



(RESEARCH ARTICLE)



Exploring business models for software-defined vehicles: Subscription-based paradigms and their impact on automotive innovation and consumer adoption

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Abstract

The automotive industry is transforming with the advent of Software-Defined Vehicles (SDVs), which leverage advanced software to enhance driving experiences and vehicle functionality. This research explores the emerging business models associated with SDVs, particularly focusing on subscription-based paradigms. These models offer an alternative to traditional vehicle ownership, potentially reshaping consumer behavior and automotive innovation.

This study examines the implications of subscription-based business models on automotive companies and consumers through a comprehensive literature review and empirical research. It analyzes how such models facilitate continuous innovation by enabling manufacturers to seamlessly deploy software updates and new features. Furthermore, the study investigates consumer attitudes towards subscription services, identifying key factors influencing adoption and barriers preventing widespread acceptance.

The findings suggest that while subscription models can foster greater flexibility and personalization for consumers, challenges such as pricing concerns and a reluctance to depart from traditional ownership remain significant. This paper concludes with recommendations for automotive stakeholders to enhance consumer acceptance and maximize the benefits of subscription-based business models, alongside suggestions for future research in this evolving field.

Keywords: Software-Defined Vehicles (SDVs); Subscription-Based Business Models; Automotive Innovation; Consumer Adoption; Mobility Solutions

1 Introduction

1.1 Background on Software-Defined Vehicles (SDVs)

1.1.1 Definition and significance of SDVs in the automotive industry

Over the past decade, the automotive industry has radically transformed, driven primarily by unprecedented technological advances and changing consumer expectations. At the heart of this transformation is the concept of software-defined vehicles (SDVs), a paradigm that reimagines vehicles not only as means of transport but as advanced technology platforms that are largely defined and controlled by software. This evolution marks a turning point in how we interact with vehicles, how they integrate into the urban ecosystem, and how automotive design and manufacturing are conceptualized.

In a nutshell, SDVs are vehicles whose features, performance, and user experience are fundamentally defined by software rather than solely by their hardware components. This philosophy (which you may recognize as something

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we already do with our smartphones) allows the same hardware to serve multiple purposes or setups through software modifications, enabling an unprecedented level of flexibility and customization through over-the-air (OTA) updates. This means that a vehicle's characteristics can evolve long after it has left the showroom floor, offering a dynamic and customizable driving experience.

SDVs are revolutionizing the entire automotive industry and its ecosystems. Car manufacturers can access new business models and revenue streams by offering software subscriptions, updates, and digital services, providing ongoing value to customers and opening up new markets. Automakers must rethink how they operate, from their human resources (with a greater emphasis on software engineering) to their manufacturing (which needs to be adapted to assembling vehicles that are essentially complex technological platforms). On the customer side, this change also affects user-vehicle interaction, enabling more intuitive, customizable, and updatable interfaces, transforming the vehicle into a personalized assistant where the user experience can be enriched and tailored to individual needs.

The rise of SDVs is also reshaping the role of suppliers. Traditional automotive suppliers focused on manufacturing physical components are now asked to pivot toward software development and digital services. This transition is fostering new partnerships between automakers, technology companies, and startups, blurring the lines between the automotive and technology sectors and breaking down silos between links in the value chain.

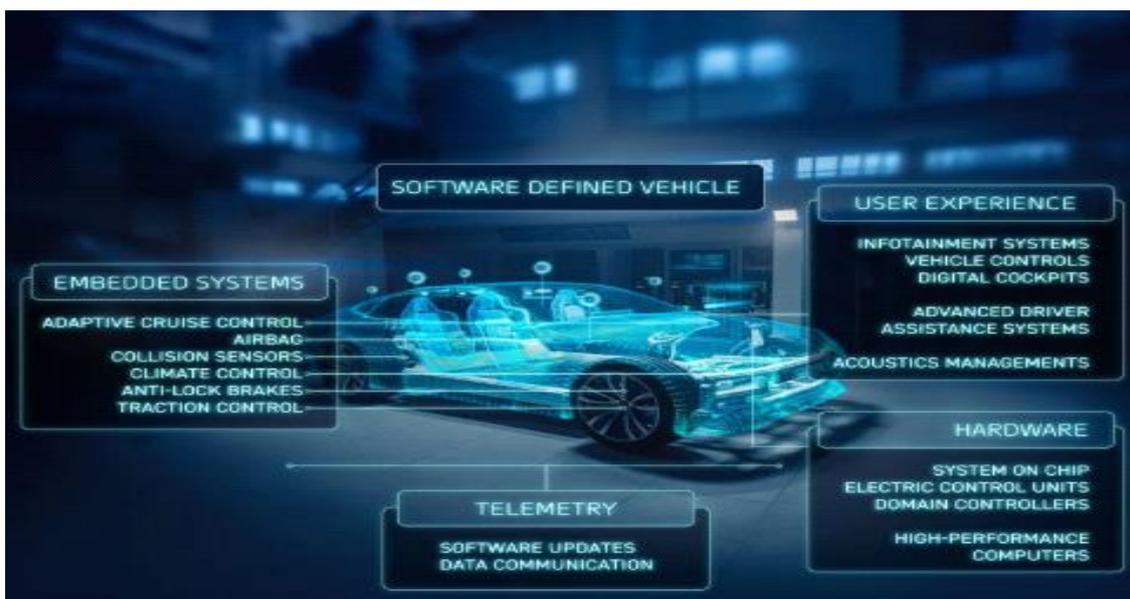


Figure 1 software defined vehicle

1.1.2 Evolution of automotive technologies and digital transformation

Look under the hood of a classic car from the 1950s, and then pop the hood of any car built this year. It is like night and day, and how different things will look. Yes, the motor and other familiar components will be key in operating the vehicle, but much has changed and evolved. Even comparing a 2019 model car and a 2000 model car will be an eye-opening experience to see how much things have advanced in the past 19 years.

1.1.3 Not All Cars Are Created Equal

You will also find some major variances between brand-new cars. What you see under the hood or on the dashboard of a high-performance luxury car, exotic sports car, or hybrid/electric will differ from a base model vehicle's features, technology, and mechanics. Of course, many features considered "standard" these days were expensive options and upgrades. It is all relative.

Automotive technology continues to evolve year after year, and the pace of evolution is only accelerating. From the onboard computers and sensors to how the mechanical systems operate, it is exciting to see the advancements in front of our eyes.

1.1.4 Staying Ahead of the Curve

As automotive technology advances, so must the auto repair facilities and the technicians who work on the vehicles. San Francisco Automotive Solutions has always been ahead of the curve. We like to keep an eye on the future and anticipate automotive trends. Our shop is in the heart of the city's SoMa District, surrounded by leading tech companies. It is easy to stay inspired and want to embrace technological evolution.

