



Exploring strategies in the digital age: The case of BMW's business ecosystem

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Abstract

This teaching case study “*Exploring strategies in the digital age: The case of BMW’s business ecosystem*” written by Teresa Marie Nerlich aims to analyze BMW’s digital ecosystem using the framework of control points. Specifically highlighting the role of control points within the digital ecosystem, by examining how original equipment manufacturers (OEMs) can create and capture value as consumer expectations change with the emerging technological innovations in the automotive industry. In this context, it is important to explore not only how companies are able to set and hold control points, but also how to maintain a competitive position within the dynamic market. This will shed light on the problem statement: what are the major challenges OEMs, such as BMW, are facing in creating a sustainable digital business strategy? The research note lays the foundation for a general understanding of the impact of data in business, the power of value network exploitation, and the development of digital business strategies. This case study examines the challenges that BMW faces in the wake of changing consumer expectations that threaten established competitive positions, by conducting five expert interviews through the lens of the protagonist, the business strategist, Alex. The teaching note outlines how students can apply the learnings from the case study and implement the control points framework for firms to gain bargaining power within the digital business ecosystem. All these components will showcase that BMW must leverage strategic partnerships, i.e., software providers, IoTPPs, and continue to invest in building a reliable digital infrastructure.

Title: “Exploring strategies in the digital age: The case of BMW’s business ecosystem.” Teresa Marie Nerlich

Keywords: Business Strategy, Business Ecosystem, Automotive Industry, Control Points, Bargaining Power

Este estudo de caso, escrito por Teresa Marie Nerlich, "*Explorando estratégias na era digital: o caso do ecossistema empresarial da BMW*", visa analisar o ecossistema digital da BMW utilizando a estrutura de pontos de controle. Destacando o papel desses pontos no ecossistema digital, o estudo examina como os fabricantes de equipamentos originais (OEM) podem criar e capturar valor à medida que as expectativas dos consumidores mudam com as inovações tecnológicas emergentes na indústria automotiva. Nesse contexto, é importante não apenas explorar como as empresas podem estabelecer e manter pontos de controle, mas também como manter uma posição competitiva num mercado dinâmico. Este estudo investiga os principais desafios enfrentados pelos OEMs, como a BMW, na criação de uma estratégia empresarial digital e sustentável, perante a mudança nas expectativas dos consumidores que ameaçam as posições competitivas já estabelecidas. Para isso, foram realizadas cinco entrevistas com especialistas, sob a perspectiva do protagonista, o estrategista empresarial Alex. A subsequente nota de investigação estabelece as bases para uma compreensão geral do impacto dos dados nos negócios, do poder da exploração da rede de valor e do desenvolvimento de estratégias empresariais digitais. Já a nota docente descreve como os alunos podem aplicar os ensinamentos do estudo de caso, e implementar a estrutura de pontos de controle para as empresas ganharem poder de negociação dentro do ecossistema empresarial digital. Todos esses componentes mostram que a BMW deve alavancar parcerias estratégicas, ou seja, com fornecedores de software, IoTPs e continuar investindo na construção de uma infraestrutura digital confiável.

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List of Abbreviations

AD	Automated Driving
ADAS	Advanced Driver Assistant Systems
AI	Artificial Intelligence
API	Application Programming Interface
AWS	Amazon Web Services
BEV	Battery Electric Vehicles
BMC	Business Model Canvas
BMW	Bayrische Motoren Werke AG
CASE	Connected, Autonomous, Shared, Electric
CPC	Control Point Constellation
GDPR	General Data Protection Regulation
ESG	Environmental, Social, and Corporate Governance
EVP	Ecosystem Value Proposition
GAFA	Google, Apple, Facebook, Amazon
IoT	Internet of Things
IoTPPs	Internet of Things Platform Providers
IT	Information Technology
LMA	Layered Modular Architecture
MaaS	Mobility as a Service
OEM	Original Equipment Manufacturer
R&D	Research and Development
SWOT	Strengths, Weaknesses, Opportunities, and Threats
VP	Value Proposition

Introduction

Digitalization is the most radical disruption corporations have faced since the industrial revolution. It is a vast, autonomous, and often invisible economy (Aagaard, 2019). The advent of digital technologies such as big data, cloud computing, and connectivity has blurred boundaries and broken-down industry barriers. Digital innovation is creating lucrative opportunities, such as cross-selling, better customer relationships, and higher margins, as well as major threats, such as data protection, regulation, and cyber threats (Bohnsack et al., 2021; Weill et al., 2015). New opportunities have arisen resulting from digitization, including reduced transaction costs and increased transparency, better decision-making using big data analytics and optimized algorithms, new business and operating models that enable better customer service or product innovation, as well as improved interactions between customers, suppliers, and stakeholders (Hirt & Willmott, 2014; Menz et al., 2021). It has altered business strategies in the automotive industry, making companies more visible and empowered than ever before. However, the constant change and rapid technological development are creating problems for established industries such as the automotive industry. In contrast to the internal combustion engine of the 20th century, modern vehicles are powered by cutting-edge sensors, software, and robust computing control (Burkacky et al., 2018). To survive in an era of digital disruption, which is creating digital Darwinism, requires both sudden action and a deliberate approach that uses technology and data to better understand people (Goodwin, 2018). The emergence of the IoT in the automotive ecosystem, along with advancements in autonomous driving, connectivity, in-vehicle infotainment, social media, big data, and the integration of digital services such as Apple CarPlay or Android Auto, has opened vast opportunities for the development of new and improved services. Market participants seek to profit from the change as software and technological advancements transform the automotive value chain (Rahim et al., 2020; Riasanow et al., 2017). Unlike in traditional competitive strategy, where oligopolistic competition was the norm, digital markets exhibit strong network effects and require novel practices, such as setting and holding control points within the digital ecosystem. Companies must identify their role within the digital ecosystem and determine the layer where the most value is created and form strategic partnerships, combining of skills and competencies from divergent industries to establish their position in the novel digital business landscape (Block et al., 2022; Jacobides et al., 2019; Menz et al., 2021).

The primary objective of this teaching case study is to explore and highlight the importance of setting control points in the digital business ecosystem to gain a strong bargaining position. The aim is to address the problem statement: *What are the main challenges that BMW faces in developing a sustainable digital business strategy?*

In this respect, the following research questions aim to further deepen the complexities of the proposed problem statement:

- *Research Question 1:* What business strategies have led BMW to set and hold control points in the digital ecosystem?
- *Research Question 2:* What partnerships does BMW foster to advance its strategic positioning?
- *Research Question 3:* How has digitalization shaped the way BMW creates and captures value?

This teaching case study is divided into three sections: a research note (or literature review), a case study on BMW, and a teaching note. The research note aims to lay a foundation for comprehending the significance of value network exploitation, the effects of data in business, and the creation of digital business strategies. The case study focuses on the strategic challenges that BMW faces within the competitive automotive industry. Through interviews with five experts of BMW's digital ecosystem the protagonist, Alex, explores rapidly changing consumer demands, pressure on the automotive industry to create sustainable solutions, and the importance of leveraging strategic partnerships. The teaching note offers guidelines and an implementation plan for students to position a company in the digital business ecosystem and use the control point strategy to gain a competitive advantage. Finally, the conclusion will further highlight how BMW must integrate strategic partnerships (i.e., industry rivals such as Mercedes-Benz AG along with local suppliers) to develop sustainable (i.e., battery electric vehicles) and innovative (i.e., iVision Model DEE) mobility solutions to establish their bargaining position in the digitally interconnected market: the digital business ecosystem.

1 Research Note: Literature Review

The following section examines the shift from conventional to disruptive competitive practices. An overview of the power of data in business (i.e., the impact of digital disruption, disruptive business models, and digital business strategy) and the impact of digital breakthroughs and the disruption they cause is explored in the first chapter (1.1). How firms compete in interconnected networks is explored in the following chapter (1.2) through an analysis of the digital ecosystem. The final chapter (1.3) provides an in-depth study of control points within the digital ecosystem, more specifically the importance of setting and occupying control points within value networks to achieve sustainable competitive advantage.

1.1 Digital Disruption – The Power of Data in Business

The radical market entry of companies such as Airbnb, Spotify, and Uber are often referred to as digital disruption, shaking an industry to its core and potentially threatening an entire sector. In the face of these threats, companies are forced to react immediately to avoid falling behind or, in some cases, diminishing from the market entirely (Skog et al., 2017). Digital innovation and technology expand the accessibility and affordability of expensive or complex goods and services. An innovative business model, supporting technology, and a well-coordinated value network are prerequisites for disruptive innovation. Investors and businesses must redirect their focus from the development to the implementation of disruptive technologies (Twin, 2022). Startups often launch these innovations, targeting low-market segments with new products or services and eventually disputing existing markets and business models (Møller et al., 2017). Digital disruption processes are characterized by three key features: 1) they stem from digital innovations that lead to the loss of competitive advantage, 2) they alter the value chain by breaking and recombining existing links, and 3) they impact the entire value creation and capture process, although coordinated by one or more firms (Skog et al., 2017).

1.1.1 The Importance of AI in Business

The rollout of 5G connectivity is expected to trigger "the next boom in trend emergence" (Schiller, 2021) and provide users with faster access to advanced digital technologies (SmacIT, 2021). Big data analytics (a combination of unstructured, semi-structured and structured data) lays the foundation of AI, as companies leverage this knowledge for 360-degree customer insights, operational functions, R&D and improved market insights (Stedman, 2022). Since the

1980s, AI has been a strategic tool for competitive advantage. Digital companies are adopting AI to make comprehensive decisions in a competitive environment with limited resources and vast amounts of data (Borges et al., 2020). Data-driven learning processes can give firms a market advantage via the cycle of gathering consumer data and improving the product or service, resulting in more customers using the product e.g., Google Maps (Hagiu & Wright, 2019). The falling costs for AI specific technologies, coupled with the expansion of cloud-based services, have favored an increased accessibility for companies (Collins et al., 2021). Projections suggest that by 2030, about 70% of companies will use AI technologies, driving business transformation (Zhang et al., 2021). Traditional firms, despite the significant operational improvements made possible by IT, are struggling because of the impact of low marginal costs and high fixed costs of information products on firm structures (Menz et al., 2021). Woodard et al. (2013) describe the shift from traditional management perspectives to today's central role of IT in the development of digital products and services as a company's "design capital and design moves." A firm's digital architecture, including software, APIs, and data structures, can be a cause of its potential for growth or failure (Woodard et al., 2013).

