different tangents from where we currently see things. So something that we took for granted will be harder for us to ensure that we maintain those revenue streams. The key to retaining those revenue streams would be how do we approach them from a strategic point of

view in terms of how do we future proof our businesses and how do we try to be compliant to things like legislation but at the same time optimised, and when I say that I talk about things like the code of conduct or Right to Repair and how that has impacted the business and how do we approach it, how are we going to be clever about the way we approach and then finally, I think the newest revenue stream that we have in our business right now is selling digital services, selling intangible things to customers and this will be the key."

With a required change in the landscape to adopt new revenue streams, the business models of OEMs must be reviewed.

4.3.4 Themes linked to research question 2b

As per the discussion in chapter 2 of this report, research question 2b was "What business model options exist for automotive OEMs?"

Figure 7 portrays the central theme linked to research question 2b.

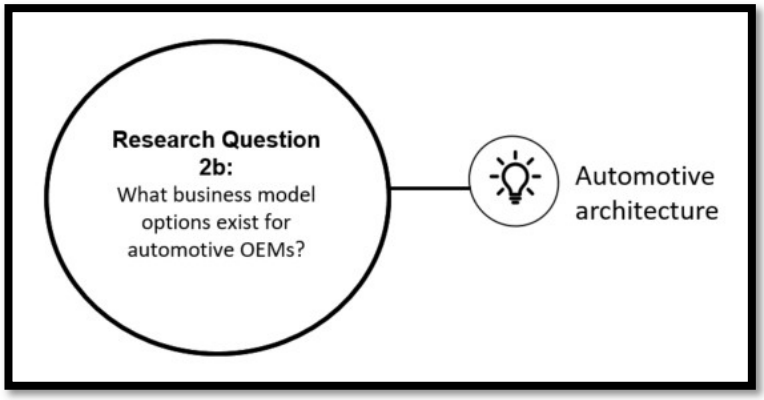


Figure 7: Theme linked to research question 2b

This section highlights the findings pertaining to research question 2b in relation to the relevant themes, as shown in figure 7.

(a) Automotive architecture

The landscape is changing, and many participants indicated a transition to a new business model concept that is also digitally streamlined and more service oriented. OEMs need to re-think what they know and develop new strategies and visions to remain sustainable as the competitive landscape changes (Accenture, 2019). Various new options for business models exist for OEMs. The most common finding arising from the interviews conducted was disintermediation and subscription-based services.

One of the participants indicated, “Services are becoming subscription-based.”

This is further corroborated by another participant who said, “OEMs should create an end-to-end commerce platform, meaning we can sell accessories, financial products, options etc., today, you typically sell a vehicle, and everything else is just, by the way, in the backend. I think online will play a major role in the future in terms of getting a better penetration of all our products into the market.”

4.3.5 Themes linked to research question 2c

Research question 2c, as mentioned in chapter 2, was “What will the automotive landscape look like in the future (in terms of customers, dealerships, partnerships, etc.)?”

Figure 8 summarises the themes linked to research question 2c.

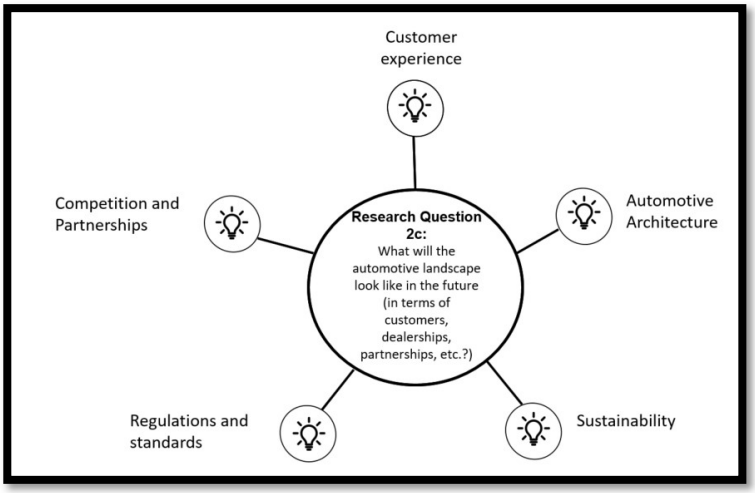


Figure 8: Themes linked to research question 2c

This section discusses the main themes associated with research question 2c, as depicted in figure 8.

(a) Automotive architecture

This research found that in future the automotive landscape would look different from today. There would be a tremendous amount of digitisation and new offerings in the market like car-sharing and mobility solutions. The car parc would also include electric vehicles and autonomous vehicles should the country's infrastructure allow.

Ashveer Mohadeo alluded to this by saying, “With everybody moving to electric, the South African market has to in order to remain relevant in the global scope within the industry. So I think it's going to be a complete shift from current ICE engines to electric engines in the market, and I think that adoption is going to happen pretty quickly.”

(b) Customer experience

The majority of the participants highlighted the importance of a seamless offline to online customer experience. Customers want a seamless experience and a digital ecosystem at their fingertips.

One of the study participants said, “Customers want a seamless online to offline approach, resulting in a seamless journey. They don’t want to start their journey online and then have to go into a dealership and start it all over again. If you go into a dealership, they should know this customer has been online and is interested in a GLA; he qualified for X amount of finance. Customers expect you to have a better level of intelligence and information and utilise this to give them a better customer experience and to give them the right product and services that are necessary for them.”

Further to this substantiation, Edmin Naidoo added, “When you jump into a vehicle, any vehicle, the starting point is the customer's mobile phone, which he is spending the majority of his time on. For sure, in the time one is awake, you are spending 90% of your on your mobile device. You become so complacent with what you are seeing, and this is where we as OEMs are wanting to match the likes of Apple or Google on whatever they have displayed to the customer to create the seamless journey between the mobile phone and vehicle. This is why Mercedes-Benz, as an example, has got the Apple CarPlay when you jump into your vehicle, you connect up to Apple CarPlay, and it feels like you're on your mobile. So from a comfort point of view, customers are really excited around keeping this technology at bay with them. When we're looking at the likes of Tesla and their business model, it's also fully online and fully engaging the customer online.”

(c) Competition and partnerships

The research found that one of the main topics the participants spoke about was the change in competition and the future of partnerships with OEMs. The future landscape of the automotive competition looks different to today, as engineering excellence was no longer required with the introduction of electric vehicles.

These additional players are disrupting the marketplace. In addition, we will see a lot more partnerships happening in the industry that was not seen before.

In this instance, when looking at competition, Mark Raine said, “EVs will have an impact, but in essence, it is not in any way different to a normal motor vehicle; if you got an EV or an ICE vehicle, it would still bring you from point A to B. The only impact that EVs has is that it lowers the entry-level barrier of disruptors coming into the market. Why was the automotive market so static for a long time because of the competence and expertise required to build an ICE car is much higher and more expensive than the building of an EV. EVs allow new players to enter the market, which did not happen in the past.”

Another participant in the study spoke out about the partnerships that we will see, “Google is a good example; they partner with an OEM at the end of the day, they bring the technology, and the OEM brings the vehicle, so they don’t have to have the investment cost that we are having; they are much more competitive, their margins are remaining so we really still have a tough job to do with having the core asset which is the vehicle which is quite expensive.”

(d) Sustainability

One of the main topics the research focused on was the introduction of electric vehicles. The term ‘electric vehicles’ have become a buzzword, and many OEMs have already committed to being more environmentally conscious.

To re-iterate the focus on the environment by OEMs, Mark Raine advised, “In 2031, Mercedes-Benz will not produce any ICE vehicles, according to the strategy and plan of Daimler AG CEO, Ola Kallenius. Maybe there will be one or the other ICE factories still around, but in the grand scheme of things, our plan is not to produce any ICE vehicles anymore. So if we like it or not in the South African context, if we as Mercedes-Benz want to continue selling cars and offering our products and services to the South African customers, we will need to do that transformation into the EV world.”

To further corroborate the feedback, Alex Boavida alluded to a current example in the South African automotive industry by saying, “Toyota invited Cyril Ramaphosa to one of their launches for Toyota Cross Hybrid vehicle, and he wants to obviously move to the green power and greener electricity, yet we burn coal in South Africa to generate electricity. So obviously, the electricity supply in South Africa has to be re-looked at to actually move to a more greener output.”

(e) Regulations and standards

Several participants spoke about the regulation in the industry. Amidst the changing landscape, the automotive industry is faced with the governing authorities introducing regulations and standards that directly impact their business. The two mentioned most in the interviews were the POPI Act and the Right to Repair or Code of Conduct.

Participant 7 highlighted the change in regulations from an aftersales perspective by saying, “In terms of revenue streams, I think that what we have to do is we have to think in different tangents from where we currently see things. So something that we took for granted will be harder for us to ensure that we maintain those revenue streams. The key to retaining those revenue streams would be how do we approach them from a strategic point of view in terms of how do we future proof our businesses and how do we try to be compliant to things like legislation but at the same time optimized, and when I say that I talk about things like the code of conduct or Right to Repair and how that has impacted the business and how do we approach it, how are we going to be clever about the way we approach and then finally, I think the newest revenue stream that we have in our business right now is selling digital services, selling intangible things to customers and this will be the key.”

