

THE AI TRANSFORMATION? UNPACKING THE IMPACT OF AI ON INCUMBENT BUSINESS MODELS

Completed Research Paper

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Abstract

Incumbent firms feel pressured to incorporate artificial intelligence (AI) in their business model (BM) to innovate and stay competitive. While transforming the BM with digital technologies is challenging, AI adds complexity through its countless applications and incomprehensible nature. Unraveling this complexity, we develop a taxonomy to describe and analyze how AI impacts incumbent BMs. The taxonomy builds on extant literature and the analysis of 46 empirical cases. Our findings reveal AI's varying roles in enhancing and transforming offerings, key operations, and financial logic. In addition, the taxonomy highlights different ways incumbents include AI capabilities and data as key enablers of the resulting BM. Despite the hype around AI, we critically reflect that most of AI's impact corresponds to well-known digital BM concepts (e.g., personalization). However, AI technology's progress might intensify the effectiveness of those BMs and spur novel opportunities within the known digital BM space.

Keywords: Artificial Intelligence, Business Model, Digital Transformation, Incumbent Firms.

1 Introduction

Artificial intelligence (AI) represents an evolving frontier in computing aimed at making machines intelligent (Russell and Norvig, 2021). Recent breakthroughs in AI, coupled with the vast availability of data and more affordable computing resources, are not just technical achievements; they mark a paradigm shift in how businesses operate (Bughin et al., 2017). Firms employ AI technology to automate cognitive tasks, gain deeper insights, engage with customers more effectively, and create new offerings (Borges et al., 2021; Davenport and Ronanki, 2018). While start-ups can incorporate this technology in their business models (BM), incumbents must reevaluate and innovate their BMs to take full advantage of AI. Prior studies illustrate this importance, as leading digital firms already benefit from AI and gain a competitive advantage (Brock and Von Wangenheim, 2019; Bughin et al., 2017).

However, integrating AI into existing BMs remains a complex and unresolved problem, especially for incumbents (Burström et al., 2021; Sjödin et al., 2021). AI affords countless applications, and its potential business impact is often hard to estimate (Berente et al., 2021; Brock and Von Wangenheim, 2019; Bughin et al., 2017), rendering strategic decisions on AI difficult. Furthermore, as with IT-driven transformations (Vial, 2019; Wessel et al., 2021), incorporating AI into an existing BM requires substantial adjustments to the organization, including its resources, capabilities, and structures (Jöhnk et al., 2021; Sjödin et al., 2021). For example, incumbents must reskill their workers and re-engineer existing business processes to transform their BM with AI (Sjödin et al., 2021). The range of activities required to benefit from AI and the resulting problems illustrate the need for a structured approach to guide incumbent firms on how to incorporate AI into their BMs.

While extant research suggests AI's broad and multi-faceted impact on the BM, a comprehensive, systematic understanding specifically tailored to incumbent firms is yet absent. Prior studies tend to focus on specific industries, applications, and BM components (e.g., Burström et al., 2021; Cao, 2021; Neuhüttler et al., 2020), limiting their generalizability and yielding seemingly contradictory findings (e.g., regarding the scope and scale of AI's impact). Studies that take a more holistic stance are exploratory (e.g., Metzler et al., 2021) or are limited to start-ups that can create a new rather than innovate their established BM (e.g., Vetter et al., 2022). Hence, a more comprehensive, systematic understanding of AI's impact on incumbent BMs is imperative to inform practitioners and lay a foundation for future research and higher-level theorizing on this urgent topic (Gregor, 2006).

Understanding how incumbent firms can use AI to innovate their BM is essential for harnessing AI's full potential and ensuring sustained competitiveness. While extant research acknowledges AI's transformative and multi-faceted impact on BMs (Borges et al., 2021; Bughin et al., 2017), current frameworks cannot provide a comprehensive, systematic understanding of how AI impacts incumbent BMs. Addressing this gap, this study answers *how the use of AI impacts the BM of incumbent firms*. Answering this question provides much-needed guidance for incumbents to adapt and thrive in an AI-driven business landscape and lays the foundation for higher-level theorizing in future research.

We employ the taxonomy development method proposed by Nickerson et al. (2013), complemented by the guidelines of Kundisch et al. (2022). This methodological choice is apt for our study because it allows for a systematic and nuanced exploration of AI's multi-faceted impacts on incumbent BMs. We enrich our taxonomy with insights from a comprehensive literature review (Webster and Watson, 2002) and an analysis of 46 empirical cases from 20 representative incumbents. This approach ensures that our findings are grounded in theoretical and practical perspectives. We showcase the application of the taxonomy using three well-documented cases. Based on this enhanced conceptual clarity and insights from empirical cases, we discuss emergent patterns of transformation that point to different outcomes and strategies incumbents employ. Furthermore, we critically situate and reflect on our findings regarding conventional wisdom on digital BMs (e.g., Bock and Wiener, 2017; Zott et al., 2011).

Our study contributes to the field by integrating and extending research on AI and BMs (e.g., Burström et al., 2021; Metzler et al., 2021). The developed taxonomy offers a novel, structured, and industry-agnostic perspective on AI's impact on incumbent BMs. The taxonomy stands out for its comprehensive scope and potential as a theoretical and practical tool for further research and application. Practitioners can leverage this taxonomy to systematically evaluate past AI initiatives and strategically guide future transformations in their BMs using AI.

2 Background

The background section is two-fold. First, we describe the role of digital technologies in transforming incumbent BMs to create a fundamental understanding of the broader phenomenon. Second, we describe extant research on AI and BMs that we later integrate and extend as part of the taxonomy development.

