FACTORS AFFECTING THE ACCEPTANCE OF DIGITALIZATION IN THE AUTOMOBILE AFTERMARKET INDUSTRY

by

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ABSTRACT

Recent trends in the automobile aftermarket industry such as, changes in the expectations of customers and generation of value; appearance of next-generation vehicles; and changes in competitive influence; indicate growing awareness of technology advancements and their implications in the business continuity and competitiveness in the automobile aftermarket. In this regard, there is a need for empirical scrutiny of the factors that impact acceptance of digitalization in this industry. This study pursued this scrutiny in the specific context of the aftermarket organisations related to off-highway vehicles (OHVs) using the Technology-Organization-Environment (TOE) framework for technology adoption as the underlying model to inform the study. The findings and recommendations resulting from the study can prospectively help organisations in the automobile aftermarket industry plan and prepare for technology adoption. Principally, the study provides insights for organisational stakeholders who have to develop an organisational strategy for digitalization adoption in their firms. The key facets to be considered in such a strategy include the complexity of digitalization and the technical competence of the firm, from a technological perspective; readiness (financial, technological, and organizational), from an organisational perspective; and the involvement/support of government and stakeholder pressure (from industry, competition, and suppliers), from the environmental perspective.

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CHAPTER I

INTRODUCTION

1.1 Background of the study

The automotive aftermarket industry, in general, broadly pertains to aspects ranging from aftersales care maintenance to the final phases of the lifecycle of an automobile. The industry's coverage encompasses auto components fitted after the automobile has exited the manufacturing unit and services. The industry comprises vehicle components, equipment, replacement tires, repair (service and collision), accessories, navigation and entertainment systems, and telematics, offered after the original sale of the automobile. Participants in the industry therefore include firms concerned with the manufacturing, distribution, retailing, installation, and remanufacturing of all automobile components and accessories (Fortune Business Insights, 2021; Hsieh and Zhang, 2022).

The size of the global automotive aftermarket industry in 2020 was USD 392.35 billion. The market witnessed an extraordinary negative impact due to the COVID-19 pandemic resulting in a decrease in growth of 3.1% in 2020. Nevertheless, the market is anticipated to grow at a CAGR of 3.8% from USD 407.51 billion to about USD 527.70 - 529.88 billion in the period 2021-2028 due to the anticipated return of the industry's demand and growth to pre-pandemic levels. Other facets influencing the industry are the increasing average vehicle age, the number of operative vehicles, and economic crises such as, the one caused by the pandemic (Fortune Business Insights, 2021; Global Industry Analysts, 2022; Hsieh and Zhang, 2022).

Factors affecting the acceptance of digitalization in the Automobile Aftermarket industry.

Technological advancements in the past decades have resulted in the digitalization of the automobile industry and hence also of automobile repair and sale of components in the automotive aftermarket industry (Fortune Business Insights, 2021; Krzywdzinski, 2021). In both developed and developing markets, digital channels (e.g., social media) have been influencing an increase in customer research and processes of purchase. Customers gain speedy access to component-related information such as, price, type, and manufacturer, through online sales channels. Moreover, they can obtain insights regarding the quality/value of after sales service. Consequently, there is an increased interest in online participation from suppliers, distributors, original equipment manufacturers (OEMs), and workshop chains, with some prominent players taking the lead in this regard (Fortune Business Insights, 2021).

At present, it seems to be an appropriate time to explore the factors that influence the acceptance of different aspects of digitalization by firms in the automotive aftermarket industry. My experience with development and sales of IT Products for different aspects of aftermarket activity such as, service life cycle, maintenance and repair contracts (MARC), re-manufacturing (REMAN), and spare parts management, of off-highway automotives and machinery lead me to consider investigating this idea in the context of automotive component manufacturers. Off-highway use signifies usage of a vehicle in an "off-road environment". Some off-highway vehicles (OHVs) can be driven on the road, while others are utilised primarily away from public roads and lands (The Welding Institute, 2022).

Factors affecting the acceptance of digitalization in the Automobile Aftermarket industry.

1.1.1 Trends in the automotive aftermarket

McKinsey & Company (Heid *et al.*, 2018) highlight ten specific trends that are anticipated to disrupt the automotive aftermarket (Figure 1.1). These trends are associated with three principal developments in the industry:

1. Changes in the expectations of customers and generation of value;
2. Appearance of next-generation vehicles; and
3. Changes in competitive influence.

These trends, nevertheless, could vary in their significance and expression based on region, segment of market, and players (Heid *et al.*, 2018).

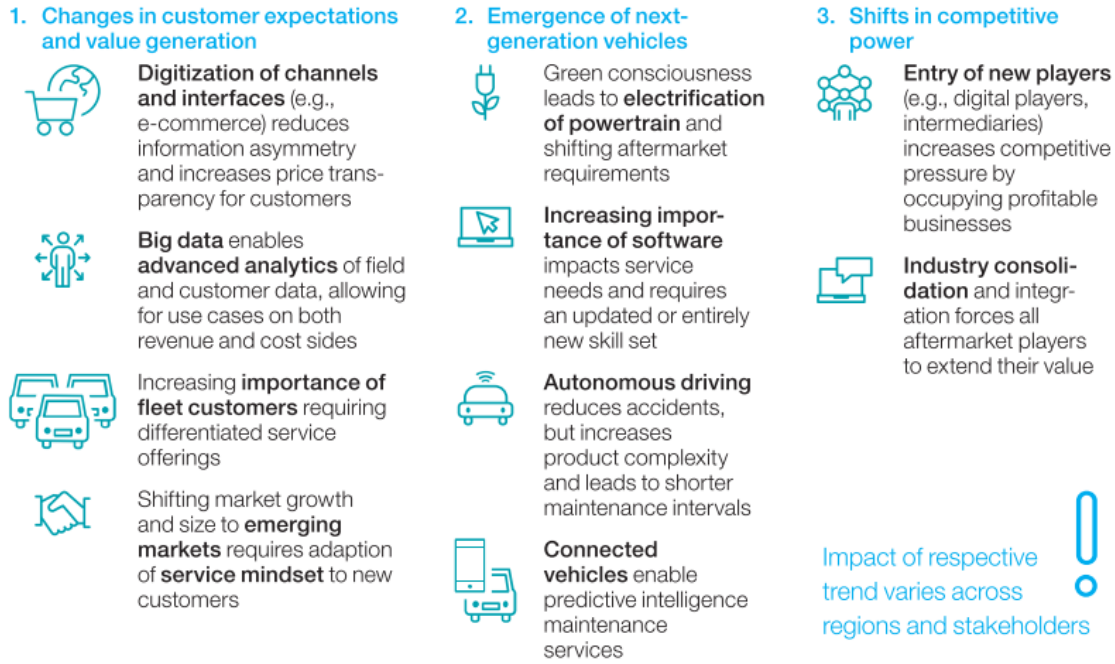

Figure 1.1 Automotive Aftermarket - Top 10 disruptive trends (Heid *et al.*, 2018, p. 17)

The first four trends are associated with the first development. The first trend is related to digitization as informed, Internet-empowered customers are anticipated to modify the aftermarket by using digital channels to obtain a well-defined image of cost and quality. Also, they are anticipated to use online sales options such as, B2B platforms, Amazon, etc., rather than physical channels to purchase car parts. Secondly, value is anticipated to be generated through new sources such as, Big Data and analytics. In other words, through the provision of deeper insights and new use cases. Furthermore, Big Data can facilitate analysis of data related to cars and customers, permitting predictive maintenance and enhanced handling of logistics related to components. The third trend of shared mobility could signify the need for professionally managed fleets with explicit implications to the aftermarket such as, vehicles with higher utilisation requiring lower downtime, and increasing centralisation of service management. A fourth trend relates to the emergence of evolving markets and a fresh outlook for service and could result in tailored ("needs-based") offerings and differentiated measures to retain customers (e.g., loyalty programs) (Heid *et al.*, 2018).

The second development relates to next-generation vehicles and contributes to four trends. The first trend relates to the profit pool being shrunk by electrification. This leads to definite consequences for the automotive aftermarket such as, the need for new technical competences, eco-friendly services and components, and varied profiles for service. The second trend relates to the growing significance of software which again can lead to a need for new competences specifically related to maintenance and monitoring (e.g., remote, onboard diagnostics), and virtual repair support. The third trend relates to autonomous

driving which implies lesser accidents but modified requirements for service (e.g., shorter intervals for maintenance) and enhanced liability. The fourth trend related to this development is related to the facilitation of predictive maintenance due to connected vehicles (i.e., through sensor arrays and Internet-based services (e.g., systems for navigation)). The enhanced connectivity offers the prospect of intimate, more direct customer associations (Heid *et al.*, 2018).

The third development related to the movement of competitive influence contributes two trends. The first trend is related to the entry of new players into the market. Specifically, digital/e-commerce firms are anticipated to increase their footprint and power in the future, becoming second in market significance after OEMs (Figure 1.2). In addition, consolidation of players is anticipated to a higher degree at the trade level.

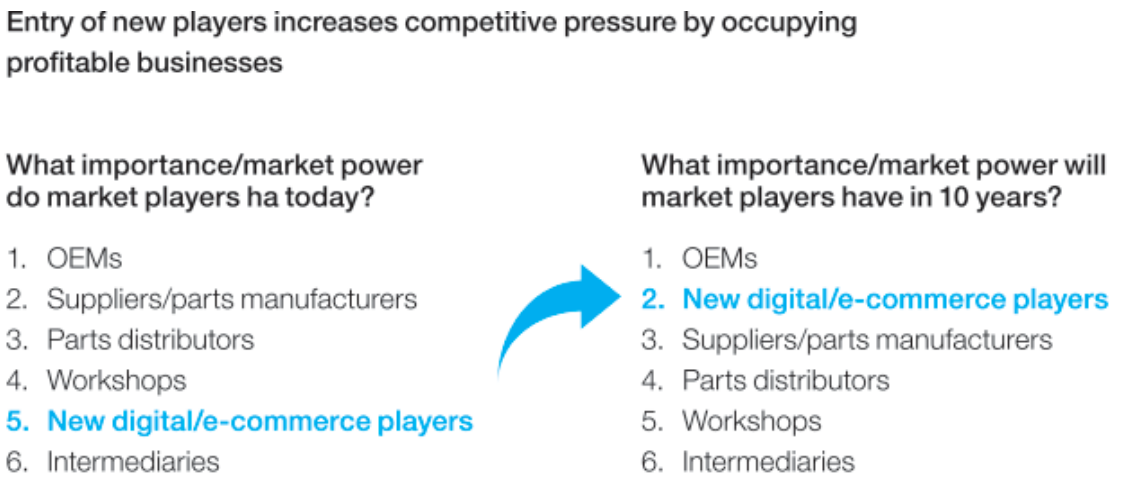

Figure 1.2 Consequences of entry of new players (Heid *et al.*, 2018, p. 26)

Overall, these trends have a compounded effect on the aftermarket ecosystem through value chain disruptions, high involvement of customers, and changes in profit pools (Figure 1.3).

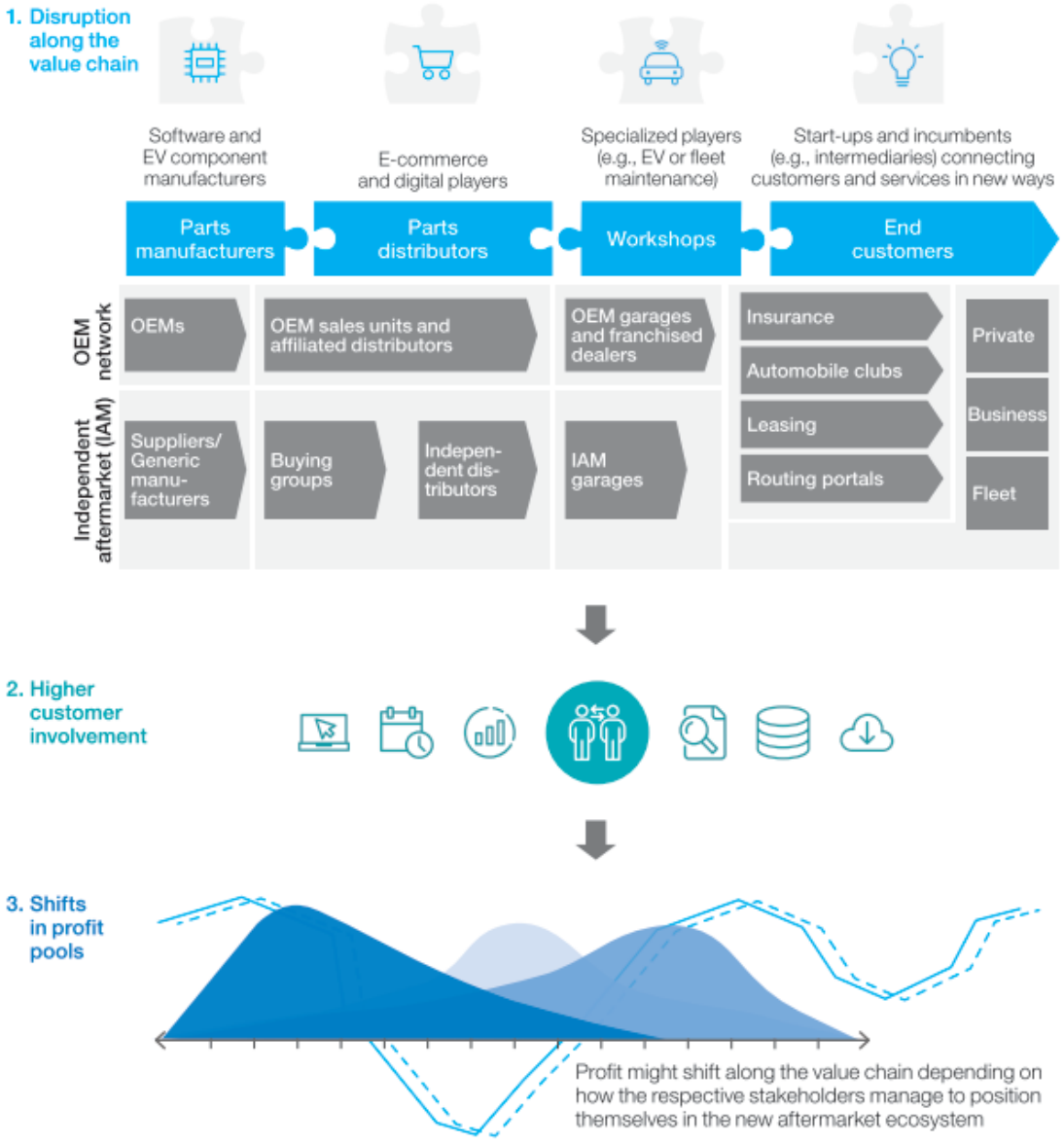

Figure 1.3 Compounded effect of the disruptive trends (Heid *et al.*, 2018, p. 30)

1.1.2 Off-Highway Vehicles (OHVs)

Off-highway use signifies usage of a vehicle in an "off-road environment". Some off-highway vehicles (OHVs) can be driven on the road, while others are utilised primarily away from public roads and lands (The Welding Institute, 2022). An OHV is defined by the U.S. Bureau of Land Management (BLM) as "'any motorized vehicle capable of—or designated for—travel on or immediately over land, water, or other natural terrain' (excluding nonamphibious registered motorboats; military, fire, emergency, or law enforcement vehicles used for emergency purposes; official vehicles used expressly by an authorized officer; and military vehicles)" (Ouren *et al.*, 2007, p. 4). Cordell *et al.*, (2005, p. 1) indicate that OHVs may encompass "1) 4-wheel drive jeeps, automobiles, or sport utility vehicles; 2) motorcycles designed for off-highway use; 3) all-terrain vehicles, better known as ATVs and other specially designed off road motor vehicles used in a wide variety of ways." The Welding Institute (2022) indicates that

> "An off highway vehicle (OHV) is one that is intended for use on steep or uneven ground and includes those used for construction or agriculture. OHVs are specifically designed for off-road use and can be enclosed or open air. Quad bikes, dirt bikes, dune buggies and other types of all-terrain vehicle (ATV) are often included as types of off highway vehicles, although their function is very different from a motor vehicle designed for industrial and farming use. An OHV is often characterised by having large tyres with deep treads, flexible suspension and, at times, caterpillar tracks. These include tractors, forklifts, cranes, combine harvesters, and bulldozers."

OHVs are used in various activities such as, recreation (Cordell *et al.*, 2005), construction, industrial applications, and agriculture (The Welding Institute, 2022). OHVs typically not used for industrial or agriculture applications include all-terrain vehicles (ATVs), recreational OHVs (ROV), and utility task vehicles (UTVs) (The Welding Institute, 2022).

Current trends in the OHV market include the manufacture of electric-powered, fully or partially, OHVs. Also, robotics and autonomy are being investigated by heavy machine OHV manufacturers (The Welding Institute, 2022). Regardless of their intent or design, OHVs have some common features. For example, they all require low ground pressure, good ground clearance, and traction to be maintained. In addition, OHVs mostly use low gearing (The Welding Institute, 2022).

1.1.3 Digitalization and Automation

According to the Oxford English Dictionary (OED), digitization signifies "the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form". In contrast, the term "digitalization" is referred to in the OED as "the adoption or increase in use of digital or computer technology by an organization, industry, country, etc." (Schumacher, Sihn and Erol, 2016, p. 3). Brennen and Kreiss (2014) used these definitions and referred to "digitization" as "the material process of converting individual analogue streams of information into digital bits" and they digitalization as "the way in which many domains of social life are restructured around digital communication and media infrastructures" (Brennen and Kreiss, 2014).

Automation, on the other hand, in the OED refers to “the use or introduction of automatic equipment in a manufacturing or other process or facility” (Schumacher, Sihn and Erol, 2016, p. 3) or “the technology by which a process or procedure is accomplished without human assistance” (Groover, 2016, p. 91).

1.1.4 Technology Adoption in the automobile aftermarket industry

Technology adoption is defined as the “acceptance or the first use of an emerged technology or product” (Khasawneh, 2008, p. 24). Considering technologies as innovation, adoption of an innovation can be considered as the process “through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision” (Rogers, 2010, p. 20).

1.1.4.1 TECHNOLOGY-ORGANISATION-ENVIRONMENT (TOE)

The TOE framework was developed by Tornatzky and Fleischer (1990) to depict aspects of the context of an enterprise that influence the adoption and application of fresh innovations. The framework comprises three contextual aspects namely, technological, organisational, and environmental. The focus of the technological context is how the adoption process is influenced by technological practices and configuration. On the other hand, the typical organizational characteristics are manifested in the organizational context. That is, characteristics of an organization such as, size, management structure, scope, human resource quality, and mechanisms for decision-making and communication, that may enable or impede adoption of innovation. Finally, the environmental context replicates

the context in which the firm is enclosed. That is, the various stakeholders surrounding the firm such as, customers, suppliers, competitors, the government, society, etc. These stakeholders control the requirement for innovation, the capacity to obtain resources for engaging in innovation, and the capacity to actually implementing it (Tornatzky and Fleischer, 1990). Arpaci *et al.* (2012) noted that the TOE framework supposes that the process of adoption in organisations is successfully launched by the appropriate match between the internal and external facets of the organisation. It may be noted that the TOE framework does not provide a specific group of aspects that impact technology adoption. Instead, it organises aspects in their individual context where the process of adoption occurs (Ven and Verelst, 2011; Ismail and Ali, 2013).

In the TOE framework, technology context signifies the technology innovation's availability and features whereas the organisation context signifies top management, the firm's resources, and size of human capital. Finally, environment context signifies certain facilitators and inhibitors relating to technology operations (Figure 1.4).

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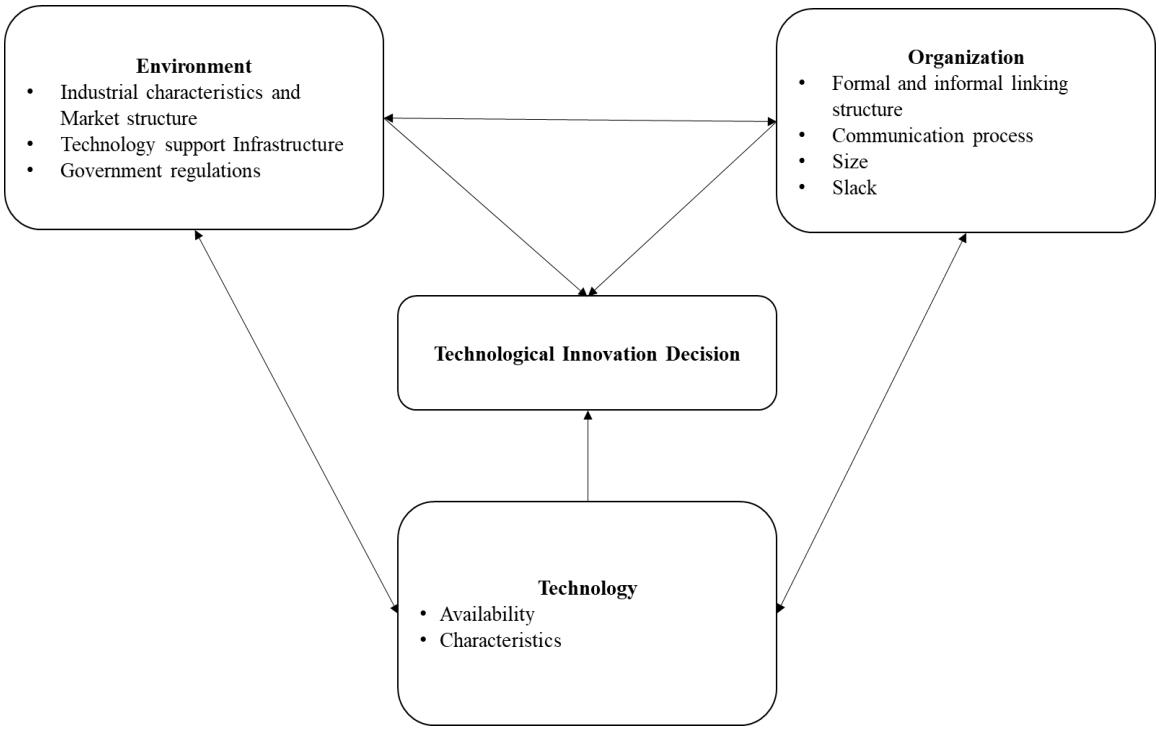

Figure 1.4 Technology–Organisation–Environment Framework

(Baker, 2012)

The chief components of the theory are summarised in Table 1.1.

Table 1.1 Technology-Organisation-Environment (TOE) Framework (Baker, 2012)

Context	Constructs
Technological	Availability Characteristics
Organizational	Formal and informal linking structures Communication processes Size Slack
Environmental	Industry characteristics and Market structure Technology support infrastructure Government regulation

This theory has been reviewed for its wide applicability across various disciplines and settings to demonstrate its theoretical robustness, empirical confirmation, and utility in examining the readiness to adopt and deploy many kinds of innovation (Aboelmaged,

2014). For example, Awa *et al.* (Awa, Ojiabo and Orokor, 2017; Awa, Ukoha and Igwe, 2017) found that aspects in the three dimensions of the TOE framework have a direct relationship with the possibilities of applying new technology. In addition, the framework has been found to place emphasis on higher-level features rather than definite actions of individuals within the firm (Thuan *et al.*, 2022).

1.1.4.2 RECENT RESEARCH IN THE AUTOMOBILE AFTERMARKET AND AUTO COMPONENT INDUSTRIES

The use of technology, specifically information technology (IT) in the automotive industry has been found to be associated with the adoption of other approaches to improve efficiency of production. For example, it has been found that the extent of usage of intra- or inter-organisational IT impacts the extent of implementation of lean production (Moyano-Fuentes *et al.*, 2012). Another study by Boboc, Gîrbacia and Butila (2020) highlights that automotive manufacturers have continuously benefited from the use of state-of-the-art technological evolutions. Moreover, Boboc *et al.* (2020) suggest that the development of the industry is connected to the adoption of novel advancements in technology such as, prototyping, virtual mock-up, progressive manufacturing techniques with complex robotic systems as the basis, and user-friendly and automated vehicle safety interfaces for enhancing the driving experience.

An earlier study regarding RFID diffusion in the industry by Schmitt *et al.* (2007) highlighted that the key aspects which contributed to the diffusion were compatibility, costs, complexity of both the technology and its implementation, performance, and support from top management. Relatedly, empirical evidence of the use of technology acceptance

models and theories to understand the facets underlying acceptance and adoption of technologies in the automotive industry could be found reported in research.

Studies have used the technological–organisational–environmental (TOE) framework to investigate technology adoption in the automotive industry. For example, a study by Xu *et al.* (2022) also used the TOE model in the context of blockchain technology adoption in the context of automobile original equipment manufacturers (OEMs) in Germany. This study found that the greatest hindrances for adoption of blockchain technology in the supply chain for these OEMs included technology immaturity, absence industry standards and of guidance, lack of cooperation between supply chain participants, and ambiguous legislations.

Aboelmaged (2014) used the TOE framework to assess readiness to utilise e-maintenance technology in the manufacturing industry. This study found that principal influences on the facets of readiness to adopt e-maintenance technology in this sector technological and organizational elements such as, technological set-up and skills, advantages and issues anticipated from e-maintenance adoption, and size of firm and ownership.

In a study based in India, Pillai *et al.* (2021) studied the adoption of AI-empowered Industrial Robots (InRos) in auto component manufacturing companies (ACMCs). Using the TOE framework, this empirical study surveyed 460 persons associated with Indian ACMCs (owners and senior managers) and found that InRos adoption intention is essentially predicted by external pressure, perceived compatibility, perceived benefits and

support from vendors. On the other hand, government support and IT infrastructure were not found to impact the intention to adopt InRos. The study also found that the relationship between the intention to adopt and prospective usage of InRos in ACMCs was negatively moderated by perceived cost issues (Pillai *et al.*, 2021).

1.2 Problem Statement

The use of technology has been acknowledged to improve the effectiveness of industries. The automotive and related aftermarket industries are no exception to this rule. Nevertheless, it is essential to understand the factors that facilitate acceptance and adoption of novel and innovative technologies as failure to adopt technology in a timely manner can obstruct the progress of an organisation in the industry. Relatedly, there are limited indications in prior research regarding the factors that impact the adoption of digitalisation and automation in these industries. In this context, a need was perceived to investigate factors in the specific context of OHVs. In this regard, the influence of technological, organisational, and environmental factors on the preparedness of OHV aftermarket firms for acceptance/adoption of digitalization will be studied. Moreover, the influence of environmental uncertainty and aspects of digitalization adoption on this relationship will also be investigated.

1.3 Research Questions

I propose to answer the following overarching research question through my study:

- What are the factors influencing the acceptance/adoption of digitalization in the automobile aftermarket industry?

Factors affecting the acceptance of digitalization in the Automobile Aftermarket industry.

The associated sub-questions are also proposed:

1. What are the different areas where digitalization can be implemented in the automobile aftermarket industry?
2. Can an existing theoretical framework such as, the TOE framework, help explain the factors that influence the acceptance of digitalization in the automobile aftermarket industry?
3. What are the technological, organizational and environmental (TOE) factors that influence acceptance/adoption of digitalization in the automobile aftermarket industry?
4. What are the aspects of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs?

1.4 Objectives of the study

The long-term objectives of the present study are to offer insights regarding the factors affecting the acceptance/adoption of digitalization in the automobile aftermarket industry. That is, to identify the different aspects, internal and external, that may contribute to organisations in this industry accepting/adopting digitalization.

The objectives of the research can be summarised as follows:

1. To investigate the different factors that affect the acceptance/adoption of digitalization in the automobile aftermarket industry using the Technology-Organization-Environment framework
2. To examine the influences of technological, organizational and environmental factors on acceptance/adoption of digitalization in the automobile aftermarket industry
3. To identify the facets of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs

1.5 Need for the study

As a response to the technological advancements in the past decades, more and more participants in the automobile industry and automotive aftermarket industry are increasingly interested in pursuing digitalization. In particular, digital channels (e.g., social media) have been influencing an increase in customer research and processes of purchase in both developed and developing markets. Online sales channels help customers gain speedy access to information related to components such as, price, type, and manufacturer. Also, insights regarding the quality/value of after sales service can be obtained. As a result, there is an increase in the interest in online participation from stakeholders in the industry. This is hence a suitable time to investigate the factors that influence the acceptance/adoption of different aspects of digitalization in the automotive aftermarket

industry. The findings and recommendations resulting from the study can prospectively help organisations in the industry plan and prepare for technology adoption.

1.6 Anticipated outcomes of the study

The findings of the study can help organisations in the automotive aftermarket industry to identify the specific internal and external facets that influence their technology acceptance/adoption. Moreover, this can be evaluated at the industry sector level. Also, the findings of the study may serve to provide insights regarding the support provided or necessitated by the external environment such as, through policy development by governments. Furthermore, the findings of the study can help technology organisations to re-examine their process of technology development and promotion of the same to take the needs of OHV aftermarket firms into consideration.

1.7 Definitions of key terms

The study will utilise the following definitions of important keywords:

Off-highway vehicle (OHV): "'any motorized vehicle capable of—or designated for—travel on or immediately over land, water, or other natural terrain' (excluding nonamphibious registered motorboats; military, fire, emergency, or law enforcement vehicles used for emergency purposes; official vehicles used expressly by an authorized officer; and military vehicles)" (Ouren *et al.*, 2007, p. 4).

Aftermarket: "the market for parts and accessories used in the repair or enhancement of a product (such as an automobile)" (Merriam-Webster, 2022).

Digital: a "host of powerful, accessible, and potentially game-changing technologies like social, mobile, cloud, analytics, internet of things, cognitive computing, and biometrics" and "the transformation that companies must undergo to take advantage of the opportunities these technologies create" (Ross, 2017).

Digitization: "the action or process of digitizing; the conversion of analogue data (esp. in later use images, video, and text) into digital form" (OED cited by Schumacher, Sihn and Erol, 2016, p. 3).

Digitalization: "the changes that the digital technology causes or influences in all aspects of human life" (Stolterman and Fors, 2004, p. 689) and "ability to turn existing products or services into digital variants, and thus offer advantages over tangible product" (Gassmann, Frankenberger and Csik, 2020, p. 6).

Digital transformation: "changes in ways of working, roles, and business offering caused by adoption of digital technologies in an organization, or in the operation environment of the organization" (Parviainen *et al.*, 2017, p. 64).

Automation: "the use or introduction of automatic equipment in a manufacturing or other process or facility" (OED cited by Schumacher, Sihn and Erol, 2016, p. 3).

Technology adoption: "acceptance or the first use of an emerged technology or product" (Khasawneh, 2008, p. 24).

Environmental uncertainty: "denotes the rate and unpredictability of environmental changes" (Lutfi, 2017, p. 16)

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1.8 Chapterisation

The present thesis is organised into five chapters. The first chapter, **Chapter 1 (Introduction),** provides the background for the study and introduced trends in the automotive aftermarket, off-highway vehicles, digitalisation and automation, and technology adoption in the automobile aftermarket industry. Moreover, it described the problem statement, define the research question and objectives of the study, and highlighted the need and anticipated outcomes of the study.

The second chapter, **Chapter 2 (Review of Literature)** offers a review of previous research related to the theme of the current study such as, the automobile aftermarket, digitalisation and automation, and technology adoption. Theories of technology adoption will also be explored together with empirical research related to technology adoption in automobile aftermarket and automobile component industries.