To further substantiate the impact of regulations, another participant spoke about the data protection regulations by saying, “However, what may be a challenge

would be data protection, especially when it comes to connected vehicles and how the information is utilised, South African regulations, the acts may also be a little bit of a hindrance in terms of how you treat information, and that is something that is needed in connected vehicles as you need the data in order to determine what are the right services to offer in the country."

4.3 CONCLUSION

This chapter looked at the findings that created emerging themes to answer the research questions. One can clearly see the impact of technology on the automotive landscape and the future of automotive business models. A detailed discussion is presented in the next chapter.

CHAPTER FIVE: DISCUSSION OF THE FINDINGS

5.1 INTRODUCTION

This chapter provides an in-depth discussion of the findings to each research question. The approach utilised highlights the insights shown in Chapter Two and determines similarities or discrepancies for each topic. Finally, the results are presented in correspondence to each research question.

5.2 DISCUSSION PER RESEARCH QUESTION

Table 14 summarises the research questions and a brief overview of their findings from chapter 4.

Table 14: Summary of research questions

Research Objective	Research Question #	Research Question	Themes
To understand the influence of technology on the automotive business model	1a	How does technology influence the business model today?	• Automotive architecture • Customer experience • Digital strategy and vision

Research Objective	Research Question #	Research Question	Themes
			• Infrastructure and resourcing • Competition and partnerships
	1b	What are the risks of adopting new technology on the business model of automotive OEMs?	• Risk management • Infrastructure and resourcing
To identify different business model options for the future automotive manufacturing OEMs	2a	What do the future revenue streams of automotive OEMs look like?	• Digital strategy and vision • Automotive architecture
	2b	What business model options exist for automotive OEMs?	• Automotive architecture
	2c	What will the automotive landscape look like in the future (in terms of customers, dealerships, partnerships, etc.?)	• Customer experience • Automotive architecture • Sustainability • Regulations and standards • Competition and partnerships

5.2.1 Discussion pertaining to research question 1a

How does technology influence the business model today?

From the literature review conducted, it was found that Johnson (2018) opines that one of the strategic situations that require a business model change is the introduction of technology. In addition, McKinsey and Company (2020) indicated on multiple occasions that Covid-19 has accelerated the adoption of technology in the automotive industry, as it pushed everyone towards online platforms and other digital channels.

The following section discusses the findings associated with each theme linked to research question 1a.

(a) Automotive architecture

The world is seeing an increased demand for online services, from ordering groceries to buying a vehicle online. This means that there are now a reduced number of dealership visits to conclude a vehicle sale (Kukkamalla et al., 2020). This was further re-iterated by the participants from the interviews conducted.

For example, Selvin Govender states, “The average number of visits to the retailer has dropped from 5 to 1.4 visits to conclude a sale”.

Traditionally, OEMs generated revenue by selling vehicles, aftersales parts and maintenance and financial services; however, this is now not sufficient to remain sustainable. Organisations need to adapt to the changing environment brought about by technology and adapt to the new trends such as online platforms, subscription and car-sharing (Llopis-Albert, Rubio & Valero, 2021). The automotive landscape is changing due to the introduction of technology, and OEMs have to sustain their revenues by introducing new value-added services to their customers. Participant 3 of this study stated that connected services, subscription-based services and value-added revenue streams would be how OEMs make their revenue going forward.

(b) Customer experience

The modern-day customer wants instant gratification and a seamless customer experience. Customers' behaviour is changing due to the introduction of technology, and with this comes a change in their buying behaviour and the desire to have their needs satisfied individually. Customers also want a fluid interaction between the offline and online world (Llopis-Albert et al., 2021).

This is further substantiated by Participant 3, who said, “Customers want a seamless online to offline approach resulting in a seamless journey. They don’t want to start their journey online and then have to go into a dealership and start it all over again. If you go into a dealership, they should know this customer has been online and is interested in a GLA; he qualified for X amount of finance. Customers expect you to have a better level of intelligence and information and utilise this to give them a better customer experience and to give them the right product and services that are necessary for them.”

Alex Boavida, who is a Dealer Principal and customer facing, further substantiated the above by saying, “Everything we do right now is touched by technology, and you are accessible all the time. There's no more eight hour days because a customer wants information all the time at their convenience, and normally it's after their working hours.”

However, amidst the change, one must be mindful of the transition period where there would be a hybrid solution of offline and online sales and experiences for the customer (Brandtner & Fredenthaler-Mayrhofer, 2020; Mcewan, 2020). Participant 3 said, “I think the older customers will have an expectation that we can manage a balance between old and new, which means the traditional model and the new model.” In addition, Alex Boavida stated that a balance must be

struck between human intervention and artificial intelligence to ensure a seamless customer experience.

Customer experience has always been a differentiating competitive factor in the automotive industry and will continue to be a differentiating factor throughout the process in the industry in the future (Llopis-Albert et al., 2021). This is further corroborated by the research conducted where Wendy Matai advised, “Customer experience and service is going to put you above the rest and allow you to be more competitive. So I think from a pricing perspective, they will be okay, but it's got to be the customer experience that differentiates you from the other brands.”

The industry is changing due to the influence of technology; however, many customers have expressed their frustration with the complex processes involved in buying a vehicle (Accenture, 2019). Customers also expect speed to market and simplification. Participant 3 suggested that customers still have to sign their purchase contract on hard copy and that these processes should become digitised and streamlined.

Due to the influence of technology, OEMs need to focus their strategies on enhancing the customer experience and retaining their customers (Llopis-Albert, 2021). The business model is changing to enhance the customer experience, as

the models are moving away from product-oriented to service-oriented models (Athanasopoulou et al., 2019). The research shows various examples of OEMs moving to a direct sales model to control the customer journey throughout the process.

(c) Digital strategy and vision

Technological advancements and the availability of technology are forcing businesses to adapt their business models, as new technologies enable new services that require new business models to see the total value. The automotive industry traditionally operates on a three-tier model (Athanasopoulou et al., 2019); however, due to the implementation of newly introduced regulations such as the POPI Act and the Right to Repair, OEMs have to reconsider this operating method by introducing new technology (BusinessTech, 2021).

The new regulations and technology available also influence the OEMs' decision to move away from the traditional three-tier model to a direct sales model (Accenture, 2019, Jacobides, MacDuffie & Tae, 2015) to ensure compliance with the data regulations that are being enforced. OEMs can only access customer data if they sell directly to them (Accenture, 2019). With all these changes, the

strategy and vision of the OEMs have to be reconsidered and adapted for future sustainability in the marketplace.

The research shows that the luxury manufacturers in South Africa are already adopting the direct sales model, which allows the OEM to provide an online platform to interact with customers and sell directly to them by having access to their customer data, which was previously owned by the dealerships (Accenture, 2019). With the intensified technology availability, an online presence is essential. In South Africa, Mercedes-Benz and BMW have already begun to solely sell vehicles directly to the end customer (Autocar, 2020; CEO Magazine, 2020).

Ultimately, to remain sustainable in the face of new technology, OEMs would have to change their value propositions, which eventually requires a business model change (Athanasopoulou et al., 2019; Grieger & Ludwig, 2018).

OEMs should consider the crucial triad that was discussed in Chapter Two. It reflects on the convergence of the technology revolution, changing business models and the transformation of society and markets (Armstrong & Lee, 2021).

(d) Competition and partnerships

Technology provides many opportunities to businesses and reduces the barriers to entry to the automotive market. There has been an increase in the number of new entrants into the automotive marketplace with the introduction of electric vehicle technology, but engineering excellence is not at the core (Athanasopoulou et al., 2019).

The research conducted provided various examples of how Google, Apple and other big tech companies are now direct competitors to the OEMs who traditionally only competed among themselves.

There are numerous projects in which technology companies partner with OEMs to invest in electric vehicles, such as Google and Nissan or Google and Toyota (Deloitte, 2020; PWC, 2018). In addition, the research also alluded to companies such as Apple, who traditionally do not play in the automotive space, now investing in developing an Apple electric vehicle (Fisher, 2022).

The research also provided insights into Google and OEMs partnering whereby Google would bring the software expertise and the OEM the product expertise. However, in line with a customer-focused approach, OEMs are trying to disrupt the Apple and Samsung arena by developing their own operating software (Mercedes-Benz Group AG, 2022). In addition, the OEMs are very conscious of the new regulations and data protection, hence they are trying to do everything

in-house (Lovells, 2019). With the introduction of the latest technology comes a new set of competitors (Cavalcante, 2013); hence, the competitive advantage of OEMs must be considered.