2.1 Incumbent business models in the digital age

We comprehend the BM as a formal, conceptual representation of a firm's business (Massa et al., 2017) that strongly relates to the firm's performance and competitive advantage (e.g., Chesbrough, 2010). While the proposed conceptual components of a BM differ throughout the literature (Massa et al., 2017), there is convergence on some essential components that the BM entails (Saebi et al., 2017). For this study, we follow Richardson (2008), who structures the BM using three key components repeatedly found in literature: 1) the value proposition for the target customers, 2) the value creation and delivery system, and 3) the value capture mechanism. First, the value proposition describes what value the firm will deliver to its target customers and why they should be willing to pay (Richardson, 2008; Saebi et al., 2017; Teece, 2010). The value proposition thus includes elements such as the focal offering, the (relative) value provided, the target customer, and market segments (e.g., Osterwalder and Pigneur, 2010; Richardson, 2008). Second, the value creation and delivery system describes how the firm creates

and delivers value to its customers (Richardson, 2008; Saebi et al., 2017; Teece, 2010). It thus specifies the required resources, activities, delivery channels, and the firm's link to suppliers, partners, and customers in the value network (e.g., Osterwalder and Pigneur, 2010; Richardson, 2008). Third, value capture describes how the firm generates revenue and profit (Richardson, 2008; Saebi et al., 2017; Teece, 2010), specifying elements such as the revenue sources, costs, and economics of the business (e.g., Osterwalder and Pigneur, 2010; Richardson, 2008).

The past two decades have seen a growing relevance of digital technologies for creating new and transforming existing BMs (Vial, 2019; Wessel et al., 2021). Digital technologies can affect virtually every previously introduced BM component (Steininger, 2019) and trigger modular and complex BM changes (Böttcher et al., 2022). The resulting "digital BMs" can be characterized by digital offerings, digital customer experiences, digital platforms, data analytics, and digital pricing (Bock and Wiener, 2017). For example, firms create new digital offerings as part of their value proposition, such as manufacturers that equip their machines with complementary predictive services (Weking et al., 2020). As another example, firms create digital platforms that integrate novel partners and customers for value (co-)creation, such as industrial Internet of Things (IoT) platforms (Hein et al., 2019).

Unsurprisingly, transforming a BM with digital technologies is complex and challenging for incumbents (Vial, 2019). The first step in unraveling this challenge is to build a comprehensive and structured understanding of how digital technologies ultimately impact the BM (e.g., Bock and Wiener, 2017; Weking et al., 2020). This understanding can both support practitioners in their transformation and lay the foundation for higher-level theorizing (Gregor, 2006).

2.2 Related work on AI and business models

We refer to AI as a technology for making machines perform intelligent, cognitive functions typically associated with the human mind, such as learning, reasoning, and perceiving (Russell and Norvig, 2021). AI technology comprises several techniques, such as shallow machine learning, deep learning, computer vision, and natural language processing. Advances in deep learning, coupled with the vast availability of computing power and data, have paved the way for integrating AI into business and everyday life (Russell and Norvig, 2021).

Given the growing adoption of AI in business, scholars have begun to investigate the role that AI plays for the BM. Some studies emphasize how AI enables the creation of new AI-based and -supported products and services in both B2C and B2B settings (Borges et al., 2021; Garbuio and Lin, 2019; Vetter et al., 2022; Weber et al., 2022). Furthermore, some firms integrate AI as an extension in their existing offerings (Metzler et al., 2021; Neuhüttler et al., 2020). In contrast, another prominent research stream highlights AI's impact on the value creation and delivery of firms, including specific studies in retail (Cao, 2021), insurance (Eling et al., 2022), professional services (Bezuidenhout et al., 2023), operations management (Helo and Hao, 2022), or support functions (Bauer and Wolff, 2022). Firms often use AI to automate tasks, augment workers, and facilitate decision-making. However, the impact was found to range from pure efficiency gains (Bauer and Wolff, 2022) to fundamental changes in the value creation, altering the sources of competitive advantage (Bezuidenhout et al., 2023). Moreover, some studies indicate how AI can have implications for other dimensions of the BM, such as customers and revenue models (Burstrom et al., 2021; Metelskaia et al., 2018; Metzler et al., 2021). Another research stream investigates how firms can successfully integrate AI in their BMs from a process perspective. These studies highlight the importance of building necessary capabilities and engaging in partnerships (Åström et al., 2022; Enholm et al., 2022; Garrel and Jahn, 2023; Sjödin et al., 2021).

In conclusion, studies suggest that AI's impact on the BM is broad and multi-faceted. However, most studies are so far isolated and limited to specific industries, applications, or BM components (e.g., Burstrom et al., 2021; Cao, 2021), which limits their generalizability and could yield seemingly contradictory findings. Only a few studies take a more holistic stance, but so far remain exploratory and do not systematically capture the range of possible impacts (e.g., Metzler et al., 2021). Notwithstanding these valuable contributions, we lack a comprehensive, systematic understanding of AI's impact on the

BM, which could impede future research on this pivotal topic (cf. Gregor, 2006). We aim to address this gap by developing a taxonomy that integrates and extends our current body of knowledge.

3 Research Approach

We develop a taxonomy to investigate the impact of AI on incumbent BMs. We follow the taxonomy development method by Nickerson et al. (2013) and the additional recommendations proposed by Kundisch et al. (2022). Taxonomy development is widely adopted in IS research on BMs (Möller et al., 2022), and various scholars have already applied this method to examine the impact of technology on BMs (e.g., Bock and Wiener, 2017; Weking et al., 2020). Following this line of research, taxonomy development is appropriate for our research goal as it allows us to systematically capture the dimensions and the variety of AI's impact on incumbent BMs.

3.1 Initialization of taxonomy development

As a first step, we need to define the meta-characteristic, ending conditions, and evaluation goals (Kundisch et al., 2022; Nickerson et al., 2013). We acknowledge that the impact of AI on incumbent BMs is likely manifold and multi-faceted since there could be multiple instances of AI implementation with entirely different outcomes. Therefore, our unit of analysis focuses on specific instances of AI implementation at the incumbent (i.e., AI initiatives) with a well-defined scope and target (e.g., a new AI-based customer relationship system). Following that, the meta-characteristic of our taxonomy (Nickerson et al., 2013) is the nature of the impact of an AI initiative on the incumbent BM. This meta-characteristic "serve[s] as the basis for the choice of characteristics in the taxonomy" (Nickerson et al., 2013, p. 343) and clarifies our angle on the phenomenon (Kundisch et al., 2022).

