



Artificial Intelligence as a Driver of Business Model Transformation: Developing and Validating an AI-Enabled Business Transformation Framework

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Abstract

Artificial Intelligence (AI) is transforming how organizations create, deliver, and capture value. As digital technologies, data infrastructures, and intelligent systems become increasingly integrated into organizational processes, firms are rethinking traditional business models and exploring new forms of value creation. Although previous research has examined servitization, digital servitization, product-service systems, AI capabilities, and business model innovation, these research streams remain fragmented, limiting the understanding of how AI drives business model transformation across different organizational contexts.

This dissertation addresses this gap by developing and validating a conceptual framework for AI-enabled business model transformation. Based on a structured literature review, the framework comprises five transformation dimensions: foundational data capabilities, AI as a transformation mechanism, ecosystem integration, business model transformation, and business model evolution, supported by human and organizational factors.

The research follows a qualitative Design Science Research approach. The framework was validated through semi-structured questionnaires with twelve organizations representing product-centric firms, service-centric firms, servitizing firms, and AI and transformation enablers. The collected data were analysed using NVivo.

The findings show that AI is not the transformation itself but a mechanism that converts data into actionable knowledge, supports decision-making, enables automation, strengthens customer relationships, and creates new value propositions and revenue opportunities. However, these benefits depend on data maturity, organizational readiness, ecosystem collaboration, and the effective integration of AI into business model architecture.

This research contributes by proposing an integrated framework linking AI capabilities, data resources, ecosystem relationships, and business model transformation, while providing practical guidance for organizations seeking to leverage AI to create and capture value.

Keywords: Artificial Intelligence; Business Model Transformation; Business Model Innovation; Digital Servitization; Product-Service Systems; Data Capabilities; Ecosystems; Design Science Research.

Resumo

A Inteligência Artificial (IA) está a transformar a forma como as organizações criam, entregam e capturam valor. À medida que as tecnologias digitais, as infraestruturas de dados e os sistemas inteligentes se tornam cada vez mais integrados nos processos organizacionais, as empresas repensam os modelos de negócio tradicionais e exploram novas formas de criação de valor. Embora a investigação anterior tenha abordado temas como a servitização, a servitização digital, os sistemas produto-serviço, as capacidades de Inteligência Artificial e a inovação dos modelos de negócio, estas linhas de investigação permanecem fragmentadas, limitando a compreensão de como a IA impulsiona a transformação dos modelos de negócio em diferentes contextos organizacionais.

Esta dissertação procura colmatar essa lacuna através do desenvolvimento e validação de um framework conceptual para a transformação dos modelos de negócio suportada por Inteligência Artificial. Com base numa revisão estruturada da literatura, o framework proposto integra cinco dimensões de transformação: capacidades fundamentais de dados, a IA como mecanismo de transformação, integração no ecossistema, transformação do modelo de negócio e evolução do modelo de negócio, suportadas por fatores humanos e organizacionais.

A investigação segue uma abordagem qualitativa baseada na metodologia Design Science Research. O framework foi validado através de questionários semiestruturados aplicados a doze organizações, representando empresas centradas no produto, empresas centradas no serviço, empresas em processo de servitização e organizações facilitadoras de IA e transformação. Os dados recolhidos foram analisados com recurso ao software NVivo.

Os resultados demonstram que a IA não constitui a transformação em si, mas sim um mecanismo que converte dados em conhecimento acionável, apoia a tomada de decisão, possibilita a automatização de processos, fortalece a relação com os clientes e promove a criação de novas propostas de valor e oportunidades de receita. Contudo, estes benefícios dependem do grau de maturidade dos dados, da preparação organizacional, da colaboração com o ecossistema e da integração eficaz da IA na arquitetura do modelo de negócio.

Esta investigação contribui para a literatura ao propor um framework integrado que relaciona as capacidades de IA, os recursos de dados, as relações no ecossistema e a transformação dos

modelos de negócio, fornecendo simultaneamente orientações práticas para organizações que pretendam utilizar a Inteligência Artificial como alavanca para criar e capturar valor.

Palavras-chave: Inteligência Artificial; Transformação de Modelos de Negócio; Inovação de Modelos de Negócio; Servitização Digital; Sistemas Produto-Serviço; Capacidades de Dados; Ecossistemas; Design Science Research.