To assess a company's strategic capabilities and competitive advantage, the VRIO criteria should be used. VRIO stands for value, rarity, inimitability and organisational support (Barney, 1991). As a result, OEMs can either have a temporary or sustained competitive advantage (Bruijl, 2018). At the time of this study, the OEMs had a sustained competitive advantage, but as the landscape changes, they are losing their foothold, and this is where their digital strategy and vision come into play.

(e) Infrastructure and resource availability

With the introduction of new technology comes the need for new infrastructure (Fritschy & Spinler, 2019). For example, the introduction of electric vehicles calls for charging stations instead of petrol stations, and the introduction of autonomous vehicles requires better road infrastructure and defined parameters in order for it to be successful.

The introduction of new regulations also plays a big part, as with electric vehicles, there are now strict emission regulations that apply (Llopis-Albert et al., 2019).

From the interviews conducted, many areas of concern were found regarding infrastructure availability in South Africa to enable the use of this new technology. South Africa does not have a widespread infrastructure of charging stations to enable customers to make use of electric vehicles for long trips. South Africa struggles with an unstable electricity supply grid and has lived with load shedding for many years. If South Africa cannot provide sufficient electricity to sustain the requirements of the people, adding electric vehicles to this grid would add more pressure to the grid (Tongwane & Moeletsi, 2021).

Llopis-Albert et al. (2021) state that increased complexity comes with the increased introduction of technology. Numerous participants raised the point that the current staff need to be re-trained and re-skilled to render customer services with all these changes. Currently, the staff are trained to handle ICE vehicles only, and with electric vehicles comes additional requirements, as high voltage batteries are involved (Ansara & Davids, 2018).

5.2.2 Discussion pertaining to research question 1b

<u>What are the risks of adopting new technology on the business model of automotive OEMs?</u>

With the rapid introduction of technology come several risks. Cyber security breaches, data protection and loss of market share are some of these risks.

An interesting finding on this topic in the research conducted was that the study participants focused mainly on the opportunities and not the risks.

(a) Risk management

We have seen companies such as Nokia Mobile and Kodak fail because they did not see the need to transform their business digitally (McKinney, 2015). OEMs are open to the same failure if they do not embrace the change. Digital transformation is already changing the automotive landscape at a rapid pace globally (Llopis-Albert, 2021). Tesla pioneered the direct sales model in the automotive industry (Bilbeisi & Kesse, 2017). The model was constantly under scrutiny until Tesla proved its success. In recent years, we have seen luxury manufacturers such as Mercedes-Benz and BMW in South Africa transitioning to the direct sales model (AutoCar, 2020; CEO Magazine, 2020). The risk lies in becoming obsolete in the industry.

Another risk to consider is that technology is not the traditional OEMs' core business. Their core business is manufacturing quality vehicles. So they would

need to manage the risk here and look at possible partnerships to mitigate this risk (Grieger & Ludwig, 2018).

In generating partnerships for future excellence, OEMs have to consider their legacy in everything they do; they are generally not agile and flexible. This is a significant risk as was the semi-conductor shortage that occurred when the covid-19 pandemic started, and traditional OEMs are struggling to produce fully finished stock to serve their markets. Companies such as Tesla, Rivian and Lynk quickly adapted their vehicles to need fewer chips to operate so they were not held hostage by the semi-conductor supply challenge (Klender, 2022). As a result, saw seeing the industry coming to a standstill when production was halted until the semi-conductors were received. This placed a massive strain on the stock situation for all OEMs, especially those with direct sales models (KPMG, 2022).

The chip shortage brought short time for plant workers, which related to the next theme that emerged from the study. One of the findings that emerged from the study was the risk of unemployment in South Africa due to the introduction of technology. The technology would render specific jobs obsolete (McKinsey & Company, 2017). Based on the above, employees would be required to be re-skilled and moved into different, more relevant roles (McKinsey & Company,

2017). This led to the next theme associated with research question 1b, infrastructure and resourcing.

(b) Infrastructure and resourcing

When one thinks of the automotive industry, one automatically thinks about exquisite dealerships that radiate with luxury and finesse. However, the buildings may become obsolete with the business moving to an online platform. There may no longer be a need for so many dealerships to service customers as all transactions can happen online (PWC, 2018). Furthermore, regular servicing and maintenance with electric vehicles and autonomous vehicles have a longer duration than ICE vehicles. The research conducted reiterated this, as many participants advised that the brick and mortar facilities would need to be reduced.

The study brought about the requirement to re-purpose the dealerships into customer experience hubs, showrooms and service centres to service the customer base in the future (Accenture, 2019; Deloitte, 2019).

However, with this reduction comes the risk of unemployment. The dealerships that remain might not need as many staff members to run the facility as most of the interactions would take place online (McKinsey & Company, 2017). In

addition, the staff that remain would have to be re-trained to handle new technology such as high voltage batteries or autonomous vehicles.

An additional risk that exists is the infrastructure availability in South Africa for autonomous and electric vehicles (Fritschy & Spinler, 2019). We are currently plagued by load shedding in the country in the running of our day-to-day lives, and with the added load of electric vehicles, the electricity grid might not be able to handle this. In addition, there is only a handful of electric vehicle charging stations in existence, which limits the customers' ability to travel freely, as one does now with an ICE vehicle.

For autonomous vehicles to work successfully, there has to be a defined set of rules programmed into the vehicle (Fritschy & Spinler, 2019), which is a challenge. The South African road infrastructure is not as well developed and maintained as other countries' infrastructure. With the number of potholes that exist, an autonomous vehicle would find it challenging to recognise the obstruction and avoid it. Another example is the South African taxi drivers who do not follow the road rules. An autonomous vehicle would not have the cognitive knowledge to know what to do when a red robot is jumped, which is a common occurrence in South Africa. Numerous participants of this study corroborated the above concerns.

The POPI Act came into full effect in 2020 (POPIA, 2019) and directly impacted the automotive industry. With the introduction of new regulations governing customer data, OEMs are on the back foot in the traditional model. They cannot access the data, as it is owned by the dealership and not the OEM. This means that OEMs cannot use the data to better understand the customers because this is regulated. Hence, the move to a direct sales model is discussed under research question 2b.

However, with access to all this data comes the need to have a highly secure online environment. OEMs need to think about data protection, encryption and cyber-attacks (Bohnsack, Kurtz & Hanelt, 2021), because, if their systems are hacked, the repercussions would be dire.

5.2.3 Discussion pertaining to research question 2a

What do the future revenue streams of automotive OEMs look like?

OEMs have traditionally made their revenue from the sale of the product, which is the vehicle (Llopis-Albert, 2021, Grieger & Ludwig, 2019). However, with the change in the value propositions offered by OEMs and the introduction of new technology, OEMs need to find alternate revenue streams to remain sustainable as the customers are slowly moving away from ownership to user-ship. In addition, with electric and autonomous vehicles, the after-sales requirements will be much less (Bernhart, Zhang & Wagenleitner, 2010).

(a) Digital strategy and vision

The digital strategy and visions of OEMs need to be re-evaluated. They can no longer solely focus on revenue from vehicle sales. If they do not broaden their vision, they will not attract sufficient revenue to remain profitable in the future (Deloitte, 2019).

Another contributor to the potential loss in revenue for OEMs is the introduction of the Right to Repair (R2R) legislation, which allows customers to service their vehicle wherever they see fit and not necessarily at a dealership. This means that the OEMs recently had to unbundle the cost of their maintenance plans from their vehicle costing, as they could no longer force a customer to buy it (Right to Repair South Africa, 2021).

OEMs need to become service oriented and provide value-added services to their customers (Grieger & Ludwig, 2018). Some of the options from the research conducted were subscription services, leasing, renting, car sharing, mobility services, digital services and mobile servicing solutions.

The OEMs should explore the three horizons concept for future ventures that looks at the core business, emerging business and new opportunities (McKinsey & Company, 2009). It would assist OEMs in assessing possible opportunities without neglecting their core business.

With the introduction of these new services comes a change in the automotive landscape, which is discussed in the next section.

(b) Automotive architecture

The most significant change in the landscape would be from an aftersales perspective. With the introduction of the R2R legislation, customers are no longer obliged to service their vehicles at a dealership to retain their warranty and guarantees (Right to Repair South Africa, 2021). This means a reduced workshop throughput for dealerships. In addition, the introduction of electric vehicles brought about the requirement for longer service intervals. An electric

vehicle only has to be serviced once every 18 to 24 months versus an ICE vehicle which must be serviced yearly (PWC, 2018).

These changes require the landscape to be agile and adaptable to the changing requirements. Many participants shared similar thoughts around the topic; however, solutions were available. Some of the proposed solutions included subscription-based services, digital services and experiences.

One of the participants gave an example of offering a subscription service to customers whereby they can access additional power on their vehicles when required. This is newly introduced into the automotive market and the new S-Class has the ability to be four-wheel drive; however, this is only accessible via a subscription from the OEM.

Furthermore, OEMs can consider venturing into opportunities for electric battery disposal, as there are minimal solutions available in the marketplace. The OEM will be upholding their promises around sustainability and generating revenue.