We define the ending conditions for the taxonomy development as follows (Table 1). We define three objective (OEC) and five subjective ending conditions (SEC) that we largely adapt from Nickerson et al. (2013). Notably, for some dimensions, we depart from the mutual exclusivity criterion (Nickerson et al., 2013) and aim for partial mutual exclusivity as a viable design choice for BM taxonomies (Möller et al., 2022). In our case, this relaxation was necessary to ensure the usefulness of the taxonomy given the complexity of the BM concept (Möller et al., 2022) and the multi-faceted impact of AI. Last, to create a baseline for the post-ante evaluation (Kundisch et al., 2022), we define the main objective of the taxonomy as to describe, categorize, and analyze how AI initiatives impact incumbent BMs.

Objective ending conditions (based on specific, measurable criteria)	Subjective ending conditions (involve subjective judgment from the research team)	Evaluation goals
OEC1: All objects or a representative sample of objects have been examined OEC2: All dimensions and all characteristics within a dimension must be unique OEC3: No structural changes to the taxonomy in the final iteration (i.e., no adding, merging, or splitting of dimensions and characteristics)	SEC1: Concise (i.e., the number of dimensions allows the taxonomy to be meaningful yet not too overwhelming) SEC2: Robust (i.e., the taxonomy provides sufficient differentiation between objects of interest) SEC3: Comprehensive (i.e., the taxonomy allows to classify all objects of interest and captures all relevant dimensions) SEC4: Extendible (i.e., the ease of adding new dimensions and characteristics to the taxonomy) SEC5: Explanatory (i.e., the explanatory value the taxonomy provides about an object)	Describe Categorize Analyze

Table 1. Ending conditions and evaluation goals for taxonomy development (taken and adapted from Nickerson et al. (2013))

3.2 Data collection and sampling

We followed a hybrid approach for data collection (Möller et al., 2022) to acknowledge prior work on AI and BMs and to gather a representative set of empirical cases of AI initiatives (Table 2). First, we conducted a systematic literature review (Webster and Watson, 2002) to identify existing categorization schemes and possibly well-documented case studies. We then performed a keyword search for title, abstract, and keywords using three widely acknowledged databases (Table 2). From an initial set of 926 search results found in January 2023, we removed 49 non-English and non-German articles due to language barriers, and 60 duplicates across the databases. We then screened the titles, abstracts, and full text of the remaining 871 articles regarding our inclusion criteria, which required the articles 1) to focus on the impact of AI on the BM and 2) to investigate incumbent firms. For example, we excluded studies on the BMs of AI start-ups (e.g., Garbuio and Lin, 2019), studies on the prerequisites of AI implementation (e.g., Jöhnk et al., 2021), and studies that only consider a narrow aspect of the BM (e.g., a specific AI product feature). Following this process, we arrived at 13 relevant articles. A forward and backward search (Webster and Watson, 2002) helped us to identify two additional articles. We attribute the small number of relevant articles to the identified research gap.

Literature review	Empirical cases
Databases: EBSCO business source complete and Scopus (for all article types), AIS Electronic Library (for AIS conferences) Search terms for title, abstract, and keywords (example for EBSCO): ("business model" OR "value creation" OR "value capture") AND ("artificial intelligence" OR "machine learning" OR "ai" OR "digital transformation" OR "deep learning") Articles screened: 871 articles	Incumbent sampling: one incumbent in each of the 20 FTSE ICB super sectors to ensure the representativeness of the taxonomy AI initiative sampling: sampled for different areas of AI use (e.g., customer interface) and to avoid identical AI initiatives to increase the comprehensiveness of the taxonomy Desk research: 115 documents
Included in the study: 15 articles	Included in the study: 46 AI initiatives

Table 2. Summary of data collection.

Second, we gathered a representative set of empirical cases of AI initiatives. We used the FTSE Industry Classification Benchmark (ICB) to sample one incumbent firm from each of the 20 super sectors (e.g., Energy, Retail). The ICB is a globally recognized classification system for categorizing firms into industries and sectors to facilitate the analysis and comparison of firms (FTSE Russell, 2023). We arbitrarily selected a firm from each of the sectors. We checked whether 1) the firm is an incumbent (i.e., established, traditional), 2) the ICB classifies the firm, 3) the firm is relevant in terms of size and revenue in its sector, and 4) there is sufficient information on the firm's AI initiatives available. With this representative sampling strategy, we aimed to derive generalizable findings regarding AI's impact.

We performed initial desk research for each identified incumbent to identify relevant AI initiatives that impact the incumbent's BM. The sampling of the AI initiatives then followed theoretical considerations: First, we used the framework proposed by Steininger (2019), which distinguishes three areas where firms use IT (or, in our case, AI) in the BM: for infrastructure management, at the customer interface, and as a product. Following the framework, we aimed to capture one AI initiative in each of the three areas for each incumbent to capture a diverse range of AI initiatives. Second, our sampling aimed at avoiding more than two (almost) identical AI initiatives across incumbents to increase the chances of identifying novel aspects of the taxonomy. For example, we found many AI initiatives related to chatbots for customer support that did not provide additional insights. Following this process, we identified 46 AI initiatives across the 20 incumbents (Table 5, Appendix). For each AI initiative, we then collected

and triangulated data from different sources, including articles published on company websites, industry reports, news articles, and annual business reports. We collected and analyzed a total of 115 documents.

3.3 Taxonomy development and evaluation

We conducted an initial **conceptual-to-empirical iteration** based on the literature review. As previously introduced, the three key components of the BM (Richardson, 2008) served as an analytical anchor to structure the taxonomy. Two researchers were intensively involved in this process and discussed and refined the emergent taxonomy. As a result, we developed a first taxonomy that captures important impact dimensions. However, we had not yet evaluated a representative set of objects (OEC1). Hence, we continued with an **empirical-to-conceptual iteration**, analyzing the 46 empirical cases. Again, two researchers were intensively involved in this process. During this iteration, we added, merged, and removed several dimensions and characteristics. For example, we gained more profound insights into how AI impacts the firm's offerings. We then discussed and critically assessed the resulting taxonomy as part of a workshop with 18 IS researchers split into five groups. As a result, we received valuable input and feedback from outside the research team. For example, the participants questioned the relative importance of certain dimensions for the BM (e.g., AI infrastructure sourcing). Furthermore, they asked for the meaning of specific terms (e.g., "AI as a Service" offering). Based on this feedback, we concluded the taxonomy was not concise (SEC1) and self-explanatory enough (SEC5).