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List of abbreviations

AI - Artificial Intelligence

BMI - Business Model Innovation

BMT - Business Model Transformation

DSR - Design Science Research

IoT - Internet of Things

LLMs - Large Language Models

NVivo - Qualitative Data Analysis Software

PSS - Product-Service Systems

PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

RQ - Research Question

RO - Research Objective

SDGs - Sustainable Development Goals

WoS - Web of Science

List of Annexes

Annex A - Article Review Template

Annex B - Comparative Classification Matrix

Annex C - Structured Study Summary

Annex D – AI and Transformation Enablers Questionnaire

Annex E – Servitization Firms Questionnaire

Annex F – Product Centric Firms Questionnaire

Annex G – Service Centric Firms Questionnaire

Annex H – Validation Questionnaire

1. Introduction

This chapter introduces the research context and presents the motivation and problem that underpin this dissertation. It defines the research questions and objectives that guide the study and provides the contextualization necessary to understand its relevance. Finally, the chapter concludes with an overview of the dissertation structure.

1.1 Project Contextualization

In today's highly competitive and digitally connected environment, organizations face increasing technological change, market uncertainty, evolving customer expectations, and an unprecedented growth in data. These developments have challenged traditional sources of competitive advantage based on product quality, operational efficiency, and cost leadership, requiring organizations to continuously rethink how they create, deliver, and capture value. Consequently, business model transformation has become a central topic within innovation and strategic management research.

One of the earliest perspectives addressing this transformation is servitization, which describes the shift from product-oriented business models towards integrated product-service offerings. Rather than creating value solely through product sales, organizations increasingly compete by delivering services, performance, and customer outcomes. (Cohen, 2012) argue that performance-based business models reward organizations according to the value delivered throughout the product lifecycle, while (Boucher & Medini, 2016) emphasize that this transition requires substantial changes to organizational structures, business models, and collaborative value networks.

The widespread adoption of digital technologies led to the emergence of digital servitization, extending traditional servitization through technologies such as the Internet of Things (IoT), cloud computing, digital platforms, advanced analytics, and connectivity. These technologies enable organizations to collect and analyse operational data, monitor products remotely, predict failures, and deliver increasingly personalized services. (Kohtamäki et al., 2024) highlight that digital servitization involves the simultaneous transformation of technologies, business models, and ecosystems, requiring organizations to develop digital capabilities that support long-term value creation.

More recently, Artificial Intelligence (AI) has emerged as a key driver of business model transformation. Beyond automating processes, AI enables organizations to transform large volumes of data into actionable knowledge, improve decision-making, generate predictions, personalize customer experiences, and develop new value propositions. (Sjödin et al., 2021) argue that successfully scaling AI requires capabilities such as data pipelines, algorithm development, and AI democratization, while (Naeem et al., 2025) identify AI-enabled product-service innovation, data-driven capabilities, and business model innovation as central themes in current research. Together, these studies position AI as a strategic capability rather than simply a technological tool.

Alongside AI, recent research highlights the importance of ecosystems and data capabilities in enabling organizational transformation. Organizations increasingly operate within collaborative networks involving technology providers, suppliers, customers, universities, and digital platforms, where innovation depends on knowledge sharing and value co-creation. Studies by (Harrington et al., 2023; Manser Payne et al., 2021; Mihailović et al., 2024) emphasize that ecosystem collaboration has become fundamental to supporting digital transformation and AI-enabled innovation. At the same time, data has become a critical organizational resource, providing the foundation for analytics, prediction, automation, and intelligent decision-making. Research by (Baek et al., 2023; Monroy-Osorio, 2024) demonstrates that AI creates value by transforming customer and operational data into strategic insights and personalized services.

Despite the growing maturity of these research areas, the literature remains fragmented. Existing studies typically focus on individual topics such as servitization, digital servitization, AI adoption, business model innovation, or ecosystem collaboration, with relatively few providing an integrated understanding of how these dimensions collectively enable business model transformation. This fragmentation highlights the need for a holistic framework capable of connecting data capabilities, AI, ecosystem collaboration, organizational capabilities, and business model evolution.