1.1.2 Disruptive Digital Business Models

As business infrastructure has evolved digitally, links among processes, products, and services have increased (Bharadwaj et al., 2013), resulting in higher consumer expectations across all markets and greater emphasis on digital services (Schiller, 2021). Digital leaders such as GAFA (Google, Apple, Facebook, Amazon) rely heavily on the Web as a disruptive technology to meet changing consumer needs (Jacobides, 2021; Twin, 2022). They combine multiple business models as a disruptive approach to introduce new ideas and technological innovations that address unmet needs in existing markets (Talin, 2022). In this context, the concept of the 'shared economy', i.e., access-over-ownership or subscription-based business models (Figure 14, Appendix), has gained significant popularity, as it enables businesses to respond to changing consumer needs by allowing consumers to use products or services on demand without the purchase of ownership (Martin, 2016; Reuschl et al., 2022). In the transport sector, for example, Mobility as a Service (MaaS) exploits the concept of monetizing time for tangible or intangible goods or services and offers a sustainable alternative in the form of shared mobility (Christens et al., 2022). Forecasts on the market size of MaaS see great potential in the EU market, valued at 25 billion USD in 2017, with projections for 2025 and 2030, MaaS is expected to be worth 198 billion USD in 2025 and 451 billion USD in 2030 (Salas, 2022). This type of business

model is mutually beneficial, as companies generate regular revenue and consumers have access to a fleet of vehicles (Guyader & Piscicelli, 2019). While other sources highlight the rise of digital business models such as crowdfunding or API business models (Michaelson et al., 2022; Zeleti et al., 2014) the most successful digital business models organize partners to support brand positioning and build ecosystems to draw in and keep customers by tailoring offerings to their need (Bentenrieder et al., 2016). The ecosystem business model creates a value network of interdependent companies or partners, offering consumers a variety of products or services such as online marketplaces or ride-sharing services (Adner & Kapoor, 2009; Watanabe et al., 2016), as seen in carsharing collaborations such as Share Now, which includes BMW AG, Mercedes-Benz AG, and others (Share Now GmbH, 2023). Since the early 2000s, ecosystem business models have gained significant popularity. According to McKinsey & Company (2018), “seven of the top 12 largest companies by market capitalization” operate within an ecosystem, this includes American tech giants GAFA and Microsoft as well as Chinese players Tencent and Alibaba (Bughin et al., 2018). In 2020, 22 of the largest 100 global businesses, accounting for 40% of the market capitalization, leveraged ecosystems. Similarly, start-ups have also embraced ecosystem business models, with 179 out of 772 unicorn start-ups adopting the approach between 2015 and 2021 (Reeves et al., 2021).

1.1.3 Digital Business Frameworks: Digitization Piano, Digital Business Model Canvas

Digital business frameworks, such as the Digitization Piano (Figure 16, Appendix), aid organizations in identifying areas for improvement, planning new technologies and strategies, tracking progress, and determining the delta between the current and desired state of digital transformation within the three main digital categories for a successful digital orchestration: strategy, engagement, and enablers (IMD, n.d.). The firm’s level of digital business agility, or Digital Vortex, is evaluated through a firm’s hyperawareness, informed decision-making, and fast execution. The framework emphasizes the importance of combining multiple approaches, playing ‘chords’ over ‘keys’, thus helping firms adapt their business model to the changing digital landscape (Wade, 2015; 2017). Some other common digital business frameworks include the Digital BMC and the Digital Maturity Model, or DMM. The digital BMC, based on Osterwalder & Pigneur’s BMC, contains elements useful for assessing the impact of technologies and trends and, as a result, developing a digital strategy (Schlimbach & Asghari, 2020). The DMM, developed by Deloitte and TM, assesses digital maturity through digital capabilities in five business dimensions: customers, strategy, technology, operations, and

organization and culture. Criteria for assessing digital maturity are further subdivided within each dimension. This approach helps organizations identify areas for improvement and develop a plan for the implementation of new technologies (Anderson & Ellerby, 2018; Dieffenbacher, 2022). Previous scholars proposed models for categorizing and understanding digital maturity (Aslanova & Kulichkina, 2020), such as an MIT Sloan research group, who identified nine elements of digital transformation including data-driven insights, customer-centricity, and digital innovation that fuel value creation (HBR, 2014; Westerman et al., 2014).

1.1.4 Digital Business Strategy

Digital business strategy leverages readily available technologies to achieve long-, medium-, and short-term business goals (Lipsmeier et al., 2020), to provide "unique, integrated business capabilities in a way that is responsive to ever-changing market conditions" (Ross et al., 2016). Thus, a digital business strategy refers to a company's approach to leveraging digital technologies, channels, and platforms to execute business objectives (Mitzkus, 2022), as opposed to digital transformation, which affects corporate culture more generally (Reyes, 2020). Digital strategies may take place on all three organizational levels - corporate, business, and functional, but Lipsmeier et al. (2020) contend that in the early stages of digital transformation, digital strategy is best placed on the business level. As a company matures digitally, business strategies and digital will eventually become inseparable (Lipsmeier et al., 2020). Companies must adopt new digital strategy frameworks that identify novel sources of value creation. Digital business strategy is cross-functional, encompassing all functional and process strategies by linking them through extensive information exchange across internal and external digital platforms, creating interdependencies between digital and non-digital capabilities, such as IT and a firm's competencies (Bharadwaj et al., 2013; Park & Mithas, 2020; Yoo et al., 2010). Business leaders typically pursue one of two digital strategies: customer engagement strategy, which focuses on building customer loyalty through unique premium experiences such as Amazon's user-friendly interactions and recommendations, or digitized solution strategy, which involves integrating digital technologies into a company's existing competencies through R&D efforts such as those seen at Apple (Sebastian et al., 2017; Talin, 2022). Despite the promise of digital technologies, incumbents are struggling to keep up with the pace of change, with merely three per cent adapting to the new business landscape due to a lack of sufficient platform strategy (Bughin et al., 2018). While digital technologies such as IoT, cloud and analytics offer new opportunities, smaller firms are capitalizing on the first-

mover advantage and incumbents need to invest in creating something unique (Ross et al., 2019). However, organizations still experience mismatches between digital strategy and firm resources, leading to misalignments and path dependencies that make it difficult to develop new resources and processes to support strategic change (Yeow et al, 2018).

1.2 Digital Ecosystems – Competing in Interconnected Networks

The basic premise of the digital ecosystem, an evolution of the business ecosystem, is a network of diverse stakeholders connected on a single platform and collaborating in pursuit of a common goal. In the literature, it is commonly described as the alignment of structures and partners with the aim of creating a unique value proposition and competitive advantage (Adner, 2017; BearingPoint, 2020; Hayes, 2022; Jacobides, 2019). The idea of redefining the business landscape as an ecosystem was first introduced by James Moore in 1993 (Hayes, 2022) and with the rise of digitization in the early 2000s, it was labeled the digital ecosystem. The digital ecosystem has fundamentally changed the way digital goods and services are used and delivered and provides a basis for understanding the interactions between stakeholders, such as organizations and interest groups, and how such joint ventures are mutually beneficial (Hein et al., 2020; Trapp et al., 2020). Digital ecosystems mimic biological ecosystems in their complexity, interdependence, and fundamental structure. When viewed as a unified entity, digital ecosystems exhibit self-organized, sustainable, and scalable behaviors that result from the interactions of the various participants (Li et al., 2012). In a digital ecosystem, the customer journey, which was previously a direct line with distinct start and end points, is transformed into a circle with continuous engagement, reaching far beyond conventional boundaries (Bentenrieder et al., 2016). Change & West characterized the digital ecosystem as a:

"loosely coupled, demand-driven, domain clustered, agent-based collaborative environment where each species is proactive and responsive for its own benefit or profit" (Change & West, 2006).

Despite each ecosystem player pursuing their own interest, the responsibility for value creation and capture is shared among multiple actors within the digital ecosystem (Block et al., 2022). Thus, to successfully compete and survive in ecosystems involves "a shift in thinking from individual causal elements to interactions among them" (Park & Mithas, 2020).

1.2.1 Digital Ecosystem Business Model: Actors

Successfully participating and competing in the ecosystem's intelligent and collaborative environment involves a balanced interaction of multiple actors. In the early years of research, Chang et al. (2006) identified three types of actors or 'species:' 1) biological or human species, 2) economic species, such as organizations and participants in the business ecosystem that require inputs to produce sustainable outputs, and 3) digital species, including software and digital components that require data inputs to produce outputs such as information and reports (Chang et al., 2006). More recently, the BCG (2021) categorized ecosystem players into orchestrator and contributor roles, including complementors, suppliers, and customers.

- *Orchestrators*: create and establish the ecosystem. Establish guidelines and norms, act as a mediator, and draw in participants. Successful orchestrators must fulfill the four requirements: control of critical resources, central ecosystem position, perceived fairness, and "high net benefit from the ecosystem." (Reeves et al., 2021)
- *Complementors*: directly provide products or services to consumers. Complementors add to the value of ecosystem components, offering the customer more options and thus, contributing to the diversification of offers and furthering innovation.

In terms of market capitalization, complementor roles can be more lucrative than orchestrators. For instance, Uber, the mobility platform orchestrator, experienced yearly revenue growth of 24% from 2016 to 2020 yet reported losses of more than 20 billion USD. On the other hand, its much less well-known payment service provider, Adyen, recorded an annual growth rate of 43% and generated an EBITDA of 1.1 billion USD (Reeves et al., 2021). Other schools categorize participants based on their customer relationships. Robra-Bissantz et al. (2022) categorize ecosystem actors according to their role as either: *Aggregators*, having a direct relationship with the customer, such as OEMs, or *Providers*, having no direct relationship with the customer, such as suppliers to determine value streams between actors and identify insufficient capabilities or resources (Robra-Bissantz et al., 2022).