Therefore, we conducted another **conceptual-to-empirical iteration** where we updated the taxonomy using the participant's feedback and our judgment (Kundisch et al., 2022). As a result, we merged or removed dimensions and characteristics to make the taxonomy more concise. We renamed several characteristics to make them more explanatory and aligned with established terms. Since we had again modified the taxonomy (OEC3), we performed another empirical-to-conceptual iteration, applying all empirical cases to the resulting taxonomy. This iteration did not require us to modify the taxonomy. Since the research team further agreed that the taxonomy meets all other ending conditions, we proceeded with the evaluation (Kundisch et al., 2022).

We performed a descriptive, **scenario-based evaluation** (Kundisch et al., 2022) by applying three well-documented cases to our taxonomy to describe, classify, and analyze the impact of AI on the incumbent BM (cf. section 4.2). We identified those three cases during desk research and held them out during taxonomy development (Kundisch et al., 2022). Following the evaluation, we concluded that the taxonomy was complete, consistent, and robust enough to describe and classify the new cases. Furthermore, we found the taxonomy simple, understandable, and easy to apply. Despite the simplicity, the taxonomy provided enough relevant details to highlight significant case differences. The positive evaluation led us to conclude the taxonomy development process.

4 Results

4.1 Taxonomy of AI's impact on incumbent business models

The resulting taxonomy allows us to systematically describe, categorize, and analyze how an AI initiative impacts an incumbent BM (Table 3). The taxonomy consists of 10 dimensions and 31 characteristics. For simplicity, the taxonomy does not explicitly include characteristics that denote the absence of AI's impact (i.e., "No Impact"). We will explain each dimension and characteristic in the following, referencing literature and empirical examples. After that, we will showcase the taxonomy application using three well-documented AI initiatives (Schuh et al., 2021).

Impact Dimension		Impact Characteristic			
Value Proposition and Customer	Offering	AI-enhanced Offering	New Complementary AI Offering	New Standalone AI Offering	Data-driven Reconfiguration
	Customer Value	Added-Value by AI		Novelty by AI	Affordability by AI
	Customer Engagement	Personalization and Individualization		Enhanced Customer Service	Enhanced Customer Feedback Loop
	Customer Segments	Customer Re-Segmentation			Additional Customers and Markets
Value Creation and Delivery	Key Operations	Process Improvement		Process Re-Engineering	Enhanced Strategic Decision-Making
	Workforce	Workforce Augmentation		Workforce Re-Allocation	Workforce Replacement
	AI Capability	Internal Capability Building	New Acquisition	New Strategic Partnership	New Platform Ecosystem
	Data Source	Existing Data Exploitation		Employee Knowledge Migration	New Data Sources
Value Captu	Revenue Model	New Direct Revenue Sources	Additional AI-driven Sales	Shift to Dynamic Pricing	Hidden Revenue Generation
	Cost Structure	Operational Cost Reduction			Excessive AI Costs

Notes: Each dimension includes a "No Impact" characteristic we did not visualize for simplicity. The taxonomy is only partially mutually exclusive to account for AI's multi-faceted impact and the complexity of the BM (Möller et al., 2022).

Table 3. Taxonomy of AI's impact on incumbent business models.

4.1.1 AI's impact on the value proposition and customers

The use of AI can impact the value proposition and customers of incumbents, especially regarding the offerings, the value provided to customers, the way incumbents engage with customers, and the customer segments.

The dimension **Offering** depicts how the use of AI impacts the offerings of incumbents (e.g., Enholm et al., 2022; Garrel and Jahn, 2023; Metzler et al., 2021; Neuhüttler et al., 2020). First, incumbents can integrate AI into existing offerings to enhance performance (*AI-enhanced Offering*). For example, CaixaBank uses AI to detect fraud and improve the security of its banking services. Second, AI can enable the provisioning of AI-based offerings that complement an existing product or service (*New Complementary AI Offering*). For example, L'Oréal offers Perso, an AI-enabled skincare application that suggests appropriate products based on personal factors. Third, AI can enable new standalone offerings based on AI (*New Standalone AI Offering*). For example, Holcim offers an AI-enabled materials platform to support business customers in designing sustainable construction projects. Fourth, AI can enable the data-driven reconfiguration of existing offerings (*Data-driven Reconfiguration*). For example, Firmenich uses AI to create novel and potentially superior laundry detergent fragrances.

The dimension **Customer Value** explains how using AI creates superior value for customers (e.g., Burström et al., 2021; Enholm et al., 2022; Garrel and Jahn, 2023; Metelskaia et al., 2018). First, AI can provide added value to the customer, meaning that the customer receives a slightly enhanced version of the previous value proposition (*Added-Value by AI*). Incumbents can achieve this in various ways, such as through new product features or better service quality. For example, Walmart Voice Order allows customers to shop via voice and chat, enabling a more convenient shopping experience. Second, AI can enable entirely novel types of value propositions that are new to the firm and potentially new to the industry (*Novelty by AI*). Incumbents can achieve this in various ways, such as through entirely new offerings or the radical improvement of existing offerings. For example, AI enables Telekom to offer its business customers a novel conversational AI suite. Third, AI can enhance the affordability of the value proposition for customers, meaning that customers can consume the same value at a lower price (*Affordability by AI*). Again, incumbents can achieve affordability in various ways, such as through AI-

enabled operational efficiency or dynamic pricing. For example, Allianz uses AI and telematics services to lower insurance prices for drivers who drive more cautiously.

The dimension **Customer Engagement** describes how the use of AI impacts how incumbents engage with their customers (e.g., Cao, 2021; Eling et al., 2022; Gallego-Gomez and De-Pablos-Heredero, 2020; Metelskaia et al., 2018; Metzler et al., 2021). First, AI can enable more personalized and relevant customer engagement at scale through highly personalized product features or individual marketing (*Personalization and Individualization*). For example, Morgan Stanley uses AI to provide personalized investment advice to their customers at scale. Second, AI can enable enhanced customer support services, typically in the form of highly available and advanced chatbots (*Enhanced Customer Service*). For example, Mercedes deploys speech- and chatbots across multiple channels for tasks such as customer self-service and intelligent FAQs. Last, AI can intensify customer feedback through better analytics and pattern detection (*Enhanced Customer Feedback Loop*). For example, L'Oréal uses AI to analyze vast amounts of social media data, such as from influencers, to identify the trends of tomorrow.