This dissertation addresses this gap by positioning Artificial Intelligence as the central mechanism linking data capabilities, organizational transformation, ecosystem collaboration, and value creation. A conceptual framework is developed through an extensive literature review and subsequently refined using empirical evidence collected from four organizational

profiles: product-centric firms, service-centric firms, servitizing firms, and AI & Transformation Enablers. By integrating these different perspectives, this research seeks to provide both theoretical and practical contributions, offering a structured understanding of how AI supports business model transformation and enables organizations to create sustainable competitive advantage in increasingly digital environments.

1.2 Motivation and Problem Description

The rapid advancement of digital technologies has fundamentally transformed the way organizations operate, compete, and create value. In particular, the increasing availability of data and the growing adoption of AI have encouraged organizations to rethink traditional business models and explore new approaches to innovation, customer value creation, and competitive advantage. Rather than being viewed solely as a technological resource, AI is increasingly recognized as a strategic capability capable of supporting decision-making, automating processes, improving customer experiences, and enabling new business opportunities.

At the same time, organizations are facing increasing pressure to adapt to dynamic markets, changing customer expectations, and accelerated digital transformation. These challenges have reinforced the importance of business model transformation as a means of ensuring long-term competitiveness. Existing research has explored this transformation from different perspectives, including servitization, digital servitization, product-service systems, AI adoption, and business model innovation. However, these research streams have largely evolved independently, providing valuable but fragmented insights into how organizations transform their business models.

Although previous studies demonstrate the potential of Artificial Intelligence to support organizational transformation, they typically examine individual dimensions such as data analytics, service innovation, ecosystem collaboration, or AI implementation in isolation. As a result, limited attention has been given to understanding how these dimensions collectively enable business model transformation across different organizational contexts. This research addresses this gap by adopting a holistic perspective that conceptualizes AI as a transformation mechanism capable of connecting data capabilities, organizational readiness, ecosystem collaboration, and value creation. By integrating these dimensions into a single conceptual framework, the dissertation seeks to provide a more comprehensive

understanding of how organizations can leverage AI to redesign and continuously evolve their business models in increasingly digital and competitive environments.

Accordingly, the central problem addressed in this dissertation is the lack of an integrated framework capable of explaining how Artificial Intelligence enables business model transformation across different types of organizations. To address this problem, the research develops and validates a conceptual framework that combines insights from the literature with empirical evidence collected from product-centric firms, service-centric firms, servitizing firms, and AI and transformation enablers. By integrating these different perspectives, the study seeks to contribute to both academic knowledge and managerial practice, providing a structured understanding of how AI can support sustainable business model transformation and long-term value creation.

1.3 Research Questions

The literature reviewed throughout this research demonstrates that Artificial Intelligence is increasingly recognized as a key enabler of organizational transformation.

Furthermore, organizations differ significantly in terms of their business model orientation, digital maturity, and AI adoption, highlighting the need for a holistic framework capable of integrating these different perspectives.

To address this research gap, the present study is guided by the following research questions:

- **RQ1:** How is Artificial Intelligence perceived and utilized across organizations from different industries and business contexts?
- **RQ2:** Which organizational capabilities, data resources, and ecosystem relationships are required to successfully leverage Artificial Intelligence in business model transformation?
- **RQ3:** How do product-centric firms, service-centric firms, servitizing firms, and AI & Transformation Enablers perceive the role of Artificial Intelligence in creating, delivering, and capturing value?
- **RQ4:** How can these organizational perspectives be integrated into a conceptual framework that supports AI-enabled business model transformation?

1.4 Research Objectives

To answer the proposed research questions, this dissertation aims to develop and empirically validate a conceptual framework that explains how Artificial Intelligence enables business model transformation across different organizational contexts. The research combines a structured literature review with qualitative empirical evidence collected from organizations representing different stages of business model evolution.

More specifically, the study pursues the following objectives:

- **RO1:** To identify the key dimensions and capabilities that enable Artificial Intelligence to support business model transformation in different contexts.
- **RO2:** To analyse how organizations with different business model orientations leverage Artificial Intelligence to create, deliver, and capture value.
- **RO3:** To examine the role of data capabilities, ecosystem collaboration, and organizational factors in facilitating AI-enabled transformation.
- **RO4:** To develop, refine, and validate a conceptual framework for AI-enabled business model transformation.

1.5 Dissertation Structure

This dissertation is organized into eight chapters, following a logical progression from the identification of the research problem to the development, validation, and discussion of the proposed conceptual framework.