1.2.2 Digital Ecosystem Framework: Layered Modular Architecture

The layered modular architecture (LMA) serves as a model to represent the five layers that comprise the digital ecosystem. The idea was derived from Fleisch et al, 2015's IoT Solution Value-Creation Layers Model, which combines tangible, or the non-digital world, and digital

business models into one hybrid construct. The LMA depicts the five key layers, from the physical device at the bottom to the digital service at the top. The different levels interact to create added value for the ecosystems and thus, deliver the jointly created Ecosystem Value Proposition (EVP) to the customer (Block et al., 2022; Fleisch et al., 2015). The descriptions of each ecosystem layer and how each layer adds value are shown in the table (Figure 1) below.

Ecosystem Layer	Description
<i>Digital Service</i>	Final layer featuring digital services, packaged in accessible forms like web services or mobile apps, that embody digital business model characteristics and are tied to the smart objects that gather data.
<i>Analytics</i>	Sensor-generated data is gathered, saved, checked for accuracy, and organized. The actions for the actuator elements are then decided upon using this data along with the outcomes from other web services, typically via a cloud-based backend system.
<i>Connectivity</i>	Connects the prior layer, sensor technology and actuator components, to the internet and allowing them to be accessed globally.
<i>Data Sampling Device</i>	Physical object is equipped with a small computer that has sensors and actuators collecting data from the environment, providing localized services and benefits.
<i>Physical Device</i>	Prior layer, physical element, providing the user with an immediate, tangible benefit, building the first value-creation layer.

Figure 1: Layers of the digital business ecosystem

Note. From: Author, based on Block et al., 2022; Fleisch et al., 2015

1.2.3 The Ecosystem Value Proposition (EVP)

To better understand the transition from linear value chains with single a value proposition to digital ecosystems and a co-created Ecosystem Value Proposition (EVP), Block et al (2022) explored a shift from traditional to smart farming. In the past, value creation occurred only at the non-digital or physical device layer, the actual tractor, and is now moving to value creation occurring at multiple layers within the digital business ecosystem (Block et al., 2022). According to Lüftenegger et al. (2013), each actor's value proposition in an ecosystem contributes to the network effect. A same-side or cross-side network effect occurs when one actor increases the value for another or for the same actor. For example, Spotify’s EVP relies on users and developers working together to deliver optimal music listening experiences, where user-generated content is networked together and developer-generated music content is networked together, allowing for more listening options (Lüftenegger et al., 2013).

1.2.4 Digital Ecosystem Strategy: Coopetition

In digital markets, strong network effects often lead to winner-take-all scenarios, in contrast to traditional competitive strategies based on oligopolistic competition. Competitors and regulators must therefore react in new ways (Menz et al., 2021). A well-planned, coordinated strategy is essential for a digital ecosystem to attract strategic partnerships and ensure sustainable success (Jacobides et al., 2019). By selecting the most suitable partners, companies can clearly identify the ecosystem assets they may exploit and generate a corresponding layout of social and technological interdependencies (Dattée et al., 2018). Interconnected players raise the value of or the demand for the goods or services of a competitor and thus turn them into complementary players. This type of market structure has given rise to the paradox of "coopetition." This type of business strategy builds directly on the principles of game theory, where cooperation creates synergies that can be achieved through agreements on criteria and product development between two competitors or across an industry. When a company develops an ecosystem, it becomes interconnected in ways not considered by conventional strategic positioning assumptions (Hayes, 2022; Krčo et al, 2019; Menz et al., 2021). Research into Amazon.com, Inc's digital ecosystem found 67 core alliances (more than twice as many as its e-retail competitors) across finance, logistics, telecoms, and media. However, selecting, organizing, and maintaining these alliances can be difficult when corporate culture and expectations are not aligned. Managing these collaborations may require contractual arrangements or small equity stakes (Jacobides et al., 2019).

1.3 Control Points – Achieving Powerful Market Positions

Control points refer to the key decision-making positions that one or multiple stakeholders, such as firms or organizations, can create and/or acquire, influencing the later development of the digital business ecosystem (Block et al, 2022; Dattée et al., 2018; Pagani, 2013). Elaluf-Calderwood et al. define control points as “socio-material objects integrated into a socio-technical system “(Elaluf-Calderwood, 2011), while Pagani (2013) further added that control points are characterized as the most valuable and/or potent market positions. Firms that hold these powerful, potent positions have control over the operation of the network, the redistribution of benefits, and how these affect the implementation of digital business strategies (Eaton et al., 2010; Pagani, 2013). Companies must shift towards platform-based and away from outdated linear business models (Block et al., 2022) therefore develop strategies to

influence, monitor and update to ensure that the emerging value proposition is able to endure and function effectively through control points through which they hope to capture some of the value created (Dattée et al., 2018). Block et al. (2022) further re-defined the concept:

“Control points constitute three building blocks: their negotiating character at the intersection of value creation and capture, their context in the digital business ecosystem and their constellation” (Block et al., 2022).

1.3.1 Leveraging Control Points

The idea of utilizing control points for the evaluation of an innovation’s success was originally proposed by the Value Chain Dynamics Groups at MIT. Bold innovations and new business models became possible as companies dynamically set control points across the industry infrastructure (Trossen et al., 2005). Eaton et al. (2010) further utilized control points and value networks to analyze business models in the mobile telecom industry and identify potential sources of revenue. The researchers first used value networks, an extension of Porter's value chain to identify industry players. In the second step, they examined how these players could extract value based on the economic power they controlled within the value network. This approach was guided by the resource-based view of the firm and the concept of core competencies (Eaton et al., 2010). Elaluf-Calderwood, Eaton et al.'s (2011) continued their research, using control points and tussles to study value networks and ecosystems. Control points were used to detect and predict tussles, as well as a variety of analytical tools to comprehend the dynamics of the value chain (Elaluf-Calderwood et al., 2011). Today industry players position themselves within the digital ecosystem by deliberately setting technical and strategic control points at one or multiple layers of the LMA to achieve a competitive advantage (Block et al, 2022; Dattée et al., 2018; Pagani, 2013).

1.3.2 Control Points Constellations

Pagani (2013) further studied the impact of digital innovations and industry disrupters, using a novel method of studying control point constellations, and analyzing their influence on value networks and ecosystems. Control points constellations (CPCs) describe the dynamic cycle of generating and capturing value, i.e., “value creation and capture points.” The study identified the three major types of CPCs: Closed Vertically Integrated Model, Loosely Coupled Coalitions and Multisided Platform Model. Companies striving for long-term success with value networks must periodically realign themselves, implementing new strategies and structures that are necessary to adjust to changing environmental conditions (Pagani, 2013). External forces, such

as technological advancements, industry structure, customer preferences or regulatory policies, can impact and change the importance of a control point. Thus, affecting the strength of the business model (Eaton et al, 2010). New value creation opportunities sparked by technological innovations and cross-border disruptions, shift control point constellations (Bharadwaj et al., 2013). The structure of the control points within the value chain are adversely affected by these shifts, whether they are gradual or abrupt (Pagani, 2013).

1.3.3 Control Point Analysis: Importance and Concentrated Control

Crook and Combs (2006) revisit resource dependence theory, arguing that firms' power depends on how much they depend on other firms for resources, when they are important, and when control is concentrated. Resource importance is determined by its *magnitude* (the proportion of input or output that a resource represents to others) and *criticality* (the ability of a firm to function without that resource). A resource can be critical without having significant magnitude. Concentrated control occurs when a few competitors control similar resources, as indicated by industry concentration. The bargaining power of the few dominant competitors is greater due to large volumes and limited alternatives (Crook & Combs, 2006).

Thus, the concept can be applied to strategically position a business within the respective digital ecosystem, a company must therefore test the control point it aims to set or occupy according to the two major characteristics resource importance, and concentrated control.

1. Importance defines:

- *Criticality*: How critical is the control point for the ecosystem?
- *Magnitude*: What is the magnitude or output of the control point?

2. Concentrated control defines:

- *Level of Control*: How much control does the company have?
- *Level of Scarcity*: How many other ecosystem players hold this control point?

2 Case Study: BMW

"Being a digital leader in the automotive industry is not just about having the latest technology, the biggest screen or writing the most code – the only thing that really matters is what the user feels and experiences"(Oliver Zipse, 2023),

emphasized the Chairman of the Board of Management of BMW AG at the company's annual conference on March 15th, 2023. To create the 'perfect customer experience', the car manufacturer emphasized the importance of integrating hardware and software, believing that "transformation will give BMW a competitive edge" (BMW AG, 2022; 2023). Throughout the conference, the Board repeatedly emphasized the group's goal to leverage digital technologies and integrate electrified vehicles. Management is challenging their employees to keep pace with the continuously changing business environment and innovate to meet evolving customer and market needs, while anticipating future trends and disruptions. Although a dominant player in the automotive sector, BMW faces a rapidly changing industry driven by consumer demands, regulatory pressures, and the rise of digital business ecosystems.

Aware of these challenges, Alex, a young business strategist based at BMW Group's headquarters in Munich, was given the task of finding solutions to help the company remain competitive in this new business environment. Alex understands that OEMs such as BMW are challenged with redefining their established bargaining positions as digital ecosystems replace traditional linear value chains. Talking to colleagues and partners in BMW's ecosystem, he seeks to identify BMW's key strategic issues. Based on his findings, he aims to analyze the participants and their roles with the automotive digital ecosystem in which BMW is embedded, using novel methods and tools to help BMW formulate a sustainable competitive strategy.

This case study focuses on how BMW faces strategic challenges, including changing consumer needs, along with societal and political pressure demanding greener mobility solutions and leveraging the power of digitally interconnected networks. Based on five interviews with employees from BMW and its respective ecosystem partners, this case will examine how the automaker is addressing the potential effects of these challenges on the groups' bargaining power within the digital ecosystem as well as its efforts and ability to remain competitive. Finally, the outlook focuses on how business strategist Alex intends to approach 'seeing the bigger picture' and makes suggestions for developing BMW's strategy in the digital age.

2.1 Strategic Issue 1: Meeting Changed Consumer Expectations

As consumer demands rise, the power dynamics between manufacturers and customers in the automotive sector are changing, and BMW is no exception. Increased transparency through digital access and social media have made customers better informed and empowered to compare product and service offers. This has led to increased bargaining power for customers, who are demanding more personalized and digitized experiences, such as in-car infotainment systems or enhanced driving comfort, increasing the pressure for OEMs to advance technology and processes in manufacturing of new models. According to the BMW Group plant manager:

"Building a network infrastructure is important. In Germany and Europe, we are not as advanced as some other countries in terms of 5G network coverage (V2X). Autonomous driving, for example, is not yet possible in some cases due to the networks not being as far developed, causing radio gaps." (Interviewee 1, Group Plant Manager).