In the third chapter, **Chapter 3 (Methodology)**, the methodology adopted to achieve the objectives of the study will be described. The chapter will describe the research approach chosen for the study along with the research design, instruments and processes adopted for this study. Methods for collection and analysis of data, and sampling techniques will also be described. The findings of the study will be presented in the fourth chapter, **Chapter 4 (Findings and Interpretation) and discussed in Chapter 5 (Discussion)**. The last chapter, **Chapter 6 (Conclusion)**, will offer a summary of the study and its findings. The resulting conclusions and implications will also be highlighted together with recommendations for practice and suggestions for future research.

CHAPTER II:
REVIEW OF LITERATURE

2.1 Chapter Introduction

This chapter will discuss existing research related to the concept of the automobile aftermarket along with the notions of digitalization and automation. In addition, the concept of technology adoption will be discussed followed by a detailed examination of related theories and models. Furthermore, the chapter will review existing research related to technology adoption in the automobile aftermarket and automobile component industries. The conceptual framework for the study will be described together with the hypotheses of the study.

2.2 The Automobile Aftermarket

Two specific customer bases lead to the segmentation of the automobile market. These are original equipment manufacturers (OEM) and the aftermarket. The focus of the manufacturers and dealers comprising the OEM market is chiefly on assembly of the vehicle and marketing. In contrast, the aftermarket is named for its principal emphasis on the repair services offered after a vehicle is first sold (Autry *et al.*, 2003). The objective of the automobile aftermarket is to ensure that repair components are available readily across a broad spectrum of business and places, with service being the principal weapon of competition (Autry *et al.*, 2003).

A report by McKinsey & Company (Heid *et al.*, 2018) highlighted that the aftermarket is composed of all businesses related to postsales. The segments of this service

business include maintenance and repair on the one hand and retail and wholesale components business on the other hand. The value of these two segments is nearly the same. Other characteristics of the aftermarket include their market structure, market size, market development, and regional growth. Fundamentally, aftermarket firms are divided into two categories: the OEM network and IAM (the independent aftermarket). In each category, five stakeholder groups are represented, each of which are definite but working together. The stakeholder groups are manufacturers of parts, distributors of parts, workshops, intermediaries, and the eventual customer (Figure 2.1). The market size of the industry was about EUR 800 million 2017 with about a third of the share belonging to North America followed by Europe and China indicating the future role of the Asian market in driving growth (Heid *et al.*, 2018).

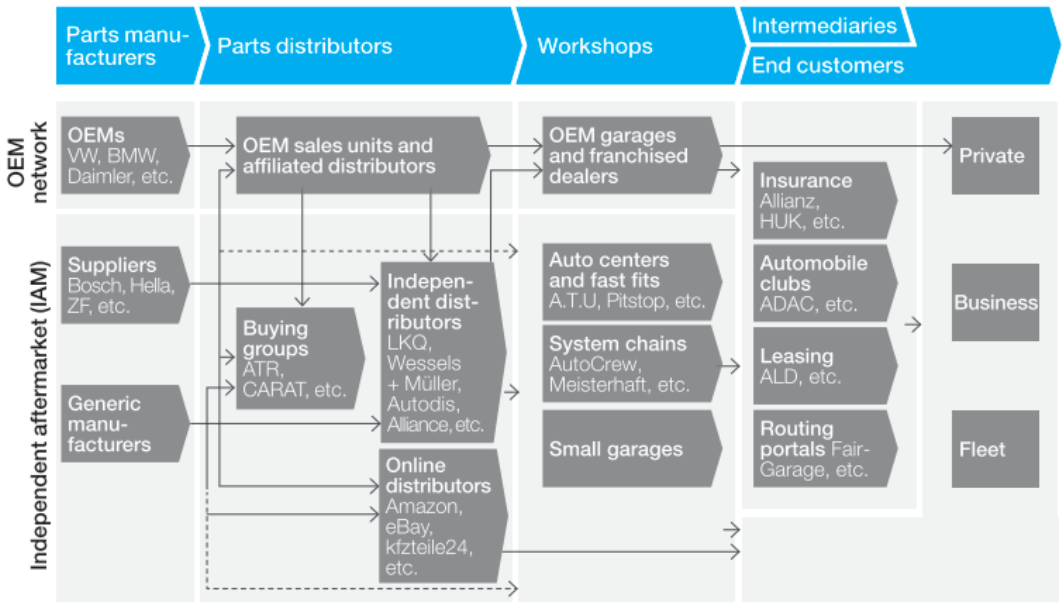

Figure 2.1 Automotive Aftermarket (Example: Germany) (Heid *et al.*, 2018, p. 13)

The growth of the overall automotive aftermarket is anticipated to reach EUR 1200 billion by 2030, an annual growth of approximately 3%. Nevertheless, some disruptive developments will robustly and conflictingly impact the market development and value distribution among players. One of the facets enhancing the yearly expenditure on maintenance for shared vehicles will be shared mobility due to the greater distance driven annually. On the other hand, electric vehicles (EVs) which possibly need lower efforts to maintain and the potential reduction on spend on crash repair by up to 90% per vehicle by 2030 for autonomous vehicles (AVs), are two aspects which can limit the growth of the market. Consequently, due to the domination of EVs and AVs, the overall per vehicle aftermarket value is anticipated to reduce (Heid *et al.*, 2018).

From a regional perspective, Asia's share in the aftermarket is anticipated to increase to more than a third of the global share due chiefly to China's steep rise in the percentage of car possession. Specifically, the service market is anticipated to demonstrate greater robustness in growth corresponding to the increase in the age of the average vehicle in China (Heid *et al.*, 2018).

2.3 Digitalization and Automation

Ross (2017) indicated that to become digital, "leaders must articulate a visionary digital value proposition. This value proposition must reassess how digital technologies and information can enhance an organization's existing assets and capabilities to create new customer value." Relatedly, digital refers to a "host of powerful, accessible, and potentially game-changing technologies like social, mobile, cloud, analytics, internet of

things, cognitive computing, and biometrics" and "the transformation that companies must undergo to take advantage of the opportunities these technologies create." Consequently, a digital transformation entails rethinking the value proposition of a firm, not merely its functions (Ross, 2017).

Table 2.1 summarises some facets of digitization, digitalization, and automation as summarised by Schumacher, Sihn and Erol (2016).

Table 2.1 Facets of digitization, digitalization and automation (Schumacher, Sihn and Erol, 2016, pp. 3–4)

Facet	Digitization	Digitalization	Automation
Description	Describes the "conversion of continuous analogue, noisy and smoothly varying information into clear bits of 1s and 0s."	Describes the "social implications of increased computer-assistance, new media and communication platforms for economy, society and culture."	Describes the "implementation of technology, software and programs to accomplish a procedural outcome with little or no human interference."
Areas of focus/extent of analysis	Micro-level; Digital and analogue signals; signal interpretation, algorithms; signal sampling, binary states; electrical components, signal storage material	Macro-level; Digital media infrastructure; social structure; communication platforms; cultural aspects, networked society; production of knowledge and management; human-centred	Systemic view; automation of analyses/decision actions or processes; control and monitoring; program instructions; automation using electrical/mechanical/thermal and light-power; Sensor/Actuators for process control
General effects/implications	Dematerialization of information; greater extent of contact between user and information	Connection of all activities in society; enhanced decision-making participation of individuals; cooperative activity in decentralized systems; enhanced scrutinising and observation	Enabling of processes to operate without human intervention; complete or partial substitution of human effort; facilitator of integration; transparency and grasping of processes can be problematic

Overall, digitization embraces the complete technological and technical conversion of analogue signals into digital signals together with their storage and transmission. On the other hand, digitalization embraces the impacts, effects, and outcomes triggered by the accessibility of digital information (Schumacher, Sihn and Erol, 2016).

Parviainen *et al.* (2017) used earlier definitions as their basis to define digital transformation as "changes in ways of working, roles, and business offering caused by adoption of digital technologies in an organization, or in the operation environment of the organization" (Parviainen *et al.*, 2017, p. 64). This signifies that changes take place at various levels, such as the process level where new digital tools are adopted and processes are streamlined by decreasing manual actions. A second level that is changed is the organization level where new services are tendered and out-of-date practices are removed while simultaneously finding new ways to offer existing services. A third level is the business domain level where roles and value chains are modified in ecosystems. Finally, change is also seen at the society level due to change in the society structures (e.g., form of work, methods of guiding decision-making) (Parviainen *et al.*, 2017). Ulas (2019) noted that various factors expedited digital transformation in firms. These include the progress in innovation and technology, transformation of business practices due to social media, electronic commerce, etc., globalisation, industry 4.0, artificial intelligence (A), internet of things (IoT), influence of generation Z expectations, blockchain, cloud computing, smartphone usage, 3D printers, chatbots, Big Data, augmented reality (AR), shared economy, nanotechnology, digital supply chain (DSC), robotics, and advanced technologies for manufacturing.

Approaches to digitalization and automation can differ in different parts of the globe. For instance, while the industry in Germany focuses on high-tech automation and promotes the use of technological developments in the construction of the car body, together with automation of the assembly line, firms in Japan have given greater significance to controlling complexity in production. In contrast, firms in the United States seem to place lower emphasis on investment in manufacturing technology (Krzywdzinski, 2021). In this context, automation signifies technology that can undertake specific tasks without the intervention of humans (Nof, 2009) whereas digitalization signifies the setting up of networks among machines and the usage of software systems and digital databases for controlling, monitoring, and improving work processes (Hirsch-kreinsen and Hompel, 2017; Cirillo *et al.*, 2021). However, Liang (2021) highlighted that aftermarket divisions such as, car dealerships, service stations, repair shops, etc., are frequently excluded from the early phase of product development. Moreover, requirements of customers and technical parameters are also not completely taken into account in automotive service.

2.4 Technology Acceptance and Adoption

Rogers (2010) conceptualised the decision-making process to adopt an innovation as progressing through five steps namely, *knowledge*, *persuasion*, *decision*, *implementation*, and *confirmation*. A person tries to find information at different phases in the process to reduce ambiguity about the anticipate outcomes of the innovation. The decision phase results either in *adoption*, which is the decision to fully utilise an innovation as the best available strategy, or in *rejection*, which is the decision against adopting the innovation. The *knowledge* phase entails obtaining information about the innovation and

contact with the innovation. The *persuasion* phase involves the creation of positive beliefs and attitudes concerning the innovation, as a response to the knowledge obtained in the prior phase. The *decision* phase indicates the evolution of behavioural intentions to put the innovation into service. The *implementation* phase signifies explicit behaviour. Lastly, the *confirmation* phase involves seeking corroboration of the decision taken, and if the decision was to adopt the innovation, acknowledgment of the innovation's benefits (Walitzer *et al.*, 2015).

Innovation in information systems (IS) can be organised into three specific categories (Swanson, 1994). Swanson (1994, p. 1076) suggested that there was a "tri-core model of IS-innovation" where the three cores were an administrative core, a technical core, and a functional IS core. Relatedly, three fundamental kinds of IS innovations are suggested, each corresponding to the three cores: Type I, Type II, and Type III. Type I innovations occur within the IS function; Type II innovations occur at the level of work group or individual user; and Type III innovations occur at the level of the organisation (Swanson, 1994). Lyytinen and Rose (2003) drew on Swanson to identify three types of IT innovation. These are "(1) changes in the base technology as defined by functionality, speed, reliability, architectural principle, or other features (Base 1); (2) changes in IS development as defined by modelling and design principles or by coordination of related processes (Base 2); and (3) changes in services as defined by changes in general service features (Base 3)" (Lyytinen and Rose, 2003, p. 562). They added that subcategories in "system development innovations affect either technical (System Development 1) or administrative development activities (System Development 2)" (Lyytinen and Rose,

2003, pp. 562–563). Within the adopting organisation, subcategories in service innovations are generated by kinds of tasks and organizational boundaries (Swanson, 1994). On the basis of Swanson, Lyytinen and Rose (2003) differentiated among four service innovations types: "(1) services that support the administrative core (Service 1); (2) services that support functional processes (Service 2); (3) ser- vices that expand and support customer interfacing processes (Service 3); and (4) services that support interorganizational processes and operations (Service 4)" (Lyytinen and Rose, 2003, p. 563).

2.5 Theories of Technology Adoption

The adoption of new technologies, or the failure to do so, can dramatically change the market performance of an organisation (Woodside and Biemans, 2005). Accordingly, there has been considerable study regarding the adoption of innovative information technology (IT) within organizational and individual contexts (Oliveira and Martins, 2011). The following sub-sections examine some existing theories and models submitted to explain technology adoption. This examination is necessary to identify the prospective factors that may affect the adoption of digitalisation by organisations in the automobile aftermarket sector.

The first group of theories and models described in the section are associated with technology adoption by individuals. The second group deals with models and theories associated with the adoption of technologies by organisations.

2.5.1 Theory of Reasoned Action (TRA)

The TRA, proposed by Fishbein and Ajzen (1975), is a well-proven socio-psychological model that deals with the elements of deliberately calculated behaviours. Theoretically, the TRA is insightful, parsimonious, and intuitive in its capacity to describe behaviour (Bagozzi, 1982). The assumption in the TRA is that individuals are typically logical and will deliberate on the consequences of their actions before determining whether or not to undertake a certain behaviour (Ajzen and Fishbein, 1980).

In its initial form, the TRA submitted that an intention to behave in a certain manner is regarded as the most appropriate predictor of whether or not an individual actually behaves in that manner. In turn, attitudes and subjective norms predict intentions. In other words, the likelihood of a person forming intentions to engage in a certain action or behaviour increases with how favourably the behaviour is regarded by a person and the more this behaviour is perceived as being significant to their family, friends, or society (LaCaille, 2020).

As can be seen in Figure 2.5, the TRA submits that the immediate antecedent of the behaviour of an individual is behavioural intention. That is, “most behaviours of social relevance are under volitional control and are thus predictable from intention” (Ajzen and Fishbein, 1980, p. 41). Moreover, the theory suggests that since various peripheral aspects impact the steadiness of intention, two factors influence the association among intention and behaviour. The first is that the “measure of intention must correspond to the behavioural criterion in action, target, context, and time”; and “intention does not change

before the behaviour is observed" (Ajzen and Fishbein, 1980; Yousafzai, Foxall and Pallister, 2010, p. 1174). The TRA indicates that behavioural intention is the outcome of two factors: an individual aspect labelled attitude toward the behaviour under consideration, and subjective norm which is an individual's view of the associated societal pressures (Fishbein and Ajzen, 1975).

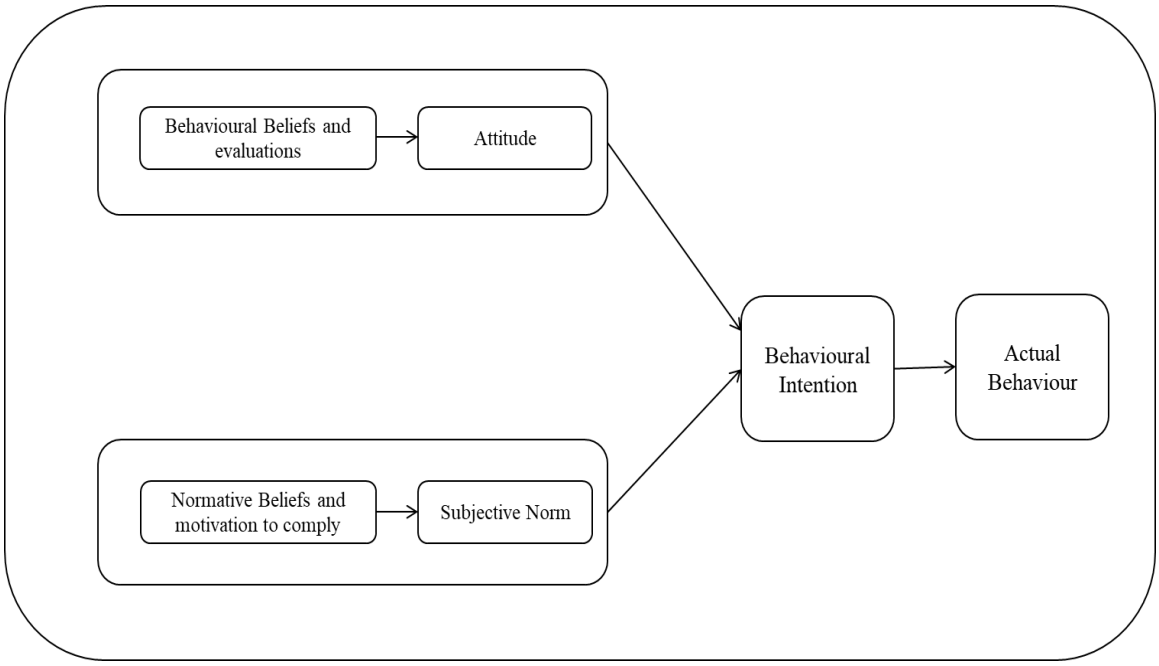

Figure 2.5 Theory of reasoned action (Fishbein and Ajzen, 1975)

The chief components of the theory are summarised in Table 2.2.

Table 2.2 Theory of reasoned action (Panagopoulos, 2010, p. 32)

Function	Constructs
Predictors	Beliefs and evaluations Normative beliefs and motivation to comply
Mediators	Attitudes toward behaviour Subjective norms Behavioural intentions
Moderators	Experience
Outcome(s)	Actual behaviour

The TRA is a broad model and consequently does not enumerate the beliefs that are active for a certain behaviour. Hence, the beliefs that are significant for participants concerning a behaviour must be first identified by a researcher using this theory. Additionally, the focus of the theory is predicting behaviour rather than behavioural outcomes. Overall, the predictability of TRA is limited to situations where there is a high correlation between intention and behaviour (Yousafzai, Foxall and Pallister, 2010).

2.5.2 Technology Acceptance Model (TAM)

The conceptual model for technology acceptance was proposed by Fred Davis in 1985 (Figure 2.2.6). He suggested that the use of a system is a response that can be predicted or explained by user motivation. This in turn is influenced directly by an external motivation comprising the characteristics and capacities of the actual system (Marangunić and Granić, 2015).

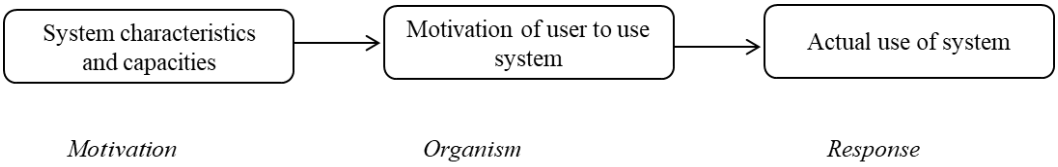

Figure 2.6 Conceptual model for technology acceptance (Chuttur, 2009, p. 1)

This conceptual model was further refined into the TAM which suggests that three factors explain the motivation of a user to use a technology namely, perceived ease of use, perceived usefulness, and attitude toward using (Figure 2.7). Davis (1985) hypothesised that a user's attitude toward a system was a significant factor in determining whether a user would actually use a system or reject it. In turn, the attitude of a user was regarded as being shaped by two significant viewpoints namely, perceived usefulness (PU) and perceived

ease of use (PEU), where PU is the subjective probability of the user that "using a specific application system will increase his or her job performance" while PEU is the extent to which "the user expects the target system to be free of efforts" (Davis, Bagozzi and Warshaw, 1989, p. 985). Further, perceived usefulness is considered to be directly influenced by perceived ease of use. Lastly, both these viewpoints were theorised to be influenced directly by the features of the system design as depicted by X1, X2, and X3 in Figure 2.7. As can be seen from the Figure 2., TAM is influenced by the TRA framework and hence hypothesises that the acceptance of technology by an individual is determined by their voluntary intention to utilise that technology. In turn, intention is determined by the attitude of the user towards the usage of that technology and their views as regards its utility (Yousafzai, Foxall and Pallister, 2010).

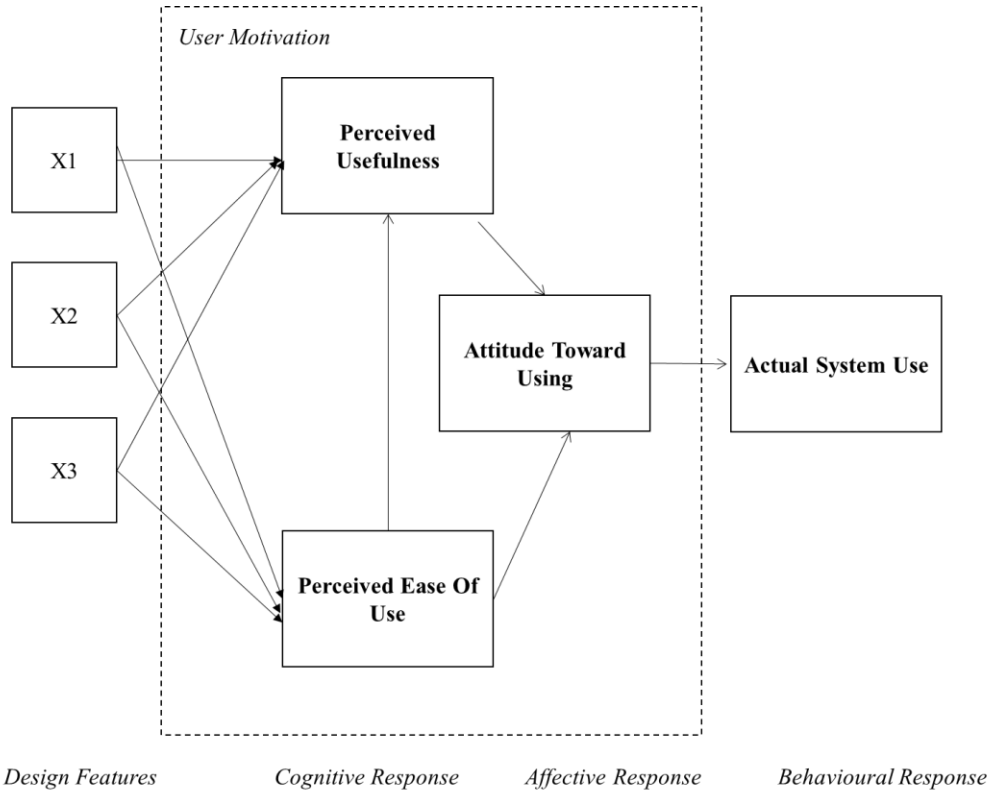

Figure 2.7 TAM (Davis, 1985)

Similar to TRA and TPB, the robustness of the relationships between belief, attitude, intention, and behaviour in calculating behaviour depends largely on the extent of measurement specificity achieved (Ajzen and Fishbein, 1980). Applying these concepts in the context of technology acceptance necessitates the measurement of beliefs as regards the usage of technology, instead of the technology itself. In other words, individuals may view a technology favourably without being positively inclined towards its usage (Yousafzai, Foxall and Pallister, 2010).

TAM has been broadly utilised in different technology contexts (Min, So and Jeong, 2019; Salloum *et al.*, 2019; Rafique *et al.*, 2020; Sagnier *et al.*, 2020). Its extensive popularity can be attached to three broad facets. Firstly, it is frugal, IT-specific, and

intended to offer a sufficient description and estimate of the acceptance of a broad variety of technologies and systems in different organisational and social settings and levels of expertise by assorted user populations. Secondly, it has a robust theoretical foundation and a well-studied and authenticated catalogue of psychometric measurement instruments, makings its usage operationally attractive. Thirdly, it has gathered robust empirical support for its explanatory power on the whole (Yousafzai, Foxall and Pallister, 2010).

The chief components of the theory are summarised in Table 2.3.

Table 2.3 Theory Acceptance Model (Panagopoulos, 2010, p. 33)

Function	Constructs
Predictors	Perceived ease of use (PEU/PEoU) Perceived usefulness (PU) External variables
Mediators	Intention to use
Moderators	Experience Gender Usage type
Outcome(s)	Usage behaviour

2.5.3 Technology Readiness Index (TRI)

The TRI was developed by Parasuraman (2000) to assess the tendency of users to adopt and utilise new technologies to accomplish work and personal goals. Four constructs pertaining to technology belief are presented by TRI namely, optimism, innovativeness, discomfort, and insecurity. These beliefs influence the level of technology readiness in an individual. A positive viewpoint that technology will enhance control, efficiency, and flexibility of prospective users is represented by the optimism construct. On the other hand, an inclination to lead in the usage of novel technology as a thought leader and pioneer is reflected by the innovativeness construct. A view of the inability of a user to regulate the

technology and a sense of being overpowered by it is indicated by the discomfort construct. Finally, a doubt and misgiving as regards the capacity of the new technology to function is reflected by the insecurity construct. In combination, the optimism and innovativeness constructs are the facilitators of technology readiness while the discomfort and insecurity constructs are inhibitors. Users who have elevated extents of optimism and innovativeness coupled with low extents of discomfort and insecurity have a higher readiness to utilise a novel technology (Parasuraman, 2000).

Researchers have used the TRI to focus on assessing users' scores on the TRI constructs and their acceptance of new technologies. For example, Jarrar, Awobamise and Sellos (2020) used TRI in their study to assess readiness of potential tourists to adopt the inDubai application. This study found that the presence of the Optimism and Innovation dimensions indicated that the greater the likelihood of a traveller seeing the perceived benefits of the technology the greater the likelihood of their using it. In contrast, the presence of the Insecurity and Discomfort dimensions indicated a lower likelihood of tourists wanting to adopt the new technology. Another study by Warden *et al.* (2022) used TRI to assess students' level of technology readiness impacted their self-efficacy in online classes. Yosser *et al.* (2020) used TRI to predict readiness of potential users to use e-health systems. Another study examined readiness of South African mobile users to utilise mobile payment apps using TRI (Wiese and Humbani, 2019). A meta-analysis by Blut and Wang (2020) of 193 independent samples mined from 163 articles found that the best conceptualisation of technology readiness was as a two-dimensional construct distinguishing between motivators (optimism, innovativeness) and inhibitors (discomfort,

insecurity). In addition, they observed that the strength of the relationship between technology readiness and technology usage was dependent on the type of technology (hedonic/utilitarian), characteristics of the firm under scrutiny (mandatory/voluntary usage, organisational support), and context of country (human development, gross domestic product). Also, Blut and Wang (2020) found that individual characteristics such as, age and education of customer, together with experience were related to technology readiness.

2.5.4 Motivational Model (MM)

The basis of the motivational model (MM) is the identification of two categories of motivated behaviour. The first category, termed *intrinsic motivation*, addresses behaviour carried out for itself, to experience the enjoyment and fulfilment characteristic of the activity. The second category, called *extrinsic motivation*, entails carrying out behaviour to accomplish some distinguishable objective, such as, being rewarded or evading punishment (Deci and Ryan, 1980, 1985). Researchers such as, Porter and Lawler (1968) had earlier submitted that an additive relationship existed between the two kinds of motivation. That is, the combination of the two motivations resulted in the greatest extent of motivation. Nevertheless, an early study by Deci (1971) which investigated the two motivations in human subjects demonstrated that directing individuals to participate in a stimulating activity to obtain a financial reward, that is, providing extrinsic motivation, resulted in a lowering of any intrinsic motivation later associated with the activity.

Vallerand (1997) described the Hierarchical Model of Intrinsic and Extrinsic Motivation that serves as a framework for categorising and identifying the fundamental

mechanisms triggering processes of intrinsic and extrinsic motivation (Figure 2.8). The model has various components. The central and primary component are the constructs of intrinsic and extrinsic motivation, and amotivation, which signifies the comparative absence of either form of motivation. The second essential component is that these constructs are present in the individual at three tiers of generality namely, global/personality, contextual/life domain, and situational/state. The third significant component are the determinants of motivation. These determinants firstly result from societal factors at each of the tiers. Consequently, situational motivation can be affected by situational factors, contextual motivation can be affected by contextual factors, and global motivation can be affected by global factors. Secondly, the assessments of competence, autonomy, and relatedness mediate the impact of societal factors on motivation at each tier. Competence indicates effective interaction with the environment; autonomy signifies experiencing freedom to choose one's options; and relatedness implies sensing attachment to significant others. Thirdly, there is a top-down influence of motivation at one tier on motivation in the next tier such as, global motivation influences contextual motivation which in turn influences situational motivation. Fourthly, there is a recursive association between motivation at the various tiers of generality. Consequently, situational motivation can recursively impact the suitable contextual motivation on a longitudinal footing. Finally, motivation results in various kinds of consequences for a person namely, affective, cognitive, and behavioural (Vallerand, 1997).

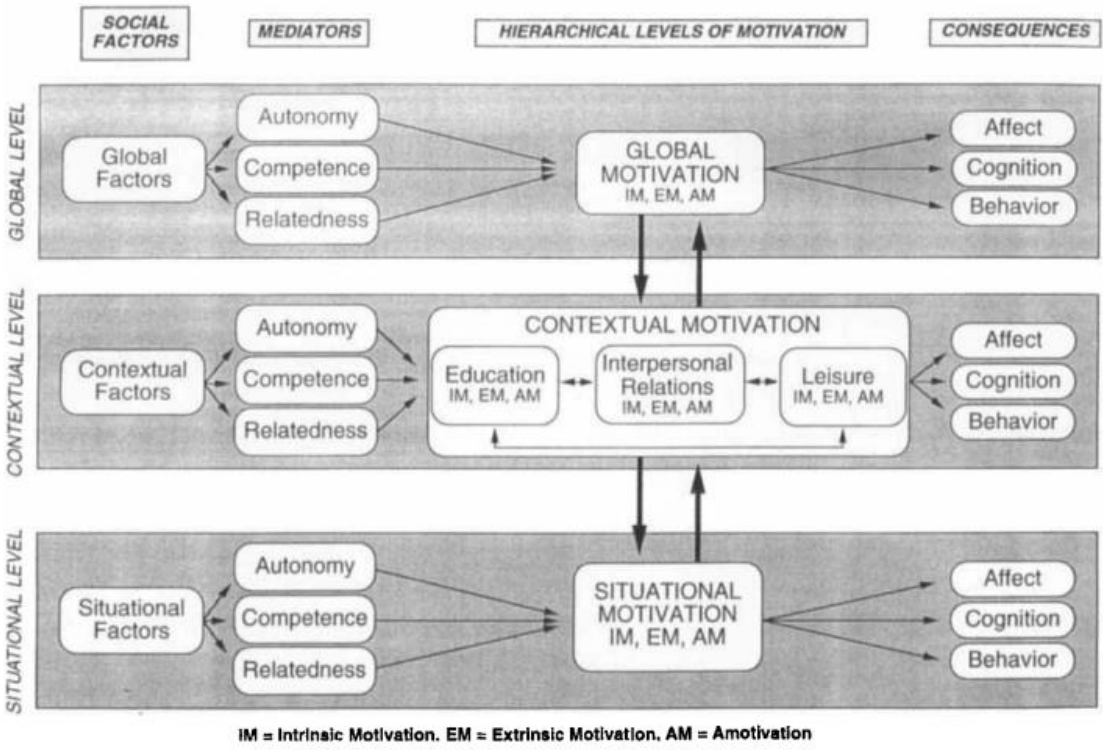

Figure 2.8 Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 1997, p. 275)

Within the domain of IS, Davis *et al.* (Davis, Bagozzi and Warshaw, 1992) applied motivational theory to gain awareness of adoption and utilisation of new technology. The suggested that the perception as regards extrinsic motivation is that users will desire to undertake an activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis, Bagozzi and Warshaw, 1992, p. 1112). On the other hand, the perception as regards intrinsic motivation is that users will desire to undertake an activity "for no apparent reinforcement other than the process of performing the37ctiveity per se" (Davis, Bagozzi and Warshaw, 1992, p. 1112).

The chief components of the theory are summarised in Table 2.4.