The dimension **Customer Segments** depicts how AI impacts the incumbent's customer segments (Eling et al., 2022; Enholm et al., 2022; Metzler et al., 2021). First, AI can provide deeper insights into customers, leading to a re-segmentation of customers that can be targeted more specifically (*Customer Re-Segmentation*). Second, AI can enable incumbents to target additional customers and markets through new offerings, lower prices, or more adaptive products (*Additional Customers and Markets*). For example, Firmenich offers Scentmate, an AI-based software solution that makes fragrance creation accessible to a broader customer base.

4.1.2 AI's impact on value creation and delivery

The use of AI can have a two-fold impact on value creation and delivery. First, AI can alter the core business's value creation and delivery, especially regarding the key operations and the role of the workforce. Second, AI requires incumbents to consider aspects of AI implementation in their value creation and delivery, especially regarding sourcing AI capabilities and data.

The dimension **Key Operations** describes how the use of AI impacts the core processes of incumbents, with application areas being as diverse as product development, manufacturing, finance, and human resource management (e.g., Bauer and Wolff, 2022; Eling et al., 2022; Enholm et al., 2022; Helo and Hao, 2022). First, AI can enable incremental improvements of existing processes by enhancing efficiency, outcome quality, or reliability (*Process Improvement*). For example, Anheuser-Busch uses AI to predict and improve beer quality based on production parameters. Second, AI can also enable more profound changes to the processes, leading to radical performance improvements and changes in the process flow (*Process Re-engineering*). For example, E.ON uses drones and robots to automatically detect and fix defects in critical utility equipment, which transforms their maintenance processes. Third, beyond operational impacts, AI can also enhance strategic decision-making through greater scope and scale of predictions (*Enhanced Strategic Decision-Making*). For example, British Petroleum uses AI to improve strategic decision-making regarding its subsurface assets based on various data sources.

The dimension **Workforce** depicts how the use of AI impacts the role of the workforce in the BM (e.g., Bauer and Wolff, 2022; Bezuidenhout et al., 2023; Helo and Hao, 2022; Metzler et al., 2021). First, AI can support the workforce in improving productivity, which might require the workforce to learn new skills to work with AI effectively (*Workforce Augmentation*). For example, Morgan Stanley augments their financial advisors with an advanced chatbot that provides seamless access to the firm's knowledge base. Second, firms using AI can reallocate the workforce toward higher-level tasks (*Workforce Re-Allocation*). For example, British Petroleum provides AI-enabled customer self-services to free up maintenance workers to focus on more complex and technical tasks. Third, AI use can also replace the workforce, reducing the personal intensity of the BM (*Workforce Replacement*).

The dimension **AI Capability** illustrates how the incumbent primarily builds its capability to use AI in the BM (e.g., Åström et al., 2022; Lee et al., 2019; Neuhüttler et al., 2020; Sjödin et al., 2021). First, incumbents can internally build an AI capability through hiring and upskilling (*Internal Capability Building*). In this case, the incumbent primarily conducts AI implementation independently, although

support from external tool providers and consultants is still common in practice. For example, Anheuser-Busch InBev used a hybrid approach to upskill their workers and hire AI experts. Second, incumbents can acquire firms such as AI start-ups to access their AI expertise and technology (*New Acquisition*). For example, Walmart acquired the start-up Zeekit to access their expertise and AI-enabled virtual fitting room solution. Third, incumbents can form strategic partnerships characterized by close and enduring collaborations for AI (*New Strategic Partnership*). For example, Xerox partnered with UiPath and realized several high-impact use cases leveraging the UiPath expertise and platform. Fourth, incumbents can build a new platform-based ecosystem around AI that relies on contributions from external parties (*New Platform Ecosystem*). For example, Bayer launched an AI platform in radiology to connect AI application providers and potential users such as hospitals.

The dimension **Data Source** explains how the incumbent primarily sources the necessary data to use AI, which can create additional internal and external dependencies for the BM (e.g., Bezuidenhout et al., 2023; Enholm et al., 2022; Sjödin et al., 2021). First, incumbents can leverage existing data sources to exploit the potential within the firm's data (*Existing Data Exploitation*). For example, Mercedes leverages internal operational and asset data to optimize car production with AI. Second, incumbents can migrate the knowledge of their employees to an AI-readable format, such as through data labeling (*Employee Knowledge Migration*). For example, CaixaBank's experts trained IBM Watson's chatbot to understand banking terminology in Spanish. Third, incumbents can collect or acquire new data that typically originates from outside the firm, such as customers and business partners (*New Data Sources*). For example, L'Oréal uses environmental data from BreezoMeter to complement its skincare prediction.

4.1.3 AI's impact on value capture

The use of AI can impact the incumbent's value capturing, especially regarding the revenue model and cost structure.

The dimension **Revenue Model** depicts how the use of AI impacts the revenue model of incumbents (e.g., Åström et al., 2022; Cao, 2021; Metzler et al., 2021; Neuhüttler et al., 2020). First, AI can enable new direct revenue sources because of additional products and services (*New Direct Revenue Sources*). For example, Firmenich receives additional revenue from its newly created Scentmate platform. Second, AI can drive existing sales through up- and cross-selling by providing personalized and relevant recommendations (*Additional AI-driven Sales*). For example, Adidas uses AI-generated outfit recommendations to drive up- and cross-selling of their products. Third, AI can enable dynamic pricing to optimize prices based on demand, supply, or actual usage (*Shift to Dynamic Pricing*). For example, Allianz uses AI to dynamically adjust insurance premiums based on the customer's predicted insurance demand. Fourth, AI can enable hidden revenue models where customer data is collected and used to generate revenue elsewhere (*Hidden Revenue Generation*). For example, Airbus offers free access to its Skywise platform when business customers agree to share their operating data.