5.2.4 Discussion pertaining to research question 2b

What business model options exist for automotive OEMs?

(a) Automotive architecture

The traditional business model in the automotive industry is a three-tier sales model in which you have the OEM as the manufacturer, the dealer as the wholesaler and the end customer. First, the OEM sells to the dealer, who marks it up and sells it to the end customer. However, a change to a direct sales model with companies such as Tesla is already visible (Bilbeisi & Kesse, 2017), Mercedes-Benz and BMW (Autocar, 2020; CEO Magazine, 2020). This change is also corroborated by the information from the interviews conducted.

The overarching business model that OEMs would take on is a direct sales model. The strategic situations contributing to the change in the automotive business model are the introduction of technology into the market, disruptive innovation, threats from low-end disruptors and agile responses to a dynamic market (Johnson, 2018).

Table 15 depicts a summary of these changes in the automotive market.

Table 15: Changes in the automotive market

Strategic situation	A current example in automotive Industry
Disruptive innovation	Car sharing and mobility services reach customers who could never afford to purchase their own vehicle.
Technology	There is a significant focus on the e-commerce business at certain OEMs as, traditionally, vehicles were sold via face-to-face interactions.
Threats from low-end disruptors	With new OEMs such as Rivian and Lynk focusing on electric vehicles, they can be highly competitive with their pricing, as they are agile and dynamic compared to traditional OEMs' legacy manufacturing processes.
Agile responses to a dynamic market	Customers' needs and wants are changing, and they want a more service-oriented offering. The concept of ownership is also under question.

Following the research discussed in Chapter Two and the information provided from the study conducted, table 16 summarises the business options for OEMs in the future.

Table 16: OEM business model options

Business model type	Description	Example in the industry
Brokerage	Using other online platforms	Fiat partnered with Amazon to sell vehicles online (Oliver Wyman, 2017).
Data into assets	Using big data analytics	Providing value-added services to customers on predictive maintenance and the like.
Digital platforms	Creating a platform-based application	OEMs are investing in platform solutions to create an ecosystem and offer many different things to their customers, such as accessories, financial products, etc., directly from the supplier of these products.
Disintermediation	Direct selling	This is the most common business model type being used in the industry. Mercedes-Benz SA and BMW SA both took this route.
Fractionalisation	Sell partial use of the vehicle	The concept of ownership vs user-ship is under question currently. However, many

Business model type	Description	Example in the industry
		people may likely find this an affordable option and go this route in the future. OEMs can offer these services to the customers.
Leasing	Renting a vehicle	Leasing is becoming a common way for customers, especially when they need different vehicles for different occasions.
Pay-as-you-go	Car sharing, mobility solutions	This model allows accessibility and convenience to customers. Examples currently in use are Car2Go and ShareNow.
Subscription	Charging a fee to the end customer to get access to something	FlexClub in South Africa offers subscriptions to customers for access to a pool of vehicles on a subscription basis.

Source: Armstrong and Lee (2021), Johnson (2018)

From the research conducted, disintermediation or direct selling would be the primary business model that OEMs would follow; however, it would not be the only model in use. This primary model would be combined with other business

models (Wang et al., 2009) depending on the vision of the OEM, such as leasing and subscription, as an example. However, there could be many different combinations.

5.2.5 Discussion pertaining to research question 2c

What would the automotive landscape look like in the future (in terms of customers, dealerships, partnerships, etc.)?

Armstrong (2019b) states that in the age of technological disruption, organisations are faced with changing business models, customers, new competitors and new resources. This change is evident in this research report and is discussed further in the following sections.

(a) Automotive architecture

The future automotive landscape will include electric and autonomous vehicles. With the introduction of this new technology comes the increased adoption of mobility and car-sharing solutions (Ritter & Schanz, 2018). The research conducted indicated that the adoption of electric vehicles will happen regardless of the country, and it will happen relatively quickly in the South African marketplace.

With the business model changing entirely due to the introduction of new technology and digitalisation adoption, there will be a complete shift from product-driven business models to service-driven business models (Linde, Sjodin, Parida & Gebauer, 2021). The service driven business model will attempt to close the gap of revenue loss from traditional sales and car maintenance, as with electric vehicles the maintenance is expected to be far less than an internal combustion engine vehicle.

With this shift to a service-driven business model, the landscape will also change the role of the dealerships. For those that are still using the traditional three-tier model, the dealer is the face to the customer. For those OEMs who are on the direct sales model, the dealer is an agent and supports with the delivery process. In the future, the footprint of the dealerships will be reduced, and dealerships will change to almost a gallery, like the Tesla galleries available. The dealers will still be responsible for servicing the vehicles; however, they would need to add mobile servicing options to their offerings (Accenture, 2019).

The OEMs will also control the pricing and discounts given so a customer would be able to get the same price for the exact same vehicle across the country, including the online platform. The dealership will also serve as the offline and online customer journey interface. There would be digital walls that would be

equipped with other new technology such as 3D and virtual reality capabilities. In essence, the dealers will become customer experience hubs. Ultimately, from the research conducted, it can be said that dealerships are here to stay, but their function will change, and the number of outlets will also be reduced (Accenture, 2019; Deloitte, 2019). It will follow the same concept of boutique shops for high-end brands such as Gucci and Louis Vuitton. The dealers will also serve as delivery hubs for online vehicles or other mobility solution offerings.

However, another significant change will be the landscape of the aftersales environment, which will become the custodian of digital services in the aftermarket. Dealerships will lose revenue because of the less frequent servicing intervals due to fewer moving parts in an electric vehicle as in an ICE vehicle. This was a strong theme that emerged from the research.

From a sales perspective, the only change will be the push to an online platform and reducing the complexity of the automotive process. However, OEMs should consider looking at a blue ocean strategy to create and capture new demand (Kim & Mauborgne, 2015) for their businesses to remain sustainable.

The last change in the landscape will be the accelerated industry lifecycle. During the research conducted, one of the participants alluded to this change. Selvin Govender said, “Many years ago, I was in Germany, at the product research and

development wing of Mercedes-Benz, and already around 2021, EVs and hydrogen-powered vehicles were being considered as part of our future. During the discussion with the scientists in these R&D buildings, we always wanted to know how far we were moving into electric vehicles in 2012. The answer was always as an automotive OEM our development cycle is 5-7 years before we go into production. Once we go into production, we need a lifecycle of at least seven years, and you will see that most of our cars have a seven-year lifecycle to make it viable to deliver the necessary return on investment. Now it differs from OEM to OEM, but generally, R&D cycles are about half of the production cycle. Now, if we had to make a decision already in 2012 that we are going electric and our first EV would have started coming about in 2015/2016, and you would have found that the world was not ready for EVs."

This accelerating lifecycle is a significant change for the automotive industry. However, this has to be considered for future business; otherwise, the OEMs will lag behind if they continue operating on the traditional method of working. Furthermore, PWC (2018) advised that, in future, vehicles in the automotive industry would have to be updated yearly. Therefore, OEMs will have to adopt a lean and agile working method to move from the long traditional lifecycles to one-year long lifecycles. A possibility that could be looked at here is to consider Peter Senge's learning organisation teachings. The five core disciplines are a shared vision, mental models, team learning, personal mastery and system thinking.

These teachings will allow people to collaborate and enhance their capabilities to achieve their desired goals (Senge, 1990).

(b) Customer experience

Wells, Wang, Wang, Liu and Orsato (2020) state that customer experience is becoming a differentiating competitive factor. The automotive landscape is transitioning to new service offerings, which is redefining the relationship between OEMs and their customers. The research found that customers want individual attention and information at their fingertips and therefore the journey from online to offline must be seamless. Customers follow the brand image of companies online and offline and want to associate themselves with brands that match their morals and values (Nadzri, Musa, Muda & Hassan, 2016). Customer-centricity will place a considerable focus on the industry and will bring about transformational change (Grieger & Ludwig, 2018).

In order to attain a form of customer-centricity, digital ecosystems would have to be created, as customers want automatic connections from their homes to their cars. The research conducted agreed with the above discussion on the customer experience. Therefore, the automotive industry will focus heavily on the

customer experience journey in the future, as that will be vital to retaining their current customers and attaining new customers.

The automotive industry will become fiercely service driven and customers will expect mobility solutions and move away from ownership to user-ship (Ritter & Schanz, 2019). The service driven business model with major focus on an online platform offering will come into effect here.

Customer expectations are also changing as the automotive environment is evolving. Customers want up-to-date technology and services to be readily available. Another significant expectation from customers will be complexity reduction and a drive towards carbon neutrality to conserve the environment.

(c) Competition and partnerships

OEMs are no longer competing against engineering excellence; they are also competing against technology companies and start-ups. This disruption puts the legacy automotive OEMs under strain, as they do not necessarily have the technological excellence of the big technology companies, nor can they compete against the start-ups that do not have legacy systems and knowledge, and operate on an agile model. With ICE vehicles, the barriers to entry into the market were very high, but with the introduction of electric vehicles, these barriers are

removed and the market could be disrupted. We already see this disruption with electric vehicles with which only OEMs are entering the scene, such as Rivian and Lynk.