Table 2.4 Motivational Model of Technology Use (Panagopoulos, 2010, p. 37)

Function	Constructs
Predictors	Output quality Perceived ease of use
Mediators	Perceived usefulness Enjoyment Intentions to use
Moderators	Task importance
Outcome(s)	System usage

2.5.5 Theory of Planned Behaviour (TPB)

TPB is an extension of the TRA (Ajzen, 1991). Here, the limitations of TRA in addressing behaviours which people can inadequately control by will are tackled. TPB indicates that a third element, perceived behavioural control (PBC), affects the intention to undertake a certain behaviour and the actual behaviour together with attitude and subjective norm (Figure 2.9). As in the TRA, a central aspect in the TPB is the intention of the individual to perform a certain behaviour. Intentions are believed to denote the motivational aspects that impact a behaviour. That is, they indicate how vigorously people are ready to make an effort, of how extensive an effort they plan to use, to carry out the behaviour. In general, the more compelling the intention to involve in a behaviour, the greater likelihood of its performance. However, it must be noted, that the behaviour in question must be something that is controlled by an individual's will before a behavioural intention can realise manifestation in it (Ajzen, 1991).

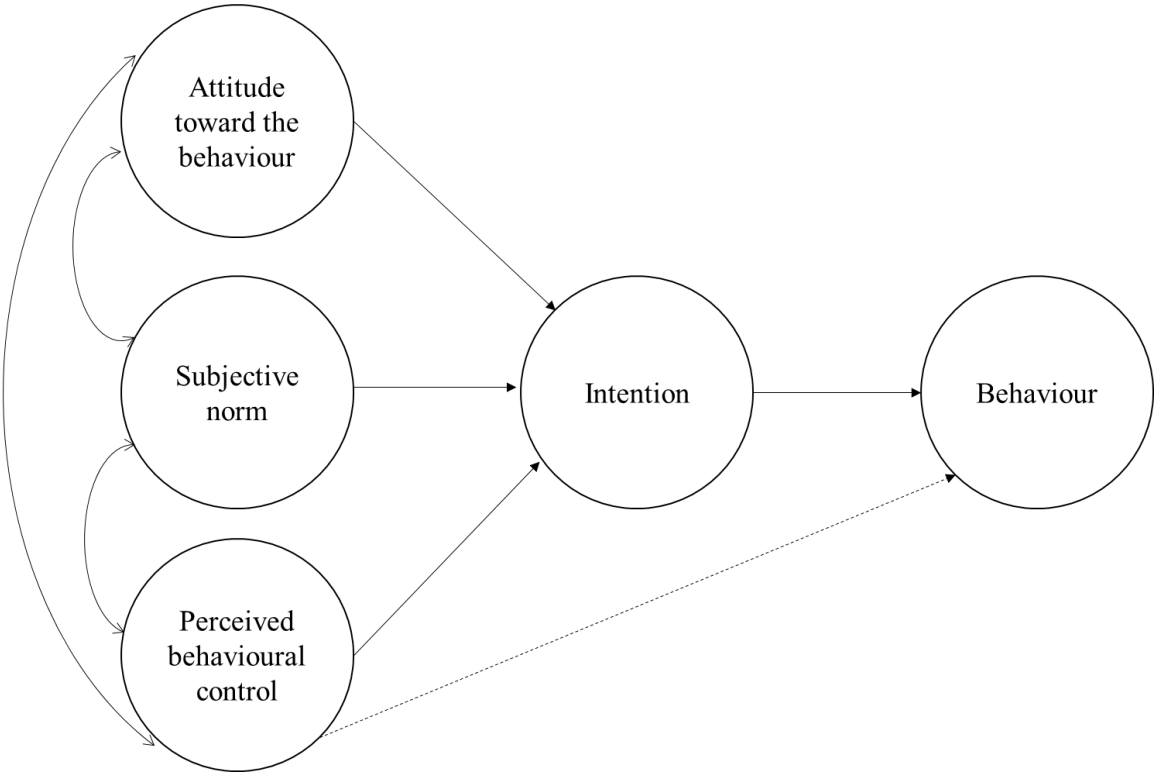

Figure 2.9 Theory of Planned Behaviour (Ajzen, 1991, p. 182)

The TRA is expanded by the TPB to consider conditions wherein individuals do not have complete control. Three types of beliefs, as per the TPB, guide human action. These are behavioural beliefs, normative beliefs, and control beliefs (Figure 2.10). Behavioural beliefs are concerned with the probable consequences of the behaviour and the assessment of these consequences. On the other hand, normative beliefs pertain to the normative outlooks of significant others and the individual's impulse to submit to these. Lastly, control beliefs signify the resources and opportunities an individual owns (or does not own) together with the challenges or barriers expected with regard to performing the concerned behaviour (Ajzen, 1991). Behavioural beliefs generate positive or negative outlooks towards the behaviour whereas normative beliefs give rise to subjective norm or

perceived societal pressure, and control beliefs result in PBC (Yousafzai, Foxall and Pallister, 2010).

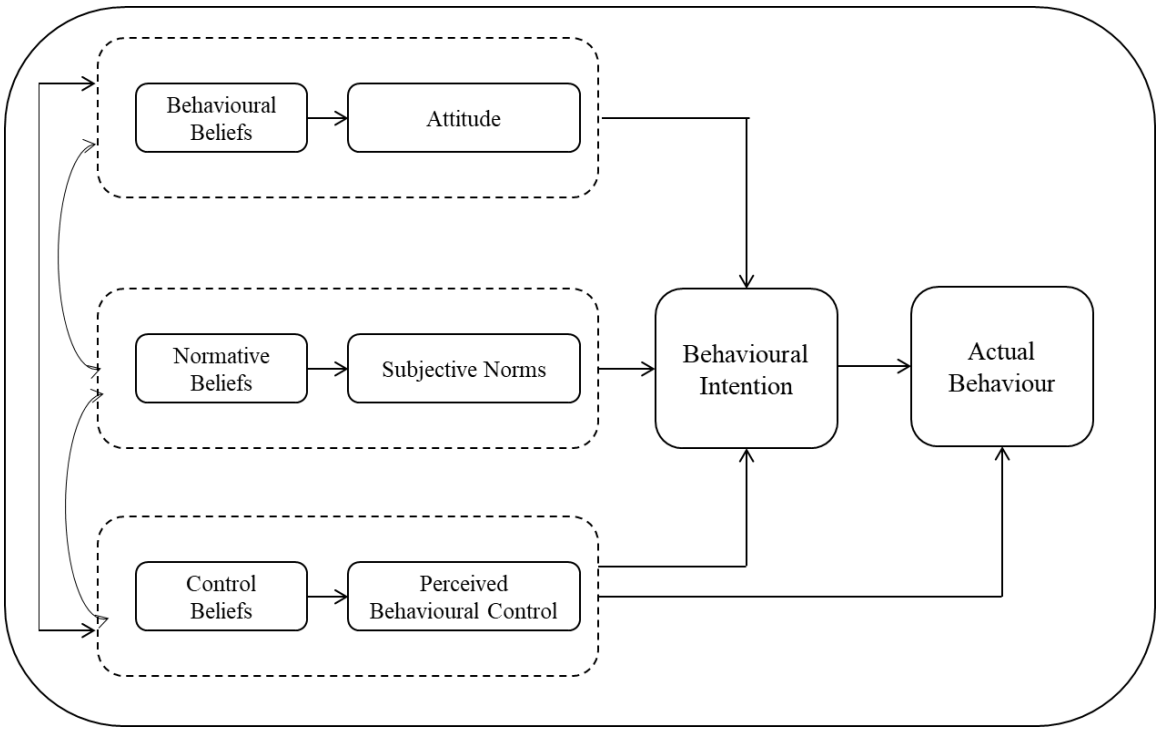

Figure 2.10 Theory of planned behaviour (Yousafzai, Foxall and Pallister, 2010, p. 1175)

The chief components of the theory are summarised in Table 2.5.

Table 2.5 Theory of planned behaviour (Panagopoulos, 2010, p. 39)

Function	Constructs
Predictors	Behavioural beliefs and outcome evaluations Normative beliefs and motivation to comply. Control beliefs and perceived facilitation
Mediators	Attitude Subjective norm Perceived behavioural control
Moderators	Gender Experience
Outcome(s)	Usage behaviour Intention to use

The TPB has its own limitations. Similar to TRA, it also supposes closeness between intention and behaviour. Hence, the accurate prediction depends on exact situational correspondence. Moreover, the theory's operationalisation is disturbed by the challenge of directly measuring PBC rather than noting control beliefs. In addition, only one new variable is introduced by the theory despite evidence that predictive power is added by other factors (Davies, Foxall and Pallister, 2002; Yousafzai, Foxall and Pallister, 2010). The theory has also received considerable criticism. For instance, for its limited emphasis on rational reasoning, omitting instinctive stimuli on behaviour and the part played by emotions beyond expected affective consequences (Conner *et al.*, 2013; Sheeran, Gollwitzer and Bargh, 2013). In addition, its static explanatory character does not facilitate understanding of the proven impacts of behaviour on cognitions and prospective behaviour (McEachan *et al.*, 2011). Nevertheless, the principal emphasis of criticism of the TPB has been its limited predictive validity as research has demonstrated that the TPB measures do not explain the margin of inconsistency in observed behaviour (Sniehotta, Presseau and Araújo-Soares, 2014).

2.5.6 Combined TAM and TPB (C-TAM-TPB)

The C-TAM-TPB model is a hybrid model which combines the predictors of the TPB and TAM models (Taylor and Todd, 1995b). While the TPB and TAM are significant models based on the TRA that facilitate explanation of decisions related to acceptance and adoption of technology, the combined model integrates the strengths of both which are harmonious and which balance the analytical and explanatory power of each other (Chen,

2013). The C-TAM-TPB uses perceived usefulness from TAM and attitude, perceived behavioural control, and subjective norm from TPB-TRA (Panagopoulos, 2010).

As per this model, behaviour (i.e., usage of the system) is impacted by behavioural intention. This, in turn, is impacted by attitude, perceived behavioural control, subjective norm, and perceived usefulness. Also, the C-TAM-TPB predicts that behaviour will be directly impacted by perceived behavioural control and indirectly impacted by intentions. Attitude is determined by perceived ease of use and perceived usefulness, whereas perceived usefulness is directly impacted by perceived ease of use (Panagopoulos, 2010).

Figure 2.11 depicts the C-TAM-TPB model.

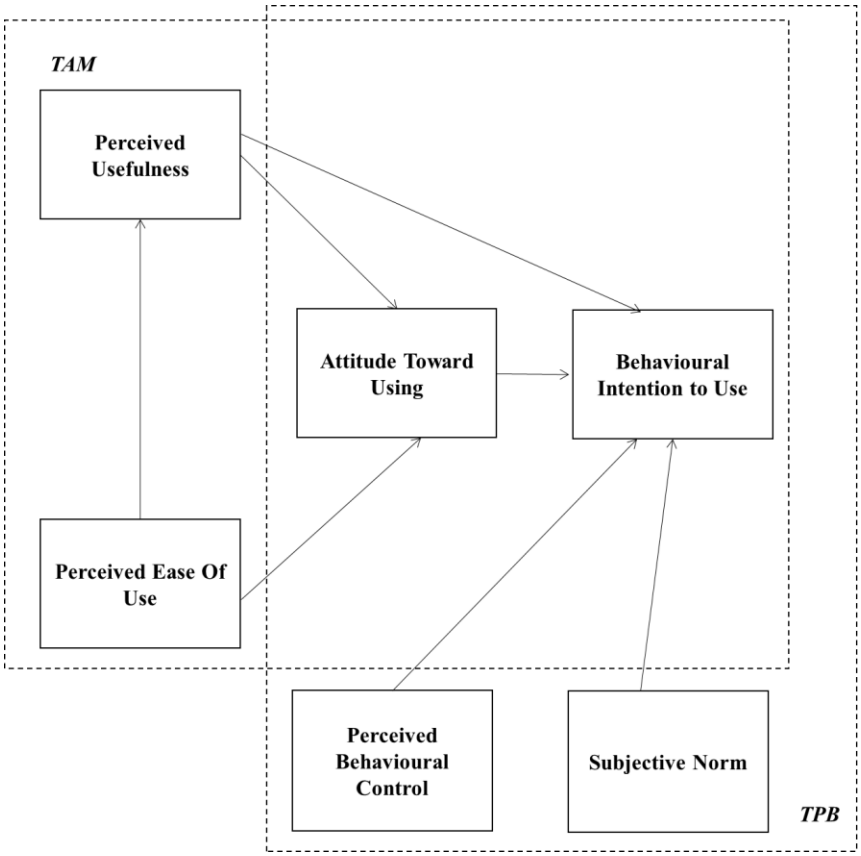

Figure 2.11 Combined TAM and TPB (C-TAM-TPB) (Ignacio *et al.*, 2019, p. 7)

Prior research on C-TAM-TPB has confirmed that perceived ease of use favourably influences perceived usefulness. Moreover, perceived ease of use and perceived usefulness favourably influence attitudes. In addition, usage behaviour is favourable influenced by attitudes, perceived behaviour control, and subjective norms (Chen, 2013). Taylor and Todd (1995a) suggested that user experience could moderate the relationship between the different constructs (Table 2.6).

Table 2.6 Combined TAM and TPB (C-TAM-TPB) (Panagopoulos, 2010, p. 40)

Function	Constructs
Predictors	Perceived usefulness Perceived ease of use
Mediators	Attitude Subjective norm Perceived behavioural control Intention to use
Moderators	Experience
Outcome(s)	Usage behaviour

2.5.7 Model of PC Utilisation (MPCU)

The MPCU is another model appropriate from the viewpoint of IS to predict individual acceptance and usage of personal computers (PC). The MPCU is directly derived from the theory of interpersonal behaviour (Thompson, Higgins and Howell, 1991). This model evaluates actual usage behaviour (i.e., of personal computers) and hence does not include behaviour intention. In addition, the model does not include habits since their association with present usage in the setting of PC usage is redundant. In particular, MPCU assesses the direct impact of affect, lasting outcomes of usage, facilitating condition, social influences, complexity, perceived consequences, and job fit on behaviour. These are consistent with the categories of behavioural intention included in the theory of

interpersonal behaviour (Panagopoulos, 2010). Of the six factors, job fit, lasting outcomes, social factors, and complexity have been found to strongly influence PC usage while facilitating condition and affect do not. Habits are excluded from MPCU as in the C-TAM-TPB though they can strongly predict of behaviour (Taherdoost, 2018). Figure 2.12 and Table 2.7 depict the MPCU model.

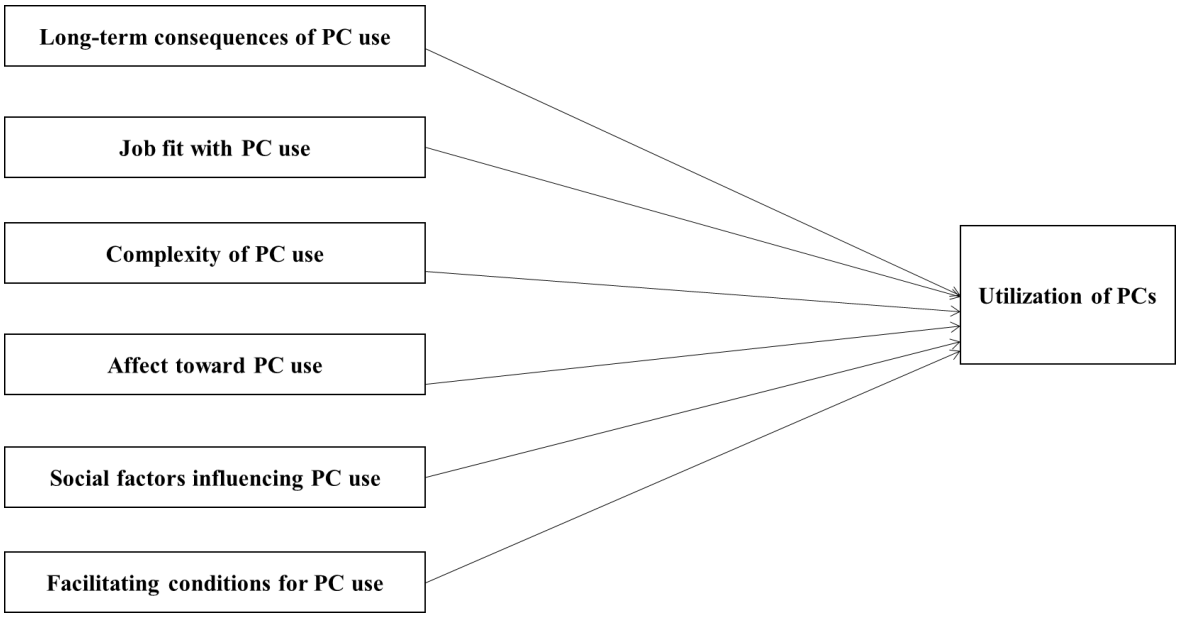

Figure 2.12 Factors influencing PC use (Thompson, Higgins and Howell, 1991, p. 131)

Table 2.7 MPCU Model (Panagopoulos, 2010, p. 41)

Function	Constructs
Predictors	Long-term consequences of using PCs Job fit with use of PCs Complexity of use of PCs Affect towards use of PCs Social factors influencing use of PCs Conditions facilitating use of PCs
Moderators	Experience
Outcome(s)	PC utilisation

2.5.8 Social Cognitive Model of Technology Usage (SCMTU)

Compeau and Higgins (1995) used Bandura's social cognitive theory (SCT) and extended it to the context of PC usage (Figure 2.13, Table 2.8). In its original form, the model utilised usage as a dependent variable (Venkatesh *et al.*, 2003), and self-efficacy, in particular, was adapted for the PC usage context (Panagopoulos, 2010). Overall, the SCMTU suggests that the prediction of computer-self-efficacy and job-related/individual outcome expectations are predicted by others' use of technology and their encouragement. Moreover, computer self-efficacy impact outcome expectations. Furthermore, emotional reactions to technology (i.e., anxiety and affect) and actual computer use are determined by self-efficacy together with outcome expectations (Panagopoulos, 2010).

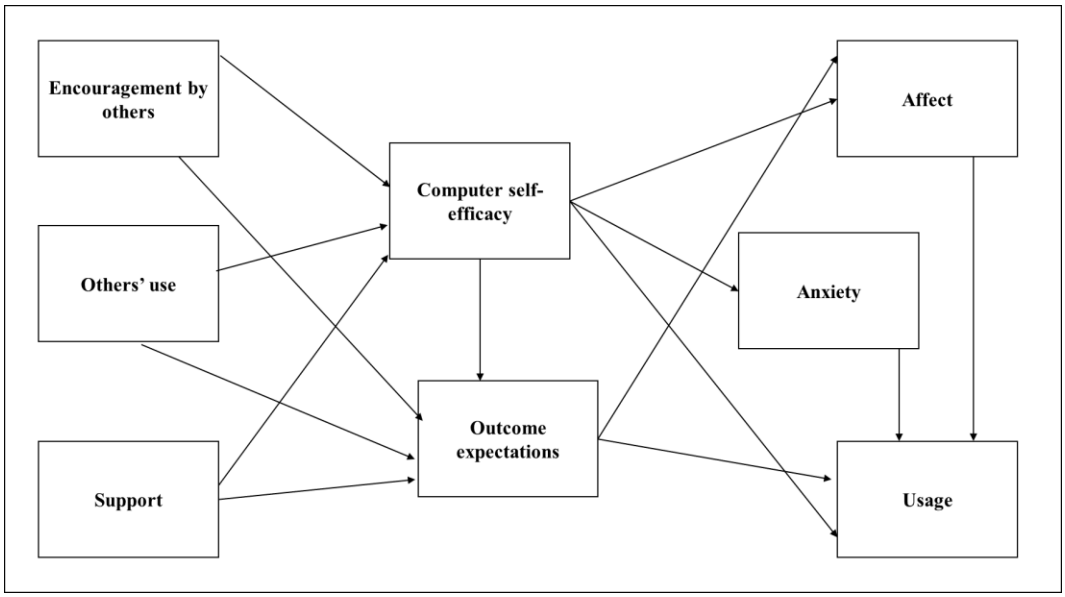

Figure 2.13 Social Cognitive Model of Technology Usage (Compeau and Higgins, 1995, p. 194)

Table 2.8 Social Cognitive Model of Technology Usage (Panagopoulos, 2010, p. 44)

Function	Constructs
Predictors	Encouragement by others Others' use Support

Function	Constructs
Mediators	Computer self-efficacy Outcome expectations (job-related / personal)
Outcome(s)	Affect Anxiety Usage

2.5.9 Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT model was derived by combining eight earlier models describing user acceptance of and motivation to use technology, namely "the Theory of Reasoned Action, the Technology Acceptance Model, the Motivational Model, the Theory of Planned Behaviour, a model combining the TAM and the Theory of Planned Behaviour, the Model of PC Utilization, Innovation Diffusion Theory, and Social Cognitive Theory" (Venkatesh *et al.*, 2003, p. 425). This combination was performed to satisfy an apparent need to obtain an integrated view of acceptance of technology by users. The developed unified model contains four aspects which regulate intention to use and actual utilisation of technology together with four major moderators. The four regulating aspects are assumed to be facets which directly influence user acceptance. That is, performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). The basis of PE is different constructs from the included theories such as, TAM's PU, and specifies the degree to which a potential user believes that he/she will acquire improvements in performance of an activity due to their utilising the system. The basis of EE, similarly, is different constructs such as, PEOU in TAM. This specifies the level of ease associated with system utilisation. The third aspect, SI, signifies the degree to which a person believes that significant others believe that he/she should utilise the new system. That is, it is comparable to subjective norm (TRA and TPB). Finally, FC is the degree to which a person believes

that present technical and administrative services support utilisation of the new technology system. Again, this construct is based on various constructs from the underlying models such as, perceived behavioural control from TPB. (Venkatesh *et al.*, 2003). The UTAUT model is depicted in Figure 2.14.

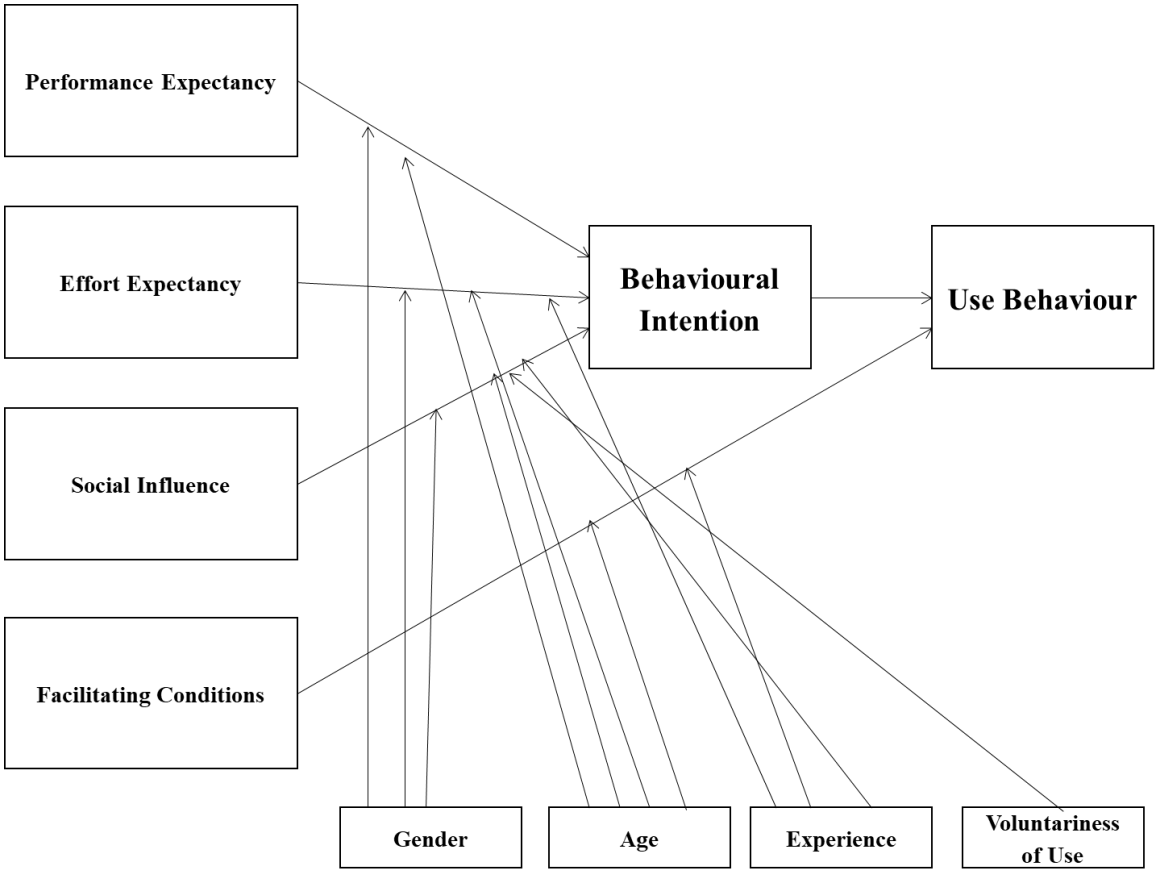

Figure 2.14 UTAUT model (Venkatesh *et al.*, 2003, p. 447)

The chief components of the theory are summarised in Table 2.9.

Table 2.9 UTAUT (Panagopoulos, 2010, p. 37)

Function	Constructs
Predictors	Performance expectancy (PE) Effort expectancy (EE) Social influence (SI) Facilitating conditions (FC)
Mediators	Behavioural intention (BI)
Moderators	Gender Age Experience Voluntariness of use
Outcome(s)	Use behaviour

2.5.10 Diffusion of Innovation/ Innovation Diffusion Theory (DOI/IDT)

The DOI (Rogers, 2010) is regarded as a foundation to ratify technology acceptance behaviour and which can be relied upon by other models of technology acceptance. The basis of the proposition for DOI is the S-shaped diffusion curve (Figure 2.15) submitted by Gabriel Tarde in 1903. Through this, the DOI successfully established definitions for "diffusion", "innovations" and the process of "communications" (Tarhini *et al.*, 2015). Diffusion is defined as the "process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system" (Rogers, 2010, p. 47). That is, the four principal components are the innovation, channels of communication, time, and the societal system. The term innovation signifies any collection of fresh ideas, notions, or applications that require to be identified and shared by individuals (Rogers, 2010).

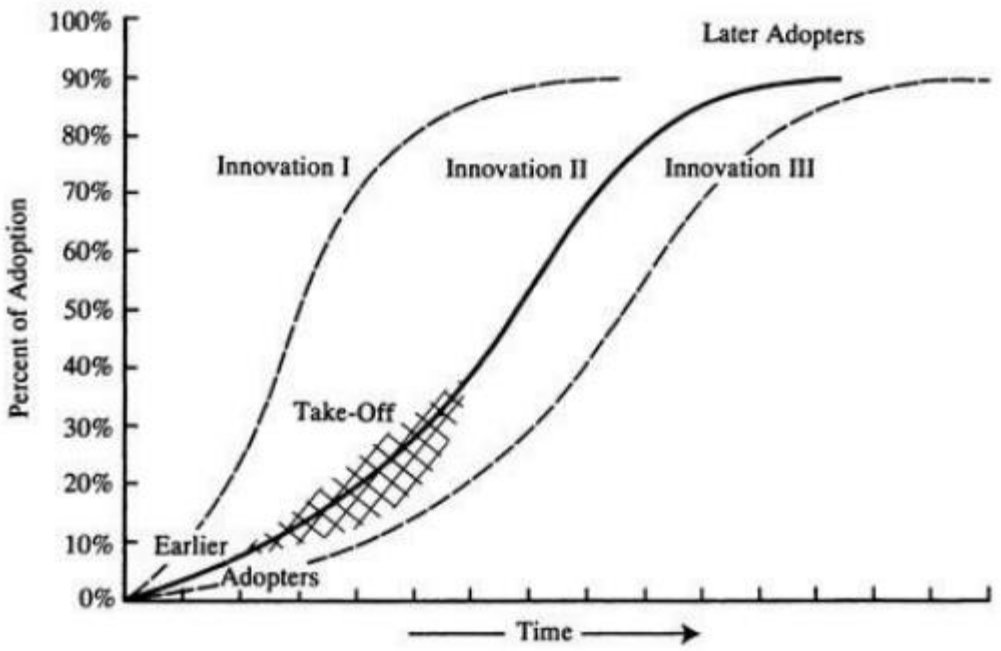

Figure 2.15 The Diffusion Process (Rogers, 2010, p. 48)

The process of innovation diffusion also depends on the characteristics of the innovation which are grouped into five categories (Rogers, 2010). As can be seen from Figure 2.16, these are Relative Advantages (RA), Compatibility (COMP), Complexity (COLX), Trialability (TRI), and Observability (OBS). RA signifies the "degree to which an innovation is perceived as being better than its precursor" (Moore and Benbasat, 1991, p. 195). The extent of RA may be assessed in terms of money, convenience, social prestige aspects, and satisfaction. That is, the innovation is perceived by an individual as beneficial. The greater an innovation's RA, the faster it is adopted (Rogers, 2010). COMP denotes "the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters" (Moore and Benbasat, 1991, p. 195). COMP is an essential aspect of the innovation adoption process since the adoption decision

can vary among group, based on their principles and social backgrounds. That is, the adoption of an idea that is not compatible with the standards and tenets of a societal system will be slower than an idea that is compatible (Rogers, 2010). COLX refers to "the degree to which an innovation is perceived as relatively difficult to understand and use" (Moore and Benbasat, 1991, p. 195). COLX cannot be overlooked since simplicity of usage and learning have considerable impact on whether or not an innovation is adopted (Tarhini *et al.*, 2015). TRI is the "degree to which an innovation may be experimented with before adoption" (Moore and Benbasat, 1991, p. 195). That is, it measures how trying out the innovation can help in making decision as regards its adoption/rejection (Rogers, 2010). Finally, OBS signifies the degree "to which the results of an innovation are observable to others (Moore and Benbasat, 1991, p. 195). That is, the easier it is for the outcomes of an innovation to be seen, the more likely that individuals will adopt it (Rogers, 2010).

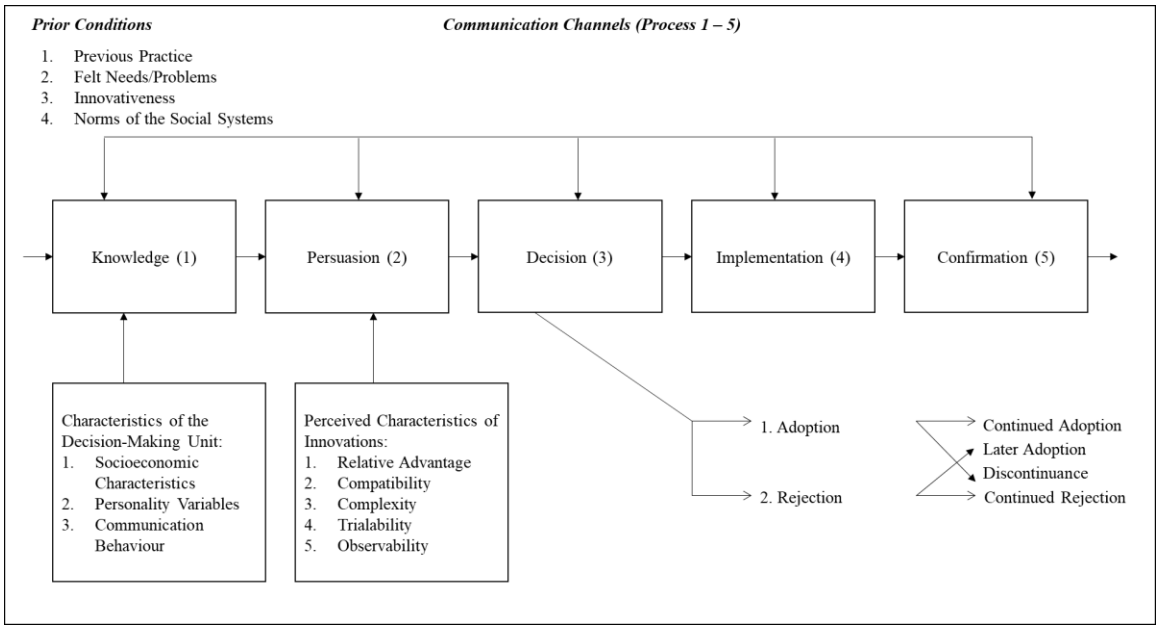

Figure 2.16 Innovation-decision process (Tarhini *et al.*, 2015)

The innovation diffusion process is greatly influenced by innovators (Figure 2.17). Innovators may be one of five types: Innovators, early adopters, early majority, late majority, and laggards (Rogers, 2010). Innovators, comprising 2.5% of the population, develop fresh products. Early adopters, the subsequent 13.5%, are among the earliest to adopt an innovation. After them come the early (34%) and late (34%) majority and finally the laggards (16%) who are the last to adopt the innovation (Dale, McEwan and Bohan, 2021).