The dimension **Cost Structure** depicts how the use of AI impacts the cost structure of the incumbent (e.g., Burström et al., 2021; Metelskaia et al., 2018; Metzler et al., 2021). First, AI use can lead to significant operational improvements that reduce operating costs through enhanced efficiency, less resource waste, or higher productivity (*Operational Cost Reduction*). For example, KLM uses AI to optimize various aspects of airline operations to save time and cost. Second, despite potential operational gains, AI can also lead to excessive additional costs due to AI implementation and operation (*Excessive AI Costs*). Notable cost drivers include human resources, software licenses, hardware, and energy consumption. For example, Morgan Stanley deploys a version of OpenAI's GPT4, which may cause excessive AI costs during operation.

4.2 Exemplary application of the taxonomy

To evaluate the taxonomy and showcase its application, we use the taxonomy to analyze three well-documented cases of AI initiatives regarding their impact on incumbent BMs (Schuh et al., 2021). Table 4 summarizes the results of the analysis. In the following, we will briefly describe the three AI initiatives.

Incumbent	Heidelberger Druckmaschinen	Siemens Mobility	HUK Coburg
AI initiative Dimension	Print Shop Analytics: AI-based platform and services to optimize customer operations	Railigent: AI-based analytics and IoT platform for enhanced railway availability	Telematik Plus: AI-based driver evaluation and personalized insurance
Offering	New Complementary AI Offering	New Standalone AI Offering	AI-enhanced Offering
Customer Value	Added-Value by AI	Novelty by AI	Affordability by AI
Customer Engagement	Enhanced Customer Service	-	Personalization and Individualization
Customer Segments	Additional Customers and Markets	Additional Customers and Markets	-
Key Operations	Process Improvement	-	-
Workforce	Workforce Augmentation	-	-
AI Capability	Internal Capability Building	New Platform-based Ecosystem	Internal Capability Building
Data Source	Employee Knowledge Migration	New Data Sources	New Data Sources
Revenue Model	-	New Direct Revenue Sources	Shift to Dynamic Pricing
Cost Structure	Operational Cost Reduction	-	Operational Cost Reduction

Table 4. Exemplary application of taxonomy.

First, **Heidelberger Druckmaschinen AG**, a leading manufacturer of printing machines, traditionally supports its customers in optimizing their operations through consulting services. To extend this service segment, they have developed an AI-based platform called "Print Shop Analytics" to support the identification of optimization potentials for customer operations (Schuh et al., 2021). The platform presents a new AI-based offering that complements the existing service line and provides added analytical value. Customers further benefit from the highly available customer service enabled by AI. However, consultants from Heidelberger Druckmaschinen also use the platform to support their continued work with the customer. Experts have trained the AI component with the support of external firms experienced in AI implementation. The platform reduces the firm's personal intensity, reduces operational costs, and allows the firm to serve much smaller business customers.

Second, **Siemens Mobility GmbH**, a leading provider of connected mobility, offers a range of vehicles, mobility infrastructure, and complementary services. They have developed a new Internet of Things (IoT) platform called "Railigent" that integrates and analyzes various data sources using AI (Schuh et al., 2021). The platform supports its customers' maintenance activities to increase the availability of railways by close to 100% and reduce operational costs. Therefore, the platform presents a new standalone offering that provides unprecedented intelligent maintenance services. Siemens Mobility relies on external complementors that develop value-adding AI applications for the platform. This open approach also widens Siemens Mobility's customer base. The platform has primarily been developed internally and uses externally acquired data sources, such as asset and traffic information. The platform provides a new direct revenue source for Siemens Mobility.

Third, **HUK Coburg**, a large private insurance company, offers a wide range of insurance services for private persons, such as liability and accident insurance. They have developed a telematics-based insurance service called "Telematik Plus" that uses AI to analyze driving behavior and driver safety (Schuh et al., 2021). HUK Coburg leverages those insights to provide driver feedback and charge personalized insurance premiums. The telematics service enhances their existing insurance offering and allows customers to receive lower-priced insurance. The customer further benefits from highly personalized driver feedback provided by HUK Coburg. The service has been predominately developed internally and uses externally collected customer data. As a result, HUK Coburg can shift its revenue model to dynamic pricing and reduce operational costs by reducing insurance claims due to safer driving. In conclusion, the taxonomy presents a valuable tool that helped us describe, categorize, and analyze the AI initiatives and their impact on the BM. Furthermore, the taxonomy allows us to pinpoint and compare important differences between the three AI initiatives (Table 4).

5 Discussion

In this study, we set out to advance our understanding of how AI impacts incumbent firms' BMs. To that end, we have developed a taxonomy that provides a structured and comprehensive tool to describe, categorize, and analyze the impact of AI on incumbent BMs. Drawing on this new conceptual clarity and the analysis of 46+3 empirical cases, we now discuss emergent patterns of how incumbents transform their BM with AI. We further want to link our findings with conventional wisdom on digital BMs. Last, we discuss our contributions and the limitations of this study.

5.1 Transforming business models with AI

Our taxonomy illustrates and captures the various ways AI impacts incumbents' BM. The analysis of our empirical cases further reveals that AI's impact on the BM in practice differs considerably concerning the *scope of affected BM components* (cf. Foss and Saebi, 2017). Whereas some AI initiatives only affect selected BM components, others significantly impact a broad range of BM components simultaneously. For example, some AI initiatives only focus on enhancing customer support functions through chatbots (i.e., "Enhanced Customer Service") or automating internal processes (i.e., "Process Improvement") (e.g., Bauer and Wolff, 2022; Helo and Hao, 2022). Firms could apply such a focused approach to secure and extend existing competitive advantage (Böttcher et al., 2022) or to reduce risk when the firm's experience with AI is low (Davenport and Ronanki, 2018).

In contrast, other AI initiatives simultaneously impact a broad range of BM components, indicating more far-reaching changes to the BM. For example, the Siemens Mobility case included implementing and providing a new AI-based offering and spurring a new platform-based ecosystem with additional partners, customers, and revenue sources. While potentially providing greater value to the firm (Brock and Von Wangenheim, 2019), this approach likely comes with greater risk, as it requires more far-reaching changes to the firm's resources (cf. Sjödin et al., 2021) and could yield stronger resistance in the organization (Vial, 2019). Firms could pursue such far-reaching AI initiatives following changes in the environment (e.g., customer needs) and insufficiencies in the current BM (Böttcher et al., 2022). While our study points to different strategies for innovating the BM with AI and their respective trade-offs, more research is needed to understand these issues and their AI-specific facets in more detail.