Another aspect that is changing the face of the automotive industry is the possibility of partnerships with technology companies, which is traditionally unheard of in the industry (Cavalcante, 2013).

With that said, one of the ways in which to mitigate the risk of new competitors would be to engage in partnerships that could be beneficial to both parties whereby the OEM provides the vehicle and the technology company the software or platform. Furthermore, in order to create digital ecosystems, one needs to have partnerships to be successful.

Using Porter's 5-Forces model (Porter, 1979), it can be seen that the barriers to entry are being reduced, as there is no longer the need for high start-up capital, accessibility to scarce resources or regulatory barriers in the automotive industry. Engineering excellence is no longer a requirement. Therefore, we are seeing an increase of new automotive manufacturers such as Rivian and Lynk, who only focus on electric vehicles. In addition, we see the big technology companies entering the automotive arena with their own set of technological expertise.

(d) Sustainability

The three pillars of sustainability are economic, social and environmental (Acciarini, Borelli, Capo, Cappa & Sarrocco, 2021). The United Nations has been working on an agenda for sustainable progress since 2016. This programme aims to transform our world by 2030 by making use of newly available technology (United Nations, 2020). This shows that environmental development is being addressed at a global level.

The automotive industry contributes significantly to most economies in the world. Even with the introduction of new technology, they would have to upskill their employees to take on different roles within the industry. In South Africa, the automotive industry contributes 7.7% to the GDP, one of the economy's most significant contributions.

In addition, customers expect carbon neutrality from OEMs. Therefore, there is a huge focus on this topic. Hence, the introduction of battery electric vehicles is welcomed. In South Africa, it is assumed that the adoption will occur rapidly because due to the unstable electricity grid, many households are installing of-the-grid solutions.

However, we need to be aware that, currently, approximately 80% of the electricity produced in South Africa is produced using coal (Department of Minerals and Energy, 2022). This means that if one had to charge an electric vehicle using electricity generated by coal, the vehicle is still indirectly contributing negatively to the environment. This was further reiterated in the research conducted, as participants mentioned examples of case studies done to assess the carbon emissions between an electric vehicle and an ICE vehicle.

Many OEMs are making commitments to stop producing ICE vehicles. For example, Daimler's CEO indicated that they would stop producing ICE vehicles entirely by 2030. This also suggests that South Africa needs to gear up for an influx of electric vehicles. Sustainable business models would be critical to the automotive industry's success (Cioca, Ivascu, Turi, Artene & Gaman, 2019).

(e) Regulations and standards

With the introduction of technology, everything is changing in the automotive industry and new regulations and standards are being introduced that directly affect the industry. Each of these standards calls for a change in the norm of business operations.

The introduction of the POPI Act means that customer data must be heavily protected and cannot be shared. This limits the information that OEMs can use, even from connected vehicles. Another reason for OEMs to transition to the direct sales model is so that they would be in control of the customer data. However, without customer consent, no information can be utilised, which would have an impact on the service offering from OEMs.

Another significant impact from an introduction of regulation is on the aftersales environment. The maintenance plan has to be unbundled from the cost of the vehicle. This regulation states that a customer has the right to service and repair his vehicle at any mechanic without having his warranty void. This has a considerable impact on the OEMs as, traditionally, income was derived from the mandatory inclusion of this maintenance package on each vehicle and the vehicle's servicing thereof. This environment will change drastically as they will lose workshop throughput and will have to find alternative revenue streams.

The final regulations impacting the automotive industry are the carbon emissions regulations that are being imposed globally. This further accelerates the drive towards electric vehicles and other new technology that have a reduced carbon emission output to the environment. Carbon neutrality came out very strong in the research conducted as the main focus area for OEMs.

5.2.7 Conclusion

The above discussions address separate elements of how the automotive industry is impacted and influenced by technology. One possibility for this research was to explore the integration of these themes into a holistic thematic map that is discussed in the next section.

5.3 THEMATIC MAP

Based on the codes and themes generated, a thematic map was created to show the correlation between the themes and how they impact or influence each other. The thematic map is tentative and exploratory in nature and arises from this study's literature review and findings.

Figure 9 shows the thematic map.

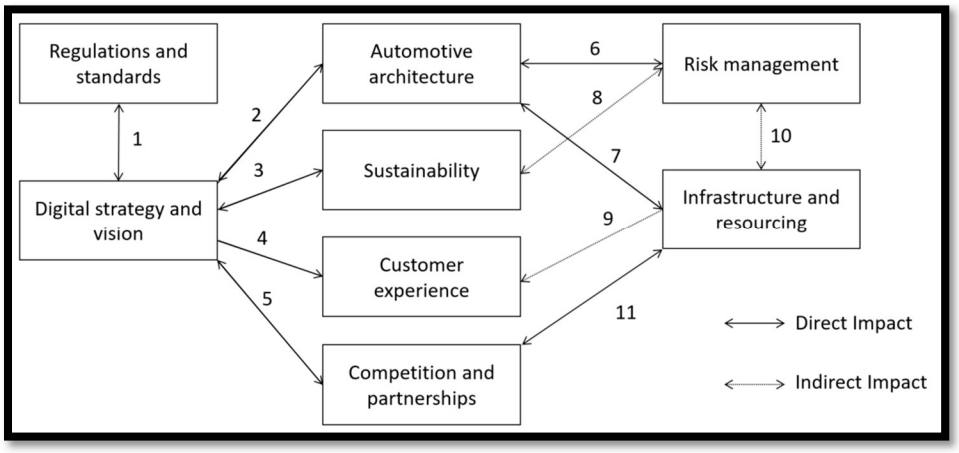


Figure 9: Illustration of thematic map

The section below explains the thematic map in detail.

5.3.1 Arrow 1: Regulations ↔ Digital strategy and vision

Regulations and standards drive the future digital strategy and vision of the OEM. New regulations such as the POPI Act and the Right to Repair shape the strategy and vision of the OEM (Foley & Lardner LLP, 2020; Armstrong, 2019). This also includes aspects such as carbon emission standards and the like.

Regulation directly influences the transformation process, however sometimes the technology itself directly affects the regulation. This refers to when technology brings about the need for a regulation such as data privacy and the

POPIA act. Upon the introduction of new technology, some regulations can be rendered obsolete or ineffective and must be reviewed (OECD, no date).

5.3.1 Arrow 2: Digital strategy and vision ↔ Automotive architecture

Digital strategy and vision affect the automotive architecture; however, the automotive architecture also influences the digital strategy and vision of the company. From a strategic point of view, changes are made, such as a change in the business model; however, the already changing landscape can also influence strategy changes (Linde et al., 2021; Llopis-Albert et al., 2021). Therefore, the impact goes two ways.

5.3.2 Arrow 3: Digital strategy and vision ↔ Sustainability

One of the main components of a digital strategy and vision is looking at sustainability, which comprises of three pillars. These pillars are economic, social and environmental. Part of the strategy and vision is what is allocated to sustainability in terms of funding and what other initiatives the company can partake in for the year (Acciarini et al., 2021). However, the push from the marketplace and the customers from a sustainability perspective can impact the strategy and vision of the company, as customers want to be associated with brands that match their values and beliefs.

5.3.3 Arrow 4: Digital strategy and vision → Customer experience

The strategy and vision of a company directly affect the customers' experience, as it includes the execution of the activities planned (Nadzri et al., 2016). From the above discussions, it can be deduced that for OEMs, the customer experience element is now even more critical than before. With the landscape becoming more customer-centric and service driven, the impact of the digital strategy and vision is vital. Accessibility is becoming vital to enhancing the customer experience, so companies need to have multiple channels of communication available to the customer. The customer experience element of the digital strategy and vision means one should create an overarching vision that ensures all facets of the business are working towards a common vision and goal (Hall, 2019).

5.3.4 Arrow 5: Digital strategy and vision ↔ Competition and partnerships

The digital strategy and vision components include aspects like the future of competition and partnerships. The changing landscape impacts the strategy and vision as competitors are no longer only other OEMs. The new competition has a direct impact on the strategy of an OEM. In terms of partnerships, OEMs can consider new partnerships or proposals for partnerships that may come to them.

This would need to be evaluated to see if it fits into the existing strategy or a new strategy (Accenture, 2019; Deloitte, 2019).

The competition landscape is governed by authorities such as the competition commission, however in this instance it is seen that the regulation directly impacts the digital strategy and vision of a company which in turn leads to the competition landscape decisions. Without the understanding of the vision of the company one cannot determine a sustainable way forward.

5.3.5 Arrow 6: Automotive architecture ↔ Risk management

OEMs have legacy operations, and if they do not adapt to the changing environment, they stand the risk of becoming the next Nokia or Kodak. So the risks of adopting a new business and the risk of not adopting it must be considered. Risks such as reliance on global vendors have proven to be a significant setback with the semi-conductor chip shortage. This shows how the risk that was not managed influenced the automotive industry.