Our state-of-the-art vehicle repair facility has the latest automotive diagnostics and repair equipment. Though we work on all types of vehicles, we specialize in cars that require extra knowledge and attention. We are talking about luxury cars, high-performance European cars, exotics, hybrids, and fully electric vehicles. San Francisco Automotive Solutions can also help with aftermarket upgrades and performance enhancements.

1.1.5 Embracing the Automotive Evolution

At San Francisco Automotive Solutions, we utilize the latest technology, and our automotive technicians are very skilled and dedicated. They are always eager to learn and advance their knowledge with new technology and automotive trends.

The evolution of automotive technology is continuing, so you need an auto repair facility that knows how to work on today's (and tomorrow's) most advanced vehicles.

1.2 Introduction to Subscription-Based Business Models

1.2.1 What Is A Subscription-based Business Model?

Like the name suggests, it is where you pay a price (either monthly, quarterly or yearly) for the use of a particular product or a service. This is one of the hottest business models that allows entrepreneurs and businesspeople to retain their customers for a specific period of time.

When you subscribe to a product or a service, it means that you find value in what you get. You either require the product to accomplish something for a considerable amount of time or that product or service adds value to your life in one way or another.

So, one of the first things to understand here is that not all businesses can be powered by a subscription-based business model as what you offer has to consistently solve the purpose of your intended audience.

SaaS products are one of the best examples of this business model, where you are renting out a software from a vendor for as long as you require. Other examples include

- CRMs like Mailchimp and Hubspot and more
- Entertainment services like Netflix, Spotify
- Personal development services like Masterclass
- Productivity apps like Calm, Office 365 and more

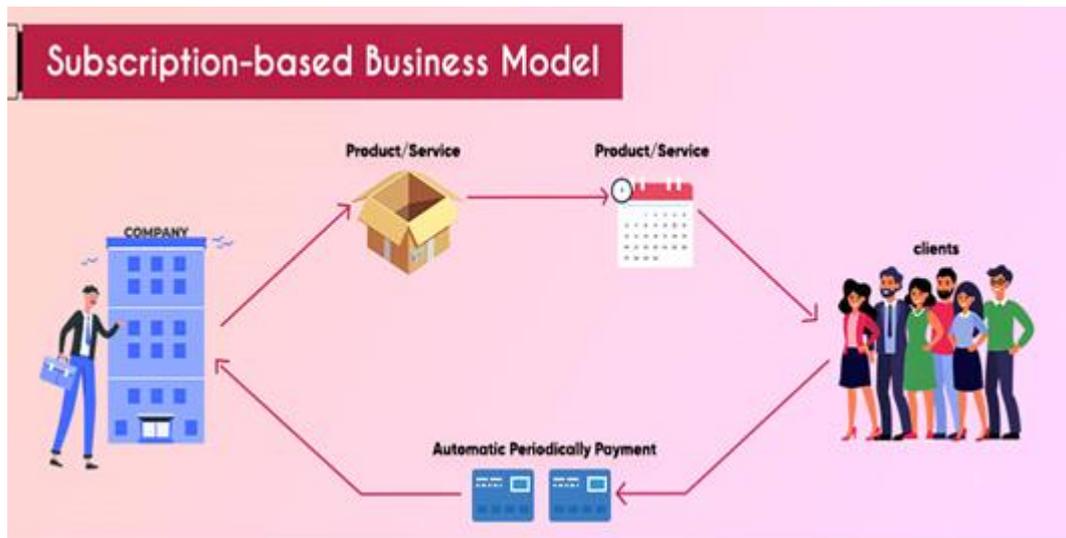


Figure 2 subscription-based business model

1.2.2 Overview of Subscription Models in Various Industries

Subscription-based business models have gained significant traction across multiple industries, offering consumers flexible access to products and services without outright ownership. This model typically involves a monthly, quarterly, or annually recurring fee that grants customers access to various offerings.

Entertainment Industry: Platforms like Netflix and Spotify have popularized subscription models by providing unlimited access to movies, music, and other media for a fixed monthly fee. This approach allows consumers to enjoy vast libraries without purchasing individual items.

Software as a Service (SaaS): Companies like Adobe and Microsoft have shifted from traditional software sales to subscription services, allowing users to access their software tools via the cloud. This model ensures that users always have the latest updates and features while providing companies with a steady revenue stream.

Consumer Goods: Subscription boxes (e.g., Birchbox, Dollar Shave Club) deliver curated products regularly, catering to consumer preferences and convenience. These services often enhance customer loyalty through personalized experiences.

Transportation: In the automotive sector, companies are exploring subscription models that allow users to access vehicles flexibly. This includes car-sharing services and vehicle subscriptions, which provide access to various vehicles for different needs without long-term commitments.

1.2.3 Rationale for Applying Subscription Models to Software-Defined Vehicles (SDVs)

The rationale for applying subscription-based business models to Software-Defined Vehicles (SDVs) stems from several key factors:

Flexibility and Convenience: Subscription models allow consumers to choose vehicles that suit their needs without the financial burden of ownership. Users can easily switch between different vehicle types based on their requirements—such as a compact car for city driving or a larger vehicle for family trips.

Continuous Innovation: SDVs rely heavily on software that can be updated and improved over time. Subscription models allow manufacturers to deliver regular software updates and new features directly to consumers, enhancing the vehicle's capabilities and safety. This ongoing relationship fosters consumer engagement and satisfaction.

Cost Management: Subscription services can help consumers manage costs more effectively by including maintenance, insurance, and other associated expenses in a single fee. This transparency can alleviate concerns over unexpected costs typically associated with vehicle ownership.

Changing Consumer Preferences: As urbanization increases and environmental concerns grow, many consumers are shifting away from traditional ownership models. Subscription services align with the trend toward shared mobility solutions, addressing the needs of consumers who prioritize access over ownership.

Data Utilization: Subscription models enable automotive companies to collect valuable consumer preferences and behavior data. This data can inform future innovations and improvements, allowing manufacturers to tailor their offerings better to meet consumer demands.

2 Literature Review

In this chapter, we provide a common understanding of the definition of the business model from the literature review. Then, we narrowed our research to include an overview of the traditional business model in the automotive industry.