Chapter 1 – Introduction presents the research context, motivation, problem statement, research questions, research objectives, and the overall structure of the dissertation.

Chapter 2 – Literature Review presents the review methodology and examines the main theoretical concepts underpinning this research, including business models, Product-Service Systems, servitization, digital servitization, Artificial Intelligence, data capabilities, ecosystem integration, and AI-enabled business model transformation. The chapter concludes by identifying the research gap addressed in this study.

Chapter 3 – Research Design and Development Process describes the Design Science Research approach adopted to develop the proposed framework. It presents the different

stages of the research process, from problem identification and framework design to its development, consolidation, evaluation, and research outcomes.

Chapter 4 – Proposed Conceptual Framework presents the conceptual framework developed from the literature review and empirical findings, describing its six dimensions and explaining the relationships established between them.

Chapter 5 – Validation of the Proposed Framework describes the framework validation process carried out with organizational experts and presents the results obtained for each framework dimension, together with the overall framework evaluation.

Chapter 6 – Discussion discusses the main findings of the research in light of the existing literature and answers the research questions defined at the beginning of the study.

Chapter 7 – Conclusions summarizes the main contributions of the research, discusses its limitations, identifies opportunities for future research, and presents the final conclusions of the dissertation.

Chapter 8 – United Nations Sustainable Development Goals outlines how the proposed research contributes to the achievement of the Sustainable Development Goals (SDGs), highlighting its relevance from both innovation and sustainability perspectives.

Overall, this dissertation combines a structured literature review, qualitative empirical research, and the Design Science Research methodology to develop and validate a conceptual framework that explains how Artificial Intelligence enables business model transformation across different organizational contexts.

2. Literature Review

This chapter presents the theoretical foundations of this dissertation by reviewing the main literature on business model transformation and its evolution from Product-Service Systems (PSS) and servitization to digital servitization and Artificial Intelligence (AI). It also describes the literature review methodology, identifies the main research streams and existing gaps, and provides the theoretical basis for the development of the conceptual framework proposed in this study.

2.1 Review Methodology

2.1.1 Data Sources and Search Strategy

The literature search was carried out using two internationally recognized scientific databases: Scopus and Web of Science (WoS). These databases were selected due to their extensive coverage of peer-reviewed publications in the fields of business, management, engineering, and information systems, ensuring the quality and scientific relevance of the selected studies.

A structured search strategy was developed by combining the main concepts underlying this research through Boolean operators. The search focused on publications addressing the relationship between Artificial Intelligence, Product-Service Systems, and Business Models. In Scopus, the search was performed within the Article Title, Abstract, and Keywords fields, while in Web of Science the Topic search option was adopted. The complete search strategy and the number of publications retrieved from each database are presented in Table 1.

Table 1- Summary of database Search Strategy and Initial Findings

Database	Scopus	WoS
Filter	Article title, Abstract, Keywords	Topic
String	("Artificial intelligence" OR "AI") AND "Product-service" AND Business model*	("Artificial intelligence" OR "AI") AND "Product-service" AND Business model*
Findings	99	124