To improve the driving experience and transform how people interact with their vehicles, BMW has developed novel advanced technologies as seen in the new fleet or BMW's vision car, the iVision Digital Emotional Experience (DEE) (see exhibit 2). The automaker's 'Future Digital Mobility' aims to set new industry standards by blurring the line between the real and virtual worlds, offering a fully virtual driving experience. However, according to new car production:

"Creating specialized products and services, including connectivity features such as infotainment systems or advanced driver assistance and digital assistant systems (ADAS), requires a significant amount of data collection about customer preferences, behavior and driving patterns." (Interviewee 2, Planning Specialist)

Currently, the company uses data from "more than 20 million vehicles connected to the BMW cloud" (BMW AG, 2023). According to an automotive data management expert, the collection, analysis, and use of such vast amounts of data can lead to three major problems:

"Not all customers will agree to their data being collected and shared. The data collected may be subject to cyber-attacks and breaches; over-reliance on technical issues may result in malfunctions and expensive repairs, which can irritate and frustrate customers. OEM's must balance the benefits of providing personalized and digital experiences with the need to protect customer privacy, store data securely and provide reliable, high-quality technologies, while giving customers awareness and control over the collection and use of their personal data." (Interviewee 4, Data Manager)

Thus, BMW's challenge to remain customer-centric is to find the right balance between leveraging the Internet of Things (IoT) and creating a V2X infrastructure versus the protection of customers personal data, especially following the adaptation of the EU GDPR.

2.2 Strategic Issue 2: Sustainability Pressure on the Automotive Industry

As pressure mounts in the automotive industry for sustainable mobility, BMW has worked to shift its strategic focus to sustainable alternatives, such as electrification. While the group has made progress in ESG dimensions and was recognized as the top sustainable automaker in 2020 by the Dow Jones Sustainability Indices World and Europe (BMW AG, 2020), it continues to be criticized for its environmental practices, including accused of ‘greenwashing’ due to false advertising (Harvey, 2017). To address these concerns and establish itself as the world's greenest carmaker, BMW launched RE: BMW's "secondary first" circular economy strategy in 2020. The aim is to reduce the use of primary raw materials and increase the use of secondary materials in car production to 50%, while implementing a closed-loop system, e.g., recycling rare earths from batteries to conserve resources, and reducing CO2 emissions by 70% compared to the use of primary materials (BMW AG, 2023). According to production:

“Currently, we are at 30% also by recycling of end-of-life vehicles, following the motto: "Turn old into new". We also focus on sustainability. One way we do this is by substituting real leather (artificial leather).” (Interviewee 1, Group Plant Manager).

However, BMW must continue to pursue its sustainability goals to address criticism and remain competitive. Following the Dieseltgate scandal in 2017, which exposed collaborations with other carmakers to limit emissions technology, BMW has faced reputational damage and financial costs of 373 million EUR (Nelson, 2019). Moreover, the emergence of new foreign competitors, giving customers more options and therefore more bargaining power in terms of product price and quality remains a source of concern for incumbents to develop cost-effective and reliable solutions. BMW views electrification as a key performance indicator and is investing heavily in developing new models to consolidate its leading position in eMobility, expecting its BEV sales to account for 15% of its total sales in 2023 (Exhibit 3, 4).

BMW aims to move to a single-drive technology in the future, either battery electric, plug-in hybrid, or hydrogen fuel cell. The group recognizes the challenge of establishing a charging infrastructure, as well as the risks of relying on a single raw material. Nevertheless, BMW advocates a technology-neutral approach to achieve effective climate protection through diversity and resilience, including a new fleet of hydrogen vehicles by 2025, *"we are co-operating with Toyota on Hydrogen power"* (Interviewee 1, Group Plant Manager).

Still, skepticism around hydrogen cell power remains due to a lack of refueling stations, high research and development costs, sustainability concerns and the long-term viability of hydrogen powered compared to battery electric technologies.

"Expensive development, testing and infrastructure are needed before hydrogen technology can be fully integrated ... the sustainability of alternative drives depends on how they're produced and developed." (Interviewee 5, Research Developer).

The challenge for OEMs like BMW is to commit to green technology and act toward creating reliable and sustainable mobility solutions as part of their long-term business strategy, as the automotive industry comes under increasing pressure to reduce emissions and not lose out to foreign rivals who are entering the market with more environmentally friendly products.

2.3 Strategic Issue 3: Building A Robust Digital Ecosystem

BMW is building a robust ecosystem of competitors, suppliers, and service providers to gain a powerful position in the dynamic market. In 2019, the group invested over 1 billion EUR in five joint ventures with Mercedes-Benz AG, formerly Daimler AG, for projects involving urban mobility services as part of their CASE strategy (BMW AG, 2019). Between them, the groups have built a network of more than 480,000 charging points across Europe, creating what the companies call a 'seamless networked ecosystem' (BMW AG, 2023). Through their significant market presence, both BMW and Mercedes-Benz AG acknowledge how joining forces can negotiate more favorable terms with suppliers, service providers and other business partners. Using a balanced approach to internal and external outsourcing, BMW continues to manufacture a significant proportion of its products in-house, including key parts such as engines and transmissions. Chairman Zipse has stated that the group is *"fully aware of their strengths, knowing when to produce internally and when to integrate partners"* (Zipse, 2023), as evidenced by its strategic partnerships with Qualcomm Technologies and Arriver Software in the field of AD systems, involving more than 1,400 specialists working together. Moreover, the group emphasizes a close collaboration with its supplier network. Joachim Post, board member overseeing purchasing and the supplier network, emphasized the group's intention to establish a local network for increased independence (Exhibit 5). BMW has made environmental protection one of the top priorities and has adopted a "local for local" strategy to increase adaptability (Post, 2023). The development of tools to recognize and take advantage of digital potential in all areas of responsibility by BMW's staff is what propels the group's advancement in this area. Yet, a potential challenge that BMW faces in its strategy is the difficulty of building and managing its own ecosystem in the age of Industry 4.0.

"It's not possible for us to gather all the know-how we need to keep a complete new vehicle production line up to industry standards on our own. The same is true for our competitors" (Interviewee 2, Planning Specialist).

This highlights the need for collaboration and partnerships with other companies that possess complementary expertise, such as the integration of technical capability with IoTPPs i.e., Apple and Google. Another interviewee added, *"only by exchanging know-how will they be able to compete with their foreign rivals"* (Interviewee 4, Software Developer). BMW leverages its strategic partnership with Amazon Web Services (AWS) as part of its IT structure to ensure digital security for data and intellectual property, independence, and privacy. The group has strengthened its collaboration with technology providers such as AIQX, Idealworks, NVIDIA and Catena-X with expertise in AI, intelligent transport robots, data-driven value chains and virtualization to maintain its position at the forefront of digital advancements (see exhibit 6).

2.4 Outlook

In his research, Alex discovered how increasing consumer power, higher expectations and greater transparency are driving change in the automotive industry, causing BMW and other OEMs to shift their focus to digitalization in response to changes in consumer needs. Nonetheless, the collection of vast amounts of consumer data raises concerns about data protection, cybercrime, and technology. Particularly with the implementation of GDPR, BMW faces the challenge of balancing the benefits of personalization, customer privacy, and reliable technology (V2X). While focusing on sustainable alternatives and a circular economy strategy to reduce primary resource use, the Group faces challenges in creating a reliable charging infrastructure and addressing manufacturing and recycling sustainability concerns to meet its green mobility commitments. In addition, successful ecosystem management is crucial, as AI plays an imperative role in preserving customer relationships and preventing revenue leakage. By taking care of software integration, IoTPPs enable the OEM to focus on hardware development and lean manufacturing (Jacobides, 2021; Wang & Meckel, 2022). From Alex's perspective, the main challenge is to make the necessary technological investments to meet customers' changing needs, whilst understanding the value of leveraging strategic partnerships, both inside and outside the group. His aim is to understand the partners involved, along with the dynamics between them, to secure BMW's viable bargaining position within the ecosystem.

Exhibit 1 Interview partners overview and key insights

Interview Partner	Company	Role, Position	Key Insights
<i>Interviewee 1</i>	BMW AG	BMW Group Plant Manager <i>Quality Management and Reporting</i>	<ol style="list-style-type: none"> 1) Supply chain management and ecosystem management play an important role in staying competitive with new developments in the automotive industry. 2) Personalisation is a top priority for BMW, with a focus on the driver's well-being. This includes personalised settings such as seat and mirror positions, temperature settings and personalised greetings. 3) Increased customer interest in battery electric vehicles (BEVs)
<i>Interviewee 2</i>	BMW AG	Planning specialist <i>Control technology in plant engineering</i>	<ol style="list-style-type: none"> 1) The collection of customer data is necessary to create specialised products and services, including connectivity features such as infotainment and ADAS systems. 2) It's not possible for BMW (and its competitors) to assemble all the necessary know-how to maintain a complete new vehicle production line to industry standards on its own. 3) Collaboration and partnerships are necessary to remain competitive and maintain industry standards in the automotive industry.
<i>Interviewee 3</i>	BASF	Business Development Manager <i>Biopolymers and Organic Recycling</i>	<ol style="list-style-type: none"> 1) Collaborating and partnering with automakers is essential to developing and implementing new technologies and solutions. To maintain competitive advantage in the marketplace, cost efficiency and supply chain optimisation are critical. 2) Meeting the demands and challenges of the automotive industry requires continuous innovation and research. 3) Sustainability and environmental concerns are of increasing importance to both the automotive manufacturers and their suppliers.
<i>Interviewee 4</i>	Mercedes-Benz (Daimler AG)	Software Developer <i>Automotive Programming and Simulation</i>	<ol style="list-style-type: none"> 1) OEMs must balance the need to protect customer privacy, store data securely and provide reliable, high-quality technology with the benefits of providing personalised and digital experiences. 2) Potential risks associated with the collection and use of data, such as cyber-attacks and data breaches. Some customers may not consent to their data being collected and shared. Companies that collect and analyse large amounts of data should continuously improve their procedures and processes to ensure the security of the data, to protect the trust of their customers and to safeguard their business operations. 3) Over-reliance on technology can lead to malfunctions and expensive repairs. This can irritate and frustrate customers.
<i>Interviewee 5</i>	Mercedes-Benz (Daimler AG)	Research Developer <i>Battery-electric vehicles and eFuels</i>	<ol style="list-style-type: none"> 1) eFuel technology development and improvement will be very costly in terms of research, testing and infrastructure development. 2) Hydrogen scepticism remains due to lack of refuelling stations, high R&D costs, sustainability concerns and long-term viability compared to battery electric technologies. 3) Hydrogen technology has sustainability concerns. CO2 emissions vary depending on the type of hydrogen produced.