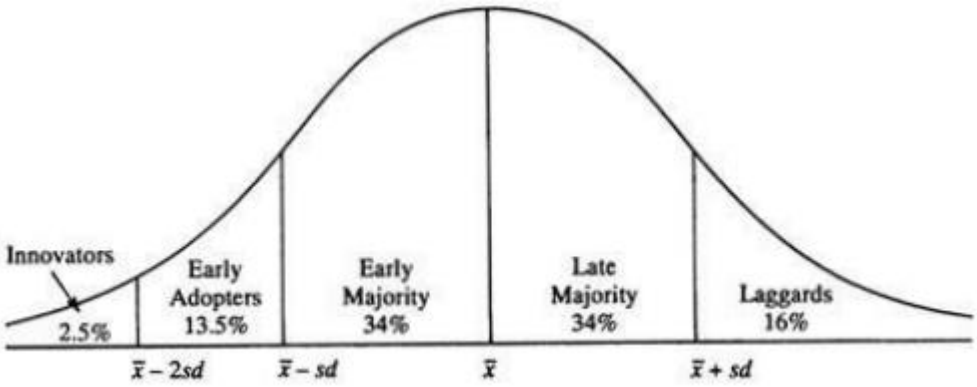

Figure 2.17 Diffusion Curve (Rogers, 2010, p. 325)

The chief components of the theory are summarised in Table 2.10.

Table 2.10 Innovation diffusion theory (Panagopoulos, 2010, p. 43)

Function	Constructs
Predictors	Relative advantage Ease of use Image Visibility Compatibility Results demonstrability Voluntariness of usage
Moderators	Experience
Outcome(s)	Innovation adoption

While the DOI has many advantages, it has some limitations which impact its applicability. For example, the justification for some of the attitudes included in its definition are not robust. That is, why certain outlooks result in the decision to adopt/reject an innovation is not known. In addition, DOI fails to connect the properties of an innovation with an appropriate anticipated outlook (Karahanna, Straub and Chervany, 1999).

2.5.11 Technology-Organisation-Environment (TOE)

The TOE framework was proposed by Tornatzky and Fleischer (1990) to explain the innovation process in an organisational context. This framework considers three characteristics of a firm that impact innovation adoption namely, the technology, organization, and environment contexts. While the technology context signifies the technology (internal and external) related to the organisation and available for adoption, the organization context signifies the informative attributes of an organization such as, its structure and size, structure of management, extent of centralization, together with its resources and communication processes as regards employees. Finally, the environment context includes elements of the market, the competitors of the firm, and the regulatory setting (Oliveira, Thomas and Espadanal, 2014).

The TOE framework thus suggests that the process of adoption of a technology innovation by a firm is influenced by the technological, organizational and environmental dimensions of its setting (Alshamaila, Papagiannidis and Li, 2013; Alharbi, Atkins and Stanier, 2016). The presence of these factors makes TOE more valuable than other models of adoption in studying adoption of technology, and technology usage and value creation

(Gangwar, Hema and Ramaswamy, 2015). Moreover, the framework is not restricted to specific industry or size of firm (Wen and Chen, 2010). Also, the TOE framework has been tested widely in various studies examining IT/IS adoption and has constant empirical support has been reported (Oliveira, Thomas and Espadanal, 2014). Additionally, the framework is widespread and hence permits scrutiny of the phenomenon of adoption and its effect on different value chain activities from a universal perspective (Gangwar, Hema and Ramaswamy, 2015).

Recent empirical investigations using the TOE framework include a study by Ullah *et al.* (2021) who used this framework in a sustainable smart city governance context to propose a multi-layered risk management framework. Another study used the TOE framework to evaluate the factors of CRM adoption and found that CRM assessment and evaluation were driven by top management support, data quality and integration, and competitive pressure (Cruz-Jesus, Pinheiro and Oliveira, 2019). In a study set in Saudi Arabia, Abed (2020) used the TOE framework to evaluate the factors influencing adoption of social commerce by small- and medium-sized enterprises (SMEs). Al-Hujran *et al.* (2018), on the other hand, used the framework to classify the challenges related to adoption of cloud computing. The framework was used in another study by Stjepić, Bach and Vukšić, (2021) to explore the risks that influence adoption of business intelligence systems (BISs) in SMEs. Malik, Chadhar and Chetty (2021) extended the TOE framework by including organizational learning capability, perceived information transparency, organizational innovativeness, perceived disintermediation, and standards uncertainty. Their study investigated the factors influencing the adoption of blockchain technology by

organisations in the Australian context. Chan and Chong (2013) used the TOE framework in combination with the innovation diffusion theory (IDT) to examine the factors that influence the mobile supply chain management (SCM) diffusion. The findings of this study indicated that the role of technological and environmental factors during the actual adoption of a technology is significant. Moreover, top management support is a significant determinant from an organisational perspective. Also, since the study was based on supply chain, interorganisational relationships (IORs) were found to play a significant role in the effectiveness of routinisation of mobile SCM. The TOE framework was also used by Lutfi (2017) together with the resource-based view (RBV) model in a study set in small and medium enterprises (SMEs) in Jordan to investigate the factors impacting adoption and usage of accounting information systems (AIS) in this context. This study additionally investigated the moderating role of environmental uncertainty (EU) and found that this did not moderate the relationship between usage and effectiveness of AIS. However, the study also found that the technological facet of compatibility; organisational facets of commitment of owner/manager and organisational readiness; and environmental facets of competitive pressure, government support, had a positive influence on AIS usage.

2.5.12 Comparison of the theories

Conventional theories of technology adoption such as, TRA (Ajzen and Fishbein, 1980), TPB (Ajzen, 1991), TAM (Davis, 1985, 1989), TRI (Parasuraman, 2000), IDT (Rogers, 2010), and UTAUT (Venkatesh *et al.*, 2003) are nearly techno-centric and hence deal with adoption at the individual level (Oliveira and Martins, 2011; Tarhini *et al.*, 2015).

On the other hand, the TOE (Tornatzky and Fleischer, 1990) places greater emphasis on factors at the organisation-level. The TRA submits that attitudinal aspects determine behaviour (Ajzen and Fishbein, 1980) and TAM submits PU and PEU as determinants of adoption (Davis, 1985, 1989). However, both these theories overlook societal and psychological factors (Venkatesh and Bala, 2008). While the IDT (Rogers, 2010) and TPB (Ajzen, 1991) attempt to be integrated models, these frameworks infrequently reinforce as many studies related to the present-day IS domain when compared to the TOE framework (Awa, Ojiabo and Orokor, 2017).

2.6 Technology Adoption in the automobile aftermarket industry

A study by Ngangi and Santoso (2019) used the Technology Acceptance Model (TAM) as the basis to study the adoption of customer relationship management (CRM) systems in the industry (Figure 2.18). This study found that the output quality, perceived ease of use, perceived usefulness, and intention to use, were key factors that influenced adoption of CRM in the automotive industry.

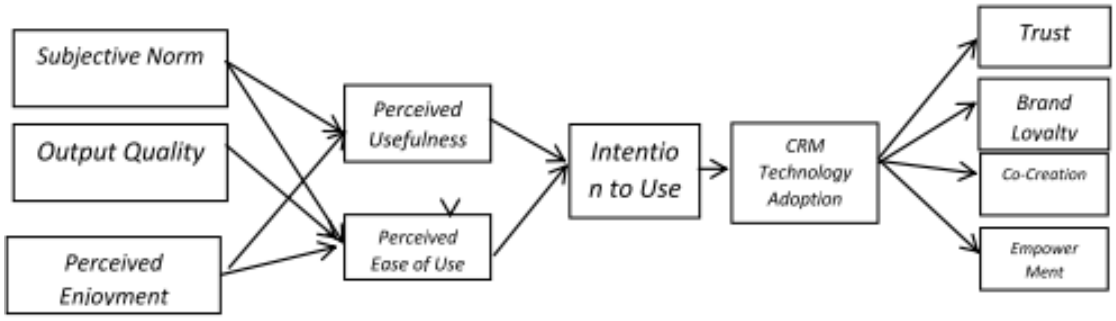

Figure 2.18 Using TAM to study CRM adoption (Ngangi and Santoso, 2019, p. 136)

Another study by Müller (2019), also used the TAM to investigate and compare technology acceptance for battery electric vehicles (BEV), autonomous vehicles (AV), and

car sharing (CS) in a multi-country context (Figure 2.19). Overall, Müller (2019) found that perceived ease of use (PEOU) had a strong positive influence on "perceived usefulness" (PU) and "attitude towards using" (ATU) as regards the different kinds of vehicles.

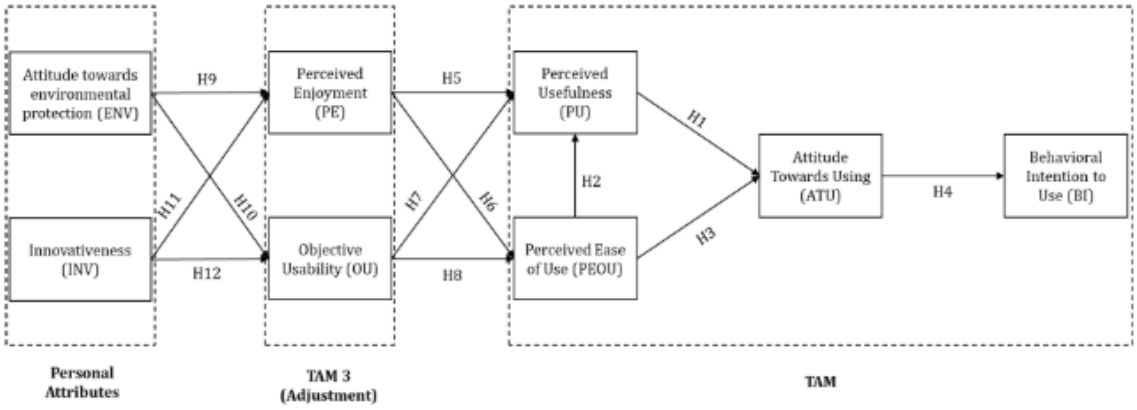

Figure 2.19 Using TAM to investigate Attitude towards using battery electric vehicles, autonomous vehicles, and car sharing (Müller, 2019, p. 3)

In another study, Osswald *et al.* (2012) extended the Unified Theory of Acceptance and Use of Technology (UTAUT) with perceived safety while driving and anxiety in the car context to propose a conceptual car technology acceptance model (CTAM) (Figure 2.20). Furthermore, these researchers highlighted that knowledge of a certain IT system could impact its adoption.

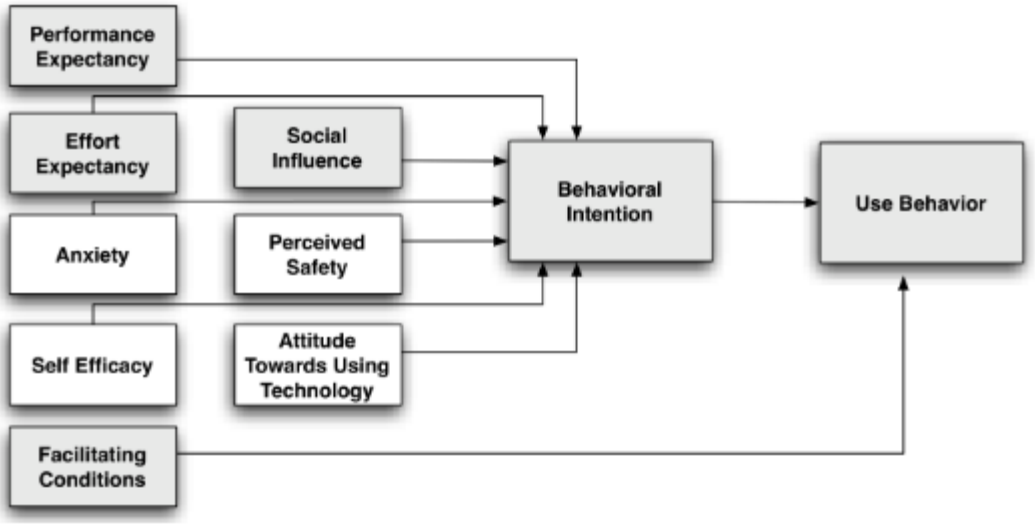

Figure 2.20 Car Technology Acceptance Model (CTAM)(Osswald *et al.*, 2012, p. 6)

Some studies have used the technological–organisational–environmental (TOE) framework to investigate technology adoption in the automotive industry. For example, a systematic review by Upadhyay *et al.* (2021) of studies related to blockchain adoption in the automotive industry found that from an organisational perspective, technology adoption is impacted by formal and informal mechanisms for contact and control within the organisation, organisational resources such as infrastructure, expertise, support for innovation or technology, knowledge skills, and top management, and organisational innovativeness. From an environmental perspective, factors impacting technology adoption included external influences such as, governmental laws and regulations. From a technological perspective, technological equipment, infrastructure, and processes were identified as factors affecting adoption. Moreover, technology-specific challenges related to their design, security and privacy, resource wastage or consumption of energy, interoperability or lack thereof, scalability, etc., were aspects that could impact technology adoption.

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Another study by Chian, Aziati and Sha'Ri (2017) used the TOE framework together with the domains of culture and human capital to obtain a comprehensive perspective of the internal and external factors favourably affecting the green manufacturing performance of the Malaysian automobile industry. The technological domain involved all tangible green technology utilised including machines and infrastructure from product development to the end-of-line of products. The organizational domain signified the role of stakeholders of the firms including customers and suppliers in achieving green objectives. The environmental domain pertained to the environmental certification, legislation and regulations, and corporate social responsibility relating to green objectives.

Park *et al.* (2022) used the TOE framework and DOI theory to identify the factors that influence the adoption intention of autonomous ships. The study found that support of top management, financial slack, and intensity of competition were significant factors impacting the intention to adopt autonomous ships. Moreover, overall awareness of autonomous ships was found to be poor among shipping companies in Korea.

Hasmet and Ferman (2020) investigated the impact of Industry 4.0 on the marketing strategies in the automobile industry in Turkey. This study used the TOE framework and found that market size was impacted by environmental factors such as, government policies and sales points.

A recent study set in Pakistan by Sadiq Jajja *et al.* (2021) used the TOE framework to explore the factors influencing the readiness of upstream value chain players as regards

the adoption of battery electric vehicles (BEVs). This study found that there a need for rigorous development of technological competencies and organisational capability, together with favourable policies, regulations, and rules to support adoption of BEVs.

2.7 Technology Adoption in the automobile component industry

Technology adoption in the automobile component industry has been studied by many researchers using different approaches. An empirical study set in India assessed the facets that enabled or inhibited adoption of advanced IT in small to medium-sized enterprises (SMEs) (Kannabiran and Dharmalingam, 2012). The enablers considered by the study were “perceived benefits”, “changes in business environment”, “IT experience of owner/CEO”, “increased information linkage with OEM/customer”, and “perceived competitive pressure”. On the other hand, the inhibitors considered were “lack of financial capacity”, “lack of in-house IT manpower”, “small-scale operation”, “lack of IT infrastructure”, and “lack of information security” (Figure 2.21).

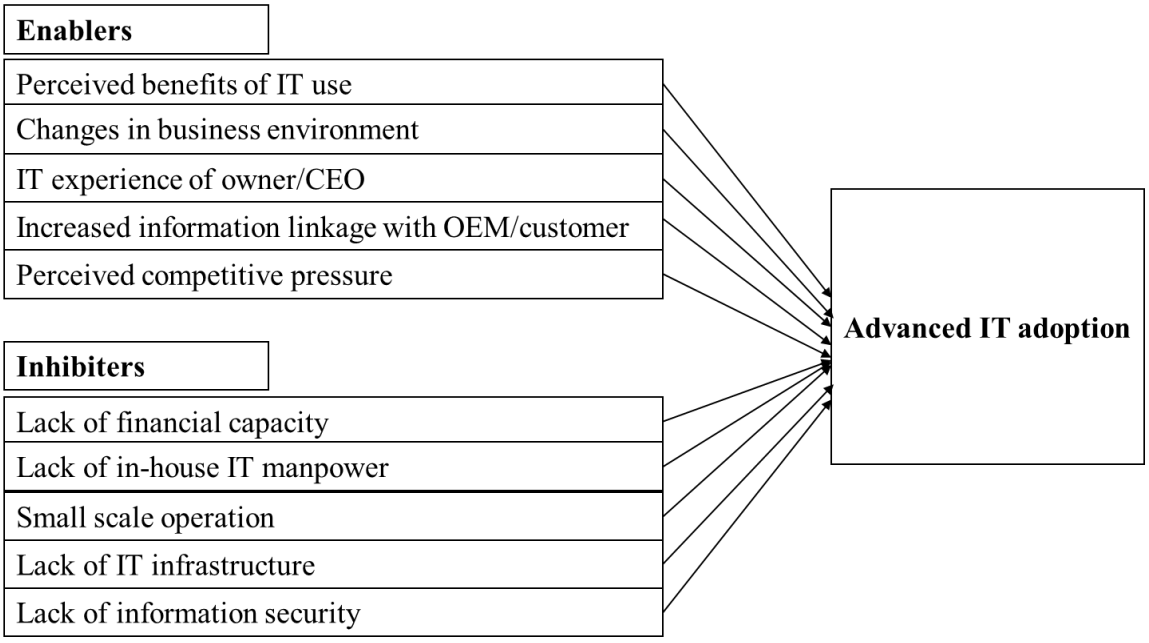

Figure 2.21 Conceptual model to study enablers and inhibitors (Kannabiran and Dharmalingam, 2012, p. 195)

From data obtained from 110 owners/ top managers of Indian SMEs, this study found that the level of adoption of advanced IT was low in auto ancillaries with only 17% of the participating SMEs reporting adoption. Additionally, this study found that enablers of advanced IT adoption included "perceived benefits" and "perceived competitive pressure" whereas "lack of financial capacity", "small scale operation and "lack of in-house IT manpower" served to inhibit the adoption. However, adoption was not influenced by enablers such as "changes in business environment", "IT experience of owner/CEO" and "increased information linkage with OEM/customer". Similarly, inhibitors such as, "lack of IT Infrastructure" and "lack of information security" did not impact adoption. The authors concluded that advanced IT adoption was limited by absence of financial means and internal IT human resources in auto ancillary SMEs. This was regardless of the

favourable external IT environment and perception of benefits (Kannabiran and Dharmalingam, 2012).

An earlier study by Parhi (2005) investigated the factors influencing technology adoption in the Indian auto component industry. Using econometric analysis based on the traditional characteristics of firms and the socio-economic environment, this study found that the structural characteristics of a firm is a significant determinant of technology adoption due to its impact on economic viability of large investments in technology. Larger firm size, human capital, and investment in R&D were all accordingly found to greatly improve adoption of new technologies.

A recent study focused on the role of inward FDIs (foreign direct investments) and other factors specific to the host-country (domestic capabilities) on the adoption of industrial robots in two chief divisions of the automotive value chain (Anzolin, Andreoni and Zanfei, 2022). This study found that host country adoption of industrial robots is not significantly influenced by FDIs in isolation. In other words, the influence of FDIs becomes significant when associated with proxies of the innovation capabilities of the host countries.

Morgan and Daniels (2001) integrated product mix and decisions to adopt technology in a technology adoption decision model. In particular, they determined that volume and product mix are significant variables in ascertaining whether new technologies are cost effective. They also included customer demand projections in the model that indicate market trends. Following this, expected experience benefits were applied to the

appropriate volumes of production to forecast the revenue impact of new technology adoption (Morgan and Daniels, 2001).

A case study of the automotive industry in Indonesia used system dynamics modelling (Figure 2.22) to investigate the policy framework that could impact the progress of Industry 4.0 technology adoption in enhancing energy efficiency in the industry. Industry 4.0 introduces five principal technologies namely, artificial intelligence, Internet of Things (IoT), enterprise wearables, advanced robotics, and additive manufacturing (Hidayatno, Rahman and Daniyasti, 2019).

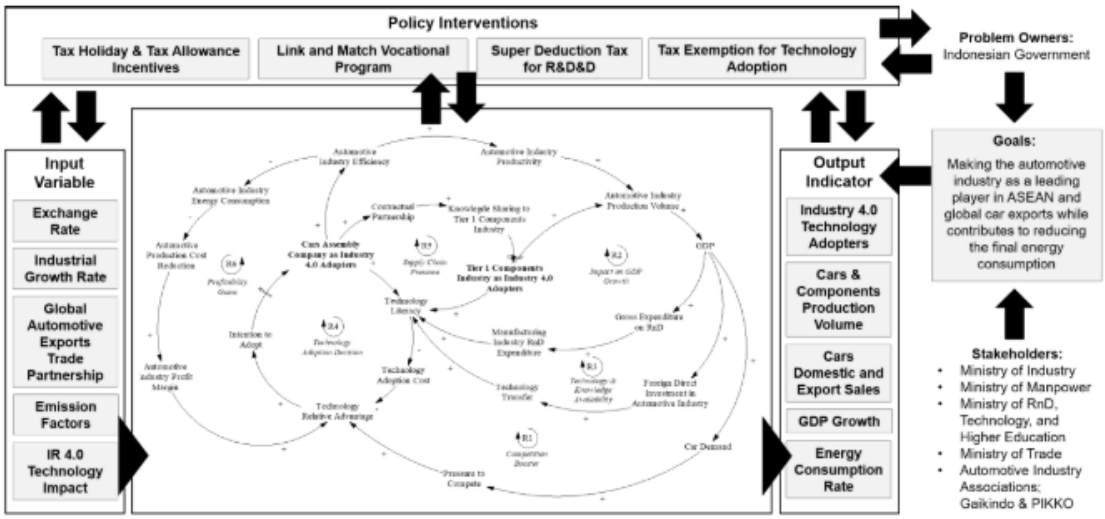

Figure 2.22 Model conceptualisation (Hidayatno, Rahman and Daniyasti, 2019, p. 337)

Bharathi, Raman, and Pramod (2013) used principal component analysis (PCA) to identify and describe the influence of Green IT factors on ERP adoption in the context of SMEs from the Indian auto-component industry. The study found the top six elements of Green IT which require to be given priority during ERP adoption decisions to be Green IT

supply chain visibility; expertise and compliance; expected Green IT outcomes; Green IT efficiency; energy and asset management; and Green IT effectiveness.

2.8 Summary of the Literature Review

The use of technology has been acknowledged to improve the effectiveness of industries. The automotive and related aftermarket industries are no exception to this rule. Nevertheless, it is essential to understand the factors that facilitate adoption of novel and innovative technologies as failure to adopt technology in a timely manner can obstruct the progress of an organisation in the industry.

This literature review discussed the automobile aftermarket and its trends along with the notion of digitalization and automation. This was followed by an introduction to the concept of technology adoption and a detailed examination of theories and models related to technology adoption. It could be seen that there were theories which focused on individual adoption of technology (e.g., TRA, TPB) and others which focused on adoption by organisations (e.g., TOE). Furthermore, this review included research related to technology adoption in the automobile aftermarket and automobile component industries.

Through the literature review we can conclude that despite the significance of the industry in the global market, there is limited empirical attention to technology adoption in the specific context of the automotive aftermarket industry. Moreover, the specific context of off-highway vehicles (OHVs) does not appear to be considered for investigation although current trends in the OHV market indicate attention to electric-powered, fully or partially, OHVs, and the usage of robotics and autonomy in heavy machine OHVs (The

Welding Institute, 2022). Nevertheless, the significant research related to the usage of technology adoption models offers an opportunity for an empirical exploration to help organisations in the OHV aftermarket business plan and prepare for technology adoption.

2.9 Conceptual Framework for the Study

Overall, the current study proposes to examine the preparedness of OHV aftermarket firms for adoption of digitalization. The scrutiny of different theories related to technology adoption suggested that the Technology-Organization-Environment (TOE) framework was a suitable theory on which to base the present study. This is not only because it addresses the setting where adoption of digitalization is to occur namely, OHV aftermarket firms, but also because it can be used to evaluate the factors that impact the adoption of digitalization. Other theories such as, TAM, TPB, and UTAUT, focus on technology adoption from the perspective of individuals. On the other hand, while the DOI theory also emphasises technology adoption by firms, it focuses more on the individual contribution to this and moreover how different societal settings can influence the adoption. As a result, the TOE framework was determined to be the most appropriate theoretical basis for the present study.

Consequently, since the chief objective of the present study is to investigate the different factors that affect the acceptance of digitalization in the OHV automobile aftermarket industry using the TOE, it was believed that generic features of digitalization could be used as technological factors. Consequently, drawing on Stjepić, Bach and Vukšić (2021) and Mckinnie (2016), the following technological factors are identified: Perceived

Benefits, Complexity of Digitization, and Technology Competence. Similarly, drawing on Leung *et al.* (2015) and Stjepić, Bach and Vukšić (2021), the following organizational factors are identified: Financial readiness, Technological readiness, Support/commitment from top management, and Organizational readiness. Finally, for the environmental perspective, the following factors were identified: Involvement/Support of government, Pressure from industry, Pressure from competition, Pressure from customers, and Pressure from suppliers. These factors were inspired by Kuan and Chau (2001), Leung *et al.* (2015), Lutfi (2020), to name a few. Other facets included in the model were the organization characteristics which will serve as control variables, and mediating and moderating variables. In general, a mediating variable accounts for the process by which two variables are associated, while a moderating variable impacts the robustness and direction of that association (Bennett, 2000). Control variables are significant instruments for offering comparative tests that can reject or accept the likelihood that extraneous factors result in the observed relationships (Spector, 2021).

Environmental uncertainty (EU) was chosen as the mediating variable for this study. This variable signifies the frequency and randomness as regards changes to the environment. In an environment that changes rapidly, top managers can experience greater extents of uncertainty and also have a higher need for information together with the competence to deal with it (Duncan, 1972; Mia and Clarke, 1999). When there is uncertainty in the environment, more information is required by business together with a greater ability to process information. Also, they need to be more agile by effectively sensing information and responding efficiently (Galbraith, 1974; Venkatraman, 1989). In

uncertain situations, the use of any information system or digitalization becomes more important since using this effectively can help organisations gain timely and factual information in an effective manner which in turn helps in better decision-making (Ham, Kim and Jeong, 2005; Ali, Rahman and Ismail, 2012). On the other hand, the moderating variable was chosen to be Aspects of Digitalization Adoption. This comprises two dimensions namely, factors expediting digitalization and areas of digitalization (Ulas, 2019). Six organisation characteristics were chosen to be the control variables namely, Age of organisation, Organisation Revenue, Number of employees, and Headquarters' location (Country).

Consequently, the following variables are included in the conceptual model for this study (Figure 2.23):

- Dependent or Consequence Variable: Preparedness of OHV aftermarket firms for adoption of digitalization
- Independent or Predictor variables: Technological Factors, Organisational Factors, Environmental Factors
- Mediating variable: Environment uncertainty (EU)
- Moderating variable: Aspects of Digitalization Adoption
- Control variables: Organisation Characteristics

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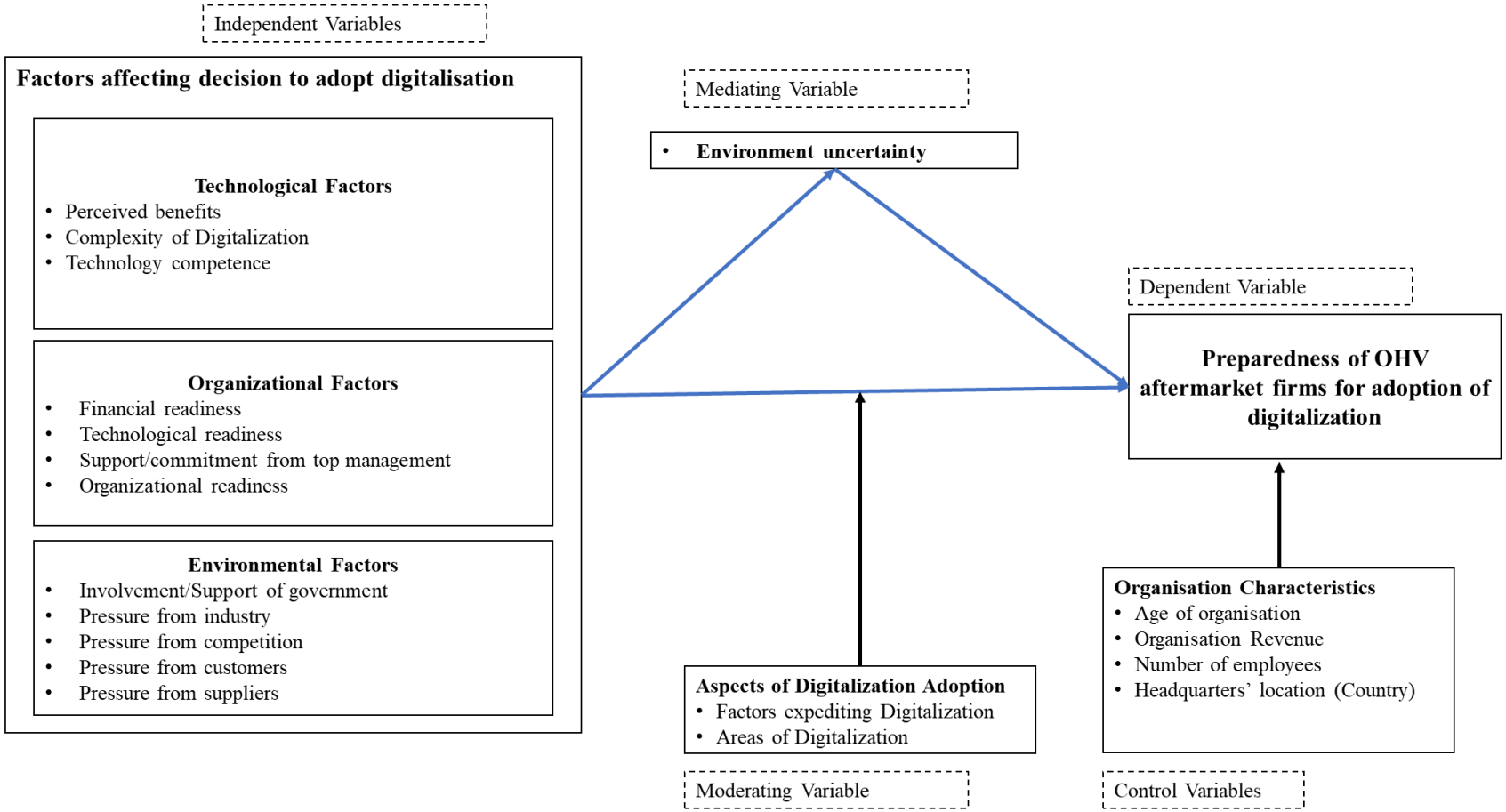

Figure 2.23 Conceptual Model for the Study

2.9.1 Hypotheses of the study

The hypotheses for the present study have been formulated on the basis of the study's research objectives and conceptual model. According to the TOE framework, three facets influence technology adoption by organisations. That is, all facets of a firm influence its preparedness to adopt digitalization namely, the technological factors, the organisational factors, and the environmental factors.