Topics like cyber security and data protection have an impact on the landscape and must be considered for sustainable operations.

The risks that exist in the marketplace directly influence the automotive landscape, and the changing landscape will bring about risk management solutions to remain sustainable.

5.3.6 Arrow 7: Automotive architecture ↔ Infrastructure and resourcing

Technology can could be available in the automotive landscape, but if the infrastructure of the country and resourcing is not ready, it could fail. Therefore, the availability of the proper infrastructure and resourcing has a direct influence on what is introduced into the automotive market. At the same time, the changes in the auto-mobility industry, such as the introduction of autonomous vehicles, bring a higher focus on the required infrastructure and resourcing (Fritschy & Spinler, 2019).

5.3.7 Arrow 8: Sustainability ↔ Risk management

Sustainability and risk management influence each other. Sustainability looks at economic, social and environmental avenues, while risk management looks at how the risks can be mitigated. Risk management frameworks can be developed which encompasses the sustainability initiative of the organisation.

5.3.8 Arrow 9: Infrastructure and resourcing → Customer experience

The availability of infrastructure and resourcing influences the customer experience. If the proper infrastructure is not available for a customer who is an early adopter, it hampers the customer experience journey created by the OEMs.

5.3.9 Arrow 10: Risk management ↔ Infrastructure and resourcing

This relationship shows the influence of infrastructure and resourcing on risk management and vice versa. The risks of not having the required infrastructure should be managed by the OEM, and risks should be identified earlier when it comes to the necessary infrastructure and resourcing needed to be successful.

5.3.10 Arrow 11: Competition and partnerships ↔ infrastructure and resourcing

Every company should know where its core expertise lies and when one does not have the infrastructure and resources, then a strategic partnership could be a consideration. It is more effective to capitalise on the positive effects of a strategic partnership instead of creating a lose-lose situation (Zwilling, 2014). Both companies must set out a clearly defined rules of engagement to avoid any negative impact on their business, especially in the case of partnerships with direct competitors (Riihikoski, 2020).

5.4 IMPLICATIONS FOR PRACTICE

The research findings indicated that all OEMs should review their business models and determine the route they want to take. However, the disintermediation or direct sales model is the most commonly used business model that is being transitioned to. OEMs need to understand the different facets of their businesses and understand that one business model is not the only solution. They can operate multiple business models. Macro and micro factors must be considered when assessing a business model at any organisation.

OEMs see the opportunities that exist with the introduction of technology; however, they tend to avoid looking at its risks. This would be an area where OEMs should consider focusing some of their attention to create plans that would mitigate these risks.

The automotive landscape is changing, and one would be naïve to not adapt to the changing landscape. However, OEMs need to better understand their wants and needs, and leverage the existing technology to provide better services to their customers.

Partnerships with technology companies should definitely be something that OEMs should consider to leverage their expertise as a manufacturer and the expertise of the technology company. New technology is revolutionising the

industry, and OEMs can exploit this opportunity. OEMs should consider the findings and recommendations that are housed in this research as the industry is going through the most significant disruption since its inception.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

The following section suggests areas for future research considerations.

Only OEMs in South Africa were considered for this research; hence, for future research, other OEMs in the global marketplace that export to South Africa should be included. Furthermore, it would also be interesting to see the difference between the luxury manufacturer and mass-market manufacturer in terms of the changes they are undergoing. This study considered the automotive market as a whole and did not make any differentiation.

A suggestion for future research would also be looking at the broader automotive market, which includes the suppliers and component manufacturers, as this research only looked at OEMs with operations in South Africa.

This research looked at the risks of not adopting technology; however, it came out strongly in this research that the opportunities of technology should be explored.

The research did not address the risks of business model transition. Areas such as profit dilution, customer attrition and business disruption should be considered for future research.

This research took on a qualitative approach. For future research, a quantitative approach could be considered instead. Further to the research approach, an alternative to thematic analysis, such as grounded theory, should be considered.

The research sample should also be considered for future research, where the broader automotive community could be included in the research. In this research, only C-Suite and upper management were considered.

The aspect of leadership and ethical leadership should be looked at concerning the current change that OEMs are undergoing. However, this topic was not considered for the purposes of this research report.

The research considered how technology influenced the business models however, a possibility for future research is to delve into why technology impacts the business operations, specifically considering the customer value propositions, revenue and profit models and resource deployment.

The partnerships between automotive OEMs and big tech companies was briefly explored in this research. A future research consideration could be looking at this partnership thoroughly and exploring the commercial aspects related to such a partnership.

Lastly, this study was conducted in 2021. It should be conducted in the future in the form of a longitudinal study to determine how the industry actually changed and if specific topics had been achieved as planned.

5.6 CONCLUSION

The discussion in this chapter shows that technology directly impacts the automotive business model and that there are many evolving aspects in the automotive industry. There is already a shift in the industry, although it is gradual. As a result, OEMs need to adapt their traditional operating manner to remain sustainable in the future.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter describes the conclusion based on the research objectives introduced in Chapter One. In addition, recommendations are made to assist the automotive industry. This study aimed to explore the future of traditional automotive OEMs and identify how technological changes are transforming their business operations.

6.2 CONCLUSIONS REGARDING RESEARCH OBJECTIVE 1

To understand the influence of technology on the automotive business model.

Technology is the enabling factor that allows for a new business to be conducted in the automotive environment. The influx of technology available in the marketplace opens OEMs up to many opportunities and risks. With technology readily available, it also means that the barriers to entry to the automotive industry are removed. It allows for additional competitors and start-ups to enter the automotive arena. However, with new technology also comes the requirement for new regulations and standards, which can be seen through the introduction of the POPI Act and carbon emission regulations.

The research found that technology impacts the automotive business model and enables numerous opportunities for OEMs; however, the risks should be not overlooked.

6.3 CONCLUSIONS REGARDING RESEARCH OBJECTIVE 2

To identify different business model options for the future automotive manufacturing OEMs

This research set out to understand what the current business model in the industry is and understand the evolution of this model. It is clear that OEMs are transitioning to a direct sales model or a disintermediation business model. The research identified eight different business model types that OEMs can use to remain relevant in the future, as the industry is moving away from product centricity to customer centricity. OEMs need to adapt or accept the risk of becoming obsolete in the evolving industry landscape.

6.4 RECOMMENDATIONS

The recommendations for the automotive industry from the research conducted are highlighted below:

OEMs need to conduct an in-depth analysis of the influence of technology and how it impacts their own business models and their competitors. Once they understand this, they will be better positioned to make informed decisions.

A new and broader competitor analysis should be conducted as other manufacturers are not the only competitors to OEMs. This theme emerged heavily in the research conducted, as shown in Chapters Four and Five.

To influence the adoption of new technology such as electric vehicles, OEMs should collaborate with each other to invest in the required infrastructure to support customers who want to adopt this technology. The research showed that partnerships are one of the main ways forward for survival as the OEM can bring their core expertise, and a technology partner can bring their core expertise. The solution will be beneficial to both parties and their customers. It will also allow for diversification of services to happen quicker.

OEMs' value propositions and unique selling points must be reconsidered and everything should be centred on the customer. The value propositions and unique selling points are critical to any business as they speak to its offers. Many OEMs have not considered these topics in a long time, and it needs to be reconsidered as the business changes, as it also needs to be validated that it

remains true. This could be made into a customer experience campaign to inform and align customers.

Another strong theme that emerged from the research was the need for OEMs to mobilise solutions to upskill and re-train their current staff to handle the new technology that is coming in. This could be done at an OEM level for their direct staff, but also needs to be filtered down into the education system so that future generations are better equipped to handle the new technology that will eventually take over the automotive landscape.

The research found that digital ecosystems should be created so the customer can have a seamless integration throughout their lifestyle. This will allow a customer-centric approach and provide added value to the digital age consumer.

6.5 CONCLUSION

The automotive industry is on the cusp of the most significant disruption it has seen since its 140 legacy. As the world evolves, so are customers and their demands. Technology made everything accessible at our fingertips, which directly impacts the customer's experience with any brand. All brands must have a digital footprint, and OEMs must adapt or run the risk of becoming obsolete. Various business model options have been highlighted in this study, and OEMs

should consider these options and new alternatives for the future. The dawn of electric vehicles and autonomous driving is upon us, and OEMs need to facilitate that change in South Africa.