Figure 2: Exhibit 1: Interview partners overview and key insights.

Note. From: Interviews conducted both in-person and digitally between February and April 2023

Exhibit 2 BMW iVision Model: Digital Emotional Experience (DEE)

PRODUCTS	
90	Innovation, Digitalisation and Customer Orientation
95	Product Quality and Safety
97	Carbon Emissions
100	Electromobility

PRODUCTS

INNOVATION, DIGITALISATION AND CUSTOMER ORIENTATION

[The BMW Group's innovations are characterised by their consistent orientation towards customer needs and the use of digital solutions. During the year under report, numerous innovations again resulted in processes being optimised, products improved and new technologies introduced to make everyday life easier for our customers.

Vision UI/UX: user interaction and the user interface of the future
 With its BMW i Vision Dee concept vehicle, the BMW Group is demonstrating how interaction between people and automobiles could look like going forward. "Dee" is a sporty, elegant mid-size sedan that epitomises the core values of the BMW brand in a new, reduced design language. It is the most recent affirmation of our digital expertise and stands for Digital Emotional Experience. "Dee" is yet another milestone on the road to the NEUE KLASSE and forms an innovative link between everyday reality and the virtual world. As of 2025, with the NEUE KLASSE the BMW Group will be taking a major technological leap forward and creating innovative drivetrain and digital modules for all relevant classes of vehicle across the BMW model range. Electrification, digitalisation and circularity are the key elements that signify the transformation currently taking place within the automotive

MINI Concept Aceman
 The Concept Aceman marks the dawn of a new era for the MINI brand. The crossover model is a preview of a completely new type of vehicle that is destined to occupy the position between the MINI Cooper and the MINI Countryman in the model family going forward. This concept vehicle reflects how MINI is reinventing itself to be part of an all-electric future and what the brand stands for by creating an electrified go-kart feeling, digital features for all the senses and a keen focus on minimising its ecological footprint.

"Charismatic Simplicity" – the new design language – pares back the look of the MINI models of the future to the essentials. The exterior of the MINI Concept Aceman features a prominent front end with an octagonal, closed, illuminated radiator grille element, an athletic shoulder section and a powerful rear fitted with vertically arranged taillights. The interior is greatly reduced and focuses on a round OLED display that enables the driver to personalise the sound, interaction, projection and light via three "Experience Modes". Like all future MINI models, the MINI Concept Aceman is designed completely without leather, is practically chrome-free and features a variety of sustainable materials.]



Figure 3: Exhibit 2: BMW iVision Model: Digital Emotional Experience (DEE)

Note. From: 2 – Combined Management Report: Products, BMW Group Report 2022

Exhibit 3 BMW Group electrification deliveries 2021, 2022

in units	2022	2021	Change in %
BEV	215,752	103,854	107.7
BMW	172,008	69,003	149.3
MINI	43,744	34,851	25.5
PHEV	218,040	224,460	- 2.9
BMW	200,945	206,069	- 2.5
MINI	17,095	18,391	- 7.0
Total³	433,792	328,314	32.1

Figure 4: Exhibit 3: BMW Group electrification deliveries and expected BEV shares

Note. From: 2 – Combined Management Report: Financial Reports, BMW Group Report 2022.

Exhibit 4 BMW Group expected BEV shares 2023 - 2030

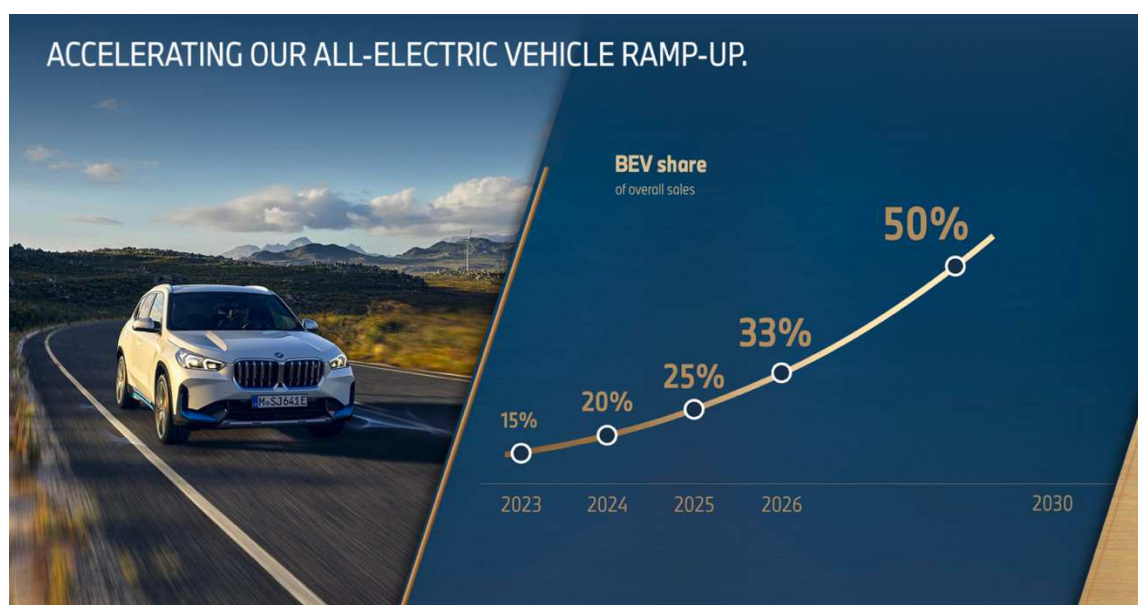


Figure 5: Exhibit 4: BMW Group expected BEV shares 2023 - 2030

Note. From: Presentation Oliver Zipse, BMW Group Annual Conference | 15 March 2023.

Exhibit 5

BMW Global production sites



Figure 6: Exhibit 5: BMW Global production sites

Note. From: Strategy, BMW Group Investor Relations, p.31 | 15 March 2023

Exhibit 6

Strategic Digital Partnerships Overview



Figure 7: Exhibit 6: Strategic Digitalization Partnerships Overview

Note. From: Strategy, BMW Group Investor Relations, p.30 | 15 March 2023

3 Teaching Note

3.1 Introduction

An interconnected group of stakeholders, such as suppliers, customers, and digital technology and service providers, that work together to create shared value is referred to as the digital business ecosystem. It is a large-scale, dynamic system made up of numerous participants, each with unique roles, interests, and viewpoints. Businesses, governments, regulators, and customers are just a few of the many actors that can participate in digital business ecosystems, which can have a truly global scope. Thus, ecosystems rely on technologies such as artificial intelligence, online platforms, applications, etc. to create value and accomplish their objectives, these actors communicate, collaborate, and transact with one another. Understanding current partners at their core is necessary for mastering a digital business ecosystem, requiring much comprehension, planning, and coordination. This study session will explore business strategies in the digital age, focusing on how organizations are leveraging their market position within the business ecosystem for sustainable competitive advantage while collaborating with other ecosystem participants via the exploitation of novel innovations and accessible technologies.

3.1.1 Multi-Media Support

The following digital podcast is suggested for students to gain a general awareness of the subject of business and digital business strategies:

- *Understanding Digital Strategy | Harvard Business Review Idea Cast | Episode 645*
Link: <https://hbr.org/podcast/2018/08/understanding-digital-strategy>
- *Dynamic Strategy and the End of Competitive Advantage | Rita McGrath*
Link: https://www.youtube.com/watch?v=BwbK54OIYbI&list=PLkzmiwAI9Dzmtro70mlOPloMV_YfwpvjF&index=45

Additionally, students can watch the following videos to learn more about digital business ecosystems:

- *How Digital Ecosystems Create Value, and How They'll Change in the Future | Boston Consulting Group | Michael G. Jacobides*
Link: <https://www.youtube.com/watch?v=hPYh0rGsDJk>

3.1.2 Learning Objectives & Goals

1. Demonstrating an understanding of the key concepts and strategies i.e., cooperation, related to digital business ecosystems and how these apply to multiple industries.
2. Identifying the various actors within the respective digital business ecosystem and assessing their roles as orchestrators or complementors.
3. Analyzing the opportunities and threats of digital business ecosystems and developing strategies to capitalize on them.
4. Developing and implementing a successful digital strategy that allows the organization to adapt to changing market conditions and capitalize on emerging technologies.
5. Evaluating and identifying areas for improvement by means of setting and holding control points in digital business ecosystem.
6. Demonstrating an understanding of the importance of setting control points within the digital business ecosystem and potential impact on the company and its stakeholders.

3.2 Implementation

The following section details the preparation required to successfully complete the study session (3.2.1) and the specifics of the recommended teaching process (3.2.2). Students should complete the provided tasks to analyze a firm's position within the digital ecosystem, understand the current and plan the creation and implementation of a future digital business strategy as part of the session on exploring business strategies in the digital age.

3.2.1 Preparation

In this study session, students should understand the basic business concepts, principles, and frameworks such as Porter's Five Forces and Value Chain Analysis, SWOT Analysis, Core Competencies, Business Model Canvas and Blue Ocean Strategy. Moreover, students are advised to apply these frameworks to identify an organization's resources and capabilities, goals, and the business environment. They can use this information to determine their strengths and weaknesses, allocate resources more wisely, and enhance current procedures. Furthermore, students will learn the significance of setting control points within digital ecosystems and how this method will assist them in developing a sustainable digital business strategy.

For students to understand the dynamics and management of this complex business landscape, the digital business ecosystem, the instructor may ask the following questions:

1. Can you describe how to identify potential control points and how to test them in the context of the digital business ecosystem?
2. In a digital ecosystem, how do you test the potential of a blue ocean strategy? What are some strategies for the merging of digital business ecosystems?
3. What are the strategies which different actors apply to jointly create new opportunities and become part of the digital business ecosystem?
4. Using BMW's example of value creation in the automotive industry, what are some strategies used for the introduction of new digital concepts into existing industries?
5. In the future, how can digital business ecosystems be connected to create new opportunities across different industries?