2.1 Business Model

The common opinion discovered in the literature review defines the business model as those mechanisms through which an organization distributes value to customers and generates revenues. Some authors described the business model as the set of mechanisms that allows the creation and distribution of value to consumers (Chesbro, 2018). Others have emphasized its composition, proposing classifications of the elements that constitute it and the established relative connections. For example, Christensen, K. and his colleagues identify four key components: the *customer value proposition, the profit formula, and the key resources and processes* (Johnson et al., 2009). Given the multiplicity of similar illustrations, Foss and Saebi explained the concept of a business model, starting from the key components recurring in the numerous definitions: *the value proposition, the target segments, the organization of the value chain, and the mechanisms used to make profits* (Foss and Saebi 2016). Therefore, the BM is used to identify business logic, as a basis for strategic planning, to respond to changes in the external environment, and to support the development of new organizational forms or the expansion of product lines. According to Magretta, J., who defines the differences between business and strategy, the first explains how to create value for customers and generate revenues, while strategy describes how to beat the competition and differentiate (Magretta, 2011). The Business Model Canvas is commonly used to explain how a firm creates and distributes value. According to Osterwalder and Pigneur, "*The business model describes the rationale of how an organization creates, delivers, and captures value*" (Osterwalder & Pigneur, 2010). The Appendix 1 shows the nine elements

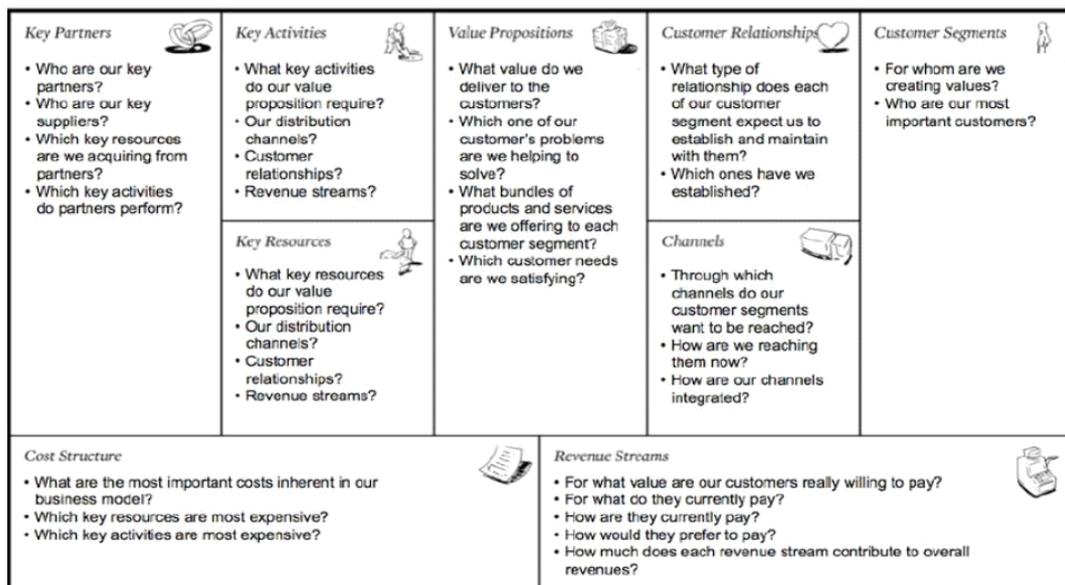


Figure 3 Osterwalder Business Model Canvas including descriptions

Business Model: Value proposition, Customer Segments, Customer Relationships, Channels, Revenue Streams, Key Partners, Key Activities, Cost Structures and Key Resources. The authors also differentiate between the "backstage" of the business and the "front stage" of the BM (Osterwalder & Pigneur, 2010). The first addresses all the resources and activities inside the firm and the strategic partnership providing value. The second represents all the visible activities that address the customers. It includes the value proposition, revenue streams, customer relationships, and channels

(Osterwalder & Pigneur, 2010). Our research focuses mainly on the front-stage elements: value proposition, customer segment, channels, revenue streams, and customer relationship.

2.2 Traditional Business Model in the Automotive Industry

In the traditional business model of car manufacturers, value creation comes mainly from the company's resources and capabilities and the supply chain network and activities within the automotive environment. OEMs following the traditional model mainly focus on producing cars, after-sales services, and financing. Revenue streams are generated mostly from selling cars, leasing models, and other aftersales services such as maintenance and repair. According to Wirtz and Daiser, the most important channel for communicating and attracting customers in the traditional model mainly focuses on the showroom and face-to-face customer interaction (Wirtz & Daiser, 2018). In the traditional model, OEMs use the dealer network and distribution channels to deliver cars, as shown in the appendix (figure 2). The customer segment focuses on people willing or wanting to buy cars.

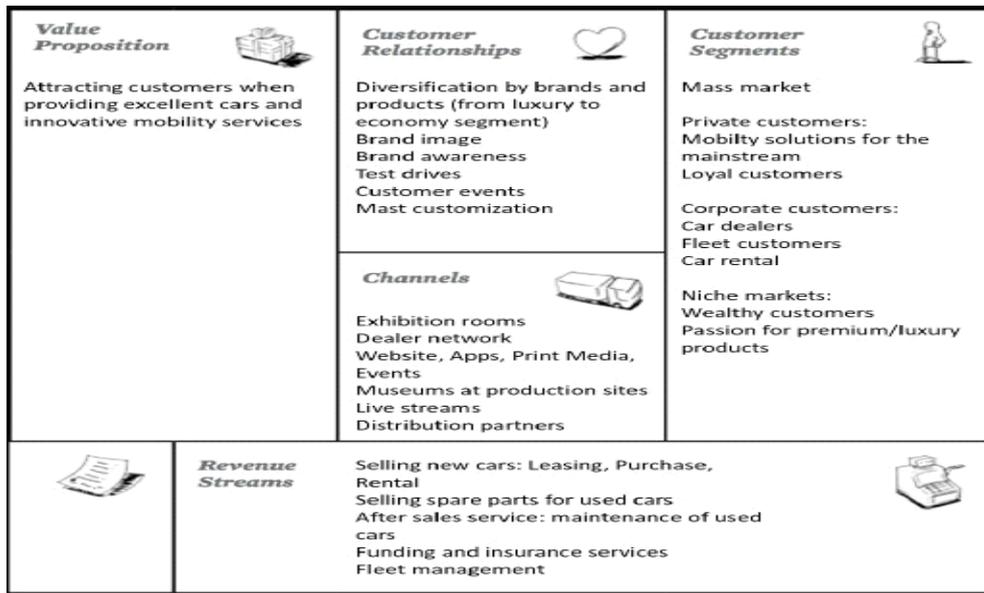


Figure 4 Traditional Business Model in the Automotive Industry, Front Stage Elements.