In addition, our empirical cases suggest emergent patterns of how incumbents use AI to transform their BM. A common pattern is the *integration of AI's capabilities in the offering* (Burström et al., 2021; Metzler et al., 2021; Neuhüttler et al., 2020). Therefore, incumbents provide their customers with AI technology to generate additional revenue. Our taxonomy shows how using AI in the offering can support and even redefine the incumbent's value proposition (cf. Wessel et al., 2021). This finding contrasts with prior views that AI predominately supports the existing value proposition (Brock and Von Wangenheim, 2019). Furthermore, an interesting pattern emerged when analyzing the cases of Telekom and Xerox, as their new AI-enabled offerings succeeded in the successful internal application of AI, pointing to potential pathways of AI-based BM transformation. For example, Xerox first implemented internal AI automation cases before offering a corresponding software platform to business customers.

Another emergent pattern is using *AI for operational excellence* (Burström et al., 2021; Enholm et al., 2022). Here, incumbents apply AI in core processes to enhance outcome quality, efficiency, resource usage, or lower operational risks, which can lead to internal cost savings or add customer value. Our taxonomy reveals that the nature of impact can be incremental but also more profound (i.e., "Process Re-Engineering"). Within this pattern, a prominent sub-pattern is the application of *bots that substitute human interaction* with the customer (Bezuidenhout et al., 2023; Cao, 2021). This sub-pattern is observable in customer support across service-intensive industries (e.g., Bezuidenhout et al., 2023). The underlying objective typically includes reallocating the workforce toward more complex tasks and reducing operational costs. Customers receive added value through enhanced service availability.

Last, *AI ecosystem building* is a common sub-pattern across AI initiatives that enables incumbents to access the resources and capabilities required to deliver value based on AI (Jöhnk et al., 2021). Few incumbents in our sample solely relied on their internal AI capabilities or existing data sources. This

finding aligns with prior arguments on the importance of partnerships and ecosystems in AI (Burstrom et al., 2021; Neuhüttler et al., 2020; Sjödin et al., 2021). Our taxonomy illustrates how incumbents can engage in this ecosystem through external data integration, firm acquisitions, or strategic partnerships. A special case presents the "New Platform Ecosystem," where incumbents build on external parties that provide complementary AI applications to a platform.

In conclusion, our discussion points to different strategies incumbents seem to employ and the great variability in their respective outcomes. Future research could build on these fundamental differences and help better understand the antecedents and outcomes of transforming incumbent BMs with AI.

5.2 Linking AI technology with digital business model wisdom

Our refined conceptual understanding of AI's impact on incumbent BMs further allows us to compare it with established digital BM concepts. Indeed, we can observe that most of the identified impacts of AI on the BM have been discussed before. Illustrative examples include personalization, new data-driven products, complementary analytics services, digital platforms, or dynamic pricing models (e.g., Bock and Wiener, 2017). As a possible explanation, AI technology has been around for a long time and encompasses various techniques, including long-established techniques for data analytics (Russell and Norvig, 2021). Hence, AI technology (although not labeled as AI) has been present in BMs for a long time, and research on digital BMs has indirectly captured this phenomenon. Another possible explanation could be that AI sometimes only presents a small, value-adding component of larger digital solutions (Brock and Von Wangenheim, 2019). Consequently, those initiatives would follow established digital BM logic (e.g., an IoT analytics platform enriched with AI). Therefore, our discussion suggests incumbents can largely build on well-known digital BM concepts when transforming their BM with AI.

Nevertheless, it is important to consider that AI technology has evolved since the advent of early digital BMs and has become increasingly capable (Russell and Norvig, 2021). AI technology and its applications continuously increase in terms of performance and application scope (Berente et al., 2021). Consequently, the digital BMs supported or enabled by AI may also intensify concerning their effectiveness. In addition, certain digital BMs might only now become feasible to incumbents due to the enhanced performance of AI. For example, today's chatbots enabled by large language models may provide more effective digital customer service than prior attempts. As another example, more complex AI algorithms may be able to predict demand-based prices more accurately. Besides effectivity gains, AI's evolving performance and application scope may also continue to provide opportunities to instantiate BMs around new or enhanced offerings. For example, advances in image recognition spur the development of new software-as-a-service solutions potentially offered by incumbents.

In conclusion, while selected digital BM concepts align well with AI technology, research and practice should consider AI an evolving frontier (Berente et al., 2021) that continuously provides opportunities to enhance existing and instantiate new BMs based on largely familiar digital BM concepts.

5.3 Contributions to research and practice

We contribute to research on digital transformation (Vial, 2019; Wessel et al., 2021) and digital BMs (e.g., Bock and Wiener, 2017) by revealing and systematically structuring how AI can impact incumbent BMs. Prior work on AI and the BM has been limited to specific industries or BM components (e.g., Cao, 2021; Sjödin et al., 2021) or has lacked a comprehensive coverage of possible impact characteristics (e.g., Metzler et al., 2021). Integrating and extending these valuable findings, we provide a structured, comprehensive, and industry-agnostic overview of AI's various impacts on incumbent BMs. Our taxonomy represents a type 1 theory that helps describe and analyze a relevant phenomenon and can serve as a foundation for further theorizing (cf., Gregor, 2006). The engagement with empirical cases allowed us to also discuss emergent patterns of transformation with AI that can inspire and guide future research. Last, we contribute to the current discourse on AI's transformative impact by situating our findings in the broader digital BM discourse.

Practitioners can use our taxonomy as a structured tool to reflect on past AI initiatives and whether and how they influenced their BM. Furthermore, the taxonomy can guide the design of new AI initiatives that proactively shape and transform their BMs. Our taxonomy further supports decision-makers by demystifying the possible impacts of AI for the BM. Specifically, we discuss how the resulting BMs mostly follow well-known digital BM concepts applied in the past two decades. Last, we recommend closely monitoring AI's evolving capabilities, as they might spur opportunities for new BMs.