3.2.2 Teaching Process

The teaching process will be split into two parts. In the first part, covered in first two sessions, students will learn about of the digital business ecosystem and based on the case study examine BMW's automotive digital ecosystem. Here students will learn to visualize the ecosystem's current participants and position the participants identified in the appropriate layer within the digital ecosystem using the Layered Modular Architecture (LMA). Moreover, they will determine the estimated the individual layers' importance of the current and future ecosystem. As part of their individual performance, they will set control points of the identified players within the automotive digital ecosystem.

In the second part, students will learn the meaning and importance of setting and holding control points within the respective digital business ecosystem and later evaluate their level of comprehension of the digital business ecosystem, by means of developing and testing the digital business strategies. They will work on developing a digital business strategy for either BMW or a company of their choosing. Here they will test control points they aim to set and how this will help them in the development process. In the final step, they will create a short five-minute pitch to present their sustainable digital business strategy to their company. The final assignment will ask students to present their learnings in a one-page digital report.

Part I: Digital business ecosystem and control point analysis.

1. Group Task: Use the case study on BMW to identify key partners and position each relevant player within the correct ecosystem layer using the table below. This will help understand the players and their roles within the digital business ecosystem.

This exercise is crucial for the students to gain an understanding of the complex dynamics of the digital business ecosystem in the automotive industry. By understanding the roles and interactions of different ecosystem players, students will be better equipped to identify industry opportunities and challenges and develop effective strategies for innovation and growth.

In this first exercise, students will use the provided table (Figure 8 below) to break down the automotive digital business ecosystem. The content is based on Block et al.'s (2022) Layered Modular Architecture and describes the five layers of the ecosystem and provides exemplary companies (global and EU) that operate within the respective layer.

By examining the table and determining the specific layer in which each player functions, students can better understand the roles and responsibilities of each player in the ecosystem. In line with the case study, Students must then position the participants (i.e., the orchestrator, complementors, suppliers, and customers) of BMW's ecosystem on the appropriate layer, as shown in the left column of the table labeled 'Ecosystem Layer'.



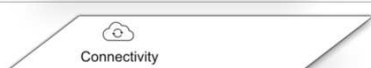

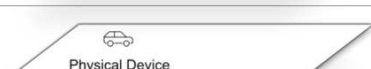
Ecosystem Layer	Description	Companies (Global, German/EU)
 <p>Digital Service</p>	Development of applications and digital services integrated into the vehicle, including infotainment systems, over-the-air software updates, and maintenance forecasts.	Alpha, Apple, Google, Tesla Audi, BMW, Daimler, Volkswagen
 <p>Analytics</p>	Collection, analysis, and processing of vehicle data using platforms and tools, and the creation of algorithms and models to predict performance, improve safety, and optimize outcomes.	Amazon WS, IBM, Microsoft, Oracle Bosch, Continental, Siemens
 <p>Connectivity</p>	Integration of digital technologies such as Wi-Fi and 5G, and the creation of services and platforms that enable the vehicle to communicate with other devices.	Ericsson, Huawei Technologies, Nokia Deutsche Telekom
 <p>Data Sampling Device</p>	Collection and analysis of data related to vehicle performance, environmental impact, and driver behaviour.	Delphi Technologies, Continental, Denso Bosch, Continental, Siemens
 <p>Physical Device</p>	Development and manufacture of all physical components that make up the vehicle, including the body and electronics.	General Motors, Ford, Toyota Audi, BMW, Daimler, Volkswagen

Figure 8: The automotive digital ecosystem

Note. From: Author, adapted from BMW (2023), Block et al. (2022), Fleisch et al. (2015), Interview Partners 1-6 (2023)

2. Group task: Use the LMA (Figure 11) to illustrate the significance of each layer in the automotive digital business ecosystem. The size of the circle indicates the importance of the respective layer. Refer to the case study that was provided.

In the following exercise, students should use two LMAs (Figure 10) to identify the current and future main contributors to the Ecosystem Value Proposition (EVP) based on the case study. Students will assess the competitive landscape to identify opportunities for innovation and growth and develop a sustainable digital business strategy in line with market developments.

Figure 9 below shows the evolution from a single-layer architecture (left) to a multi-layer architecture in the present (middle) and in the expected future (right). In the past, the physical product has been the main driver of EVP. In the future, however, the digital service layer is expected to become the main driver of EVP as digitalization increases.

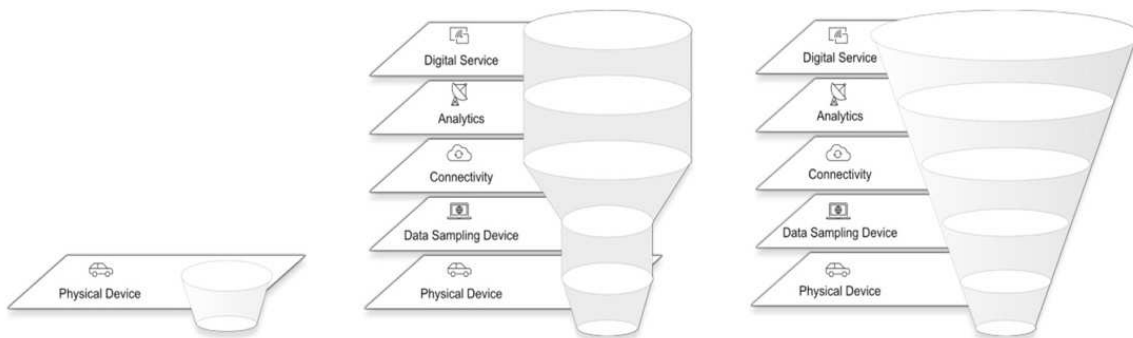


Figure 9: Single layer to the layered modular architecture

Note. From: Author, adapted from Block et al. (2022)

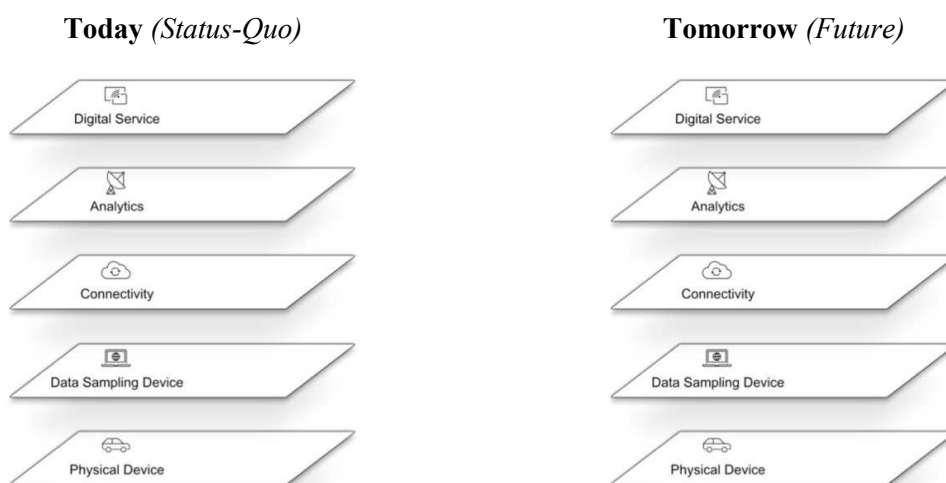


Figure 10: Today versus Tomorrow.

Note. From: Author, adapted from Block et al (2022), Fleisch et al. (2015), Yoo et al. (2010)

3. Group Task: Put yourself in the shoes of business strategist Alex and in a group, answer the following questions about the case study.

- a. *How is BMW adapting to the changing power dynamics in the automotive sector between OEMs and customers, particularly in relation to the use of customer data for personalized experiences and the need for sustainable mobility?*

BMW is investing in technology and software to increase customer loyalty by using customer data for personalized experiences, while at the same time promoting green technologies such as battery electric vehicles (BEVs) and sustainability in its supply chain, i.e., “secondary first” circular economy strategy, to reduce CO2 emissions and avoid accusations of greenwashing.

- b. *What are the advantages and disadvantages of BMW's approach to developing specialized products and services, such as connectivity features and advanced driver assistance? How does BMW ensure the balance between delivering personalized and digital experiences and protecting customer privacy, storing data securely and delivering high quality and reliable technology?*

The benefits of BMW's specialized products and services approach include increased customer satisfaction and loyalty, while the disadvantages include increased R&D costs and potential privacy risks. To protect customer information and ensure trustworthy technology, BMW has implemented strict privacy policies and security measures in-line with GDPR.

- c. *How is BMW adapting to the emergence of new foreign competitors, and what cost-effective and reliable solutions is the company developing to address this challenge? What strategic approaches would you recommend BMW to take?*

BMW is investing in affordable solutions and exploring new business models and technologies. It's diversifying revenue streams by partnering with Mercedes-Benz, Amazon, and Apple to enter new markets. In the future, BMW can attract more foreign partners by leveraging its innovative, customer-focused strategy and strong brand reputation. The group can further develop sustainable technology for the emerging electric and autonomous vehicle market, possibly by acquiring or partnering with startups. Improving supply chain and manufacturing processes would reduce costs and increase efficiency.

4. Individual assignment: Using the table (Figure 11), set the technical and strategic control points that the participants identified in the previous exercises hold within the respective layer of the automotive digital business ecosystem.

The task involves students plotting strategic and technical control points within the LMA; this entails knowing where to place a specific control point within the automotive digital business ecosystem. The primary objective of the digital ecosystem analysis is to identify the strategic and technical control points the various ecosystem participants hold.

Once students have gained an understanding of the different roles and development of the digital ecosystem, they should make use of technical and strategic control points specific to the automotive industry (Figure 11 below) and set them accordingly (Figure 13).