3 Innovative Business Models in the Automotive Industry

From the different definitions regarding the business model, it is clear that the BM is not a one-time activity during the life of a company. Instead, it requires modifications and adjustments in response to changing contingencies. Suppose we consider changes in the competition, developing new technologies, and shifting customer preferences and needs. In that case, innovating how the value is created becomes the only way for companies to survive. The following chapter describes three innovative business models developed in the automotive industry: Car Sharing, Subscription, and Multi-sided platforms

3.1 Car Sharing Model

Companies are investing more in new mobility service solutions based on data collection and digital platforms (Björkdahl, 2018). One innovative business model developed in the automotive industry is the car-sharing model. Car sharing has gained much attention due to its sustainability and scalability in the last decade. In Europe. This on-demand system, enabled by the new app-based mobile technologies, allows using a car for a demanded duration at any time. According to a survey, car sharing reduces transportation emissions by 50% (Chen & Kockelman, 2016). Daimler's Car2go was the first example of B2C car-sharing operations in 2008; it complements Daimler's core business model with on-demand mobility solutions with a city smart car fleet, as shown in (Figure 3). Within the Car sharing business model, we can find three different types:

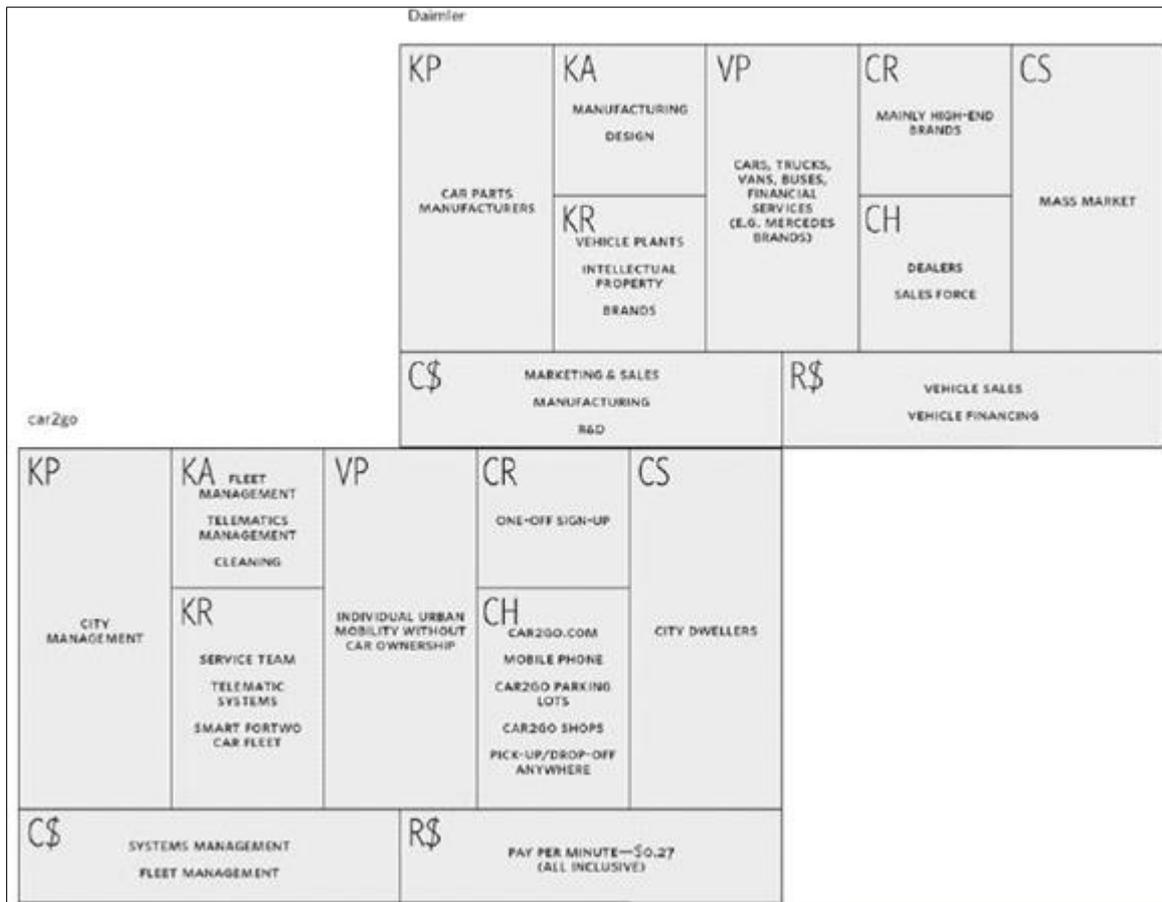


Figure 5 Daimler VS Car2go's BM

3.1.1 Free-floating

This model is the most recent, as free-floating providers have been in the market for less than 5 years. Customers can pick up the car and return it within a restricted area. The main advantage of this model is flexibility, but it has higher prices as they are based on time only. Most free-floating providers are OEMs, such as Daimler's Car2go or Drive Now after the merger with BMW Group.

3.1.2 Stationary

This model is older than 20 years and is based on fixed stations, and usually, the starting and ending points are the same. It is more adaptable for longer trips. Thus, utilization is higher because of longer distances, while turnover is lower than free-floating.

3.1.3 Peer-to-peer

This car-sharing-based model provides vehicles owned by private individuals to a community. Companies offer the service through a digital platform; prices are usually based on a daily rate, and cars must return to the pick-up area. Therefore, they are less flexible than free-floating and are a valid alternative to rental autos.

The table below summarizes the front-stage elements of the car-sharing business model.

Table 1 Front-Stage Business Model Car Sharing

Business Model Areas	
Value Proposition	Alternative of ownership, Flexibility with pay per use Without insurance, fuel or electricity costs Availability 24/7 and free parking slots Sustainable and economic convenience of mobility
Customer segment	People who need last minute reservation One-way travelers and people taking trips in the cities Sustainable-conscious individuals
Revenue Streams	Pay as you drive based on minute, hours or days All inclusive solutions (maintenance, fuel, rental, insurance, etc.)

3.2 Subscription Model

In the age of digitalization, this model has gained much attention from manufacturers, who are implementing new solutions to monetize products and services, as customers are increasing their interest in mobility performances more than products (Kumar & Kumar, 2004). Recently, car manufacturers have recognized the increased demand for flexible vehicle subscription models, transforming the OEMs into an all-inclusive sales and customer service model. One example is the Care by Volvo subscription model, which provides monthly payments for customers with all-inclusive services and the option to change vehicles. Gen Y and Z prefer this model, but older generations also showed interest because of the depreciating costs of new products (Martinez & Walsworth, 2018). The main elements of the Subscription model front stage are described below.

Table 2 Front stage of Subscription Business Mode

Business Model Areas	
Value proposition	Offer mobility solutions such as the use of cars, based on usually monthly payment and limited KM
Customer segment	Consumers are usually young generations, who mainly need more flexible and cheaper solutions, convenience on the use rather than ownership
Revenue Streams	Usually there are monthly payments and other sources of revenues can come from additional services

3.3 Multi-sided Platforms

Another innovative business model in the automotive industry is the one followed by Uber: the multi-sided platform (MSP). This model is enabled by a digital platform connecting several customers with mutual interests. For example, Uber connects drivers with passengers; it is a marketplace where customers and drivers conduct their transactions. This model gives flexibility to drivers by not having scheduled time and to customers by facilitating and providing information. The front-stage elements of a ride-sharing business model like Uber are described:

Table 3 The front-stage elements of the Multi-sided platform

Business Areas	Model
Value Proposition	Value for customers Convenience of not looking for a taxi Availability of cars 24/7 Trackability of the routes Know before how much the ride cost Value of Drivers: Source of income Independency with flexible working schedules Destination provided already on the app
Customer segment	Rider segment People who did not have their own car People who need to travel People with specific needs, ex. Go to the airport Driver segment People who work professionally People who want to start or need an extra-job
Revenue streams	Sources: Payments per ride Fees charge per ride Dynamic prices on demand and distances

3.4 Consumer Behavior in Automotive Purchases

Understanding consumer behavior in automotive purchases is essential for manufacturers, especially with the rise of Software-Defined Vehicles (SDVs) and changing business models such as subscription services. This section explores trends in consumer preferences toward ownership and subscription models and the factors influencing the adoption of SDVs.