Hypotheses related to technological factors

In the TOE framework, the technological context signifies properties of the information system that may influence adoption (Tornatzky and Fleischer, 1990). Thus, the study posits that:

- *Hypothesis 1: Technological factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*

In the present study, factors identified as pertaining to the technological context were perceived benefits, complexity of digitization, and technology competence (Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021). Perceived or anticipated benefits indicate the benefits expected by a firm when adopting a new IS innovation to replace existing processes or systems (Chwelos, Benbasat and Dexter, 2001). These benefits encompass not only direct savings and productivity resulting from a new system, but also the indirect benefits to the firm. In general, a firm must be inspired to proceed with new technology adoption. When there are low expectations, firms may prefer to play a waiting game until further awareness of the potential advantages are acquired. Digitalization, in

general, offers the following advantages: (1) Connection of all activities in society; (2) enhanced decision-making participation of individuals; (3) cooperative activity in decentralized systems; and (4) enhanced scrutinising and observation (Schumacher, Sihn and Erol, 2016). Moreover, it can enhance operational efficiency, reduce costs of operation, improve customer service experience, develop a competitive edge, improve market efficacy, helps with time-savings and eliminates unnecessary costs, has high cost-effectiveness, supports better and quicker decision-making and actions, facilitates performance of business tasks, and supports greater control over the business (Leung *et al.*, 2015; Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021). Hence, it is appropriate to hypothesise that OHV aftermarket firms with greater awareness of the benefits of digitalization are more likely to adopt digitalization:

- *Hypothesis 1a: Perceived benefits positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Complexity, in general, can be described as the extent of user perception regarding how difficult it is to understand or utilise a technology innovation (Walker, Saffu and Mazurek, 2016; Ahmad and Siraj, 2018). In other words, complexity signifies the barriers or obstacles to adoption of digitalization. A technology has a greater likelihood of being adopted if it is easy to integrate into business operations (Oliveira, Thomas and Espadanal, 2014). The complexity of digitalization is related to its functions, the complexity of its usage, the difficulty regarding how to work with it, and complex introduction process (Stjepić, Bach and Vukšić, 2021). Hence, it is appropriate to hypothesise that that OHV

aftermarket firms with positive perceptions of the complexity of digitalization are more likely to adopt digitalization:

- *Hypothesis 1b: Complexity of digitalization positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Technology competence encapsulates the internal technology resources of a firm. Hence, it is essential for both IS utilisation and impact. Technology competence essential comprises technology infrastructure and IT competence (Zhu *et al.*, 2006). In the present study, technology competence was conceptualised to encompass capabilities in data management services and architectures, network communication services, application portfolios and services, IT facilities' operations/services, and in-house expertise to adopt digitalization (Mckinnie, 2016). Hence, it is appropriate to hypothesise that that OHV aftermarket firms with positive perceptions of their technology competence are more likely to adopt digitalization:

- *Hypothesis 1c: Technology competence positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Hypotheses related to organisational factors

In the TOE framework, the organizational context signifies the orientation of a firm towards innovation. That is, the openness of the firm to fresh concepts based on its culture. Thus, the study posits that:

- *Hypothesis 2: Organisational factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*

In the present study, organizational readiness signifies the extent of the available technological and financial resources to utilise digitalization. Organizational readiness, as a whole, has a significant role to play in terms of influence on an organisation's intent to utilise an innovation (Chwelos, Benbasat and Dexter, 2001; Khalifa and Davison, 2006). Financial readiness, specifically, has been used in many studies. This signifies the availability of financial resources to bear the expense of new technology innovation, implementation of future enhancements, and continuing expenses during utilisation (Nam, Kang and Kim, 2015). Hence, it is appropriate to hypothesise that that OHV aftermarket firms with financial readiness are more likely to adopt digitalization:

  - *Hypothesis 2a: Financial readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

On the other hand, technical readiness is a measure of the extent of a firm's IT sophistication from the perspective of management and usage (Iacovou, Benbasat and Dexter, 1995; Yoon, 2009; Kinuthia, 2014). In the present study, technology readiness was assumed to comprise of sophistication as regards usage and management of technology, right level of IT expertise and resources, right level of technical competence, right level of IS knowledge, and existence of an IT department. Hence, it is appropriate to hypothesise that that OHV aftermarket firms with appropriate technological readiness are more likely to adopt digitalization:

- *Hypothesis 2b: Technological readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Another aspect of the organisational context, is support/commitment from top management. The willingness of top management to understand business-related benefits of digitalization and its competitiveness, and to implement it in the firm is important (Gangwar, Hema and Ramaswamy, 2015). In the present study, this aspect was considered to encompass support for implementation and adoption of digitalization, participation in establishing the vision and shaping the strategy for adoption of digitalization, preparedness to deal with potential risks of adoption of digitalization, and personnel at the management level who emphasise the benefits of digitalization and highlight the significance of adoption of digitalization and persuade others to adopt digitalization. Thus, it is appropriate to hypothesise that that OHV aftermarket firms with appropriate support/commitment from top management are more likely to adopt digitalization:

- *Hypothesis 2c: Support/commitment from top management positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Organizational readiness encompasses both technology readiness and financial readiness (Iacovou, Benbasat and Dexter, 1995). In the present study, organizational readiness was considered to involve knowledge of how to use digitalization for business support, understanding well how to use digitalization in business, existence of sufficient technical, managerial, and other capabilities needed to adopt digitalization, existence of sufficient financial, technological, and other resources needed to adopt digitalization,

financial readiness, adequacy of technological resources, etc. Thus, it is appropriate to hypothesise that that OHV aftermarket firms with appropriate organizational readiness are more likely to adopt digitalization:

- *Hypothesis 2d: Organizational readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Hypotheses related to environmental factors

In the TOE framework, the external environmental context is the environment where a firm conducts its business. This may include the its industry, its competitors, suppliers, regulations, and the government. Thus, the environment context signifies certain facilitators and inhibitors relating to technology operations (Baker, 2012). Thus, the study posits that:

- *Hypothesis 3: Environmental factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*

In the present study, the following factors were identified the environmental perspective: involvement/support of government, pressure from industry, pressure from competition, pressure from customers, and pressure from suppliers (Leung *et al.*, 2015; Lutfi, 2017, 2020; Stjepić, Bach and Vukšić, 2021)**.** Government support/involvement signifies the commitment and assistance offered by the authorities to inspire the usage of innovation (Ifinedo, 2011). Tornatzky and Fleischer (1990) stated that the government can encourage the usage of innovations in organizations through rules and regulations. In the present study, involvement/support of the government was conceptualised to signify

among other items, interest, support, and involvement as regards digital transformation/digitalization in automotive aftermarket. Thus, it is appropriate to hypothesise that that OHV aftermarket firms with appropriate involvement/support of government are more likely to adopt digitalization:

- *Hypothesis 3a: Involvement/Support of government positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Pressure from the industry signifies the extent of technological capability of the industry of a firm and its competition (Grandon and Pearson, 2004; Fuchs *et al.*, 2010; Leung *et al.*, 2015). TOE research (Kuan and Chau, 2001; Lian, Yen and Wang, 2014) indicates that the response to industry pressure differs between technology adopters and rejecters. Thus, it can be posited that that OHV aftermarket firms which respond to pressure from the industry are more likely to adopt digitalization:

- *Hypothesis 3b: Pressure from industry positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Pressure from competition signifies the extent of pressure felt by an organization to imitate the actions of their competitors. As per Tornatzky and Fleischer (1990), this facet also can impact innovation usage positively. Research using the TOE framework has revealed that innovation usage is significantly influenced by competition. Competitive pressure has a significant role to play in the use of technological innovation as it can force a firm to look for better practices and accelerate their use of innovation (Yoon, 2009; Ifinedo, 2011; Lutfi, 2017). Thus, it can be posited that that OHV aftermarket firms which respond to pressure from the competition are more likely to adopt digitalization:

- *Hypothesis 3c: Pressure from competition positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Customer pressure signifies the extent of pressure induced by customer expectation and demand (Fuchs *et al.*, 2010; Leung *et al.*, 2015). TOE research has indicted that apart from competitors, external forces driving adoption of technology can include customers. The increasing competition in the business environment ensures that firms cannot choose to ignore customer expectation and demand (Leung *et al.*, 2015). Thus, it can be posited that that OHV aftermarket firms which respond to pressure from their customers are more likely to adopt digitalization

- *Hypothesis 3d: Pressure from customers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Suppliers, together with customers, are sources of normative pressure on firms (Basaglia *et al.*, 2009; Lutfi, 2020; Lutfi *et al.*, 2022). The technologies adopted by suppliers can influence firms in their decision-making regarding adoption (Basaglia *et al.*, 2009; Lutfi, 2020). Thus, it can be posited that that OHV aftermarket firms which respond to pressure from their suppliers are more likely to adopt digitalization:

- *Hypothesis 3e: Pressure from suppliers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Hypotheses related to moderating and mediating variables.

Moreover, the study considers that the moderator and mediator variables can impact the relationships proposed by the model. A moderating variable impacts the robustness and direction of an association between two variables. In this study, aspects of digitalization

adoption was chosen to be the moderator of the relation between the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization. This variable is considered to be made up of two facets: factors expediting digitalization and areas of digitalization (Ulas, 2019). Hence, the following hypothesis is proposed:

- *Hypothesis 4: Aspects of Digitalization Adoption moderates the relation between the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization.*

Environmental uncertainty is based on the theory that the external environment is dynamic (Lutfi, 2020). It signifies the volatile environmental changes and incomplete information available for making and executing decisions in business (McGee and Sawyerr, 2003; Newkirk and Lederer, 2006). Prior research on innovation has acknowledged that environmental uncertainty was the outcome of a dynamic environment. Miller and Friesen (1982) suggested that the need for innovation is increased by an environment that is very dynamic, and consequently, the likelihood of firms being innovative is higher. Due to this, the necessity for firms to pursue advice and information can increase. In this study, environmental uncertainty will be used as a mediating variable to provide greater insights regarding the process by which the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization are associated. An earlier study by Lutfi (2020) studied the moderating impact of environmental uncertainty on the relationship between different pressure encountered by a firm and adoption of ERP. However, the present study will examine the mediating impact of this variable. Hence, the following hypothesis is proposed:

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- *Hypothesis 5: Environment uncertainty mediates the relation between the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization.*

2.10 Chapter Conclusion

This chapter discussed existing research related to the concept of the automobile aftermarket along with the notions of digitalization and automation. In addition, the concept of technology adoption was discussed followed by a detailed examination of related theories and models. Furthermore, the chapter reviewed existing research related to technology adoption in the automobile aftermarket and automobile component industries. Finally, the conceptual framework for the study was described together with the hypotheses of the study.

CHAPTER III:
METHODOLOGY

3.1 Chapter Introduction

This chapter describes the methodology utilised by the present study to achieve its objectives. An overview of the research problem is first provided followed by a discussion of the operationalization of the theoretical constructs as appropriate for the study. The research purpose and questions are reiterated and the research design is explained. Following these, the population and sample, process of participation selection, instrumentation, procedures for data collection and analysis, the timeline of the research, and limitations of the research, are discussed.

3.2 Overview of the Research Problem

The significance of the automotive aftermarket industry in the global industrial scenario indicates that the industry will continue to undertake research and development (R&D) to sustain its performance. This implies the use of novel technological advancements across different areas of the industry's value chain. The review of literature revealed limited empirical attention to technology adoption in the specific context of the automotive aftermarket industry. Moreover, the context of off-highway vehicles (OHVs) did not appear to be considered for investigation. Consequently, the researcher believed that an empirical study undertaken at this time using a quantitative approach, would help obtain insights regarding technology adoption in the automotive aftermarket industry, in general, and in the context of OHVs, in particular. Specifically, an exploratory study based

on the positivist philosophy was used to investigate the perceptions of stakeholders from the automotive aftermarket industry to understand the factors that influence technology adoption in the sector.

3.3 Operationalization of Theoretical Constructs

As mentioned in the previous chapter (Section 2.9), the Technology-Organization-Environment (TOE) framework for technology adoption is the underlying model informing the study since this considers the organisational perspective for technology adoption rather than the individual perspective. The intent of the study was to identify the factors influencing the acceptance/adoption of digitalization in the automobile aftermarket industry. After considering the different approaches to research, the three most frequently utilised being quantitative, qualitative, and mixed methods, the researcher decided to use a quantitative approach so as to establish a generalisable basis to study the phenomenon under consideration in this study. Research using surveys is recommended in management studies when the phenomenon under consdideration is investigated in its natural environment, takes place in the recent past or the present time, the researcher has no contol over dependent and independent variables, and the focus of the research is ‘what’ is happening (Saunders, Lewis and Thornhill, 2019).

Studies utilising the TOE framework typically utilise a quantitative approach to investigate technology adoption. For example, Alharbi et al. (2016) used the TOE framework with a quantitative approach to study the the determinants influencing adoption

of cloud computing in healthcare organisations in Saudi Arabia. A similar approach was utilised by Lutfi et al. (2022) to study the factors influencing the adoption of Big Data Anaytics in small and medium-sized enterprises (SMEs) in Jordan. Angeles (2014) used a similar approach to study the implementation of an environmental management information system while Awa et al. (2016) used this to study adoption of ERP software in SMEs. Consequently, the researcher believed that the quantitative approach using a questionnaire would be most appropriate for the present study.

3.4 Research Purpose and Questions

The long-term objectives of the present study are to offer insights regarding the factors affecting the acceptance/adoption of digitalization in the automobile aftermarket industry. That is, to identify the different aspects, internal and external, that may contribute to organisations in this industry accepting/adopting digitalization. The following overarching research question thus informs the study:

- What are the factors influencing the acceptance/adoption of digitalization in the automobile aftermarket industry?

The associated sub-questions are also considered:

1. What are the different areas where digitalization can be implemented in the automobile aftermarket industry?

2. Can an existing theoretical framework such as, the TOE framework, help explain the factors that influence the acceptance of digitalization in the automobile aftermarket industry?

3. What are the technological, organizational and environmental (TOE) factors that influence acceptance/adoption of digitalization in the automobile aftermarket industry?

4. What are the aspects of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs?

3.5 Research Design

The study shall use a quantitative approach to answer the research questions. Before determining that this approach would be most appropriate for the present study, the researcher examined the different research paradigms which inform the beliefs regarding the manner in which a study should be performed. In general, there are two principal paradigms of philosophies of research: positivism and interpretivism. These two paradigms are commonly implemented in social science research. Typically, the positivist approach is performed using quantitative methods of research where the research design is established prior to beginning the research. The interpretivist approach, on the other hand, is frequently associated with qualitative methods of research (Denzin and Lincoln, 2018). In this, researchers are required to interpret the biased and socially constructed implications

articulated about the phenomenon under consideration (Saunders, Lewis and Thornhill, 2019).

The goal of research, according to positivists, is to describe or explain phenomena, which quantitative means can directly measure and observe. Their belief is that an unbiased reality is present in the universe and that this reality can be proven through scientific process. That is, by investigating the relationships present between latent variables methodically and statistically (Saunders, Lewis and Thornhill, 2019). Moreover, positivists believe that the universe functions through the principle of cause-and-effect which a scientific research approach can help understand. They follow a deductive method of analysing in gaining awareness of a phenomenon. Consequently, their interest is in assessing present suppositions rather than forming new ones, and hence, hypotheses are created and assessed. Positivists also condense variables or notions into lesser components through operationalization in order to observe and measure them quantitatively. The concern of positivitists is research rigour and replicability, consistency of the study, and generalisability of research outcomes. Overall, the approach to research is quantitative in character for positivists and they believe that the researcher should be neutral to the subject under consideration (Sekaran and Bougie, 2016; Saunders, Lewis and Thornhill, 2019).

Interpretivism, is an alternative to positivism, and is typically associated with qualitative methods (Collis and Hussey, 2014). This philosophy lends itself to research which considers certain data or experiences that are difficult or cannot be articulated numbers. Moreover, the belief underlying philosophy is that social reality is highly

subjective not objective since it is influenced by the perceptions of individuals. Due to this, the interpretivist researcher works together with what is being studied because it is not possible to separate what is present in the social universe from what is present in the mind of the reseacher (Creswell and Creswell, 2018). The focus, consequently, is to explore the intricacy of societal phenomena with the objective of gaining interpretive awareness. Hence, interpretivists adopt different methods that focus on describing, translating, or understanding the meaning of phenomena that occur naturally in the social world. As a result, the findings of qualitative research are analysed qualitatively typically through an inductive approach. The researcher investigates the phenomenon in its natural setting and utilises an emerging design wherein categories are recognised during the process. Also, patterns and theories are created for awareness. The findings are verified for accuracy and reliability (Saunders, Lewis and Thornhill, 2019).

Another facet considered by the researcher was the the purpose of the present study. The study intends to examine the association between TOE factors, environment uncertainty, aspects of digitalization adoption, and the preparedness of OHV aftermarket firms for adoption of digitalization. Consequently, it can be categorised as an explanatory or causal study which deals with testing of hypotheses. In addition, since it describes these relationships in a specific context namely, the OHV aftermarket, it can be further categorised as a descriptive study (Sekaran and Bougie, 2016). Descriptive research is typically utilised to describe organizations, situations, or events accurately (Sekaran and Bougie, 2016). Customarily, this form of research is undertaken when some prior awareness of the problem exists so as to provide a more detailed description. Explanatory

or causal research, on the other hand, allows researchers to illustrate the character of associations between variables and also to discover and derive inferences regarding the underlying associations among the variables being scrutinised (Sekaran and Bougie, 2016).

After due consideration of the characteristics of these two research paradigms, the positivist approach was used due to the following rationale. Firstly, the variables included for investigation in the study had been empirically examined in earlier studies. Consequently, the present study further explained the type of relationships that exist between them in a different setting. Secondly, the present study is interested in evaluating existing theories instead of creating new ones. Hence, research hypotheses were proposed and tested. Finally, the latent variables scrutinised in the present study were reduced, through operationalisation, into smaller elements so as to facilitate their quantitative measurement and observation. Also, the researcher remained independent of the matter under consideration. Hence, based on these arguments, the usage of the positivist approach in this study can be considered to be adequately justified.

Overall, the present study is an explanatory, descriptive study that will use a positivist paradigm with quantititative methods of data collection and analysis, to achieve its stated objectives.

3.6 Population and Sample

In the context of research, the term population signifies all the persons, happenings, or items of interest, that the researcher desires to investigate. Thus, the population of the study comprises all the persons working in the global automobile aftermarket industry

specifically related to OHVs. However, since it is not feasible to include all these persons in the study, a subset of the population was considered for the study. This subset, or sample, comprises some members of the population (Sekaran and Bougie, 2016).

The researcher first determined the size of the sample which would provide meaningful outcomes for the study (Sekaran and Bougie, 2016). This indicates the number of units necessary to obtain precise outcomes (Fink, 2003). Since the study population is significantly large (in millions), the sample size for the proposed study will be determined based on the following formula (Krejcie and Morgan, 1970),

$$s = \frac{\left(\frac{\mathrm{X}^2 p(1-p)}{d^2}\right)}{1 + \frac{\mathrm{X}^2 p(1-p)}{d^2 N}}$$

Where

s = required size of sample,

X = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = size of the population

p = population percentage (assumed to be 0.5 to ensure the maximum size of sample),

d = degree of accuracy stated as a fraction (0.05).

Since it can be assumed that there are millions of people employed in OHV aftermarket firms across the globe, a sample size of at least 384 would be used for the study based on the above formula (Krejcie and Morgan, 1970, p. 608).

3.7 Participant Selection

Due to constraints related to time, expenses, and accessibility of resources, among others, the population of the study was limited to employees of OHV aftermarket firms to which the researcher had access. The unit the study for the present study was therefore OHV aftermarket firms. The questionnaire was administered to 686 employees from these organisations after obtaining permission from the human resources departments.

3.8 Instrumentation

Since this study used a quantitative research design, a custom-designed questionnaire was utilised to obtain information from different stakeholders from OHV firms related to digitalization in the automobile aftermarket industry. A questionnaire tool helps researchers to collect the necessary data from participants in a short time, while simultaneously reducing response bias (Zikmund *et al.*, 2012; Sekaran and Bougie, 2016). Moreover, the questionnaire survey is commonly used in management studies.

In the present study, the development of the questionnaire was informed by prior literature. Questionnaire surveys can be utilised in three ways for data collection namely

self-administered, electronic, or mail (Sekaran and Bougie, 2016). The second and third options are beneficial since they can be administered easily, have a wider coverage, and the respondents can respond when it is convenient to them. Also, these are less expensive than the self-administered option. On the other hand, electronic surveys require computer literacy while the capacity to provide clarifications is low in both electronic and mail surveys (Sekaran and Bougie, 2016). The researcher decided to use electronic surveys through Google Forms for the present study since this ensured greater ease of administration and a broader coverage which was not limited by his geographic location.

3.8.1 Employee questionnaire

A questionnaire was designed for use with stakeholders from OHV firms. The questionnaire contained eight sections. The first contained seven questions related to the **demographic** details of the participants (age, gender, educational qualification, designation, overall work experience, work experience in the current organisation, overall experience in aftermarket industry). The second section contained seven questions related to the **organisation characteristics** of the OHVs (age of organisation, organisation revenue, number of employees, location of operations, location of headquarters, types of OHVs catered to, auto component segment). These two sections contained only close-ended questions and the participants were provided with options to choose their responses.

The third section focused on **Status of Digitalization Adoption in the Organisation** and contained four questions. The first two questions were close-ended and were related to the digitalization status in the organisation and the technologies currently adopted, if applicable. The third question was composed of seven statements and was

related to factors which can expedite adoption of digitalization (Ulas, 2019)**.**. The final question in this section contained eight statements and measured the employees' opinion regarding areas where digitalization could be adopted in their firms (Ulas, 2019). The responses for these two questions followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The focus of the fourth section of the questionnaire was **Technology Factors Affecting Digitalization adoption** and contained one question related to the technology factors which may impact a firm's decision to adopt digitalization (Leung *et al.*, 2015; Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021)**.**. This question contained 21 statements related to technology factors such as, perceived benefits (11 statements), complexity of digitalization (5 statements), and technology competence (5 statements). The responses for this question followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The focus of the fifth section of the questionnaire was **Organizational Factors Affecting Digitalization adoption** and contained one question related to organizational factors which may impact a firm's decision to adoption digitalization (Iacovou, Benbasat and Dexter, 1995; Yoon, 2009; Nam, Kang and Kim, 2015; Lutfi, 2017; Stjepić, Bach and Vukšić, 2021)**.** This question contained 24 statements related to organizational factors such as, financial readiness (4 statements), technological readiness (5 statements), support/commitment from top management (6 statements), and organizational readiness (9

statements). The responses for this question again followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The focus of the sixth section of the questionnaire was **Environmental Factors Affecting Digitalization adoption** and contained one question related to environmental factors which may impact a firm's decision to adoption digitalization (Leung *et al.*, 2015; Lutfi, 2017, 2020; Stjepić, Bach and Vukšić, 2021)**.** This question contained 24 statements related to environmental factors such as, involvement/support of government (6 statements), pressure from industry (4 statements), pressure from competition (8 statements), pressure from customers (3 statements), and pressure from suppliers (3 statements). The responses for this question again followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The focus of the seventh section of the questionnaire was **Environmental Uncertainty** and contained one question related to the environment surrounding the organisation and which may impact adoption of digitalization (Lutfi, 2017, 2020). This question contained eight statements and the responses for this question also followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The focus of the final section of the questionnaire was **Adoption of digitalization** and contained one question related to the organization's adoption of digitalization (Chan and Chong, 2013; Alharbi, Atkins and Stanier, 2016; Lutfi, 2020). This question contained

eight statements and the responses for this question again followed a 5-point Likert scale ranging from 5 - strongly disagree; 4 - disagree; 3 - neutral; 2 - agree to 1- strongly agree.

The questionnaire design is summarised in Table 3.1.

Table 3.1: Questionnaire design

Section	Description	Details	#Items	Adapted from
1	Demographic details	Age, Gender, Educational Qualification, Designation, Overall Work Experience (in years), Work Experience in current organisation (in years), Overall experience in Aftermarket Industry (in years)	7	NA
2	Organisation Characteristics	Age of organisation (in years), Organisation revenue (USD), Number of Employees, Location of Operations (Regions), Location of Headquarters (Country), Type of OHVs catered to; Auto Component Segment	7	NA
3	Status of Digitalization Adoption in Organisation	Is digitalization adopted in organisation? Which technologies are used in the organisation? Factors which can expedite adoption of digitalization and areas where digitalization can be adopted in the firm; five-item Likert scale utilised for the last two questions (1 indicating “Strongly disagree” to 5 indicating “Strongly Agree”)	4	(Ulas, 2019)

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Section	Description	Details	#Items	Adapted from
4	Technology Factors Affecting Digitalization adoption	To gain awareness of the employees' perceptions regarding technology factors affecting digitalization adoption; five-item Likert scale utilised (1 indicating "Strongly disagree" to 5 indicating "Strongly Agree")	21	(Leung *et al.*, 2015; Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021)
5	Organizational Factors Affecting Digitalization adoption	To gain awareness of the employees' perceptions regarding organizational factors affecting digitalization adoption; five-item Likert scale utilised (1 indicating "Strongly disagree" to 5 indicating "Strongly Agree")	24	(Iacovou, Benbasat and Dexter, 1995; Yoon, 2009; Nam, Kang and Kim, 2015; Lutfi, 2017; Stjepić, Bach and Vukšić, 2021)
6	Environmental Factors Affecting Digitalization adoption	To gain awareness of the employees' perceptions regarding environmental factors affecting digitalization adoption; five-item Likert scale utilised (1 indicating "Strongly disagree" to 5 indicating "Strongly Agree")	24	(Leung *et al.*, 2015; Lutfi, 2017, 2020; Stjepić, Bach and Vukšić, 2021)
7	Environmental Uncertainty	To gain awareness of the employees' perceptions regarding the environment surrounding their organisation and which may impact digitalization adoption; five-item Likert scale utilised (1 indicating "Strongly disagree" to 5 indicating "Strongly Agree")	8	(Lutfi, 2017, 2020)

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Section	Description	Details	#Items	Adapted from
8	Adoption of digitalization	To gain awareness of the employees' perceptions regarding their organisation's digitalization adoption; five-item Likert scale utilised (1 indicating "Strongly disagree" to 5 indicating "Strongly Agree")	8	(Chan and Chong, 2013; Alharbi, Atkins and Stanier, 2016; Lutfi, 2020)

3.9 Data Collection Procedure

As mentioned in the previous section, the researcher decided to use a questionnaire to obtain data for the survey. The questionnaire was entered into a Google Form and the link to the survey was circulated via WhatsApp and email to prospective participants. It may be noted that participation was on a voluntary basis. These methods of administering the questionnaire were chosen due to the savings of time and cost, speed of responses, broad coverage, and participants' freedom to fill up the questionnaire when it suited them (Dillman, Smyth and Christian, 2014).

The researcher took some measures to ensure that the response rate to the questionnaire was not too low. The measures included:

Pre-notification of the firms: By doing this the researcher was able to obtain a list of target respondents before questionnaire distribution;

Including an invitation to the study: The messages/emails sent to the respondents requested the co-operation of the respondents and included information regarding the objectives of the study, and assurance of confidentiality and anonymity of the information provided by them.

The questionnaire design was planned so as to be simple and understandable by all participants;

The wording used in the questionnaire was easily understandable; and

The length of the questionnaire was reasonable, being ten pages long.

3.10 Data Analysis

The primary data obtained using the questionnaire were analysed statistically using IBM's SPSS (Statistical Package for the Social Sciences) and SmartPLS software. Different descriptive and inferential statistical tests were utilised:

- Descriptive statistics (averages and percentages, mean and standard deviation), Descriptive statistical tests summarise the study's data. They provide insights regarding the distribution of data across the sample of the study. The present study computed the statistical mean and standard deviation (SD) for different facets of the variables included in the study;

- Regression analysis, to demonstrate the relationship among two (or more) variables;

- Pearson's correlation, to assess the robustness of the linear relationship among two variables; and
- Structural Equation Modelling (SEM), using SmartPLS 3 to analyse the structural relationships between the measured variables of the study and the latent constructs.

3.11 Timeframe of the research

This study was conducted between October 2022 and May 2023 in a cross-sectional timeframe. This study design was chosen since the recruitment of participants, collection of data, followed by the data analysis and reporting will be completed at a single point of time.

3.12 Research Design Limitations

Some limitations with the research design are acknowledged. Firstly, the researcher assumed that the sample size would be adequate for the study. Also, the researcher assumed that the data obtained from the particpants would be reliable and provide an accurate picture of the status of digitalization adoption in the firms and also the TOE factors.

3.13 Chapter Conclusion

This chapter described the methodology utilised by the present study to achieve its objectives. An overview of the research problem was first provided followed by a discussion of the operationalization of the theoretical constructs as appropriate for the study. The research purpose and questions were reiterated and the research design was

explained. Following these, the population and sample, process of participation selection, instrumentation, procedures for data collection and analysis, the timeline of the research, and limitations of the research, were discussed.

CHAPTER IV:
FINDINGS AND INTERPRETATION

4.1 Chapter Introduction

As described in the Introduction chapter, the long-term objectives of the present study are to offer insights regarding the factors affecting the acceptance/adoption of digitalization in the automobile aftermarket industry. That is, the study's objective is to identify the different aspects, internal and external, that may contribute to organisations in this industry accepting/adopting digitalization.

The purpose of this chapter is to present the findings from the data obtained from 686 participants from different firms in the aftermarket industry. The collected data were coded and then analysed using IBM's Statistical Package for Social Sciences (SPSS v24) and SmartPLS 3. The findings are organised based on the research questions of the study. As mentioned previously, the study seeks to answer the overarching research question "What are the factors influencing the acceptance/adoption of digitalization in the automobile aftermarket industry?"

The associated sub-questions are as follows:

1. What are the different areas where digitalization can be implemented in the automobile aftermarket industry?

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2. Can an existing theoretical framework such as, the TOE framework, help explain the factors that influence the acceptance of digitalization in the automobile aftermarket industry?

3. What are the technological, organizational and environmental (TOE) factors that influence acceptance/adoption of digitalization in the automobile aftermarket industry?

4. What are the aspects of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs?

The demographic information of the participants and the characteristics of their organisations are first presented. These data were analysed using descriptive statistical tests namely, frequencies and percentages. Following this the descriptive analysis of the organisation characteristics is provided followed by the analysis performed using Pearson's correlation. The findings are then organised into different sections based on the research questions.

4.2 Demographic details

The analysis of demographic factors, in general, provides a thorough understanding of the features of a study's participants and their appropriateness for participation in the study. In the present study, various demographic details were collected from the respondents such as, age, gender, educational qualification, designation, overall

experience, experience in current firm, and overall experience in the aftermarket industry (Table 4.1). On the whole, it appeared that the participants were appropriate for their study based on their distribution by age, qualification, designation, and work experience. There were more male participants than female participants, but this could be due to the employment trends in the OHV industry.