Technical Control Points		Strategic Control Points	
<i>Content</i>	Applications, AI, IoT, Connectivity, Vehicle-to-Cloud (V2C)	<i>Agility</i>	Being a market pioneer, such as a first mover Immediately attend to customer needs
<i>Data</i>	Possess data authority Possess distinctive and top-notch data	<i>Brand</i>	Profiting from long-term customer loyalty (e.g., OEMs such as BMW benefiting from reputation)
<i>Digital Infrastructure</i>	Establishment of a central data hub Providing the necessary system technology Vehicle-to-Infrastructure (V2I) Vehicle-to-Cloud (V2C) Vehicle-to-Everything (V2X) Vehicle-to-Pedestrian (V2P) Vehicle-to-Vehicle (V2V)	<i>Customer Access</i>	Access to digital customers to gather more user insights Developing an integrated front-end user experience Excellent service and customer satisfaction Physical access to the client during and after the purchase
<i>Modularity</i>	Having open APIs allowing everyone to connect Defining APIs to control which products, systems and services are interoperable Harmonization of user interfaces to facilitate switching machines within a brand Support of industrywide standards (e.g. ISOBUS)	<i>Financial Solutions</i>	Holding companies can compensate for losses in the digital sector in the case of large cooperation's Possess resources to invest in research and development Reliability can be proven by financial stability.
<i>Scalability</i>	Create once, deploy anywhere Rapid scalability of digital services ADAS (Advanced Driver Assistant Systems) Connectivity, Automotive, Electrification	<i>Know-How</i>	Industry knowledge e.g., knowledge of automotive analysis IT and cloud system expertise User-specific knowledge (about and how to communicate with the user)
<i>Unique Solution</i>	Offering holistic solutions for the entire product life cycle Possess unique algorithms or AI solutions The platform is simple and simple to use.	<i>Networking</i>	Collaborate with start-ups (for example, ride-hailing and car-sharing services) Engage in strategic alliances, such as those with rivals, to draw in more customers Have authorised dealers
		<i>Orchestration</i>	Merging of several players and creation of new markets Platformization

Figure 11: Automotive Control Points.

Note. From: Author, adapted from Block et al. (2022), Interview Partners 1-6 (2023).

Students can use the example of the smart lighting ecosystem by Block et al. (2022) (Figure 12), here companies such as Apple or Google Home hold multiple strategic (i.e., *Brand, Content and Customer Access*) and technical (i.e., *modularity*) control points on the digital service layer.

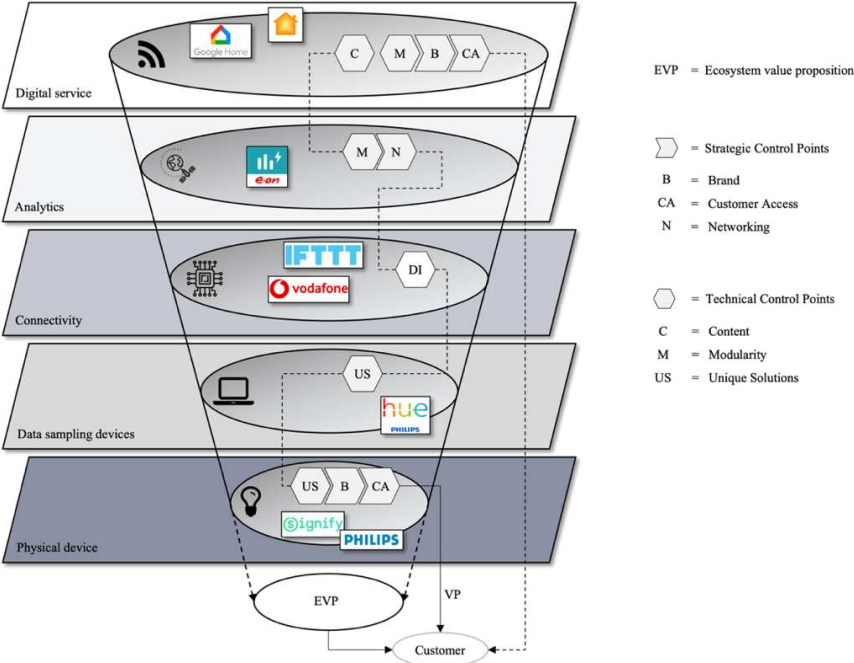


Figure 12: “Smart Home” control points on the layered modular architecture

Note. From: Block et al (2022)

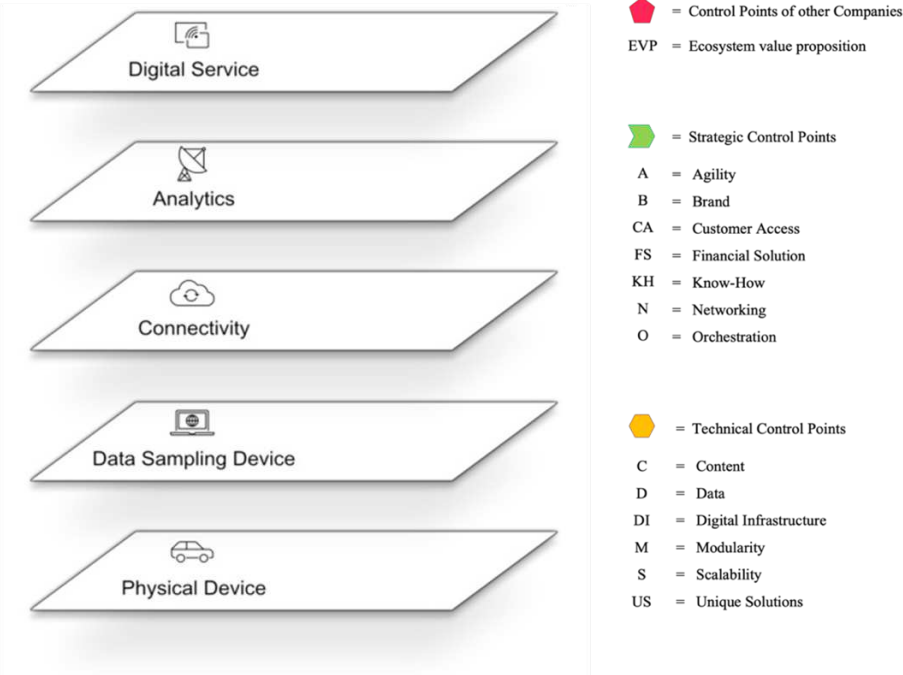


Figure 13: Control point setting within the automotive ecosystem.

Note. From: Author, adapted from Block et. al (2022)

Part II: Develop a digital business strategy.

The strategy formulation process is essential for businesses to set long-term goals, choose the best approach to achieve them and allocate resources efficiently. It involves the analysis of the internal and external environment, the identification of SWOT and the determination of the best course of action. The result can be improvements in performance and competitiveness.

- 1. Group task: Pick a company and consider possible ways of setting new control points within the digital business ecosystem the firm operates in (Figure 14). Ask questions such as: how can we scale-up/grow our firm given the current ecosystem dynamics? What strategic partnerships can we foster to set and hold more control points?**

Identifying and setting control points is essential for students to understand how organizations and other actors can strategically position themselves in the digital ecosystem to gain a competitive advantage. The application of the concepts and frameworks explored during the sessions will help students to understand the resources, capabilities, and business environment of an organization to identify strengths and weaknesses and efficiently allocate resources. Students should use the table (Figure 14 or Figure 17) for control point analysis.

Today (Status Quo) Where are we now?

Ecosystem Layer	Feature	Control Point/s	Expected Market Size	Importance	Concentrated Control	Is it a Control Point?
<i>Example: Physical Device</i>	Car/Automobile 	Technical (T): Unique Solution Strategic (S): Brand, Customer Access	Small Medium Large	Yes No	Yes No	Yes No
Digital Service			Small Medium Large	Yes No	Yes No	Yes No
Analytics			Small Medium Large	Yes No	Yes No	Yes No
Connectivity			Small Medium Large	Yes No	Yes No	Yes No
Data Sampling Device			Small Medium Large	Yes No	Yes No	Yes No
Physical Device			Small Medium Large	Yes No	Yes No	Yes No

Tomorrow (Future) Where are we heading?

Ecosystem Layer	Feature	Control Point/s	Expected Market Size	Importance	Concentrated Control	Is it a Control Point?
<i>Example: Digital Service</i>	Car Sharing Service 	Technical (T): Unique Solution Strategic (S): Customer Access	Small Medium Large	Yes No	Yes No	Yes No
Digital Service			Small Medium Large	Yes No	Yes No	Yes No
Analytics			Small Medium Large	Yes No	Yes No	Yes No
Connectivity			Small Medium Large	Yes No	Yes No	Yes No
Data Sampling Device			Small Medium Large	Yes No	Yes No	Yes No
Physical Device			Small Medium Large	Yes No	Yes No	Yes No

Figure 14: Control point analysis.

Note. From: Author, 2023

2. Group task: Develop a five-minute pitch for a client, outlining the specific control points for their company [client] to gain a competitive advantage.

Students will practice setting control points and creating a compelling pitch to clients based on the acquired knowledge. This exercise helps students understand how to formulate and implement a sustainable business strategy to ‘master the digital ecosystem.’ The pitch will teach them how to effectively communicate their ideas and strategies to clients or stakeholders.

3. Individual assignment: Create a one-page digital report drawing insights from the lesson. This should include a visual representation of the digital business ecosystem in the form of the LMA, together with information about the estimated layer sizes and control points placed within the various layers, alongside the three main strategic approaches required to secure an appropriate competitive edge.

Students will apply their understanding of digital strategy and management to a real-world case study by producing a one-page digital report, demonstrating their ability to analyze and understand the digital business landscape, visualize the digital business ecosystem using the LMA, identify control points and outline strategies such as orchestration and cooperation.

3.3 Organization & Timeline

3.3.1 Structure

To enhance understanding of the material, students will actively participate in classroom sessions, group exercises, and individual assignments. The recommended format is a minimum of three sessions. It is a hybrid system of in-class and online learning, with short, comprehensive digital materials provided by the instructor. In-class sessions should last 180 minutes, although the sessions may vary in length depending on the students’ prior knowledge.

All group tasks are to be completed in class. The recommended group size for active participation in the tasks is 3 to no more than 6 members, with 4 being the ideal size. The groups will present their ideas and recommendations in the third and final session.