Trends in Consumer Preferences towards Ownership and Subscription

- Shift in Ownership Attitudes

Traditional vehicle ownership has long been viewed as a status symbol and a necessity for many consumers. However, recent trends indicate a shift in attitudes. Younger generations, particularly Millennials and Gen Z, increasingly value access over ownership. This demographic prioritizes flexibility and convenience, leading to a growing interest in subscription services and car-sharing platforms

- Growth of Subscription Models

Subscription-based services are gaining traction as consumers seek alternatives to traditional ownership. These models allow driving different vehicles as needed without the long-term financial commitment associated with purchasing a car. Studies show that consumers appreciate the all-inclusive nature of subscription services, which often cover insurance, maintenance, and roadside assistance, simplifying the overall experience.

- Environmental Concerns

Increasing awareness of environmental issues is influencing consumer preferences. Many consumers are leaning towards more sustainable transportation options, such as electric vehicles (EVs) under subscription services. This trend

reflects a broader societal shift towards sustainability, where consumers are willing to consider new ownership models that align with their values.

- Urbanization and Mobility Solutions:

As urban areas become more congested, consumers seek mobility solutions that fit their lifestyles. The convenience of subscription services, which often allow for easy vehicle access without the hassles of parking and maintenance, appeals to urban dwellers. Additionally, these services provide flexibility for consumers who may not need a vehicle daily.

3.5 Factors Influencing Consumer Adoption of SDVs

- Technological Familiarity

Their familiarity with technology heavily influences consumer adoption of SDVs. As consumers become more comfortable with digital interfaces, mobile apps, and connected devices, they are more likely to embrace SDVs that feature advanced technologies such as connectivity, automation, and software updates.

- Perceived Value and Cost

The perceived value of SDVs plays a crucial role in consumer adoption. Factors such as pricing, cost of ownership, and the overall value proposition of subscription services versus traditional ownership will impact consumer decisions. Consumers are increasingly looking for transparent pricing models that communicate the total cost of ownership or subscription.

- Safety and Reliability

Safety features are a significant consideration for consumers when adopting new vehicle technologies. SDVs with advanced safety systems, driver-assistance features, and robust cybersecurity measures are more likely to gain consumer trust. Manufacturers must communicate the safety benefits of SDVs effectively to encourage adoption.

- Social Influence and Marketing

Social factors, including peer influence and marketing, are essential in shaping consumer perceptions of SDVs. Positive reviews, testimonials, and recommendations from friends and family can significantly impact a consumer's decision to adopt new technologies. Effective marketing strategies that highlight the benefits and features of SDVs are crucial for driving consumer interest.

- Regulatory and Policy Environment

The regulatory landscape can influence consumer adoption of SDVs. Incentives for electric vehicles, such as tax credits and rebates, can encourage consumers to consider new technologies. Additionally, policies that support the development of charging infrastructure and smart city initiatives can enhance the attractiveness of SDVs.

4 Methodology

A well-defined methodology is essential in exploring consumer behavior in automotive purchases, particularly regarding subscription models and Software-Defined Vehicles (SDVs). This methodology encompasses research design, data collection, and analysis techniques to ensure comprehensive and valid findings.

4.1 Research Design

This study's research design integrates qualitative and quantitative approaches, leveraging their strengths to provide a holistic understanding of consumer behavior. The quantitative approach focuses on numerical data and statistical analysis to quantify consumer attitudes and behaviors regarding subscription models. For example, surveys may gather data on how many consumers know about subscription services, their willingness to adopt such models, and their preferences for vehicle types. This method allows for the generalization of findings across a larger population.

In contrast, the qualitative approach seeks to understand consumers' underlying motivations, beliefs, and attitudes. In-depth interviews and focus groups can gather rich, detailed insights into consumer perceptions of SDVs and

subscription services. This approach helps uncover nuanced views that quantitative data may not fully capture, such as emotional responses or personal experiences with vehicle ownership.

The combination of qualitative and quantitative methods is justified by the complex nature of consumer behavior in the automotive sector. Quantitative data provides a broad overview of trends and patterns, while qualitative insights enrich understanding of those trends by exploring the "why" behind consumer choices. This mixed-methods approach enables researchers to triangulate findings and enhance the validity of the results.

4.2 Data Collection

Data collection will utilize multiple sources to understand consumer behavior comprehensively. Structured surveys will be distributed to a diverse sample of consumers to gather quantitative data on their preferences, awareness, and willingness to adopt subscription models. The surveys will include questions on demographics, current vehicle ownership, and attitudes toward subscription services.

In-depth interviews with consumers and industry experts will provide qualitative data. These interviews will explore personal experiences, motivations for considering subscription services, and perceptions of SDVs. Interview questions will be open-ended to encourage detailed responses, allowing researchers to gain insights into consumer sentiments.

Additionally, case studies of companies successfully implementing subscription models, such as Volvo and Porsche, will be conducted. These studies will analyze the strategies employed, consumer feedback, and overall market impact, providing a practical context for understanding consumer behavior. The data collected will analyze consumer attitudes toward subscription models, assessing factors such as awareness of subscription options, perceived benefits and drawbacks, willingness to pay for subscription services, and preferences for vehicle types and features.

4.3 Data Analysis Techniques

The quantitative data gathered from surveys will undergo statistical analysis to identify patterns and correlations. This analysis may include descriptive statistics to summarize the data, providing insights into average consumer attitudes and demographic breakdowns. Inferential statistics, such as regression analysis, will assess relationships between variables, such as how demographics influence willingness to adopt subscription models. Comparative analysis will involve comparing consumer segments, such as age groups and urban versus rural residents, to identify significant differences in attitudes and behaviors.

The qualitative data collected from interviews and case studies will be analyzed using thematic analysis. This method involves coding, where researchers review the interview transcripts and case study notes to identify recurring themes and patterns in consumer responses. Codes will be grouped into broader themes that reflect key insights about consumer motivations, preferences, and concerns regarding subscription services and SDVs. Thematic analysis will enable researchers to interpret the meaning behind consumer sentiments, providing a deeper understanding of how and why consumers make decisions regarding automotive purchases.

5 Business Models for Software-Defined Vehicles

The automotive industry is undergoing significant transformation with the rise of Software-Defined Vehicles (SDVs). This shift is leading to the adoption of innovative business models, particularly subscription-based services, which offer flexibility and new revenue opportunities for manufacturers.