The majority of the participants were aged between 31 and 40 years (47.7%) followed by those in the age group of 21-30 years (27.6%) and persons in the age group of 41-50 years (16.0%). The least number of participants (8.7%) were aged over 50 years. Most of the participants were male (89.1%) and the remainder were female (10.9%). The participants were found to be well-qualified as the majority were Graduates (35.1%) followed by persons with Other qualifications (29.9%), persons with Masters (19.1%), persons with Diplomas (9.2%), and Doctorates (6.7%). Furthermore, the participants were from various levels in the organisation including Managers (Area/Zone/Region/Head of Department) (30.8%), After Market Heads (13.1%), and Team / Group Leader (11.4%).

The participants also had considerable work experience. For instance, the majority had overall experience of up to 20 years (85.3%) with the largest number in this group being persons with >10 – 20 years (47.1%) overall experience. A smaller group (14.7%) had overall experience of more than 20 years. As regards work experience in the current organization, the majority of the participants had worked for up to 20 years in their current organisation (87.7%) with the largest number in this group being persons with >10 – 20 years (44.9%) in the organisation. A smaller group (12.3%) had worked in the current

organisation for more than 20 years. In addition, the majority of the participants had worked for up to 20 years in the aftermarket industry (83.4%) with the largest number in this group being persons with >10 – 20 years (42.4%) experience. A smaller group (16.6%) had worked in the industry for mor– than 20 years.

Table Error! No text of specified style in document.**.1 Participant demographics**

Demographic variable	N	%	Demographic variable	N	%
Age			**Designation**		
21-30 years	189	27.6	After Market Head	90	13.1
31-40 years	327	47.7	CXO	27	3.9
41-50 years	110	16.0	Dealer Development Manager	1	0.1
51-60 years	53	7.7	Directors / Owners	38	5.5
> 60	7	1.0	Enabling Team (IT / Finance / Admin / HR / Support)	23	3.4
Gender			IT Head	1	0.1
Male	611	89.1	Manager (Area/Zone/Region/Head of Department)	211	30.8
Female	75	10.9	Parts Head	64	9.3
Educational Qualification			Purchase engineer	1	0.1
Graduate	241	35.1	Sales Account Manager	1	0.1
Masters	131	19.1	Senior Software Engineer	3	0.4
Doctorate	46	6.7	Service Head	68	9.9
Diploma	63	9.2	Support Staff	14	2.0
Others	205	29.9	Team / Group Leader	78	11.4
			Team Member	65	9.5
			Vice President and Global Head, Industrial Heavy Machinery Practice	1	0.1
Overall Work Experience			**Overall experience (Aftermarket Industry)**		
<5 years	78	11.4	<5 years	85	12.4
5 – 10 years	184	26.8	5-10 years	196	28.6
>10 – 20 years	323	47.1	>10 – 20 years	291	42.4
>20 – 30 years	73	10.6	>20 – 30 years	78	11.4
>30 years	28	4.1	>30 years	36	5.2

Demographic variable	N	%	Demographic variable	N	%
Work Experience (current organisation)					
<5 years	99	14.4			
5-10 years	195	28.4			
>10 – 20 years	308	44.9			
>20 – 30 years	56	8.2			
>30 years	28	4.1			

4.3 Organisation Characteristics

Table 4.2 summarises the characteristics of the participants' organisations. Overall, the participants seemed to be organisations of different sizes ranging from small to moderate. Most of the organizations were at least 10 years old (82.8%) and had revenues lower than a million USD (80.7%). Of these, the largest number of organizations (39.4%) had revenues in the region of 10,000 – 99,999 USD. The number of employees was typically lower than 10,000 in 88.8% of the organisations, with the majority of the organisations having 500 – 999 employees (31.3%). The participants were from organisations across the globe with the majority being from North America (83.7%).

Table Error! No text of specified style in document.**.2 Organisation characteristics**

Organisation characteristic	N	%	Organisation characteristic	N	%
Age of organisation			**Number of Employees**		
<5 years	33	4.8	1-99	39	5.7
5-10 years	85	12.4	100-499	148	21.6
>10 – 20 years	111	16.2	500-999	215	31.3
>20 – 30 years	264	38.5	1,000-9,999	207	30.2
>30 years	193	28.1	10,000-99,999	53	7.7
Organisation revenue			>100,000	24	3.5

Organisation characteristic	N	%	Organisation characteristic	N	%
<10,000 USD	20	2.9	**Region of headquarters**		
10,000 – 99,999 USD	270	39.4	Africa	1	0.1
100,000 – 499,999 USD	152	22.2	Asia	84	12.2
500,000 – 999,999 USD	111	16.2	Europe	26	3.8
1 million USD – 99 million USD	78	11.4	North America	574	83.7
>=100 million USD	53	7.7	South America	1	0.1
Other	2	0.3			

The organisations catered to different kinds of OHVs, such as, construction equipment (22.7%), material handling (20.1%), mining equipment (17.3%), road machinery (14.3%), agriculture equipment (14.0%), and other equipment. It would seem that the organisations catered to specific forms of OHVs as there appeared to be limited overlap between the OHV types. The specific auto component segment was typically engine parts (26.7%), electrical parts (22.6%), automobile equipment (20.4%), suspension and braking parts (17.1%), and other segments. Again, it appeared that the organisations focused on a certain segment of the industry as there appeared to be limited overlap between the segments (Table 4.3).

Table Error! No text of specified style in document.**.3 Type of OHVs catered and Auto component segment**

Type of OHVs catered	No (n (%))	Yes (n (%))
Road machinery	588 (85.7)	98 (14.3)
Agriculture equipment	590 (86)	96 (14.0)
CNC (computer numerical control) machines	622 (90.7)	64 (9.3)
Material handling	548 (79.9)	138 (20.1)
Port handling	593 (86.4)	93 (13.6)
Construction equipment	530 (77.3)	156 (22.7)

Type of OHVs catered	No (n (%))	Yes (n (%))
Mining equipment	567 (82.7)	119 (17.3)
Aggregate Manufacturers	618 (90.1)	68 (9.9)
Other	416 (60.6)	270 (39.4)
Auto component segment	**No (n (%))**	**Yes (n (%))**
Data Transmission and Steering Parts	626 (91.3)	60 (8.7)
Automobile equipment	546 (79.6)	140 (20.4)
Engine parts	503 (73.3)	183 (26.7)
Electrical parts	531 (77.4)	155 (22.6)
Suspension and Braking parts	569 (82.9)	117 (17.1)
Automobile ancillaries	605 (88.2)	81 (11.8)
Other	410 (59.8)	276 (40.2)

4.4 Correlation studies

Pearson's correlation test was used to analyse the associations between the different factors relating to digitalization adoption of OHV aftermarket firms. The outcome of this test, i.e., the 'r' values, indicate the robustness and also emphasis of the relationship between two tested. The correlation values could range between -1 and +1. Additionally, the statistical significance of the correlations is considered. The typical rule of thumb for interpretation of the values is as follows: values of 'r' <0.4 indicate weak or very weak correlations; values between 0.4 and 0.69 indicate moderately strong correlations; and values >0.7 indicate strong and very strong correlations (Schober and Schwarte, 2018).

The correlation analysis revealed that all the variables were significantly and positively correlated with each other. Specifically, Technology factors had moderate to

weak and statistically significant correlations with Aspects of digitalization adoption (r=0.439); Organizational factors (r=0.456); Environmental factors (r=0.254); Environmental Uncertainty (r=0.186); and Preparedness of OHV aftermarket firms for adoption of digitalization (r=0.146). On the other hand, the correlations between Technology factors and Organizational factors (r=0.611); Environmental factors (r=0.501); Environmental Uncertainty (r=0.449); and Preparedness of OHV aftermarket firms for adoption of digitalization (r=0.404); were all moderately strong and statistically significant. The correlations between Organizational factors and Environmental factors (r=0.557); Environmental Uncertainty (r=0.478); and Preparedness of OHV aftermarket firms for adoption of digitalization (r=0.420); were again moderately strong and statistically significant. The correlations between Environmental factors and Environmental Uncertainty (r=0.642); and Preparedness of OHV aftermarket firms for adoption of digitalization (r=0.570); were also moderately strong and statistically significant. Finally, the correlation between Environmental Uncertainty and Preparedness of OHV aftermarket firms for adoption of digitalization (r=0.863) was found to be strong and also statistically significant (Table 4.4).

Table Error! No text of specified style in document.**.4 Correlation between the variables**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Aspects of digitalization adoption	1					
Technology factors	0.439**	1				

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Variables	(1)	(2)	(3)	(4)	(5)	(6)
Organizational factors	0.456**	0.611**	1			
Environmental factors	0.254**	0.501**	0.557**	1		
Environmental Uncertainty	0.186**	0.449**	0.478**	0.642**	1	
Preparedness of OHV aftermarket firms for adoption of digitalization	0.146**	0.404**	0.420**	0.570**	0.863**	1

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis at the sub-factor level (Table 4.5) revealed that apart from the correlation between Complexity of Digitalization with Factors which can expedite adoption of digitalization (r= 0.074) and Areas where digitalization can be adopted in your firm (r=-0.025); Financial readiness with Complexity of Digitalisation (r=0.068); and Involvement/support of government with Factors which can expedite adoption of digitalization (r= 0.038), Areas where digitalization can be adopted in your firm (r=-0.031), and Perceived benefits (r=0.031); all other correlations were positive, statistically significant, and ranged in strength from weak to strong. Nevertheless, it could be inferred that the study's variables were related to each other.

Table Error! No text of specified style in document.**.5 Correlation between the variables**

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Factors which can expedite adoption of digitalization (1)	1															
Areas where digitalization can be adopted in your firm (2)	0.510**	1														
Perceived benefits (3)	0.504**	0.530**	1													
Complexity of Digitalization (4)	0.074	-0.025	0.130**	1												
Technology Competence (5)	0.372**	0.340**	0.388**	0.196**	1											
Financial readiness (6)	0.236**	0.191**	0.301**	0.068	0.361**	1										
Technological readiness (7)	0.294**	0.327**	0.378**	0.153**	0.547**	0.368**	1									
Support/commitment from top management (8)	0.431**	0.428**	0.492**	0.117**	0.530**	0.387**	0.572**	1								
Organizational readiness (9)	0.278**	0.239**	0.264**	0.397**	0.441**	0.317**	0.515**	0.525**	1							
Involvement/support of government (10)	0.038	-0.031	0.031	0.477**	0.181**	0.146**	0.257**	0.169**	0.538**	1						
Pressure from industry (11)	0.197**	0.146**	0.142**	0.320**	0.271**	0.199**	0.370**	0.285**	0.501**	0.554**	1					
Pressure from competition (12)	0.243**	0.121**	0.190**	0.453**	0.230**	0.186**	0.298**	0.312**	0.517**	0.545**	0.529**	1				

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Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Pressure from customers (13)	0.205**	0.216**	0.208**	0.186**	0.268**	0.183**	0.318**	0.301**	0.361**	0.292**	0.357**	0.475**	1			
Pressure from suppliers (14)	0.287**	0.205**	0.320**	0.164**	0.280**	0.243**	0.303**	0.357**	0.424**	0.260**	0.275**	0.341**	0.491**	1		
Environmental Uncertainty (15)	0.172**	0.168**	0.221**	0.376**	0.318**	0.249**	0.398**	0.318**	0.514**	0.529**	0.481**	0.518**	0.396**	0.411**	1	
Preparedness of OHV aftermarket firms for adoption of digitalization (16)	0.141**	0.129**	0.184**	0.366**	0.267**	0.232**	0.346**	0.259**	0.462**	0.494**	0.425**	0.463**	0.339**	0.350**	0.863**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.5 Research Question 1: What are the different areas where digitalization can be implemented in the automobile aftermarket industry?

Analysis of the data obtained from the participants regarding the status of digitalization adoption in their organizations revealed that the majority (98.1%) of the participating organisations had adopted digitalization (Table 4.6). This confirmed that the participants were well-positioned to provide insights regarding the preparedness of OHV aftermarket firms for digitalisation adoption.

Table Error! No text of specified style in document.**.6 Digitalization adopted in organisation**

Digitalization adopted in organisation	Frequency	Percentage
No	13	1.9
Yes	673	98.1
Total	**686**	**100.0**

Moreover, it was found that the technologies commonly used in the participants' organisations were smartphones (24.8%), cloud computing (16.5%), Big Data (15.5%), IoT (14.6%), Chatbots (14.1%), 3D printers (13.1%), and other technologies (43.3%) (Table 4.7).

Table Error! No text of specified style in document.**.7 Technology used in organisation**

Technology used in organisation	No (n (%))	Yes (n (%))
Internet of Things (IoT)	586 (85.4)	100 (14.6)
Blockchain	634 (92.4)	52 (7.6)
Cloud computing	573 (83.5)	113 (16.5)
Smartphones	516 (75.2)	170 (24.8)
3D printers	596 (86.9)	90 (13.1)
Big Data	580 (84.5)	106 (15.5)
Chatbots	589 (85.9)	97 (14.1)
Augmented reality (AR)	623 (90.8)	63 (9.2)
Robotics/autonomous robots	620 (90.4)	66 (9.6)

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Technology used in organisation	No (n (%))	Yes (n (%))
Nanotechnology	649 (94.6)	37 (5.4)
Cyber-physical systems	638 (93)	48 (7.0)
Non-smart and non-flexible automation systems	653 (95.2)	33 (4.8)
Smart sensors	621 (90.5)	65 (9.5)
Computer Numerical Control (CNC)	634 (92.4)	52 (7.6)
Other	389 (56.7)	297 (43.3)

Additionally, descriptive analysis (Table 4.8) of the participants' perceptions of the aspects of digitalization adoption revealed that "Globalization, due to increased mobility of goods, services, and capital" (Mean=4.012±0.713) was the most significant factor expediting adoption of digitalization. Their perceptions also revealed that "Customer management" (Mean=4.026±0.666) and "Forecasting of demand" (4.020±0.641) were two of the leading areas where digitalization could be adopted in an OHV aftermarket firm. Since the SD varied from 0.622 to 0.909, it could be inferred that the majority of the participants were in agreement with the different statements pertaining to aspects of digitalisation adoption.

Table Error! No text of specified style in document.**.8 Aspects of digitalization adoption**

Aspects of digitalization adoption	Mean ± SD
Factors which can expedite adoption of digitalization	
There is considerable progress in technology and innovation, sensor technology (ST)	3.757±0.909
Business practices are getting transformed of due to internet economy, social media, electronic commerce	3.962±0.716
Globalization, due to increased mobility of goods, services, and capital	4.012±0.713
Digitization of the manufacturing process due to Industry 4.0	3.988±0.655
Increased use of artificial intelligence in manufacturing	3.959±0.684
Digital supply chain has become an essential part of the automotive aftermarket industry	3.952±0.710
Expectations of a new generation of consumers is affecting the automotive aftermarket	3.832±0.788
Areas where digitalization can be adopted in firm	
Design and Development of New Products	3.844±0.787
Forecasting of demand	4.020±0.641
Supply and logistics	4.004±0.676
Manufacturing	3.972±0.711

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Aspects of digitalization adoption	Mean ± SD
Human resources	4.004±0.622
Marketing and sales	3.981±0.697
Customer management	4.026±0.666
Payment and other financials	3.981±0.716

In summary, it was found that the participating OHV organisations had already adopted digitalization. Moreover, they used varied technology, such as smartphones, cloud computing, Big Data, IoT, chatbots, 3D printers, and others. As regards the areas where digitalization can be implemented, it could be concluded that the most popular areas were customer management, forecasting of demand, supply and logistics, and human resources. It appeared that the OHV aftermarket firms gave slightly lower priority to the use of digitalization in manufacturing and design and development of new products.

4.6 Research Question 2: Can an existing theoretical framework such as, the TOE framework, help explain the factors that influence the acceptance of digitalization in the automobile aftermarket industry?

The participants' perceptions regarding the essential factors of the TOE framework were analysed using inferential statistical tests.

4.6.1 Technology factors

Linear regression was then utilised to test the influence of technological factors on the preparedness of OHV aftermarket firms for adoption of digitalization (Tables 4.9 and 4.10). The following hypothesis and sub-hypotheses were tested in this regard.

- *Hypothesis 1: Technological factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 1a: Perceived benefits positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 1b: Complexity of digitalization positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

- *Hypothesis 1c: Technology competence positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Overall, the outcomes of the linear regression test revealed that technological factors had a significant impact on preparedness of OHV aftermarket firms for adoption of digitalization at $p<0.01$. Specifically, complexity of digitalization and technology competence had a statistically significant influence on preparedness of OHV aftermarket firms for adoption of digitalization ($F(3, 682)=49.269$, $p<0.001$, $R2=.175$). That is, two out of the three technology factors added statistically significantly to the prediction of preparedness of OHV aftermarket firms for adoption of digitalization at $p< 0.01$. Hence, the sub-hypotheses *H1b: Complexity of digitalization positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* and *H1c: Technology competence positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* are Accepted whereas sub-hypothesis *H1a: Perceived benefits positively influence the preparedness of OHV aftermarket firms for adoption of digitalization* is Rejected. The overall hypothesis *H1: Technological factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization* is thus Partially Accepted.

Table Error! No text of specified style in document.**.9 Model summary for the influence of technological factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
					F Change	df1	df2	Sig. F Change
0.422	0.178	0.175	0.491	0.178	49.269	3	682	0.000

Table Error! No text of specified style in document.**.10 Coefficients for the influence of technological factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.745	0.211		8.289	0.000
Perceived benefits	0.097	0.049	0.074	1.963	0.050
Complexity of Digitalization	0.286	0.032	0.322	9.079	0.000
Technology Competence	0.173	0.038	0.175	4.589	0.000

4.6.2 Organizational factors

Linear regression was also utilised to test the influence of organizational factors on the preparedness of OHV aftermarket firms for adoption of digitalization (Tables 4.11 and 4.12). The following hypothesis and sub-hypotheses were tested in this regard:

- *Hypothesis 2: Organisational factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 2a: Financial readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 2b: Technological readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 2c: Support/commitment from top management positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 2d: Organizational readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Overall, the outcomes of the test revealed that organizational factors had a significant impact on preparedness of OHV aftermarket firms for adoption of digitalization at $p<0.01$. Specifically, financial readiness, technological readiness, and organizational readiness had a statistically significant influence on preparedness of OHV aftermarket firms for adoption of

digitalization (F(4, 681)=52.216, p<0.001, R2=.230). That is, three out of the four organizational factors added statistically significantly to the prediction of preparedness of OHV aftermarket firms for adoption of digitalization at p< 0.01. Consequently, the sub-hypotheses *H2a: Financial readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization*; *H2b: Technological readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization*; and *H2d: Organizational readiness positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* are Accepted. On the other hand, sub-hypothesis *H2c: Support/commitment from top management positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* is Rejected. Thus, the overall hypothesis *H2: Organisational factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization* is Partially Accepted.

Table Error! No text of specified style in document.**.11 Model summary for the influence of organizational factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
					F Change	df1	df2	Sig. F Change
0.484	0.235	0.230	0.474	0.235	52.216	4	681	0.000

Table Error! No text of specified style in document.**.12 Coefficients for the influence of organizational factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.333	0.196		6.807	0.000
Financial readiness	0.082	0.040	0.076	2.040	0.042
Technological readiness	0.166	0.048	0.151	3.473	0.001
Support/commitment from top management	-0.069	0.049	-0.063	-1.419	0.156

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	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Organizational readiness	0.476	0.050	0.392	9.441	0.000

4.6.3 Environmental factors

Linear regression was also utilised to test the influence of environmental factors on the preparedness of OHV aftermarket firms for adoption of digitalization (Tables 4.13 and 4.14). The following hypothesis and sub-hypotheses were tested in this regard:

- *Hypothesis 3: Environmental factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 3a: Involvement/Support of government positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 3b: Pressure from industry positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 3c: Pressure from competition positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 3d: Pressure from customers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*
    - *Hypothesis 3e: Pressure from suppliers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization.*

Overall, the outcomes of the test revealed that environmental factors had a significant impact on preparedness of OHV aftermarket firms for adoption of digitalization at $p<0.01$. Specifically, Involvement/support of government, Pressure from industry, Pressure from competition, and Pressure from suppliers had a statistically significant influence on preparedness of OHV aftermarket firms for adoption of digitalization ($F(5, 680)=70.161$, $p<0.001$, $R2=.335$). That is, four out of the five environmental factors added statistically

significantly to the prediction of preparedness of OHV aftermarket firms for adoption of digitalization at p< 0.01. As a result, the sub-hypotheses *H3a: Involvement/Support of government positively influences the preparedness of OHV aftermarket firms for adoption of digitalization*; *H3b: Pressure from industry positively influences the preparedness of OHV aftermarket firms for adoption of digitalization*; *H3c: Pressure from competition positively influences the preparedness of OHV aftermarket firms for adoption of digitalization*; and *H3e: Pressure from suppliers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* are Accepted. However, sub-hypothesis *H3d: Pressure from customers positively influences the preparedness of OHV aftermarket firms for adoption of digitalization* is Rejected. The overall hypothesis *H3: Environmental factors positively influence the preparedness of OHV aftermarket firms for adoption of digitalization* is thus Partially Accepted.

Table Error! No text of specified style in document.**.13 Model summary for the influence of environmental factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
					F Change	df1	df2	Sig. F Change
0.583	0.340	0.335	0.440	0.340	70.161	5	680	0.000

Table Error! No text of specified style in document.**.14 Coefficients for the influence of environmental factors on the preparedness of OHV aftermarket firms for adoption of digitalization**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.740	0.179		4.139	0.000
Involvement/support of government	0.269	0.039	0.279	6.961	0.000
Pressure from industry	0.115	0.039	0.117	2.938	0.003

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	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Pressure from competition	0.211	0.053	0.166	3.964	0.000
Pressure from customers	0.062	0.041	0.058	1.504	0.133
Pressure from suppliers	0.157	0.036	0.159	4.398	0.000

In summary, it was found that of the Technology factors, only Complexity of digitalization and Technology competence positively influenced the preparedness of OHV aftermarket firms for adoption of digitalization. Moreover, of the Organizational factors, Financial readiness, Technological readiness, Organizational readiness positively influenced the preparedness of OHV aftermarket firms for adoption of digitalization. In addition, of the Environmental factors, Involvement/Support of government; Pressure from industry; Pressure from competition; and Pressure from suppliers positively influenced the preparedness of OHV aftermarket firms for adoption of digitalization.

4.7 Research Question 3: What are the technological, organizational and environmental (TOE) factors that influence acceptance/adoption of digitalization in the automobile aftermarket industry?

The participants' perceptions regarding the essential factors of the TOE framework were analysed using descriptive statistical tests.

4.7.1 Technology factors

The descriptive analysis of the participants' perceptions regarding the technology factors affecting digitalization adoption (Table 4.15) revealed that the highest benefit perceived by the participants was that "Digitalization is helpful in improving customer service experience" (Mean=4.022±0.649). Regarding the Complexity of Digitalization, the participants' perceptions revealed that "The process of getting acquainted with the functions of

digitalization is complex" (Mean=3.844±0.776) and "The process of introducing Digitalization is complex" (Mean=3.845±0.779) were two leading facets contributing to complexity. Regarding Technology Competence, the participants' perceptions indicated that "In contrast to other firms in our industry, my organization has significant capabilities in IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.)" (Mean=3.873±0.735). The participants' perceptions indicated that customer service was the highest benefit followed by marketing efficacy, greater control, and quicker and better decision-making, among others. However, they acknowledged digitalization adoption would be complex principally from the viewpoint of introducing digitalization and learning its functions. Finally, it also required a firm to be technologically competent.

Table Error! No text of specified style in document.**.15 Technology factors affecting digitalization adoption**

Technology factors affecting digitalization adoption	Mean ± SD
Perceived benefits	
Digitalization is helpful in enhancing operational efficiency	3.886±0.810
Digitalization is helpful in reducing operating costs	3.974±0.732
Digitalization is helpful in improving customer service experience	4.022±0.649
Digitalization is helpful in distinguishing from rivals	3.959±0.674
Digitalization is helpful in improving marketing efficacy	3.993±0.627
Using Digitalization allows the organization to save time and avoid unnecessary costs.	3.945±0.683
The cost-effectiveness of digitalization is high.	3.907±0.679
Digitalization enables the organization to make better decisions.	3.965±0.676
Digitalization enables the organization to take quicker decisions and actions.	3.977±0.643
Digitalization makes it easier for the organization to perform business tasks.	3.966±0.675
Digitalization allows the organization to have greater control over the business.	3.988±0.648
Complexity of Digitalization	

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Technology factors affecting digitalization adoption	Mean ± SD
The process of getting acquainted with the functions of digitalization is complex.	3.844±0.776
The process of introducing Digitalization is complex.	3.845±0.779
Using Digitalization is complex and demanding for users.	3.799±0.832
It is difficult to learn how to work with digitalization	3.717±0.886
Resistance to Digitalization is a consequence of the complexity of working with digitalization.	3.768±0.789
Technology Competence	
In contrast to other firms in our industry, my organization has significant capabilities in data management services and architectures (e.g., databases, data warehousing, data availability, storage, accessibility, sharing etc.)	3.761±0.827
In contrast to other firms in our industry, my organization has significant capabilities in network communication services (e.g., connectivity, reliability, availability, LAN, WAN, etc.)	3.834±0.806
In contrast to other firms in our industry, my organization has significant capabilities in application portfolio & services (e.g., ERP, ASP, SCM, reusable software modules/components, APIs, emerging technologies, etc.)	3.867±0.720
In contrast to other firms in our industry, my organization has significant capabilities in IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.)	3.873±0.735
Overall, my organization has the in-house expertise to adopt full-scale digitalization	3.848±0.768

4.7.2 Organizational factors

Analysis of the participants' perceptions regarding the organizational factors affecting digitalization adoption (Table 4.16) revealed that from the perspective of financial readiness, "My organisation has the necessary financial resources available for installing and implementing new technology as part of digitalization" (Mean=4.128±1.080) was the most common aspect. The presence of an IT department seemed to be the most common aspect for technological readiness (Mean=3.980±0.739). From the perspective of Support/commitment from top management, the participants' perceptions indicated that it was "Top management

supports the implementation and adoption of digitalization" (Mean=4.009±0.646). Finally, for organizational readiness, the participants' perceptions indicated that it the presence of "enough technological resources to adopt digitalization" (Mean=3.952±0.659). Overall, the participants' perceptions indicated that financial and technological resources, an existing IT department, and support from top management were organisational facets affecting digitalization adoption.

Table Error! No text of specified style in document.**.16 Organizational factors affecting digitalization adoption**

Organizational factors affecting digitalization adoption	Mean ± SD
Financial readiness	
My organisation has the necessary financial resources available for installing and implementing new technology as part of digitalization	4.128±1.080
My organisation has the financial resources required to pay for new technology innovation costs related to digitalization	3.838±0.784
My organisation has the financial resources for implementation of any subsequent enhancements related to digitalization	3.926±0.652
My organisation has the financial resources required to pay for ongoing expenses during usage related to digitalization	3.934±0.664
Technological readiness	
My organisation has the right level of sophistication as regards usage and management of technology to proceed for adoption of digitalization	3.902±0.682
My organisation has the right level of IT expertise and resources to proceed for adoption of digitalization	3.886±0.728
My organisation has the right level of technical competence to proceed for adoption of digitalization	3.902±0.707
My organisation has the right level IS knowledge among employees to proceed for adoption of digitalization	3.862±0.688
My organisation has an IT department	3.980±0.739
Support/commitment from top management	
Top management supports the implementation and adoption of digitalization.	4.009±0.646
Top management actively participates in establishing the vision and shaping the strategy to adopt digitalization.	3.950±0.675

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Organizational factors affecting digitalization adoption	Mean ± SD
Top management is prepared to deal with the potential risks of adoption and use of digitalization.	3.860±0.791
There is a person at the management level who strongly promotes the implementation of the digitalization (highlights the significance of adopting digitalization).	3.862±0.788
There is a person at the management level who shows great enthusiasm in initiating the digitalization adoption (persuades to adopt the system).	3.901±0.714
There are one or more people at the management level who constantly emphasize the benefits of digitalization.	3.924±0.684
Organizational readiness	
Managers and employees in our firm know how to use digitalization for business support.	3.886±0.697
Managers and employees in our firm understand well how to use digitalization in business.	3.869±0.660
Our firm has sufficient technical, managerial, and other capabilities needed to adopt digitalization.	3.882±0.720
Our firm has sufficient financial, technological, and other resources needed to adopt digitalization.	3.824±0.821
We are financially ready to adopt digitalization	3.940±0.701
We have enough technological resources to adopt digitalization.	3.952±0.659
Our employees do not have adequate knowledge to adopt digitalization.	3.796±0.857
Our business values and norms would not prevent us from adopting digitalization in our operations.	3.859±0.771
We do not have in-house expertise to adopt digitalization.	3.778±0.865

4.7.3 Environmental factors

The participants' perceptions regarding the environmental factors affecting digitalization adoption (Table 4.17) revealed that key aspects were "Government understands the significance of digital transformation/digitalization in automotive aftermarket" (Mean=3.911±0.641); "The level of technological capability in the OHV aftermarket industry is very high" (Mean=3.942±0.696); "For our firm, it is strategically necessary to start with

digitalization" (Mean=3.964±0.660); "Our customers are increasingly adopting digitalization" (Mean=3.978±0.631); and "Our suppliers are increasingly preferring firms who have adopted digitalization" (Mean=3.972±0.642). Overall, the perceptions indicated that the OHV aftermarket industry had a high level of technological capability. Moreover, there was pressure from customers and suppliers for firms to use digitalization. Hence, it was a strategic necessity for firms to adopt digitalization.

Table Error! No text of specified style in document.**.17 Environmental factors affecting digitalization adoption**

Environmental factors affecting digitalization adoption	Mean± SD
Involvement/support of government	
Government involvement with digital transformation/digitalization in automotive aftermarket is strong.	3.736±0.854
Government is not interested in digital transformation/digitalization in automotive aftermarket.	3.726±0.850
Government understands the significance of digital transformation/digitalization in automotive aftermarket.	3.911±0.641
Government does not support digital transformation/digitalization in automotive aftermarket.	3.681±0.877
Government does not understand strategic importance of digital transformation/digitalization in automotive aftermarket.	3.733±0.837
Our firm/industry is under pressure from the government to implement digital transformation/digitalization.	3.746±0.842
Pressure from industry	
The level of technological capability in the OHV aftermarket industry is very high.	3.942±0.696
The firm's competitors in the OHV aftermarket industry have a very high level of technological capability.	3.848±0.715
Pressure caused by the degree of competition in our business has influenced the decision on the necessity to adopt digitalization	3.869±0.707
There is intense pressure from the aftermarket industry association for firms to adopt digitalization.	3.768±0.757
Pressure from competition	
Our firm has to start adopting digitalization to maintain its competitive advantage in the market.	3.892±0.671

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Environmental factors affecting digitalization adoption	Mean± SD
Our competitors have already adopted digitalization in their business.	3.902±0.671
For our firm, it is strategically necessary to start with digitalization.	3.964±0.660
Our firm is not under pressure from competitors to use digitalization.	3.860±0.709
Some of our competitors have already started using digitalization.	3.972±0.607
Our firm experienced competitive pressure to implement digitalization.	3.885±0.709
Our firm is affected by competitors in the local market.	3.867±0.754
Our firm is affected by competitors in the national market.	3.872±0.701
Pressure from customers	
Our customers are increasingly adopting digitalization	3.978±0.631
Our customers are increasingly preferring firms who have adopted digitalization.	3.974±0.627
Our customers have a positive perception towards firms who have adopted digitalization.	3.907±0.696
Pressure from suppliers	
Our suppliers are increasingly adopting digitalization.	3.956±0.660
Our suppliers are increasingly preferring firms who have adopted digitalization.	3.972±0.642
Our suppliers have a positive perception towards firms who have adopted digitalization.	3.859±0.746

Overall, from the perspective of technology factors, the participants' perceptions of Perceived Benefits, Complexity of Digitalization, and Technology Competence, indicated that a combination of all three facets could impact an organization's decision to adopt digitalization. In addition, the participants' perceptions indicated that a combination of the organizational facets considered in the study namely, Financial readiness, Technological readiness, Support/commitment from top management, and Organizational readiness, could influence an organization's decision to adopt digitalization. Also, the participants' perceptions indicated that they agreed that environmental aspects, such as Involvement/Support of government; Pressure from industry; Pressure from competition; Pressure from customers; and Pressure from

suppliers, were influences on the preparedness of OHV aftermarket firms for adoption of digitalization.