3.3.2 Study Session Plan

Part I (50 minutes): *Introduction to the basic concepts of digital business ecosystems, the layered modular architecture (LMA) and control points.*

- Introduction, learning objectives, and goals.
- Overview of the digital business ecosystem, the LMA, and control points
- In-class group assignments: Part I, Exercises 1 – 3

10 minutes Break

Part II (50 minutes): *In-depth study of technical and strategical control points, setting and holding these in the digital business ecosystem.*

- 5-minute recap of session 1
- In-depth study of control points; types (technical, strategical), and strategy
- In-class group assignments: Part II, Exercises 1 & 2

10 minutes Break

Part III (60 minutes): *Learning how to create a sustainable business strategy to compete in the digital age based on the concepts explored in sessions 1 and 2.*

- 5-minute recap of session 2
- Overview of strategic approaches for mastering the digital business ecosystem
- In-class group assignment: Pitch presentation

Take-home assignment:

- Watch online revision and tutorials
- Individual assignments: Part I, Exercise 4 & Part II, Exercise 3

This organization and session plan provides students with the opportunity to learn the fundamental concepts of digital business ecosystems and control points, as well as practical skills such as creating a pitch and presenting results to clients or stakeholders.

3.4 Background Readings & References

The suggested readings below can be provided to support students with a basic introduction to the topic, allowing them to build on the theories covered. The list is provided as a set of examples and can be modified as necessary to cover the digital business ecosystem and strategy.

Control Points

Block, C., Bohnsack, R., Wustmans, M., & Bröring, S. (2022). Control Point Dynamics in Emerging Digital Business Ecosystems: The Case of the Digital Agriculture. In *Academy of Management Proceedings* (Vol. 2022, No. 1, p. 13275). Briarcliff Manor, NY 10510: Academy of Management.

Crook, T. R., & Combs, J. G. (2007). Sources and consequences of bargaining power in supply chains. *Journal of operations management*, 25(2), 546-555.

Pagani, M. (2013). Digital business strategy and value creation: Framing the dynamic cycle of control points. *Mis Quarterly*, 617-632.

Digital Business Ecosystem

Adner, R. (2017). Ecosystem as structure: An actionable construct for strategy. *Journal of management*, 43(1), 39-58.

Jacobides, M. G., Brusoni, S., & Candelon, F. (2021). The evolutionary dynamics of the artificial intelligence ecosystem. *Strategy Science*, 6(4), 412-435.

Digital Business Strategy

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. V. (2013). Digital business strategy: toward a next generation of insights. *MIS quarterly*, 471-482.

Bohnsack, R., Kurtz, H., & Hanelt, A. (2021). Re-examining path dependence in the digital age: The evolution of connected car business models. *Research Policy*, 50(9), 104328.

Conclusion

This teaching case study on “Exploring strategies in the digital age: The case of BMW’s business ecosystem” examined how the traditional original equipment manufacturer, BMW, faces challenges in creating a sustainable business strategy to establish a competitive position within the novel business landscape, the digital ecosystem. The research note examined the topics: digital disruption (i.e., the importance of data and digitalization in business), digital ecosystem (i.e., competing in interconnected networks by means of collaborating and co-creation), and control points (i.e., how companies can achieve powerful market positions through setting technical and strategic control points in the digital ecosystem). The case study on BMW investigated the three major strategic challenges: 1) rapidly changing consumer expectations, 2) pressure on the automotive industry to create alternate sustainable mobility solutions and, 3) building a robust interconnected network, a business ecosystem. Through the lens of protagonist Alex, who works as a business strategist at the BMW headquarters, five interviews with experts from BMW and its ecosystem partners explored the specifics of how the group can respond to these challenges. The results suggest that BMW must continue to integrate strategic partnerships within the industry (i.e., Mercedes-Benz, Toyota), software and IoT platform providers (i.e., AWS, Arriver Software), and local suppliers (i.e., BASF) to collectively gather the necessary knowledge and resources to co-create sustainable (i.e., battery-electric, and hydrogen-powered vehicles) and innovative (i.e., a new fleet including iVision Model DEE) mobility solutions. Moreover, for the group to establish bargaining power in the novel business landscape, the automaker must leverage the power of consumer data, while respecting consumers' privacy, EU regulations (i.e., GDPR) and securing the collected data from potential cyber breaches. The subsequent teaching note provides an outline for the study session on exploring business strategies in the digital age. The group and individual assignments provide students with visual frameworks (i.e., the layered modular architecture) and a worksheet (i.e., control point analysis) to deepen their understanding of the concepts introduced in the literature review (i.e., ecosystems, technical and strategic control points). Finally, this format will guide students to integrate ecosystem strategy (i.e., co-competition) and thus, create a sustainable digital strategy for incumbents that aim to establish themselves within the dynamic market, the digital business ecosystem.

Appendices

Figure 15:

The ten most common disruptive business models

Business Model	Concept	Digital Incumbent/s
Access-over-Ownership	Usage based approach Sharing expensive physical or intangible assets with consumers	<i>Airbnb, Mobility, Lyft, Zipcar</i>
Ecosystem	Lock-in process approach Limiting consumer choices by offering multiple compatible products/services	<i>Apple, Alibaba, Amazon, Facebook (Meta), Google (Alpha), Microsoft</i>
Experience	Customer experience approach Offering unique, innovative products/experiences to add value	<i>Apple, Tesla, Premium-Brands</i>
Free Offerings	Free usage approach Users can use product/service for free, revenues created through advertisement	<i>Google, Facebook, YouTube</i>
Freemium	Digital sampling approach Free version to attract customers and upsell to subscription model	<i>Canva, LinkedIn, Spotify, Xing</i>
Hyper-Marketplace	Economies of scale approach Firms with large market shares offering products/services at a lower price	<i>Alibaba, Amazon</i>
Marketplace (One-/two-sided)	Digital marketplace approach Buyers and sellers can transact, paying a fee/commission to the marketplace	<i>Alibaba, Amazon, eBay, Etsy, Uber</i>
On-Demand	Time is money approach Companies provide instant access to product or service by monetizing time	<i>Amazon Prime, Cloud Services, Uber</i>
Pyramid	Community based model Network of resellers/affiliates compensated in commissions	<i>Amazon Affiliate, Dropbox, Microsoft</i>
Subscription	Usage based approach Offering access to services in return for recurring monthly or annual payments	<i>Amazon Prime, Coursera, Netflix, Udemy</i>

Figure 15: Ten Disruptive Business Models

Note. From: Obear, 2017; Talin, 2022

Figure 16:

Digitization Piano

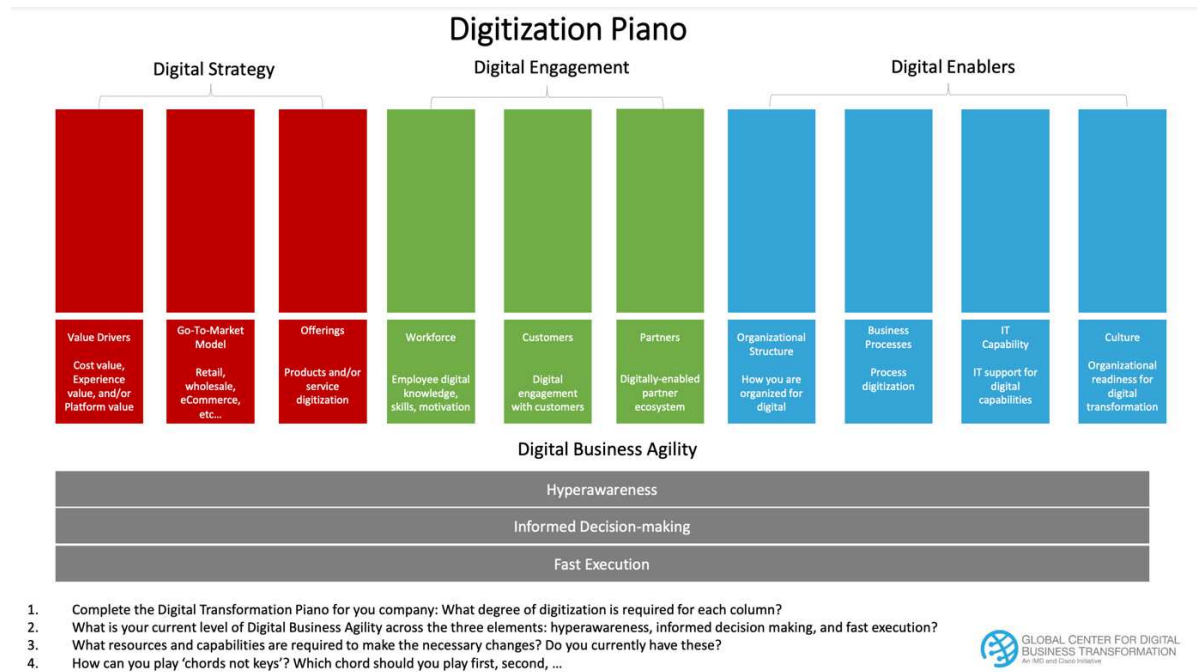


Figure 16: *Digitization Piano*

Note. From: IMD,n.d.

Figure 17:

Control point analysis (printable version)

Breaking out of Value-Chains into Digital Ecosystems

How many Control Points do you own?

Today (Status Quo) Where are we now?		Feature	Control Points	Expected Market Size	Importance	Concentrated Control	Is it a Control Point?
Ecosystem Layer	Example: Physical Device	 Car/Automobile	Technical (T): Unique Solution Strategic (S): Brand, Customer Access	Small Medium Large	Yes No	Yes No	Yes No
	Digital Service			Small Medium Large	Yes No	Yes No	Yes No
	Analytics			Small Medium Large	Yes No	Yes No	Yes No
	Connectivity			Small Medium Large	Yes No	Yes No	Yes No
	Data Sampling Device			Small Medium Large	Yes No	Yes No	Yes No
	Physical Device			Small Medium Large	Yes No	Yes No	Yes No
Tomorrow (Future) Where are we heading?		Feature	Control Points	Expected Market Size	Importance	Concentrated Control	Is it a Control Point?
Ecosystem Layer	Example: Digital Service	 Car Sharing Service SHARENOW	Technical (T): Unique Solution Strategic (S): Customer Access	Small Medium Large	Yes No	Yes No	Yes No
	Digital Service			Small Medium Large	Yes No	Yes No	Yes No
	Analytics			Small Medium Large	Yes No	Yes No	Yes No
	Connectivity			Small Medium Large	Yes No	Yes No	Yes No
	Data Sampling Device			Small Medium Large	Yes No	Yes No	Yes No
	Physical Device			Small Medium Large	Yes No	Yes No	Yes No

Figure 17: Control point analysis (printable version).

Note. From: Author, 2023.

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