5.1 Description of Subscription-Based Models

5.1.1 *Monthly/Annual Subscription Services:*

Subscription-based models allow consumers to access vehicles for a monthly or annual fee. This model typically includes various services such as maintenance, insurance, and roadside assistance, providing a hassle-free experience for users. Consumers can enjoy the benefits of vehicle access without the long-term commitment associated with purchasing or leasing a vehicle. This approach particularly appeals to urban dwellers and those who prefer flexibility in their transportation options.

5.1.2 *Tiered Service Offerings and Customization Options:*

Many subscription services offer tiered packages that cater to different consumer needs and preferences. These packages can vary based on vehicle types, mileage limits, and additional features, allowing consumers to customize their

subscriptions. For example, a basic tier might include a standard vehicle with limited mileage. In contrast, a premium tier could offer luxury vehicles with higher mileage allowances and additional services like concierge support or enhanced connectivity features.

5.2 Comparison with Traditional Ownership Models

5.2.1 Advantages and Disadvantages of Each Model:

Subscription models provide several advantages over traditional ownership. They offer flexibility, allowing consumers to switch vehicles easily and avoid the burdens of maintenance and depreciation. Additionally, subscription services often include all associated costs in a monthly fee, simplifying consumer budgeting. However, these models can be more expensive in the long run compared to outright ownership, especially for consumers who drive frequently. Some consumers may also prefer a sense of ownership when buying a vehicle.

5.2.2 Financial Implications for Consumers and Manufacturers:

For consumers, subscription services can lead to predictable monthly expenses that encompass all costs, making financial planning easier. For manufacturers, subscription models create new revenue streams and can enhance customer loyalty as users engage with the brand over time. However, manufacturers must also manage the complexities of vehicle logistics and ensure high levels of customer service to maintain satisfaction and retention.

5.3 Case Studies of Successful Implementation

5.3.1 Examples of Automotive Companies Adopting Subscription Models:

Several automotive companies have successfully implemented subscription models. For instance, Volvo's "Care by Volvo" program allows customers to subscribe to a vehicle for a fixed monthly fee, including insurance, maintenance, and roadside assistance. Similarly, Porsche's "Porsche Passport" offers a flexible subscription service that allows users to switch between different Porsche models based on their preferences.

5.4 Lessons Learned from Early Adopters:

Early adopters of subscription models have learned valuable lessons, such as the importance of customer service and the need for seamless technology integration. Providing an intuitive app for managing subscriptions and vehicle access is crucial for enhancing user experience. Additionally, effective marketing strategies that educate consumers about the benefits and flexibility of subscription services can drive adoption. Early experiences also highlight the necessity of robust logistics and vehicle management systems to ensure availability and reliability for subscribers.

6 Impact on Automotive Innovation

Adopting subscription-based business models in the automotive industry, particularly with Software-Defined Vehicles (SDVs), significantly influences innovation. This impact is manifested in various ways, including encouraging continuous software updates, developing new features based on consumer feedback, and collaborations between automotive manufacturers and technology companies.

6.1 How Subscription Models Foster Innovation

Subscription models enable automotive manufacturers to implement a continuous delivery approach for software. This means vehicles like mobile devices or computers can receive regular updates. These updates can enhance performance, improve safety features, and introduce new functionalities without requiring the consumer to purchase a new vehicle. Deploying updates remotely allows manufacturers to respond quickly to issues or bugs, enhancing vehicle reliability and customer satisfaction. This agility fosters a culture of innovation, where improvements can be made in real time based on the latest technological developments or regulatory requirements.

Subscription models facilitate a closer relationship between manufacturers and consumers, allowing companies to gather detailed usage data and feedback. This data can inform future feature development, ensuring new functionalities align with consumer needs and preferences. Manufacturers can experiment with new features in a live environment, using feedback from subscribers to refine and improve these features before broader rollouts. This iterative process helps ensure that innovations are practical and well-received by users.

6.2 Collaboration with Tech Companies

The complexity of SDVs necessitates collaboration between automotive companies and technology firms. Partnerships can leverage the expertise of tech companies in software development, data analytics, and user experience design, enhancing the overall capabilities of vehicles. Collaborating with tech firms allows automakers to integrate cutting-edge technologies into their vehicles, such as artificial intelligence (AI), machine learning, and advanced connectivity features. This access can accelerate innovation and improve the competitiveness of automotive brands.

Advances in technology, such as the Internet of Things (IoT), enable SDVs to become more connected and intelligent. Features like real-time traffic updates, predictive maintenance, and enhanced infotainment systems can seamlessly integrate into vehicles through subscription services. Collaborations with tech companies can lead to the development of advanced user interfaces and personalized experiences. For example, voice-activated controls, customizable dashboard displays, and integration with smart home systems can enhance the driving experience and increase consumer satisfaction.

7 Correlation Between Customer Journey and Impact on Automotive Innovation

7.1 Understanding the Customer Journey

The customer journey is crucial for optimizing customer experience (CX) and understanding consumer behavior. Defined as a customer-centric process, it outlines the various stages and touchpoints where a customer interacts with an organization. In the context of the automotive industry, particularly with the rise of Software-Defined Vehicles (SDVs) and subscription models, the customer journey becomes increasingly complex and dynamic.

Consumer decision journeys are dynamic and structured, reflecting the evolving nature of consumer expectations. The traditional funnel model, which represented a linear progression from brand awareness to purchase, must be revised in today's digital landscape. Instead, the McKinsey framework introduces a circular model, emphasizing that each touchpoint represents an opportunity for engagement with the brand.

The journey consists of four phases: initial consideration, active evaluation, moment of purchase, and post-purchase experience. Each phase is influenced by the customer's interactions with the brand, which can be significantly shaped by innovations introduced through subscription models.

7.1.1 *How Subscription Models Foster Innovation*

Subscription models facilitate ongoing customer engagement through regular software updates and enhancements. Each update is a touchpoint reinforcing the relationship between the consumer and the brand. Customers experience innovation firsthand, increasing their satisfaction and likelihood of continued subscription. As consumers navigate their journey—from initial consideration to post-purchase—they provide feedback that influences future updates. This iterative process aligns perfectly with the active evaluation phase, where customers assess their experiences and expectations, leading to further innovations.

Subscription models allow manufacturers to gather consumer preferences and behavior data, creating tailored experiences that resonate with customers at each touchpoint. For example, if feedback indicates a desire for enhanced navigation features, manufacturers can prioritize this in their updates, directly addressing consumer needs. The post-purchase phase is essential for maintaining customer loyalty. Continuous innovation through subscription services enhances this experience, ensuring customers feel valued and engaged long after their initial purchase decision.

7.1.2 *Collaboration with Tech Companies*

Collaborations with tech companies can enhance the customer journey by integrating advanced technologies that improve vehicle capabilities. These partnerships facilitate a more seamless experience, making it easier for consumers to evaluate their options during the active evaluation phase. Manufacturers can leverage tech advancements to create new touchpoints that engage consumers more effectively. For instance, integrating smart technologies allows real-time updates and personalized notifications, enriching the customer experience.