5.4 Limitations

This study comes with limitations. First, we relied on public information regarding the AI initiatives of incumbents, which can be biased and incomplete. We triangulated the data using multiple sources and used the empirical cases only as an additional data source for the taxonomy in the second iteration. For example, we identified "New Platform Ecosystems" as a previously overlooked impact characteristic. Second, taxonomy development always involves subjective decisions regarding design choices and evaluation (Nickerson et al., 2013). To mitigate the researcher's bias, we had two researchers deeply engaged in the taxonomy development process that constantly compared and challenged their perspectives. Furthermore, we extensively discussed the taxonomy at a workshop with 18 IS researchers split into five groups that challenged our perspectives. Third, the taxonomy is based on the current state of AI and will likely have to be revised, given the rapid progress of AI technology and its growing diffusion. We designed the taxonomy to be extendable and adjustable (Nickerson et al., 2013) so that future research can adapt the taxonomy as the impact of AI on incumbent BMs evolves.

6 Conclusion

In the paper's very title, we asked whether AI would transform the BMs of incumbents, alluding to the digital transformation phenomenon that enjoys continued relevance for research and practice. To that end, we have developed a taxonomy that provides a structured, comprehensive, and industry-agnostic overview of AI's various impacts on incumbent BMs. The engagement with empirical cases further revealed interesting patterns and possible AI transformation pathways that can stimulate future research. Interestingly, however, most of the resulting incumbent BMs align with well-known concepts from digital BM research (e.g., personalization). Despite being conceptually similar, we argue that AI's evolving capabilities continuously enable incumbents to enhance their existing and explore new BMs based on AI. Our taxonomy can support incumbents in navigating this important journey.

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Note: Asterisk (*) indicates inclusion in the literature review.

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Appendix

#	Incumbent firm	Supersector (FTSE ICB)	AI initiative	Purpose of IT use (Steininger, 2019)
1	Mercedes Benz	Automobiles and Parts	MO360: AI-empowered platform to increase production efficiency	Infrastructure Mgmt.
			Ask Mercedes: Bot for conversational exchange with customers	Customer Interface
			MBUX: new context-sensitive infotainment system and assistant	Product / Value Prop.
2	CaixaBank	Banks	AI-driven assistant to answer internal employee queries	Infrastructure Mgmt.
			Neo: AI-driven chatbot for spoken and written customer conversations	Customer Interface
3	Arcelor Mittal	Basic Resources	Global Product Quality System: incorporates AI to automate and improve quality control processes	Infrastructure Mgmt.
4	Firmenich	Chemicals	Combine AI and human creativity in product development	Infrastructure Mgmt.
			Scentmate: AI-enabled fragrance platform designed for SMEs	Product / Value Prop.
5	Holcim	Construction and Materials	Transport Analytics Centre: platform uses AI to optimize logistics	Infrastructure Mgmt.
			ORIS: material management platform uses AI	Product / Value Prop.
6	Adidas	Consumer Products and Services	AI-enabled production to deliver personalized sneakers within 24 hours	Infrastructure Mgmt.
			Using AI to provide better outfit and style recommendations to customers	Customer Interface
7	British Petroleum	Energy	Sandy: AI-based platform to support asset-relevant projects	Infrastructure Mgmt.
			AI-based support tool to automate responses to technical questions	Customer Interface
8	Morgan Stanley	Financial Services	Provide financial advisors with seamless access to internal knowledge base	Infrastructure Mgmt.
			Next Best Action: AI-based personalized tool for investment decisions	Customer Interface
9	Anheuser-Busch InBev	Food, Beverage and Tobacco	AI to simplify back-office tasks for employees	Infrastructure Mgmt.
			Chatbots to increase customer engagement and operational efficiency	Customer Interface
			Smart Barley: AI-supported platform to optimize farmers' yields	Product / Value Prop.
10	Bayer	Health Care	AI to enhance efficiency and productivity in R&D processes	Infrastructure Mgmt.
			Calantic: digital platform for AI-enabled medical imaging	Product / Value Prop.
11	Airbus	Industrial Goods and Services	AI to identify patterns and address issues in the production process	Infrastructure Mgmt.
			Skywise: data platform that offers AI-powered services	Product / Value Prop.
12	Allianz Group	Insurance	Automating claims management through AI-powered solutions	Infrastructure Mgmt.
			AI-powered virtual assistant to simplify customer interactions and support	Customer Interface
			AI-enabled telematics-based insurance	Product / Value Prop.
13	BBC	Media	AI-powered content automation and generation	Infrastructure Mgmt.
			Citron: AI-based open-source tool to extract quotes from text documents	Product / Value Prop.
14	L'Oréal	Personal Care, Drug and Grocery Stores	AI-powered engine to detect trends of tomorrow via social media	Infrastructure Mgmt.
			Facebook Messenger bot provides personalized gift recommendations	Customer Interface
			Perso: AI-based personalized cosmetic product recommender	Product / Value Prop.
15	Anywhere Real Estate	Real Estate	AI to identify and predict potential customer leads	Infrastructure Mgmt.
			Chatbot for customer self-service and purchasing support	Customer Interface
16	Walmart	Retail	AI for operational efficiency in supply chain management	Infrastructure Mgmt.
			AI-based voice ordering and customer support	Customer Interface
17	XEROX	Technology	AI-powered automation solutions for internal use	Infrastructure Mgmt.
			AI-powered end-to-end automation solution as as-a-service	Product / Value Prop.
18	Deutsche Telekom	Telecommunications	AI to optimize fiber optic roll-out planning	Infrastructure Mgmt.
			Conversational AI suite developed to enhance customer interactions	Customer Interface
			Conversational AI suite as-a-service	Product / Value Prop.
19	KLM Royal Dutch Airlines	Travel and Leisure	AI-based solution for optimization and digitization of operations	Infrastructure Mgmt.
			BlueBot: AI-based service bot to answer questions and sell tickets	Customer Interface
			AI-based solution for the optimization and digitization of airline operations	Product / Value Prop.
20	E.ON	Utilities	AI for automation and enhancement of maintenance activities	Infrastructure Mgmt.
			Conversational AI platform to automate customer service	Customer Interface
			AI-powered smart home control platform	Product / Value Prop.

Table 5. Overview of empirical cases used for taxonomy development.