4.7.4 Environmental uncertainty

In addition to the three facets of the TOE framework, the study also considered the environmental uncertainty of the external environment in which an OHV aftermarket firm operates. The participants' perceptions (Table 4.18) revealed that technological changes provide huge opportunities in the OHV aftermarket industry (Mean=4.036±0.642). Moreover, the industry has experienced major technological developments (Mean=3.955±0.641) and the technology in the industry changed quite rapidly (Mean=3.948±0.711). In addition, the participants agreed that their firm has to frequently change its marketing practices to remain competitive (Mean=3.936±0.714). On the whole, it appeared that the participants were convinced about the opportunities provided by digitalization. However, their opinions about the environment for OHV aftermarket firms seemed to be more neutral.

Table Error! No text of specified style in document.**.18 Environmental uncertainty**

Environmental uncertainty	Mean± SD
The actions of our competitors are easy to predict.	3.694±0.925
The demand for our products is unpredictable.	3.821±0.820
Our firm has to frequently change its marketing practices to remain competitive.	3.936±0.714
The rate of technological evolution in our industry (automobile aftermarket) is very slow.	3.765±0.828
My organisation is satisfied about the number of new products and services that have been marketed.	3.825±0.754
The technology in our industry changes quite rapidly.	3.948±0.711
Technological changes provide huge opportunities in our industry.	4.036±0.642
Our industry has experienced major technological developments.	3.955±0.641

4.7.5 Preparedness of OHV aftermarket firms for adoption of digitalization

The study considered that technological, organizational, and environmental factors impact the preparedness of OHV aftermarket firms for digitalization adoption. In this regard, it could be seen according to the participants' perceptions that the most important aspects of the preparedness of OHV aftermarket firms for digitalization adoption (Table 4.19) were acceptance that "Some of the functional areas in my firm require the adoption of digitalization" (Mean=4.051±0.652); willingness of a firm to invest resources to adopt digitalization (Mean=3.977±0.657); and the intention to adopt digitalization in the next 2 years (Mean=3.965±0.724). As with the perceptions on environment uncertainty, the opinions of the participants about the preparedness of firms for digitalization adoption seemed to be more neutral on the whole. Nevertheless, the perceptions of the participants indicated that some of their firms' departments and business processes required digitalization.

Table Error! No text of specified style in document.**.19 Preparedness of OHV aftermarket firms for adoption of digitalization**

Preparedness of OHV aftermarket firms for adoption of digitalization	Mean±SD
We have already adopted some digitalization in the organisation	3.710±0.934
My firm collects information about digitalization with the possible intention of using it	3.835±0.823
We intend to adopt digitalization in the next 2 years	3.965±0.724
We do not intend to adopt any digitalization services for the foreseeable future	3.780±0.835
The business processes in my firm require the adoption of digitalization	3.918±2.094
Some of my firm's departments require the adoption of digitalization.	3.958±0.717
Some of the functional areas in my firm require the adoption of digitalization.	4.051±0.652
My firm is willing to invest resources to adopt digitalization.	3.977±0.657

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4.8 Research Question 4: What are the aspects of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs?

As seen in the Conceptual Framework for the study (Section 2.9), the TOE framework was determined to be the most appropriate theoretical basis for the present study. In addition, Environmental uncertainty and Aspects of Digitalization Adoption were included in the model as mediating and moderating factors which respectively mediated and moderated the relationships between the TOE factors and the Preparedness of OHV aftermarket firms for adoption of digitalization. Moreover, organisation characteristics were chosen to be the control variables.

SmartPLS 3 was used to create and test the structural equation model (SEM) for the study. SEM is a group of statistical techniques utilised to measure and examine the associations between observed and latent variables. SEM is similar to regression analyses but more powerful as it scrutinises linear causal relationships between variables. Also, it simultaneously accounts for measurement error (Beran and Violato, 2010).

4.8.1 Assessment of measurement model

The measurement model created for the study can be found in Figure 4.1. The Dependent or Consequence Variable (Preparedness of OHV aftermarket firms for adoption of digitalization), Independent or Predictor variables (Technological Factors, Organisational Factors, Environmental Factors); Mediating variable: Environment uncertainty (EU); and Moderating variable (Aspects of Digitalization Adoption); are depicted as blue circles. The Control variables (Organisation Characteristics) are depicted as clear circles.

The principal criteria used to assess measurement models include reliability of individual items (indicators), reliability analysis, and construct validity (convergent and discriminant validity) (Henseler, Ringle and Sarstedt, 2015). Table 4.20 summarises the threshold values for assessing the model.

Table Error! No text of specified style in document.**.20 Threshold values for assessing measurement models** (Henseler and Fassott, 2010; J. F. Hair *et al.*, 2014; J.F. Hair *et al.*, 2014; Henseler, Ringle and Sarstedt, 2015)

Assessment	Threshold value
Individual item (indicator) reliability	Loading > 0.40 Denotes the appropriateness and capacity of indicators (i.e., items) created for a certain construct in evaluating the chief notions in a particular study
Reliability analysis	CR (composite reliability) and CA (Cronbach's alpha) > 0.70 Pertains to how well the items within each domain were interrelated with each other.
Convergent validity	AVE (average variance extracted) > 0.50 AVE signifies the mean quantity of variance explained by a construct in its indicator variables in comparison to the variance of its indicators on the whole
Discriminant validity	• The loadings for all indicators on a latent variable should be greater than its cross-loadings with another variable. • The square root of the AVE of each latent variable should be greater than its maximum correlation with any other variable.

Figure Error! No text of specified style in document.**.1 Measurement model**

The threshold for item loading is ideally >=0.70 (Henseler, Ringle and Sinkovics, 2009; J. F. Hair *et al.*, 2014). However, some researchers have suggested that the threshold be 0.40. In other words, any factor with an outer loading <0.40 should be eliminated from the measurement model (Hulland, 1999; Hair, Ringle and Sarstedt, 2011; J. F. Hair *et al.*, 2014). It has also been suggested that items with outer loadings ranging from 0.40 to 0.70 should be considered for elimination from the scale only if the deletion results in an increase in the CR or AVE to above the recommended threshold value (J. F. Hair *et al.*, 2014, p. 103).

Loadings for individual factors, Cronbach's alpha, composite reliability, and AVE are tabulated in Table 4.21 after removing items with loading below the threshold value. The constructs in their original state contained 101 items. After the removal of items with poor loading, 62 items were retained for the final model.

Table Error! No text of specified style in document.**.21 Construct Reliability and Validity**

Factors	Loading	Indicator reliability	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Aspects of digitalization adoption						
Factors expediting Digitalization			0.623	0.626	0.799	0.570
AD_ED_2	0.742	0.551				
AD_ED_3	0.794	0.631				
AD_ED_4	0.727	0.529				
Areas of Digitalization			0.721	0.724	0.827	0.546
AD_A_2	0.721	0.520				
AD_A_3	0.764	0.584				
AD_A_4	0.786	0.618				
AD_A_6	0.678	0.460				
Technological Factors						
Perceived benefits			0.738	0.748	0.835	0.559
TF_PB_4	0.673	0.453				
TF_PB_5	0.736	0.542				
TF_PB_6	0.793	0.628				
TF_PB_7	0.782	0.611				
Complexity of Digitalization			0.802	0.803	0.863	0.558
TF_CD_1	0.738	0.544				
TF_CD_2	0.766	0.587				
TF_CD_3	0.776	0.602				

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Factors	Loading	Indicator reliability	Cronbach's Alpha	rho_A	Composite Reliability	AVE
TF_CD_4	0.741	0.549				
TF_CD_5	0.714	0.510				
Technology competence			0.756	0.756	0.837	0.507
TF_TC_1	0.669	0.447				
TF_TC_2	0.703	0.494				
TF_TC_3	0.738	0.544				
TF_TC_4	0.732	0.536				
TF_TC_5	0.717	0.514				
Organizational Factors						
Financial readiness			0.676	0.683	0.822	0.606
OF_FR_2	0.740	0.547				
OF_FR_3	0.816	0.666				
OF_FR_4	0.777	0.604				
Technological readiness			0.732	0.733	0.833	0.555
OF_TR_1	0.710	0.505				
OF_TR_2	0.793	0.628				
OF_TR_3	0.750	0.563				
OF_TR_4	0.724	0.524				
Support/commitment from top management			0.732	0.732	0.833	0.556
OF_SC_2	0.720	0.518				
OF_SC_3	0.766	0.587				
OF_SC_4	0.789	0.623				
OF_SC_5	0.703	0.494				
Organizational readiness			0.746	0.747	0.840	0.569
OF_OR_2	0.699	0.488				
OF_OR_3	0.789	0.623				
OF_OR_4	0.792	0.628				
OF_OR_5	0.732	0.535				
Environmental Factors						
Involvement/Support of government			0.834	0.834	0.889	0.668
EF_IG_2	0.828	0.686				
EF_IG_4	0.842	0.709				
EF_IG_5	0.833	0.693				
EF_IG_6	0.764	0.584				
Pressure from industry			0.769	0.770	0.853	0.591
EF_PI_1	0.756	0.572				
EF_PI_2	0.787	0.620				
EF_PI_3	0.786	0.618				
EF_PI_4	0.745	0.555				
Pressure from competition			0.777	0.795	0.856	0.601
EF_PC_5	0.652	0.426				

Factors	Loading	Indicator reliability	Cronbach's Alpha	rho_A	Composite Reliability	AVE
EF_PC_6	0.793	0.629				
EF_PC_7	0.841	0.707				
EF_PC_8	0.800	0.641				
Pressure from customers			0.691	0.693	0.829	0.618
EF_PCU_1	0.783	0.614				
EF_PCU_2	0.804	0.647				
EF_PCU_3	0.769	0.592				
Pressure from suppliers			0.725	0.735	0.844	0.644
EF_PS_1	0.796	0.633				
EF_PS_2	0.834	0.696				
EF_PS_3	0.776	0.602				
Environment uncertainty			0.692	0.708	0.812	0.521
EU_1	0.759	0.577				
EU_2	0.784	0.614				
EU_4	0.724	0.524				
EU_5	0.606	0.367				
Preparedness of OHV aftermarket firms for adoption of digitalization			0.713	0.721	0.822	0.537
A_1	0.722	0.522				
A_2	0.800	0.639				
A_3	0.676	0.457				
A_4	0.727	0.528				

4.8.2 Discriminant Validity

Discriminant validity is "the extent to which a measure is novel and not simply a reflection of some other construct. Specifically, it is the 'degree to which scores on a studied instrument are differentiated from behavioural manifestations of other constructs, which on theoretical grounds can be expected not to be related to the construct underlying the instrument under investigation'" (Boateng *et al.*, 2018, p. 14).

In general, discriminant validity is verified by examining cross-loadings. It is achieved by comparing the component scores of the different latent variables with not only their own block of indicator items but also all other items included in the model (Chin and Dibbern, 2010). Table 4.22 summarises the discriminant validity for the study's constructs using the Fornell and Larcker (1981) criterion. According to this criterion, the off-diagonal relationships

of indicator items are matched with the square root of the AVE (Fornell and Larcker, 1981). That is, discriminant validity is "established if a latent variable accounts for more variance in its associated indicator variables than it shares with other constructs in the same model. To satisfy this requirement, each construct's average variance extracted (AVE) must be compared with its squared correlations with other constructs in the model" (Henseler, Ringle and Sarstedt, 2015, p. 116). The threshold value for this test is a minimum AVE value of 0.50 (Fornell and Larcker, 1981). As can be seen from the diagonal cells in Table 4.22, the square roots of the AVE are greater than the correlations between the individual constructs for the majority of the items. This confirms that the constructs have sufficient discriminant validity.

The discriminant validity of the constructs was further checked using the Heterotrait-Monotrait (HTMT) criterion (Henseler, Ringle and Sarstedt, 2015). In this criterion, the means of the relationships of indicators across different constructs are compared with means of the relationships of indicators within the same construct. The threshold value for this test is 0.85 (Henseler, Ringle and Sarstedt, 2015). Table 4.23 summarises the discriminant validity for the study's constructs using the Heterotrait-Monotrait (HTMT) criterion. From the table it can be seen (in the diagonal cells) that while not all the square roots of the AVE are higher than the relationships among the constructs, it can be inferred that there is adequate discriminant validity. In addition, the majority of the correlations fall under the threshold (0.85) of the test which again supports the overall discriminant validity of the scale.

Table Error! No text of specified style in document..**22 Fornell-Larcker Criterion**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Areas of Digitalization (1)	**0.739**															
Complexity of Digitalization (2)	-0.003	**0.747**														
Environment uncertainty (3)	0.070	0.403	**0.722**													
Factors expediting Digitalization (4)	0.380	0.064	0.017	**0.755**												
Financial readiness (5)	0.259	0.126	0.263	0.218	**0.778**											
Involvement/Support of government (6)	-0.076	0.495	0.564	-0.089	0.140	**0.817**										
Organizational readiness (7)	0.297	0.171	0.353	0.232	0.379	0.228	**0.754**									
Perceived benefits (8)	0.320	0.161	0.188	0.296	0.292	0.006	0.232	**0.747**								
Preparedness of OHV aftermarket firms for adoption of digitalization (9)	0.096	0.390	0.948	0.012	0.218	0.532	0.320	0.177	**0.733**							
Pressure from competition (10)	0.024	0.434	0.446	0.082	0.182	0.466	0.224	0.116	0.420	**0.775**						
Pressure from customers (11)	0.154	0.185	0.295	0.188	0.225	0.221	0.291	0.162	0.270	0.473	**0.786**					

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Pressure from industry (12)	0.156	0.318	0.425	0.110	0.273	0.503	0.370	0.172	0.404	0.416	0.358	**0.769**				
Pressure from suppliers (13)	0.167	0.168	0.347	0.284	0.285	0.199	0.373	0.262	0.298	0.294	0.491	0.289	**0.802**			
Support/commitment from top management (14)	0.360	0.142	0.229	0.307	0.428	0.075	0.545	0.406	0.198	0.155	0.264	0.250	0.304	**0.745**		
Technological readiness (15)	0.264	0.147	0.352	0.228	0.476	0.191	0.540	0.343	0.315	0.191	0.296	0.366	0.300	0.506	**0.745**	
Technology competence (16)	0.278	0.202	0.264	0.267	0.432	0.104	0.517	0.314	0.222	0.112	0.263	0.269	0.272	0.514	0.526	**0.712**

Table Error! No text of specified style in document.**.23 Heterotrait-Monotrait Ratio (HTMT)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Areas of Digitalization (1)																
Complexity of Digitalization (2)	**0.118**															
Environment uncertainty (3)	0.107	**0.544**														
Factors expediting Digitalization (4)	0.565	0.129	**0.125**													
Financial readiness (5)	0.368	0.174	0.392	**0.333**												
Involvement/Support of government (6)	0.126	0.609	0.734	0.124	**0.180**											
Organizational readiness (7)	0.408	0.220	0.506	0.340	0.530	**0.286**										

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Perceived benefits (8)	0.454	0.207	0.261	0.433	0.414	0.103	**0.315**									
Preparedness of OHV aftermarket firms for adoption of digitalization (9)	0.142	0.511	0.820	0.117	0.301	0.676	0.437	**0.241**								
Pressure from competition (10)	0.093	0.543	0.596	0.137	0.251	0.563	0.294	0.160	**0.549**							
Pressure from customers (11)	0.224	0.249	0.435	0.287	0.338	0.287	0.408	0.236	0.385	**0.640**						
Pressure from industry (12)	0.213	0.405	0.584	0.157	0.377	0.623	0.489	0.241	0.540	0.538	**0.490**					
Pressure from suppliers (13)	0.237	0.217	0.515	0.427	0.402	0.246	0.512	0.358	0.409	0.391	0.694	**0.376**				
Support/commitment from top management (14)	0.498	0.186	0.336	0.460	0.607	0.123	0.739	0.567	0.278	0.210	0.374	0.334	**0.427**			
Technological readiness (15)	0.365	0.195	0.504	0.335	0.666	0.243	0.729	0.459	0.431	0.260	0.420	0.489	0.407	**0.691**		
Technology competence (16)	0.377	0.253	0.370	0.394	0.602	0.141	0.687	0.419	0.292	0.158	0.366	0.353	0.374	0.691	**0.706**	

4.8.3 Evaluation of model fitness

After checking the discriminant validity, the coefficient of determination (R square values) was computed to check the measurement model (Table 4.24). The values for this coefficient range from weak to substantial and many researchers have provided different guidelines. For instance, according to Chin (Chin and Dibbern, 2010) the range is 0.19 (weak), 0.33 (moderate), and 0.67 (substantial). On the other hand, Hair *et al.* (2014) suggest that the range is 0.25 (weak), 0.50 (moderate), and 0.75 (substantial). From the table it can be seen that most of the constructs can be collectively explained by the underlying latent constructs in the range of 90.0% (Preparedness of OHV aftermarket firms for adoption of digitalization) to 99.7% (Environmental factors) indicating substantial R square results. In contrast, environment uncertainty alone was at a moderate level.

Table Error! No text of specified style in document.**.24 Coefficient of determination – R square**

	R Square	R Square Adjusted
Aspects of Digitalization Adoption	0.982	0.982
Environment uncertainty	0.360	0.359
Environmental Factors	0.997	0.997
Factors affecting decision to adopt digitalisation	0.996	0.996
Organizational Factors	0.995	0.995
Preparedness of OHV aftermarket firms for adoption of digitalization	0.901	0.900
Technological Factors	0.995	0.995

Next, Effect Size (f^2) was measured to describe the comparative impact of certain independent variables on dependent variables (Table 4.25). According to Cohen (2013), f2 values indicate effect sizes and may range from weak (0.020 to 0.150), medium (0.150 to 0.350), or large (>=0.350). In the present study, the values were >1 indicating very large effects of the independent variables on the dependent variables.

Table Error! No text of specified style in document..**25 Effect Size – F square**

	Aspects of Digitalization Adoption	Environment uncertainty	Environmental Factors	Factors affecting decision to adopt digitalisation	Organizational Factors	Preparedness of OHV aftermarket firms for adoption of digitalization	Technological Factors
Factors expediting Digitalization	12.911						
Areas of Digitalization	22.064						
Perceived benefits							16.747
Complexity of Digitalization							57.015
Technology competence							57.294
Financial readiness					9.419		
Technological readiness					16.511		
Support/commitment from top management					15.336		
Organizational readiness					8.640		
Involvement/Support of government			25.518				
Pressure from industry			22.098				
Pressure from competition			14.601				
Pressure from customers			11.202				
Pressure from suppliers			11.341				
Technological Factors				15.721			
Organizational Factors				30.181			
Environmental Factors				50.836			
Factors affecting decision to adopt digitalisation		0.562				0.011	
Aspects of Digitalization Adoption						0.009	
Environment uncertainty						5.882	

Table 4.26 summarises the Goodness of fit of the model created for the study. It can be seen that the SRMR value is 0.073 which is acceptable. The NFI is also greater than the threshold value of 0.90 which suggests the model is a good fit (Hu and Bentler, 1999). The two criteria for exact model fit (d_ULS and d_G) are not significant indicating the model fit is acceptable (Dash and Paul, 2021).

Table Error! No text of specified style in document.**.26 Model fit summary**

	Saturated Model	**Estimated Model**
SRMR (standardized root mean squared residual)	0.050	0.073
d_ULS (squared Euclidean distance)	0.792	0.963
d_G (geodesic distance)	0.555	0.458
Chi-Square	1456.325	1985.325
NFI (normed fit index)	0.915	0.915

The predictive relevance of the model (Figure 4.2) was measured by using the blindfolding technique. The values of $\mathbf{Q^2}$ are positive (Table 4.27) indicating that the model has predictive validity (Henseler, Ringle and Sinkovics, 2009).

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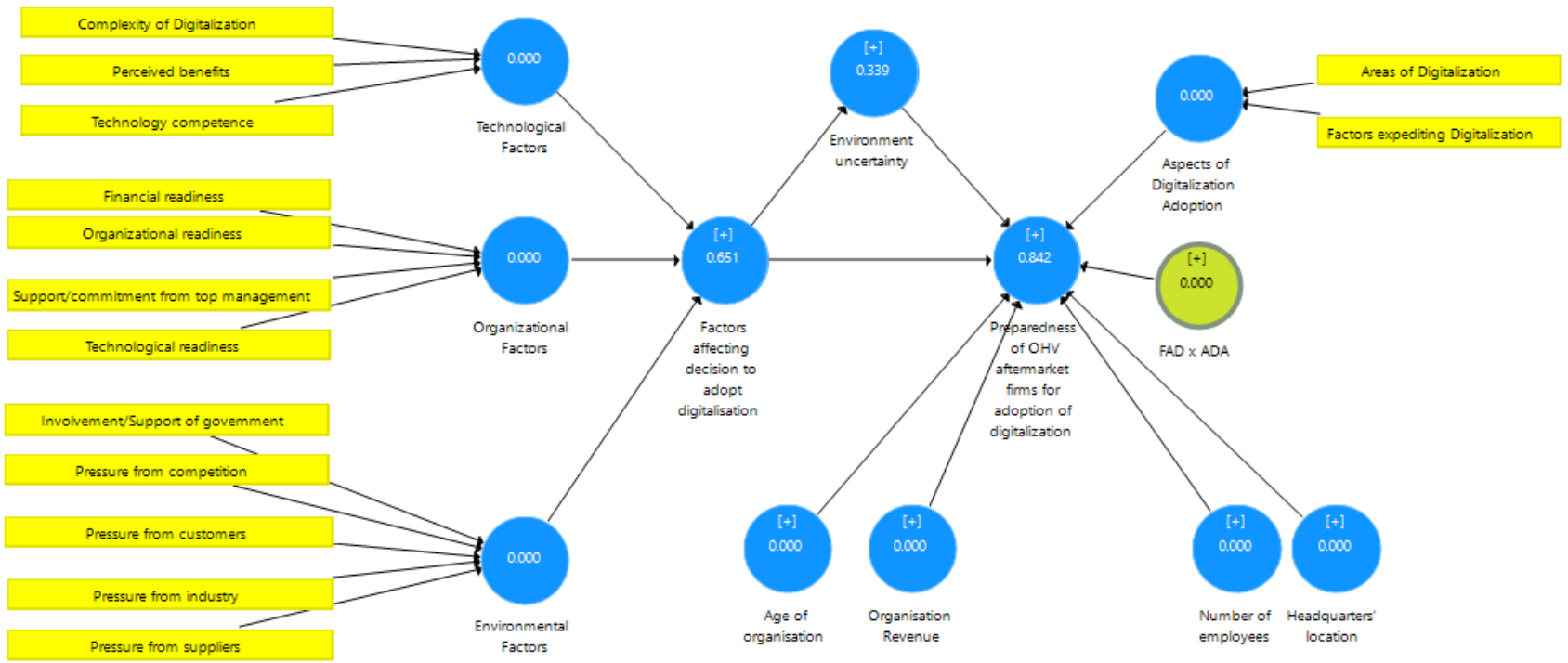

Figure Error! No text of specified style in document..**2 Predictive relevance**

Table Error! No text of specified style in document.**.27 Predictive relevance**

Factor	SSO	SSE	Q^2 (=1-SSE/SSO)
Environment uncertainty	686.000	453.752	0.339
Factors affecting decision to adopt digitalisation	2058.000	717.846	0.651
Preparedness of OHV aftermarket firms for adoption of digitalization	686.000	108.130	0.842

4.8.4 Collinearity Assessment

The collinearity testing of the model (Table 4.28) revealed that the Variance Inflation Factor (VIF) ranged between 1.189 and 2.06 which indicates that all the indicators are free from bias (Hariandja *et al.*, 2021).

Table Error! No text of specified style in document.**.28 Outer VIF**

Item	VIF	Item	VIF
AD_ED_2	1.189	OF_SC_5	1.367
AD_ED_3	1.304	OF_OR_2	1.295
AD_ED_4	1.233	OF_OR_3	1.517
AD_A_2	1.326	OF_OR_4	1.629
AD_A_3	1.482	OF_OR_5	1.437
AD_A_4	1.521	EF_IG_2	1.983
AD_A_6	1.246	EF_IG_4	2.060
TF_PB_4	1.209	EF_IG_5	1.933
TF_PB_5	1.532	EF_IG_6	1.475
TF_PB_6	1.544	EF_PI_1	1.471
TF_PB_7	1.560	EF_PI_2	1.564
TF_CD_1	1.536	EF_PI_3	1.593

Item	VIF	Item	VIF
TF_CD_2	1.721	EF_PI_4	1.458
TF_CD_3	1.760	EF_PC_5	1.355
TF_CD_4	1.684	EF_PC_6	1.537
TF_CD_5	1.450	EF_PC_7	1.932
TF_TC_1	1.382	EF_PC_8	1.737
TF_TC_2	1.442	EF_PCU_1	1.331
TF_TC_3	1.523	EF_PCU_2	1.361
TF_TC_4	1.543	EF_PCU_3	1.338
TF_TC_5	1.481	EF_PS_1	1.386
OF_FR_2	1.303	EF_PS_2	1.453
OF_FR_3	1.375	EF_PS_3	1.443
OF_FR_4	1.282	EU_1	1.425
OF_TR_1	1.318	EU_2	1.473
OF_TR_2	1.517	EU_4	1.302
OF_TR_3	1.437	EU_5	1.218
OF_TR_4	1.389	A_1	1.300
OF_SC_2	1.380	A_2	1.520
OF_SC_3	1.522	A_3	1.339
OF_SC_4	1.608	A_4	1.324

4.8.5 Testing of model

The next step involved the testing of the structural model (Figure 4.3). The outcomes of the analysis revealed that the paths were not significant for Age of organisation -> Preparedness of OHV aftermarket firms for adoption of digitalization; Headquarters' location -> Preparedness of OHV aftermarket firms for adoption of

digitalization; Number of employees -> Preparedness of OHV aftermarket firms for adoption of digitalization; Organisation Revenue -> Preparedness of OHV aftermarket firms for adoption of digitalization (Table 4.29). Nevertheless, it could be seen that Aspects of Digitalization Adoption (ADA) moderates the relation between the TOE factors (FAD) and preparedness of OHV aftermarket firms for adoption of digitalization ($p<0.5$). Consequently, hypothesis *H4: Aspects of Digitalization Adoption moderates the relation between the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization* could be Accepted.

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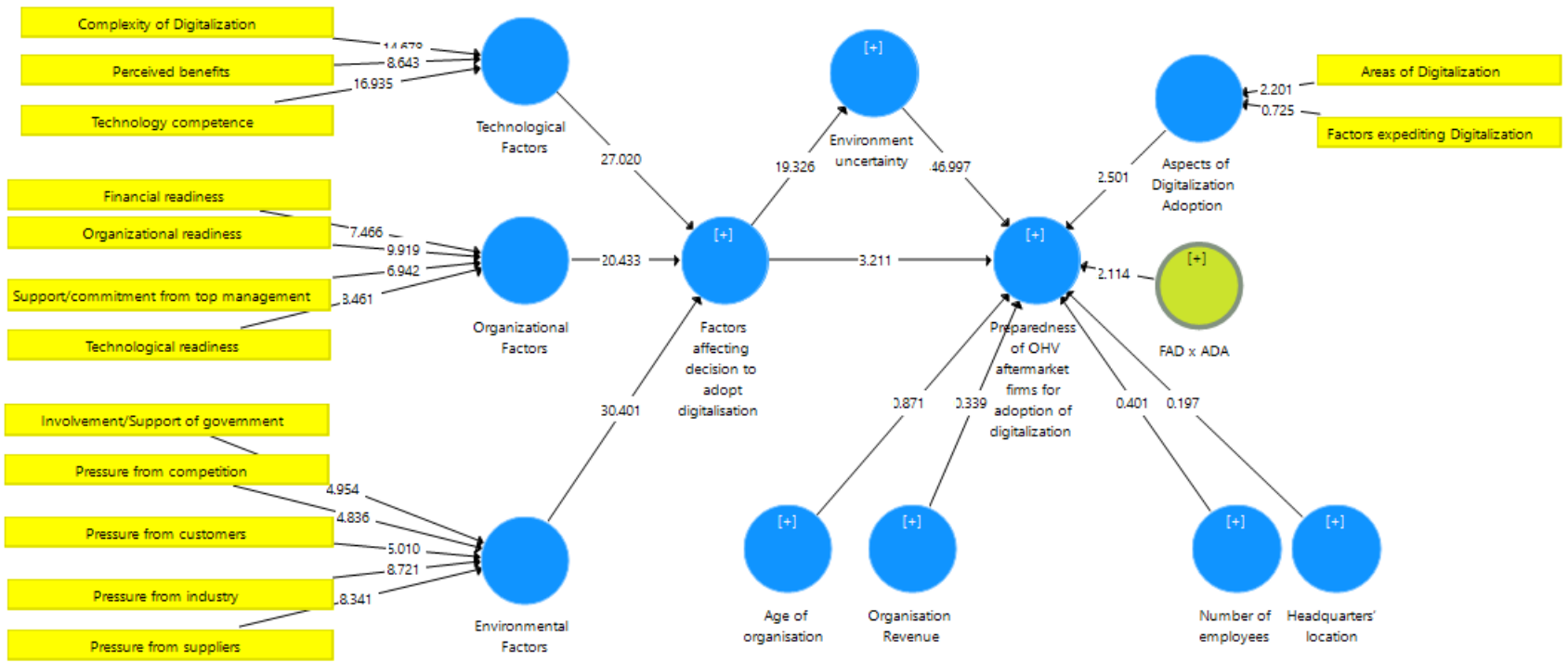

Figure Error! No text of specified style in document.**.3 Structural model**

Table Error! No text of specified style in document.**.29 Path coefficients**

Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Technological Factors -> Factors affecting decision to adopt digitalisation	0.410	0.408	0.015	27.020	0.000
Organizational Factors -> Factors affecting decision to adopt digitalisation	0.355	0.354	0.017	20.433	0.000
Environmental Factors -> Factors affecting decision to adopt digitalisation	0.446	0.444	0.015	30.401	0.000
Factors affecting decision to adopt digitalisation -> Environment uncertainty	0.585	0.586	0.030	19.326	0.000
Environment uncertainty -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.869	0.867	0.018	46.997	0.000
Factors affecting decision to adopt digitalisation -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.080	0.082	0.025	3.211	0.001
Aspects of Digitalization Adoption -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.059	0.059	0.024	2.501	0.013
FAD x ADA -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.024	0.026	0.011	2.114	0.035
Age of organisation -> Preparedness of OHV aftermarket firms for adoption of digitalization	-0.017	-0.016	0.019	0.871	0.384

Paths	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Headquarters' location -> Preparedness of OHV aftermarket firms for adoption of digitalization	-0.003	-0.003	0.015	0.197	0.844
Number of employees -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.008	0.009	0.021	0.401	0.689
Organisation Revenue -> Preparedness of OHV aftermarket firms for adoption of digitalization	-0.007	-0.008	0.019	0.339	0.735

The effect of the independent variable (Factors affecting decision to adopt digitalisation) on the dependent variable (Preparedness of OHV aftermarket firms for adoption of digitalization) through the mediator variable (Environment uncertainty) was found to be significant (Table 4.30). Hence, Hypothesis *H5: Environment uncertainty mediates the relation between the TOE factors and preparedness of OHV aftermarket firms for adoption of digitalization* could be Accepted

Table Error! No text of specified style in document.**.30 Indirect effect (Mediation)**

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Factors affecting decision to adopt digitalisation -> Environment uncertainty -> Preparedness of OHV aftermarket firms for adoption of digitalization	0.508	0.508	0.027	18.900	0.000

4.10 Chapter Conclusion

The purpose of this chapter was to present the findings from the data obtained from 686 participants from different firms in the aftermarket industry. The collected data were coded and then analysed using IBM's Statistical Package for Social Sciences (SPSS v24) and SmartPLS 3. The findings were organised into different sections based on the research questions.