Integrating smart technologies and advanced features influences each phase of the customer journey. For example, during the initial consideration phase, consumers may be drawn to brands that offer superior technological capabilities. As they evaluate options, the availability of cutting-edge features can significantly impact their decision-making process. By providing innovative functionalities and enhancements through subscriptions, automotive manufacturers can

maintain engagement with customers long after the purchase, reinforcing brand loyalty and encouraging future subscriptions or upgrades.

8 Consumer Adoption of Subscription-Based Models

Subscription-based models have proven to be effective tools for fostering customer loyalty. The recurring nature of these models creates an ongoing relationship between the business and the consumer, providing the perfect ground for loyalty to flourish. These models allow businesses to continuously demonstrate value to their customers, thereby increasing the likelihood of retaining them.

There are several strategies that businesses can adopt to retain subscribers. Personalized offerings are a crucial part of this. By understanding customer preferences and behaviors, businesses can curate personalized experiences, increasing customer satisfaction and, in turn, loyalty. Additionally, loyalty programs, such as rewards or points systems, can incentivize customers to continue subscribing. Excellent customer service is also a key factor in retaining subscribers. Responsive and helpful customer service can turn a potentially negative experience into a positive one, thus preventing customer churn.

Many companies have leveraged subscription services to retain customers successfully. Netflix, for instance, has maintained a strong customer base with its personalized viewing recommendations. With its fast shipping, extensive content library, and exclusive deals, Amazon Prime is an excellent example of a successful subscription service. Moreover, software companies like Adobe have transformed their one-time purchase model into a subscription service, successfully retaining customers by continuously providing the latest updates and improvements. These examples highlight the potential of subscription models in fostering customer loyalty and shaping the future of business customer retention strategies.

9 Pricing and Revenue Models

Choosing the right pricing strategy is pivotal to the success of a subscription-based business. One commonly adopted approach is tiered pricing, where different price levels correspond to varying levels of service or features offered. This model caters to a broad customer base with diverse needs and budgets, offering flexibility and choice. For example, a software company may offer a basic package at a lower price for casual users and a premium package with advanced features for enterprises or power users.

In addition to tiered pricing, the freemium model has gained popularity in the digital era. This approach allows users to access a product or service for free, with the option to upgrade to a premium version for additional features or benefits. This model benefits businesses by attracting a large user base, some of whom may eventually convert into paying customers. Companies such as Spotify and LinkedIn have successfully adopted this model, providing free services to users while offering a premium tier for an enhanced experience.

There are also more innovative pricing strategies, like usage-based pricing, which charges customers based on the service they consume. This can be particularly effective for businesses whose services are irregularly or intensively used, such as cloud storage or utilities.

Regardless of the pricing model chosen, transparency is critical. Businesses must communicate what each pricing tier includes, avoiding hidden fees that could damage trust and customer relationships. Equally important is the value proposition—customers must perceive that their price is commensurate with the value they receive. The ultimate aim of pricing strategies in subscription-based businesses is to balance maximizing revenue and maintaining customer satisfaction and loyalty.

10 Discussion

This discussion synthesizes the findings from the research on consumer behavior in automotive purchases, particularly focusing on subscription models and Software-Defined Vehicles (SDVs). It highlights key insights and their implications for industry stakeholders while also considering the future of subscription models in the automotive sector.

10.1 Synthesis of Findings

The research has revealed several key insights into consumer attitudes toward subscription models in the automotive industry. First, there is a noticeable shift in consumer preferences from traditional vehicle ownership to more flexible

options, including subscription services. This trend is particularly strong among younger generations, who prioritize access over ownership due to financial constraints, lifestyle changes, and a desire for convenience. Many consumers prefer all-inclusive packages that simplify the vehicle usage experience by covering maintenance, insurance, and other costs.

Another significant finding is the growing awareness and acceptance of electric vehicles (EVs) within subscription models. Environmental concerns influence consumer choices, with many individuals seeking sustainable transportation options. Subscription services that offer access to EVs are increasingly appealing, reflecting a broader societal shift toward sustainability.

The implications for industry stakeholders are profound. Automakers and dealerships must adapt their business models to accommodate these changing consumer preferences. This includes developing and marketing subscription services highlighting flexibility, convenience, and sustainability. Additionally, manufacturers should focus on enhancing consumer education regarding the benefits of subscription models and SDVs to build trust and encourage adoption.

10.2 The Future of Subscription Models in the Automotive Sector

The future of subscription models in the automotive sector appears promising. Predictions based on current data suggest that subscription services will continue to grow in popularity as consumers increasingly value flexibility and convenience. Emerging trends indicate that subscription models may evolve to offer more customized options, allowing consumers to tailor their subscriptions to better fit their individual needs and lifestyles.

Potential shifts in consumer behavior and market dynamics are also anticipated. As urbanization increases, more consumers may turn to subscription services as a practical solution to the challenges of vehicle ownership in crowded cities. Furthermore, advancements in technology and increased vehicle connectivity will likely enhance the subscription experience, making it easier for consumers to manage their subscriptions and access services.

Additionally, partnerships between automotive manufacturers and technology companies may play a crucial role in shaping the future of subscription models. By integrating smart technologies and data analytics, companies can create more personalized and efficient offerings that resonate with consumers. This collaborative approach could lead to innovative subscription services that cater to evolving consumer demands and further disrupt traditional ownership models.

In conclusion, the research indicates a significant transformation in consumer behavior regarding automotive purchases, driven by the rise of subscription models and SDVs. Industry stakeholders must recognize these trends and adapt strategies to remain competitive in an evolving market. The future of subscription models holds great potential, with opportunities for innovation and growth as consumer preferences shift toward flexibility, sustainability, and convenience.

11 Conclusion

The exploration of business models for Software-Defined Vehicles (SDVs), particularly focusing on subscription-based paradigms, has revealed critical insights into the ongoing transformation of the automotive industry. This research has demonstrated that the rise of subscription models represents a significant shift in consumer behavior and industry practices driven by technological advancements and changing consumer preferences.

The primary objective of this research was to investigate how subscription-based business models can influence innovation within the automotive sector and enhance consumer adoption of SDVs. The findings indicate a clear trend toward increased consumer interest in flexible and convenient vehicle access, moving away from traditional ownership models. Key insights include the importance of all-inclusive service offerings, the appeal of electric vehicles within subscription frameworks, and the necessity for manufacturers to adapt their strategies to meet evolving consumer demands. Moreover, the research highlighted how subscription models encourage continuous innovation by fostering regular software updates and developing new features based on consumer feedback. This dynamic enhances the user experience and promotes collaboration between automotive manufacturers and technology companies, paving the way for advancements that align with consumer expectations.