APPENDIX A: PERMISSION LETTER



Adobe Acrobat
Document

APPENDIX B: INFORMATION SHEET



Adobe Acrobat
Document

APPENDIX C: CONSENT FORM



Adobe Acrobat
Document

APPENDIX D: ETHICS CLEARANCE CERTIFICATE



Adobe Acrobat Document

REFERENCE LIST

Accenture. (2019). Direct. A new way for OEMs and dealers to thrive in times of disruption. https://www.accenture.com/_acnmedia/pdf-108/accenture-study-the-future-of-automotive-sales.pdf

Acciarini, C., Borelli, F., Capo, F., Cappa, F. & Sarrocco, C. (2021). *Can digitalisation favour the emergence of innovative and sustainable business models? A qualitative exploration in the automotive sector.* https://www.emerald.com/insight/1755-425X.htm

Anney, V.N. (2014). *Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria*. https://www.semanticscholar.org/paper/Ensuring-the-Quality-of-the-Findings-of-Qualitative-Anney/7428c4909feee722a717527d4a835320cf18a106

Ansara, D. & Davids, M. (2018). Motor industry skills of the future. https://www.merseta.org.za/wp-content/uploads/2021/05/merSETA-Motor-Industry-Skills-of-the-Future-Research-Report.pdf

Armstrong, B. (2019a). *Business* strategy for a digital world. Internal Publication.

Armstrong, B. (2019b). *Digital transformation and change management*. Internal Publication.

Armstrong, B. & Lee, G.J. (2021). *Digital business*. Silk Route Press.

Athanasopoulou, A., De Reuver, M., Nikou, S. & Bouwman, H. (2019). What technology-enabled services impact business models in the automotive industry? An exploratory study. *Futures, 109*(2019), 73-83. https://www.sciencedirect.com/science/article/abs/pii/S0016328718302544

Autocar. (2020). *Successful BMW pilot takes control of sales process from dealers.* https://www.autocar.co.uk/car-news/industry/successful-bmw-pilot-takes-control-sales-process-dealers

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120. https://www.ftms.edu.my/images/Document/MOD001074%20-%20Strategic%20Management%20Analysis/WK6_RR_MOD001074_Barney_1991.pdf

Bernhart, W., Zhang, J. & Wagenleitner, J. (2010). EV/PHEV-changing revenue and profil pools in the automotive value chain require new business models. https://www.mdpi.com/2032-6653/4/1/104

Bilbeisi, K.M. & Kesse, Moulare. (2017). Tesla*: A successful entrepreneurship strategy*. https://www.researchgate.net/publication/ 316628561_Tesla_A_Successful_Entrepreneurship_Strategy

Bizcommunity. (2020). *Banks and beer top the 2020 BrandZ™ Most Valuable South African brands*.

https://www.bizcommunity.africa/Tag/BrandZ%20Top%20100%20Most%20Valuable%20Global%20Brands

Bohnsack, R., Kurtz, H. & Hanelt, A. (2021). Re-examining path dependence in the digital age: The evolution of connected car business models. https://www.sciencedirect.com/science/article/pii/S0048733321001281

Boston Consulting Group. (2021). Business model innovation. https://www.bcg.com/capabilities/innovation-strategy-delivery/business-model-innovation

Brandtner, P. & Fredenthaler-Mayrhofer, D. (2020). *Business model innovation in the automotive industry- socio-cultural trends in Generation Y & Z*. https://www.researchgate.net/publication/342303180__Business_Model_Innovation_in_the_Automotive_Industry_-Socio-cultural_Trends_in_Generation_Y_Z

Bruijl, G. (2018). The relevance of Porter's five forces in today's innovative and changing business environment. https://www.researchgate.net/publication/326026986_The_Relevance_of_Porter's_Five_Forces_in_Today's_Innovative_and_Changing_Business_Environment

BusinessTech. (2022). *Car tax changes proposed for South Africa*. Car tax changes proposed for South Africa (businesstech.co.za)

BusinessTech. (2021a). *South African car subscription service FlexClub scores R75 million funding*. https://businesstech.co.za/news/motoring/475460/south-african-car-subscription-service-flexclub-scores-r75-million-funding/

BusinessTech. (2021b). *New car service guidelines take effect next week – What every driver in South Africa should know*. https://businesstech.co.za/news/motoring/500981/new-car-service-guidelines-take-effect-next-week-what-every-driver-in-south-africa-should-know/

Cavalcante, A. S. (2013). Understanding the impact of technology on firms' business models. *European Journal of Innovation Management, 16*(3), 85-300. https://doi.org/10.1108/EJIM-10-2011-0085

CEO Magazine. (2020). *Mercedes-Benz rolls out radical new way to buy luxury cars*. https://www.theceomagazine.com/executive-interviews/automotive-aviation/mercedes-benz/

Choudhary, A. (2020). The convergence of technology and manufacturing in the automotive sector. https://www.forbes.com/sites/forbestechcouncil/2020/06/19/the-convergence-of-technology-and-manufacturing-in-the-automotive-sector/?sh=4e019ce433d9

Cioca, L., Ivascu, L., Turi, A., Artene, A. and Gaman, G.A. (2019). Sustainable Development Model for the Automotive Industry. https://www.researchgate.net/publication/337300144_Sustainable_Development_Model_for_the_Automotive_Industry

Creswell, J.W. & Creswell, J.D. (2018). *Research design*. Sage Publications.

Daimler. (2019). *Joint venture closing*. https://www.daimler-mobility.com/en/company/news/joint-venture-closing/

Deloitte. (2017). *The future of the automotive value chain*. 2025 and Beyond. https://www2.deloitte.com/de/de/pages/customer-industrial-products/articles/automotiv-value-chain-2025.html

Deloitte. (2020). *The future of the automotive value chain*. https://www2.deloitte.com/content/dam/Deloitte/us/Documents/customer-business/us-auto-the-future-of-the-automotive-value-chain.pdf

Deloitte. (2019). *Rooting SA: Strengthening the local automotive industry*. https://www2.deloitte.com/za/en/pages/customer-industrial-products/articles/rooting-sa.html

Deloitte. (2019). *Future of sales and aftersales*. https://www2.deloitte.com/content/dam/Deloitte/de/Documents/consumer-industrial-products/Future-of-Automotive-Sales-and-Aftersales_Germany_Deloitte.pdf

DHL. (2021). *Automotive – a shifting landscape*. https://www.dhl.com/content/dam/dhl/global/dhl-supply-chain/documents/pdf/SC_Automotive_Trend_Report_2021_EN_.pdf

Dieguez, T., Corcetti, L., Silva, F.J.G., Campilho, R.D.S.G. & Ferreira, L.P. (2020). How can technology on the automotive industry save the future? *Procedia Manufacturing 51*(2020), 1763-1772. https://www.sciencedirect.com/science/article/pii/S2351978920321235

Digital Innovation and Transformation. (2015). *Local motors is crowd sourcing your next car*. https://digital.hbs.edu/platform-digit/submission/local-motors-is-crowd-sourcing-your-next-car/

Fisher, T. (2022). *Apple car: News, price, release date, features and rumors.* https://www.lifewire.com/apple-car-5210313

Foley and Lardner LLP. (2020). *Top legal issues facing the automotive industry in 2020.* https://www.foley.com/en/insights/publications/2020/02/top-legal-issues-facing-automotive-industry-2020

Friese, S. (2017) Translating the Process of Open/ Initial Coding in Grounded Theory. https://atlasti.com/2017/07/01/gt/

Fritschy, C. & Spinler, S. (2019). The impact of autonomous trucks on business models in the automotive and logistics industry – a Delphi-based scenario study. *Technological forecasting & social change 148.* https://www.sciencedirect.com/science/article/abs/pii/S0040162518312666

Girotra, K. & Netessine, S. (2014) Four paths to business model innovation. *Harvard Business Review.* https://hbr.org/2014/07/four-paths-to-business-model-innovation

Grieger, M. & Ludwig, A. (2018). On the move towards customer-centric business models in the automotive industry – a conceptual reference framework of shared automotive service systems. *Electronic Markets (2019).* https://www.researchgate.net/publication/329406485_On_the_move_towards_customer-centric_business_models_in_the_automotive_industry_-_a_conceptual_reference_framework_of_shared_automotive_service_systems

Hacklin, F., Björkdahl, J. and Wallin, M. W. (2017). Strategies for business model innovation: How firms reel in migrating value. *Long Range Planning, 51,* pp. 82-110. https://www.sciencedirect.com/science/article/pii/S0024630117302881

Hall, S. H. (2019). *What does digital customer experience (CX) really mean?* https://slickplan.com/blog/what-does-digital-customer-experience-cx-really-mean

Investopedia. (2019). *Original equipment manufacturer definition*. https://www.investopedia.com/terms/o/oem.asp

Jacobides, M.G., MacDuffie, J.P. & Tae, C.J. (2015). Agency, structure, and the dominance of OEMs: Change and stability in the automotive sector.

Strategic management journal. https://0-onlinelibrary-wiley-com.innopac.wits.ac.za/doi/full/10.1002/smj.2426

Johnson, M.W. (2018). *Reinvent your business model*. Harvard Business Review Press.