CHAPTER V
DISCUSSION

5.1 Chapter Introduction

This chapter presents the discussion of the key findings from the study through the lens of existing literature and is organised around the study's research questions.

5.2 Discussion of findings

The use of technology has been acknowledged to improve the effectiveness of industries including the automotive and its associated aftermarket industries. However, despite the significance of the automotive aftermarket industry in the global market, a lack of empirical attention could be discerned as regards technology adoption in this setting. Specifically, the aftermarket for off-highway vehicles (OHVs) has not received much consideration in research. The present study thus examined the preparedness of OHV aftermarket firms for adoption of digitalization. While different theories related to technology adoption exist, the Technology-Organization-Environment (TOE) framework was found to be a suitable theory on which to base the present study because it deals with technology adoption by organisations.

The participants of the study were middle to senior managers with considerable work experience in the aftermarket industry. Moreover, they were from organisations of different sizes, age, and revenues. The majority of the organisations were from North America and had already adopted digitalization. The findings of the study indicated that various contemporary technologies, such as IoT, blockchain, cloud computing, Big Data,

etc., were being used in the participants' organisations. This indicated that the organisations were influenced by the factors furthering digitalization or digital transformation (Ulas, 2019). Moreover, consistent with Ulas (2019) the findings revealed that the participants were in agreement with the factors that could expedite digitalisation adoption and areas where digitalisation could be adopted in their firms.

Overall, the correlation studies indicated that all the study's variables were correlated significantly ($p<0.01$) at the variable level. This was confirmed at the sub-factor level for all correlations except for those between complexity of digitalization with factors which can expedite adoption of digitalization and areas where digitalization can be adopted in a firm; and involvement/support of government with factors which can expedite adoption of digitalization, areas where digitalization can be adopted in a firm, and perceived benefits.

5.2 Discussion of Research Question 1: What are the different areas where digitalization can be implemented in the automobile aftermarket industry?

The findings of the study revealed that digitalization could be implemented in different areas in the automobile aftermarket industry. The more popular areas were customer management, demand forecasting, supply and logistics, and human resources (Ulas, 2019). This was interesting since it indicated that perhaps not all of the participants' firms were utilising digitalization for the core manufacturing, and marketing and sales aspects of their business.

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5.3 Discussion of Research Question 2: Can an existing theoretical framework such as, the TOE framework, help explain the factors that influence the acceptance of digitalization in the automobile aftermarket industry?

The present study evaluated different theories of technology adoption and found that the Technology-Organization-Environment (TOE) framework was appropriate for the present study since it deals with the setting where digitalization adoption is to take place namely, OHV aftermarket firms, but also because it can be used to assess different factors that influence the adoption of digitalization. In this regard, the study found that complexity of digitalization and technology competence were technology factors that influenced the preparedness of OHV aftermarket firms for adoption of digitalization. This was in contrast to the findings of Stjepić, Bach and Vukšić (2021) who found complexity of the technology (BIS) was not a significant factor in its adoption. On the other hand, McKinnie (2016) also found that technical competency was a significant factor in cloud adoption. However, in the present study perceived benefits did not have an influence which was in line with the findings of Stjepić, Bach and Vukšić (2021) but contrasted with the findings of McKinnie (2016) who found it to be a significant influence on cloud adoption. Moreover, the study found that financial readiness, technological readiness, and organisational readiness, were organisational factors that influenced the preparedness of OHV aftermarket firms for adoption of digitalization. However, support/commitment from top management was not found to be an influencing factor which contrasted with the findings of Cruz-Jesus, Pinheiro and Oliveira (2019).

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5.4 Discussion of Research Question 3: What are the technological, organizational and environmental (TOE) factors that influence acceptance/adoption of digitalization in the automobile aftermarket industry?

The TOE framework has been previously utilised in studies of technology adoption in the automotive industry (Chian, Aziati and Sha'Ri, 2017; Hasmet and Ferman, 2020; Sadiq Jajja *et al.*, 2021; Upadhyay *et al.*, 2021; Park *et al.*, 2022). Similar to these earlier studies, the present study also found that a combination of technological, organisational, and environmental factors influenced technology adoption by an organisation. The most important technology facets as regards digitalization in the opinion of the participants were its usefulness in improving customer service experience, a perceived benefit, which was in line with the findings of Leung *et al*. (2015); the complexity associated with becoming familiar with digitalization functions and the process of introducing digitalization, which are facets of the complexity of digitalization, which were also studied by Stjepić, Bach and Vukšić (2021) and Oliveira, Thomas and Espadanal (2014); and the existence of significant IT capabilities, a facet of technology competence, which is in line with the findings of McKinnie (2016).

The most important organizational factors in the opinion of the participants were the existence of necessary financial resources, which is an aspect of financial readiness as suggested by Iacovou, Benbasat and Dexter (1995) and Nam, Kang and Kim (2015); the existence of an IT department, which is an aspect of technological readiness, which was studied by Yoon (2009); support of top management regarding digitalization

implementation and adoption, which is an aspect of top management support/commitment which were also studied by Stjepić, Bach and Vukšić (2021); and the existence of sufficient technological resources, which is an aspect of organizational readiness, which were again studied by Stjepić, Bach and Vukšić (2021).

The most important environmental factors in the opinion of the participants were the government's understanding of the significance of digital transformation/digitalization in automotive aftermarket, the high level of technological capability in the OHV aftermarket industry, and the use of digitalization by competitors, suppliers, and customers. These confirmed the facets which have been highlighted previously by various researchers (Leung *et al.*, 2015; Lutfi, 2017, 2020; Stjepić, Bach and Vukšić, 2021)**.**

As regards the environment surrounding the organisation and which may impact adoption of digitalization, the opinions of the participants indicated the opportunities provided by technological changes in the OHV aftermarket industry, the considerable technological advancements in the industry, and the rapid technological changes in the industry (Lutfi, 2017, 2020). Overall, these indicated that the OHV aftermarket industry was good environment for adoption of new technology.

Finally, as regards the preparedness of OHV aftermarket firms to adopt digitalization, the participants' opinions indicated that the most salient aspects were the existence of functional areas in the firm which required digitalization, the willingness of the organisation to invest resources to adopt digitalization, and a firm intention to adopt digitalization. These findings were consistent with prior research which suggested that

these facets were significant in different settings (Chan and Chong, 2013; Alharbi, Atkins and Stanier, 2016; Lutfi, 2020).

5.5 Discussion of Research Question 4: What are the aspects of a conceptual framework to explain acceptance/adoption of digitalization in organisations that support the aftermarket of OHVs?

The conceptual model for the study (Figure 2.23) was derived using insights from prior studies which had also studied technology adoption. Specifically, the following technological factors were considered: Perceived Benefits, Complexity of Digitization, and Technology Competence (Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021), to influence digitalization adoption. Similarly, the following organizational factors were included: Financial readiness, Technological readiness, Support/commitment from top management, and Organizational readiness (Leung *et al.*, 2015; Stjepić, Bach and Vukšić, 2021). Finally, for the environmental perspective, the following factors were identified: Involvement/Support of government, Pressure from industry, Pressure from competition, Pressure from customers, and Pressure from suppliers (Kuan and Chau, 2001; Leung *et al.*, 2015; Lutfi, 2020). The model also included a mediating variable (environmental uncertainty) and a moderating variable (aspects of digitalization adoption) (Lutfi, 2017; Ulas, 2019).The model also considered various organisation characteristics as control variables: age of organisation, organisation revenue, number of employees, and headquarters' location (country).

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Using partial least squares structural equation modelling (PLS-SEM), the study found confirmation of the mediating role of environment uncertainty on the relationship between of the independent variable (Factors affecting decision to adopt digitalisation) and the dependent variable (preparedness of OHV aftermarket firms for adoption of digitalization). Moreover, the study found confirmation of the moderating role of aspects of digitalization adoption on the relationship between the TOE factors (factors affecting decision to adopt digitalisation) and preparedness of OHV aftermarket firms for adoption of digitalization. However, the control variables namely, age of organisation, organisation revenue, number of employees, and headquarters' location (country), did not have any impact on the preparedness of OHV aftermarket firms for adoption of digitalization.

Overall, the findings of the study indicate certain modifications in the conceptual model which are depicted in Figure 5.1.

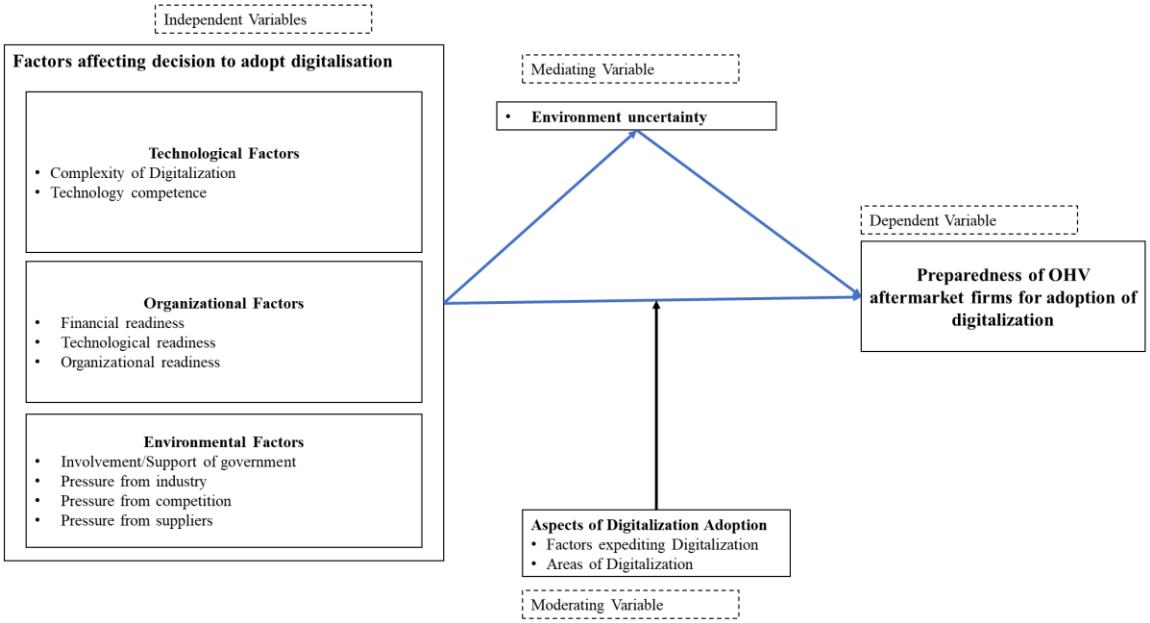

Figure 5.1 Final conceptual model revised based on the study's findings

5.6 Chapter Conclusion

This chapter presented the discussion of the key findings from the study as evaluated through the lens of existing literature and was organised around the study's research questions.

CHAPTER VI:
SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

This study was undertaken in response to a perceived need to investigate the factors that impact the adoption of digitalization and automation in the OHV aftermarket industry. In this regard, the influence of technological, organisational, and environmental factors on the preparedness of OHV aftermarket firms for acceptance/adoption of digitalization were studied. Moreover, the influence of environmental uncertainty and aspects of digitalization adoption on this relationship were also investigated using data from 686 employees of OHV aftermarket firms.

The participants were from OHV aftermarket firms from across the globe which catered to construction equipment, material handling, mining equipment, road machinery, agriculture equipment, and other equipment. The specific auto component segments catered to by the firms were engine parts, electrical parts, automobile equipment, suspension and braking parts, and other segments. The majority of the participants' organisations had already adopted digitalization and the technologies commonly in use included smartphones, cloud computing, Big Data, IoT, Chatbots, 3D printers, and other technologies.

From the participants' perceptions, the study found that different factors could expedite adoption of digitalization. These included globalization, digitization of manufacturing process, enhanced use of AI in manufacturing, the digital supply chain,

transformation of business processes, expectations of consumers, and progress in technology and innovation, sensor technology. Moreover, the study found that areas where digitalization could be adopted in their firms included customer management, demand forecasting, logistics and supply, human resources, sales and marketing, financials, new product design and development, and manufacturing.

Regarding the TOE factors affecting digitalization adoption, the participants' perceptions indicated that perceived benefits, complexity of digitalization, and technology competence were technological facets to be considered by organisations prior to technology adoption. Additionally, readiness (financial, technological, and organizational), and support/commitment from top management were necessary organizational facets to be considered by organisations prior to technology adoption. Furthermore, involvement/support of government, and stakeholder pressure (industry, competition, customers, suppliers) were necessary environmental facets to be considered by organisations prior to technology adoption. The participants' perceptions also revealed that technological changes provide huge opportunities in the OHV aftermarket industry and important facets of preparedness for digitalization adoption included acceptance that some functional areas required digitalization, willingness of the firm to invest resources, and intention to adopt.

Overall, the testing of the study's hypotheses highlighted that complexity of digitalization, and technology competence were technological facets to be considered by organisations prior to technology adoption. In addition, readiness (financial, technological,

and organizational) was a necessary organizational facet to be considered by organisations prior to technology adoption. Also, involvement/support of government, and stakeholder pressure (industry, competition, suppliers) were found to be necessary environmental facets to be considered by organisations prior to technology adoption. A further facet for consideration was the environmental uncertainty that surrounds a firm in the OHV aftermarket industry and the aspects of digitalization adoption that could impact a firm from the perspective of factors expediting adoption and the areas where digitalization could be adopted.

6.2 Implications

The following overarching research question was used to inform the study:

- What are the factors influencing the acceptance/adoption of digitalization in the automobile aftermarket industry?

The findings of the study indicate that an overall consideration of technological, organizational, and environmental factors would be beneficial for firms looking to adopt digitalization. Consequently, it contributes substantively to the research related to adoption of digitalization, in general, and in OHV aftermarket firms, in particular. For example, the study is an empirical investigation of organizational adoption of digitalization in the OHV aftermarket industry. Moreover, it highlights key aspects of adoption in the TOE framework as applicable to digitalization adoption. Additionally, it provides a generical conceptual framework for adoption of digitalization which considers moderating,

mediating, and control variables together with the independent and dependent variables pertaining to factors influencing digitalization adoption.

The study adds to existing research on technology adoption using the TOE framework by being as far as the researcher is aware, the first empirical scrutiny on technology adoption in the OHV aftermarket industry. The TOE framework is a well-known framework and has been used successfully in different adoption studies across a wide range of applications in the specific context of the automotive and automotive aftermarket industry, such as cloud computing, blockchain adoption, green manufacturing adoption, autonomous ships adoption, battery electric vehicles (Mckinnie, 2016; Chian, Aziati and Sha'Ri, 2017; Hasmet and Ferman, 2020; Sadiq Jajja *et al.*, 2021; Upadhyay *et al.*, 2021; Park *et al.*, 2022), to name a few. Hence, the findings of this study offer insights for adoption of digitalization in the OHV aftermarket environment.

Primarily, the study offers insights for stakeholders who have to devise an organisational strategy for digitalization adoption in their firms. The facets to be considered from a technological perspective are the complexity of digitalization and the technical competence of the firm. From an organisational perspective, facets for consideration are readiness (financial, technological, and organizational). From the environmental perspective, the involvement/support of government and stakeholder pressure (from industry, competition, and suppliers) are key facets to be considered in a strategy for digitalization adoption. That is, the strategy creation requires assessing the complexity of the technology and the extent of the firm's competence; assessing its readiness from

financial, technological, and organizational perspectives; and assessing the extent of governmental support/involvement and the overall compulsion from the industry participants as regards the technology under consideration. Overall, from an internal perspective, the readiness of a firm and its technological competency are key requirements for planning a strategy. On the other hand, from an external perspective, there is a need for awareness of the technological advancements, in general, and those related to the industry, in particular, and the extent to which competitors and suppliers have adopted different technology.

6.4 Limitations of the study

The study used an explanatory, descriptive study with quantititative methods of data collection and analysis. The findings of the study are therefore generalisable to other organisations in the OHV aftermarket industry. However, some limitations exist since the majority of the participants were from firms with headquarters in North America where the technological competence of firms, in general, is high. Hence, the applicability of the findings to firms in developing countries is perhaps limited.

Moreover, while the conceptual framework for the study was derived by the researcher using insights from existing literature, these could have been influenced by his subjective bias. Consequently, there is a need for further scrutiny of the model.

6.4 Suggestions for Future Research

The long-term objectives of the present study were to provide insights regarding the factors affecting the acceptance/adoption of digitalization in the automobile aftermarket industry. The study pursued this objective through an explanatory study. A future researcher could delve into this in a deeper manner by taking up a multiple case

study approach using a mixture of qualitative and quantitative methods to compare the status of digitalization adoption in different organisations in the OHV aftermarket industry. In addition, future researchers can test the robustness of the study's conceptual framework in a different industry setting.

APPENDIX A

SURVEY COVER LETTER

Questionnaire for participants in the off-highway vehicle (OHV) aftermarket industry

This questionnaire is part of an empirical research study titled "*Factors affecting the acceptance of digitalization in the Automobile Aftermarket industry*" as part of my Doctor of Business Administration. My study is an attempt to discover the factors affecting the acceptance of digitalization in the automobile aftermarket industry by focusing specifically on the aftermarket for Off-highway vehicles (OHVs).

I would be grateful if you could contribute to my study by filling up this questionnaire. I assure you that the data collected through this questionnaire shall be kept confidential and will be used only for academic purposes.

Regards,

Rudresh S Basavarajappa

Swiss School of Business and Management (SSBM)

Avenue des Morgines 12

1213 Genève

Switzerland

APPENDIX B

Questionnaire for participants in the off-highway vehicle (OHV) aftermarket industry

Section I: Demographic details (Choose only one option for each question)

1. **Age**:
   - □ 21-30 years
   - □ 31-40 years
   - □ 41-50 years
   - □ 51-60 years
   - □ Above 60 years
   - □ Other (Please specify) _____

2. **Gender**:
   - □ Male
   - □ Female
   - □ Other (Please specify) _____

3. **Educational Qualification:**
   - □ Undergraduate
   - □ Diploma
   - □ Graduate
   - □ Masters
   - □ Doctorate
   - □ Other (Please specify) _____

4. **Designation:**
   - □ Directors / Owners
   - □ CXO
   - □ After Market Head

- Parts Head
- Service Head
- Manager (Area/Zone/Region/Head of Department)
- Team / Group Leader
- Team Member
- Support Staff
- Enabling Team (IT / Finance / Admin / HR / Support)
- Other (Please specify) _____

5. Overall Work Experience (in years):

- <5 years
- 5 - 10 years
- >10 - 20 years
- >20 – 30 years
- >30 years

6. Work Experience in current organisation (in years):

- <5 years
- 5 - 10 years
- >10 - 20 years
- >20 – 30 years
- >30 years

7. Overall experience in Aftermarket Industry (in years):

- <5 years
- 5 - 10 years
- >10 - 20 years
- >20 – 30 years
- >30 years

Section II: Organisation Characteristics

8. Age of your organisation (in years):

- □ <5 years
- □ 5 - 10 years
- □ >10 - 20 years
- □ >20 – 30 years
- □ >30 – 50 years
- □ >50 – 80 years
- □ >80 – 100 years
- □ >100 years

9. Organisation revenue (USD)

- □ <10,000 USD
- □ 10,000 – 99,999 USD
- □ 100,000 – 499,999 USD
- □ 500,000 – 999,999 USD
- □ 1 million USD – 99 million USD
- □ 100 million USD – 1 billion
- □ 1 billion USD to – 10 billion
- □ Above 10 billion
- □ Other (Please specify) _____

10. Number of Employees:

- □ 1-99
- □ 100-499
- □ 500-999
- □ 1,000-9,999
- □ 10,000-99,999
- □ >100,000

11. Location of Operations (Regions) (More than one option can be chosen, if applicable)

- ☐ Asia
- ☐ Africa
- ☐ South America
- ☐ North America
- ☐ Europe
- ☐ Oceania
- ☐ Antarctica
- ☐ Other (Please specify) _____

12. Location of Headquarters (Country)

- ☐ Please specify _____

13. Type of OHVs catered to: (More than one option can be chosen, if applicable)

- ☐ Road machinery
- ☐ Agriculture equipment
- ☐ CNC (computer numerical control) machines
- ☐ Material handling
- ☐ Port handling
- ☐ Construction equipment
- ☐ Mining equipment
- ☐ Aggregate Manufacturers
- ☐ Other (Please specify) _____

14. Auto Component Segment: (More than one option can be chosen, if applicable)

- ☐ Transmission and Steering Parts
- ☐ Automobile equipment
- ☐ Engine parts
- ☐ Electrical parts
- ☐ Suspension and Braking parts

- ☐ Automobile ancillaries
- ☐ Body Parts
- ☐ Hydraulics
- ☐ Other (Please specify) _____

Section III: Status of Digitalization Adoption in your Organisation

15. Is digitalization adopted in your organisation?

- ☐ Completely
- ☐ Partially
- ☐ Not Implemented

16. **Which of the following are used in your organisation?** (More than one option can be chosen)

- ☐ Internet of Things (IoT)
- ☐ Blockchain
- ☐ Cloud computing
- ☐ Smartphones
- ☐ 3D printers
- ☐ Big Data
- ☐ Chatbots
- ☐ Augmented reality (AR)
- ☐ Robotics/autonomous robots
- ☐ Nanotechnology
- ☐ Cyber-physical systems
- ☐ Non-smart and non-flexible automation systems
- ☐ Smart sensors
- ☐ Computer Numerical Control (CNC)
- ☐ Artificial Intelligence (AI) and Machine Learning (ML)
- ☐ Other (Please specify) _____

17. The following statements are related to factors which can expedite adoption of digitalization (Ulas, 2019)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
1	There is considerable progress in technology and innovation, sensor technology (ST)					
2	Business practices are getting transformed due to internet economy, social media, electronic commerce					
3	Globalization, due to increased mobility of goods, services, and capital					
4	Digitisation of the manufacturing process due to Industry 4.0					
5	Increased use of artificial intelligence in manufacturing					
6	Digital supply chain has become an essential part of the automotive aftermarket industry					
7	Expectations of a new generation of consumers is affecting the automotive aftermarket					

18. The following statements are related to areas where digitalization can be adopted in your firm (Ulas, 2019)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
1	Design and Development of New Products					
2	Forecasting of demand					

Sl #	Statement	1	2	3	4	5
3	Supply and logistics					
4	Manufacturing					
5	Human resources					
6	Marketing and sales					
7	Customer management					
8	Payment and other financials					
9	Customer Support after Sales (end to end)					

Section IV: Technology Factors Affecting Digitalization adoption.

19. The following statements are related to technology factors which may impact your firm's decision to adopt digitalization (Leung *et al.*, 2015; Mckinnie, 2016; Stjepić, Bach and Vukšić, 2021)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
Perceived benefits						
1	Digitalization is helpful in enhancing operational efficiency					
2	Digitalization is helpful in reducing operating costs					
3	Digitalization is helpful in improving customer service experience					
4	Digitalization is helpful in distinguishing from rivals					
5	Digitalization is helpful in improving marketing efficacy					
6	Using Digitalization allows the organization to save time and avoid unnecessary costs.					

Sl #	Statement	1	2	3	4	5
7	The cost-effectiveness of Digitalization is high.					
8	Digitalization enables the organization to make better decisions.					
9	Digitalization enables the organisation to take quicker decisions and actions.					
10	Digitalization makes it easier for the organisation to perform business tasks.					
11	Digitalization allows the organization to have greater control over the business.					
Complexity of Digitalization						
12	The process of getting acquainted with the functions of Digitalization is complex.					
13	The process of introducing Digitalization is complex.					
14	Using Digitalization is complex and demanding for users.					
15	It is difficult to learn how to work with Digitalization					
16	Resistance to Digitalization is a consequence of the complexity of working with Digitalization.					
Technology Competence						
17	In contrast to other firms in our industry, my organization has significant capabilities in data management services and architectures (e.g., databases, data warehousing, data availability, storage, accessibility, sharing etc.)					
18	In contrast to other firms in our industry, my organization has significant capabilities in network communication services (e.g., connectivity, reliability, availability, LAN, WAN, etc.)					
19	In contrast to other firms in our industry, my organization has significant capabilities in application portfolio & services (e.g., ERP, ASP, SCM, reusable software modules/components, APIs, emerging technologies, etc.)					

Sl #	Statement	1	2	3	4	5
20	In contrast to other firms in our industry, my organization has significant capabilities in IT facilities' operations/services (e.g., servers, large-scale processors, performance monitors, etc.)					
21	Overall, my organization has the in-house expertise to adopt full-scale digitalization					

Section V: Organizational Factors Affecting Digitalization adoption.

20. The following statements are related to organizational factors which may impact your firm's decision to adoption digitalization (Iacovou, Benbasat and Dexter, 1995; Yoon, 2009; Nam, Kang and Kim, 2015; Lutfi, 2017; Stjepić, Bach and Vukšić, 2021)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
Financial readiness						
1	My organisation has the necessary financial resources available for installing and implementing new technology as part of digitalization					
2	My organisation has the financial resources required to pay for new technology innovation costs related to digitalization					
3	My organisation has the financial resources for implementation of any subsequent enhancements related to digitalization					

Sl #	Statement	1	2	3	4	5
4	My organisation has the financial resources required to pay for ongoing expenses during usage related to digitalization					
Technological readiness						
5	My organisation has the right level of sophistication as regards usage and management of technology to proceed for adoption of digitalization					
6	My organisation has the right level of IT expertise and resources to proceed for adoption of digitalization					
7	My organisation has the right level of technical competence to proceed for adoption of digitalization					
8	My organisation has the right level IS knowledge among employees to proceed for adoption of digitalization					
9	My organisation has an IT department					
Support/commitment from top management						
10	Top management supports the implementation and adoption of digitalization.					
11	Top management actively participates in establishing the vision and shaping the strategy to adopt digitalization.					
12	Top management is prepared to deal with the potential risks of adoption and use of digitalization.					
13	There is a person at the management level who strongly promotes the implementation of the digitalization (highlights the significance of adopting digitalization).					
14	There is a person at the management level who shows great enthusiasm in initiating the digitalization adoption (persuades to adopt the system).					
15	There are one or more people at the management level who constantly emphasize the benefits of digitalization.					
Organizational readiness						
16	Managers and employees in our firm know how to use digitalization for business support.					

Sl #	Statement	1	2	3	4	5
17	Managers and employees in our firm understand well how to use digitalization in business.					
18	Our firm has sufficient technical, managerial, and other capabilities needed to adopt digitalization.					
19	Our firm has sufficient financial, technological, and other resources needed to adopt digitalization.					
20	We are financially ready to adopt digitalization					
21	We have enough technological resources to adopt digitalization.					
22	Our employees do **not** have adequate knowledge to adopt digitalization.					
23	Our business values and norms would **not** prevent us from adopting digitalization in our operations.					
24	We do **not** have in-house expertise to adopt digitalization.					

Section V: Environmental Factors Affecting Digitalization adoption

21. The following statements are related to environmental factors which may impact your firm's decision to adoption digitalization (Leung *et al.*, 2015; Lutfi, 2017, 2020; Stjepić, Bach and Vukšić, 2021)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
Involvement/support of government						

Sl #	Statement	1	2	3	4	5
1	Government involvement with digital transformation/digitalization in automotive aftermarket is strong.					
2	Government is not interested in digital transformation/digitalization in automotive aftermarket.					
3	Government understands the significance of digital transformation/digitalization in automotive aftermarket.					
4	Government does not support digital transformation/digitalization in automotive aftermarket.					
5	Government does not understand strategic importance of digital transformation/digitalization in automotive aftermarket.					
6	Our firm/industry is under pressure from the government to implement digital transformation/digitalization.					
Pressure from industry						
7	The level of technological capability in the OHV aftermarket industry is very high					
8	The firm's competitors in the OHV aftermarket industry have a very high level of technological capability					
9	Pressure caused by the degree of competition in our business has influenced the decision on the necessity to adopt digitalization.					
10	There is intense pressure from the aftermarket industry association for firms to adopt digitalization.					
Pressure from competition						
11	Our firm has to start adopting digitalization to maintain its competitive advantage in the market.					
12	Our competitors have already adopted digitalization in their business.					
13	For our firm, it is strategically necessary to start with digitalization.					

Sl #	Statement	1	2	3	4	5
14	Our firm is not under pressure from competitors to use digitalization.					
15	Some of our competitors have already started using digitalization.					
16	Our firm experienced competitive pressure to implement digitalization.					
17	Our firm is affected by competitors in the local market.					
18	Our firm is affected by competitors in the national market.					
Pressure from customers						
19	Our customers are increasingly adopting digitalization					
20	Our customers are increasingly preferring firms who have adopted digitalization					
21	Our customers have a positive perception towards firms who have adopted digitalization					
Pressure from suppliers						
22	Our suppliers are increasingly adopting digitalization					
23	Our suppliers are increasingly preferring firms who have adopted digitalization					
24	Our suppliers have a positive perception towards firms who have adopted digitalization					

Section VII: Environmental Uncertainty

22. The following statements are also related to the environment surrounding your organisation and which may impact adoption of digitalization (Lutfi, 2017, 2020). Please indicate your extent to which you agree or disagree with these.

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Factors affecting the acceptance of digitalization in the Automobile Aftermarket industry.

Sl #	Statement	1	2	3	4	5
1	The actions of our competitors are easy to predict.					
2	The demand for our products is unpredictable.					
3	Our firm has to frequently change its marketing practices to remain competitive.					
4	The rate of technological evolution in our industry (automobile aftermarket) is very slow.					
5	My organisation is satisfied about the number of new products and services that have been marketed					
6	The technology in our industry changes quite rapidly.					
7	Technological changes provide huge opportunities in our industry.					
8	Our industry has experienced major technological developments					

Section VIII: Adoption of digitalization

T**he following statements are also related to your organization's adoption of digitalization** (Chan and Chong, 2013; Alharbi, Atkins and Stanier, 2016; Lutfi, 2020)**. Please indicate your extent to which you agree or disagree with these.**

1: Strongly disagree **2:** Disagree **3:** Neither agree nor disagree **4:** Agree **5:** Strongly Agree

Sl #	Statement	1	2	3	4	5
1	We have already adopted some digitalization in the organisation					
2	My firm collects information about digitalization with the possible intention of using it					
3	We intend to adopt digitalization in the next 2 years					

Sl #	Statement	1	2	3	4	5
4	We do not intend to adopt any digitalization services for the foreseeable future					
5	The business processes in my firm require the adoption of digitalization					
6	Some of my firm's departments require the adoption of digitalization.					
7	Some of the functional areas in my firm require the adoption of digitalization.					
8	My firm is willing to invest resources to adopt digitalization.					

Thank you very much for your Valuable time and effort in participating in this survey!

We will come back with survey results once it is completed, and I hope you are looking forward to knowing about outcome of this Survey.

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