Based on the findings, several recommendations are proposed for various stakeholders in the automotive industry. Automotive companies should prioritize the development of flexible subscription offerings that cater to diverse consumer needs. Marketing strategies should emphasize the benefits of subscription models, such as convenience, cost

predictability, and access to the latest vehicle technologies. Additionally, engaging in partnerships with tech companies can enhance the capabilities of SDVs and improve customer satisfaction. Policymakers should consider implementing incentives to support the adoption of subscription models, particularly for electric vehicles. Governments can facilitate infrastructure development, such as charging stations, to enhance the feasibility of EV subscriptions and promote sustainable transportation options. Consumers would benefit from educational initiatives that raise awareness about the advantages of subscription services. Addressing long-term costs and reliability concerns is crucial, and pilot programs that allow consumers to experience subscription services firsthand can help build trust and acceptance.

While this study provides valuable insights, some gaps warrant further investigation. Future research could explore the long-term financial implications of subscription models for consumers compared to traditional ownership. Additionally, studies could examine the impact of demographic factors on the adoption of subscription services, providing a deeper understanding of consumer segments. Investigating the role of digital platforms and technology integration in enhancing the subscription experience could further illuminate the future of automotive business models.

In conclusion, the emergence of subscription-based paradigms for Software-Defined Vehicles presents a transformative opportunity for the automotive industry. By embracing innovation and adapting to consumer preferences, stakeholders can navigate this evolving landscape and shape the future of mobility in a way that aligns with modern needs and expectations

References

- [1] Software-Defined Vehicles (SDVs): revolutionizing the automotive industry. (n.d.-b). <https://www.gmv.com/en-pt/node/8381/printable/print>
- [2] Stiglitz, J. (2009). "The Financial Crisis of 2007/2008 and its Macroeconomic Consequences".
- [3] Stone, S. M. (2018). *Digitally Deaf: Why Organizations Struggle With Digital Transformation*. Denver, NC, USA: Springer.
- [4] Szabo, N. (1997). "Formalising and Securing Relationships on Public Networks." *First Monday*.
- [5] Tapscott, Don, and Alex Tapscott. 2018. *Blockchain Revolution: How the technology behind Bitcoin is changing money, business, and the world*. Penguin.
- [6] *The Blockchain and Us*. Directed by Manuel Stagers. Switzerland: 2017.
- [7] Toyota, "Aioi Nissay Dowa Insurance and Toyota Develop Telematics Damage Service System, an Accident Response Service that Uses Connected Car Data," Accessed December 10, <https://global.toyota/en/newsroom/corporate/31088545.html>.
- [8] Tukker, A. (2004). Eight types of product-service systems: eight ways to sustain experiences from Suspronet. Wiley InterScience. doi:10.1002/bse.414.
- [9] Magretta, J. (2011). "Why business models matter. In *HBR on rebuilding your business model*". HBR Press Boston.
- [10] Uslaner, E. (2010). "Trust and the Economic Crisis of 2008". *Corporate Reputation Review* 13, no. 2: pp. 110–123.
- [11] Vannucci, Virginia, and Eleonora Pantano. 2019. "Digital or human touchpoints? Insights from consumer-facing in-store services." *Information Technology & People* 33 (1): 296-310. doi.org/10.1108/ITP-02-2018-0113.
- [12] Verhoef, Peter C., P. K. Kannan, and J. Jeffrey Inman. 2015. "From multi-channel retailing to omni-channel retailing: introduction to the special issue on multi-channel retailing." *Journal of Retailing* 91 (2): 174-181. doi.org/10.1016/j.jretai.2015.02.005.
- [13] W.Seifert, Ralf, Ulrich W.Thonemann, and Marcel A.Sieke. 2006. "Integrating direct and indirect sales channels under decentralized decision-making." In *International Journal of Production Economics* Volume 103, Issue 1, by Ralf W.Seifert, Ulrich W.Thonemann and Marcel A.Sieke, 209-229. Elsevier.
- [14] Wadhwa, Vivek, and Alex Salkever. 2019. *Driver in the Driverless Car: How Your Technology Choices Create the Future*. Berrett-Koehler Publishers.
- [15] Walton, Dr Bryn. (2019). *Disruption in the automotive industry: How digital is changing car sales: report*, UK: Deloitte LLP.

- [16] Walton, Dr. Bryn. (2019). "Deloitte: Disruption in the automotive industry." <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/ConsumerIndustrialProducts/deloitte-uk-consumer-industrial-products-how-digital-is-changing-car-sales>.
- [17] Westerman, George, Claire Calm ejane, Didier Bonnet, Patrick Ferraris, and Andrew McAfee.
- [18] Williams, C. A., & Daniel R. A. Schallmo. (2018). Digital Transformation Now!: Guiding the successful digitalization of your business model. Springer.
- [19] Wirtz, B., and P. Daiser. 2018. Business model innovation: An integrative conceptual. Journal of Business Models, 5.
- [20] Wi niewska, A. (2018). "The initial coin offering – challenges and opportunities." Copernican Journal of Finance & Accounting 7, no. 2: 99–110.
- [21] Yoo, Y., O. Henfridsson, and K. Lyytinen. 2010. Research commentary: The new organizing logic of digital innovation: an agenda for information systems research.
- [22] Yu, Min, and Weimin Zhang, Horst Meier. 2008. Modularization-based design for innovative product-related industrial service. Institute of Electrical and Electronics Engineers. doi:10.1109/SOLI.2008.4686360.
- [23] Martinez, M., & J. Walsworth. (2018). "Subscription drive; The Next Big Thing? Automakers,." Automotive News, vol. 92, no. 6824, pp. 1.
- [24] Bacher, J., & Manowicz, S. (2020). *Understanding the customer journey: A new framework for optimizing customer experience*. Journal of Business Research, 119, 230-238. <https://doi.org/10.1016/j.ibusres.2019.08.008>
- [25] Court, D., Elzinga, D., Mulder, S., & Vetvik, O. J. (2009). *The consumer decision journey*. McKinsey Quarterly. <https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-consumer-decision-journey>
- [26] Santos, J., & Martins Gonalves, D. (2021). *A review of consumer decision journey models*. International Journal of Marketing Studies, 13(3), 1-15. <https://doi.org/10.5539/ijms.v13n3p1>
- [27] Osterwalder, A., and Y. (2010) Pigneur. 2010. Business model generation: a handbook for.
- [28] Oszust, Kinga, and Justyna Stecko. 2020. "Theoretical aspects of consumer behavior together with an analysis of trends in modern consumer behavior." Modern Management Review 25 (4): 113-121. doi.org/10.7862/rz.2020.mmr.32.
- [29] Redefining the driving experience for software-defined vehicles. (n.d.). <https://mobica.com/advancing-automotive-redefining-the-driving-experience-for-software-defined-vehicles>
- [30] X-Byte Enterprise Solutions. (n.d.). Subscription Business Model: Future of Ecommerce. <https://www.xbytesolutions.com/subscription-based-business-models-assessing-the-opportunities-and-challenges-in-this-fast-growing-sector.php>