Johnson, M.W., Christensen, C.M. & Kagermann, H. (2008). *Reinventing your business model*. Harvard Business Review Press. https://hbr.org/2008/12/reinventing-your-business-model

Jordaan, J., Dinham, J., Fieldgate, I. & Rolland, S. (2018). Economic & socio-economic impact of SA automotive industry. *Econometix.* http://tomsa.co.za/wp-content/uploads/2018/11/SA-Automotive-Economic-Impact-Presentation.pdf

Kavadias, S., Ladas, K. and Loch, C. (2016). *The transformative business model.* https://hbr.org/2016/10/the-transformative-business-model

Ke, H., Chai, S. & Cheng, R. (2019). Selling or sharing: Business model selection problem for an automobile manufacturer with uncertain information. *Journal of Intelligent and Fuzzy Systems (36)*. https://content.iospress.com/articles/journal-of-intelligent-and-fuzzy-systems/ifs18961

Kim, W.C. & Mauborgne, R. (2015). *Blue Ocean Strategy*. Harvard Business Review Press

Klender, J. (2021). *Tesla reveals its secret to surviving semiconductor shortages.* https://www.teslarati.com/tesla-secret-surviving-semiconductor-shortage/

KPMG. (2019). When automakers shift business models. https://home.kpmg/xx/en/home/insights/2019/07/when-automakers-shift-business-models.html

KPMG. (2022). *Way ahead for global automotive industry amid semiconductor chip.* https://home.kpmg/in/en/blogs/home/posts/2022/01/semiconductor-chip-shortage-manufacturers-suppliers-mantra.html

Kukkamalla P.K., Bikfallvi, A. and Arbussa A. (2020). The new BMW: business model innovation transform an automotive leader. *Journal of Business Strategy,* 42(4). https://www.emerald.com/insight/ content/doi/10.1108/JBS-02-2020-0021/full/html

Landry, L. (2020). Business model innovation: What it is and why it's important. https://www.northeastern.edu/graduate/blog/implementing-business-model-innovation/

Linde, L., Sjodin, D., Parida, V. & Gebauer, H. (2021). Evaluation of digital business model opportunities. https://doi.org/10.1080/08956308.2021.1842664

Llopis-Albert, C., Rubio, F. & Valero, F. (2021) Impact of digital transformation on the automotive industry. *Technological Forecasting & Social Change*

162(2021). https://0-www-sciencedirect-com.innopac.wits.ac.za/science/article/pii/S0040162520311690?via%3Dihub

Lovells, H. (2019). Automotive in South Africa. https://www.lexology.com/library/detail.aspx?g=084b4c41-5e13-4873-859d-2b532f9a7969

Mcewan, P. (2020). *Car ownership, the mobility revolution & the future of automotive OEMs.* https://news.vaimo.com/car-ownership-mobility-revolution-automotive-oems

McKinney, P. (2015). *5 innovation blind spots that Nokia and Kodak overlooked.* https://killerinnovations.com/5-innovation-blind-spots-that-killed-nokia-and-kodak-s11-ep9/

McKinsey & Company. (2009). *Enduring ideas: The three horizons of growth.* https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-three-horizons-of-growth

McKinsey & Company. (2017). *Technology, jobs, and the future of work*. https://www.mckinsey.com/featured-insights/employment-and-growth/technology-jobs-and-the-future-of-work

McKinsey & Company. (2020). *How Covid-19 has pushed companies over the technology tipping point and transformed business forever*. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever

McKinsey & Company. (2021). *From no mobility to future mobility: Where COVID-19 has accelerated change: Compendium 2020/2021*. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/from-no-mobility-to-future-mobility-where-covid-19-has-accelerated-change

Mercedes-Benz Group AG. (2022). *Mercedes-Benz operating system*. https://group.mercedes-benz.com/careers/about-us/mercedes-benz-operating-system/#:~:text=With%20the%20transition%20to%20%22Digital,the%20Mercedes%2DBenz%20Operating%20System.

Miller, S. (2018). *The future of the automotive industry: Why adaptivity is key to thriving*. https://www.leolearning.com/blog/learning-strategy/future-of-the-automotive-industry/

Naamsa. (2020). *Economic impact of Covid-19 on the South African automotive sector, May 2020*. https://www.naamsa.co.za/assets/downloads/Impact_Of_Covid-19On_SA_Automotive_Sector.pdf

Nadzri, W.N.M., Musa, R., Muda, M. & Hassan, F. (2016). The antecedents of brand experience within the National Automotive Industry. https://www.sciencedirect.com/science/article/pii/S2212567116301319

OECD. (no date). Regulatory reform and innovation. https://www.oecd.org/sti/inno/2102514.pdf

Oliver Wyman. (2017). *Digital business models for automakers*. https://www.oliverwyman.com/our-expertise/insights/2017/jan/automakers-in-a-digital-world/driving-digital-business-models-in-automotive.html

Ovans, A. (2015). *What is a business model?* https://hbr.org/2015/01/what-is-a-business-model

Oxford University Press. (2021). *Automotive definition*. https://www.google.com/search?q=automotive+definition&rlz=1C1GCEB_enZA928ZA928&oq=automotive+def&aqs=chrome.1.69i57j0l9.6780j1j15&sourceid=chrome&ie=UTF-8

Oxford University Press. (2021). *Business model definition*. https://www.google.com/search?q=business+model+definition&safe=active&rlz=1C1GCEB_enZA928ZA928&ei=npPkYPzkMIbBgQaps4LgDA&oq=business+model+defi&gs_lcp=Cgdnd3Mtd2l6EAMYADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAA6BQgAEJECOgoIABCxAxCDARBDOgQIABBDOggIABCxAxCDAToFCAAQsQM6CAguEMcBEK8BOgQILhAKOgIILjoLCC4QsQMQxwEQowI6CAguELEDEIMBOgUILhCxAzoJCAAQQxBGEPkBSgQIQRgAUL_jBVimhAZg-loGaARwAngEgAGZB4gBqEaSAQwyLTYuMTQuNC4wLjGYAQCgAQGqAQdnd3Mtd2l6sAEAwAEB&sclient=gws-wiz

Piepponen, A., Ritala, P., Keränen, J. and Maijanen, P. (2022). *Digital transformation of the value proposition: A single case study in the media*

industry. Journal of Business Research. 150. 311-325. 10.1016/j.jbusres.2022.05.017.

POPIA. (2019). *Protection of Personal Information Act (POPI Act)*. https://popia.co.za/

Porter, M.E. (1979). *How Competitive Forces Shape Strategy*. https://hbr.org/1979/03/how-competitive-forces-shape-strategy

PWC. (2018a). *Five trends transforming the automotive industry*. https://www.pwc.com/gx/en/industries/automotive/publications/eascy.html

PWC. (2018b). *The future of automotive retail*. https://www.pwc.de/en/automotive-industry/the-future-of-automotive-retail.html#physical-retail

Right to Repair South Africa. (2021). *Right to repair South Africa*. https://www.right2repair.org.za/

Riihikoski, R. (2020). *Partnering with Competitors- SMEs' relationships in the Western European Deference sectors.* https://www.diva-portal.org/smash/get/diva2:1460145/FULLTEXT01.pdf

Ritter, M. & Schanz, H. (2019). The sharing economy: A comprehensive business model framework. https://www.sciencedirect.com/science/article/abs/pii/S0959652618338642

Schindler, P.S. (2019). *Business research methods*. McGraw Hill Education.

Sekaran, U. & Bougie, R. (2016). *Research methods for business*. Wiley.

Senge, P. (1994). *The fifth discipline*. Doubleday Dell Publishing Company.

Shipilov, A. (2016). Why aren't automakers embracing digital business models? *Harvard Business Review*. https://hbr.org/2016/12/why-arent-automakers-embracing-digital-business-models

Tesla. (2021). *Gigafactory*. https://www.tesla.com/gigafactory

Tongwane, M.I. & Moeletsi, M.E. (2021). Status of electric vehicles in South Africa and their carbon mitigation potential. *Scientific African 14.* https://reader.elsevier.com/reader/sd/pii/S2468227621003033?token=F773551A2A24522C3B90ACE5324C0A186365AF46006F4ACC18B9AB2E0B8B2A553EBD0C64F22F878A1EB7AA60785A2731&originRegion=eu-west-1&originCreation=20220220185732

Wang, L., Jaring, P. & Wallin, A. (2009). *Developing a conceptual framework for business model innovation in the context of open innovation*. https://www.researchgate.net/publication/224599060_Developing_a_conceptual_framework_for_business_model_innovation_in_the_context_of_open_innovation

Wells, P. Wang, X. Wang, L. Liu, H. & Orsato, R. (2020). *More friends than Foes? The impact of automobiity-as-a-service on the incumbent automotive industry*. https://www.sciencedirect.com/science/article/pii/S0040162518318213

Wirtz, B.W. & Daiser, P. (2017). Business model innovation: An integrative conceptual framework. *Journal of Business Models, 5*(1). http://journalofbusinessmodels.com/media/1182/vol5-no-1-pp-14-34.pdf

Zipcar. (2021). *About us*. https://www.zipcar.com/about

Zwilling, M. (2014). *Win-Win: Strategically Partner with your top competitors.* https://www.entrepreneur.com/article/234522