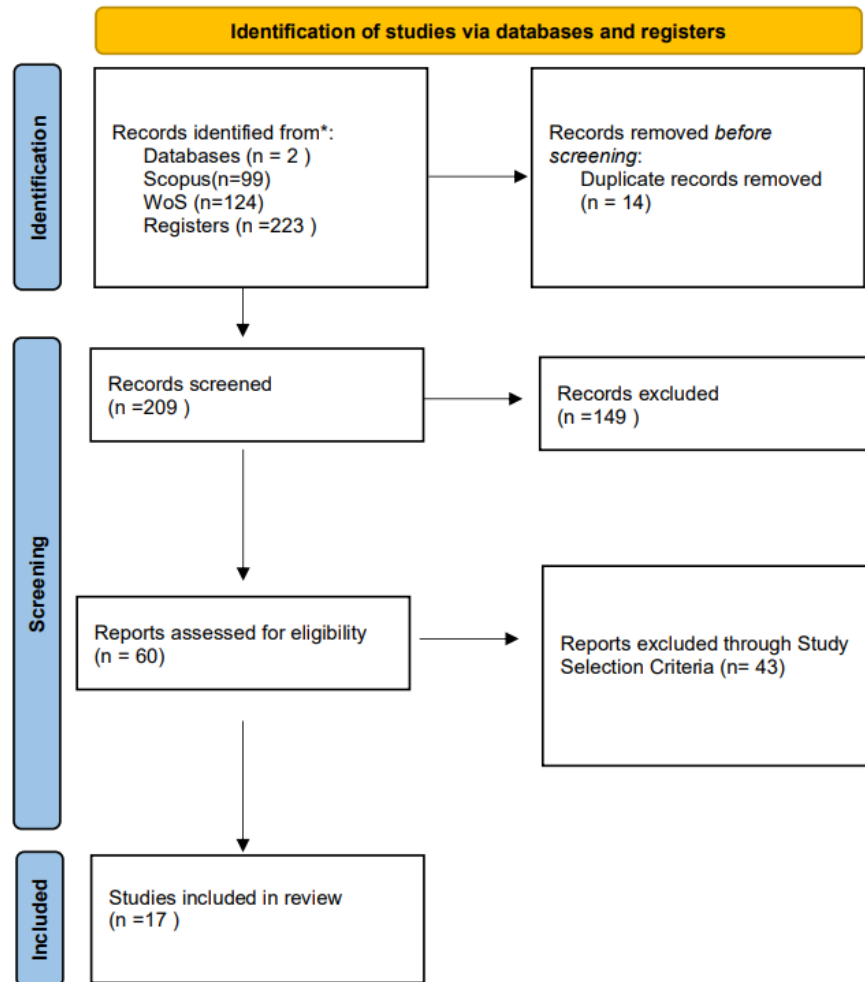
The initial search, conducted in October 2025, identified 223 scientific publications, including 99 records from Scopus and 124 records from Web of Science. These publications constituted the starting point for the study selection process described in the following section.

2.1.2 Study Selection Process

Following the initial database search, a structured screening process was conducted to identify the publications most relevant to the objectives of this research. The selection procedure followed the general principles of the PRISMA framework (Page et al., 2021),

providing a transparent and reproducible overview of the identification, screening, eligibility assessment, and final inclusion of the selected studies.

Figure 1- PRISMA Flow Diagram of the systematic review conducted



As illustrated in Figure 1, the initial search retrieved a total of 223 records. After removing 14 duplicate publications, 209 articles remained for the screening stage. Titles and abstracts were subsequently reviewed to assess their relevance to the research objectives. Publications that did not directly address the role of Artificial Intelligence in business model transformation or that fell outside the scope of this research were excluded during this phase.

The remaining 60 studies were then evaluated in greater detail according to predefined inclusion and exclusion criteria. Following the eligibility assessment, a final sample of 17 scientific articles was selected for detailed analysis. These articles formed the theoretical basis of this dissertation and were subsequently analysed through individual technical review sheets

and a comparative literature analysis, providing the foundations for the development of the proposed conceptual framework.

2.1.3 Inclusion and Exclusion Criteria

To ensure consistency and objectivity throughout the literature review, a set of predefined inclusion and exclusion criteria was established prior to the article selection process.

The inclusion criteria focused on identifying publications in which Artificial Intelligence constituted either the central research topic or a strategic enabler of business model transformation. Particular emphasis was placed on studies addressing business model innovation, value creation mechanisms, and the transition from product-oriented business models towards service-oriented or AI-enabled solutions. The complete inclusion criteria adopted throughout the review are summarized in Table 2.

Table 2- Inclusion Criteria

ID	Criteria	Description
Inclusion 1	Focus on Artificial intelligence (AI)	Articles that discuss AI as a central concept or as a driver of business model transformation.
Inclusion 2	Relevance to Business Model Innovation	Studies addressing how AI influences value creation, delivery, or capture within business models.
Inclusion 3	Connection to Product-to-Service Transformation	Research exploring how AI enables servitization or supports shifts from product-based to service-oriented models.

Similarly, a number of exclusion criteria were defined to remove publications that were not directly aligned with the objectives of this research. Studies primarily focused on digital technologies other than Artificial Intelligence, highly industry-specific applications without broader business model implications, or macro-level societal and technological discussions unrelated to organizational transformation were excluded from the final sample. The complete exclusion criteria are presented in Table 3.

Table 3-Exclusion Criteria

ID	Criteria	Description
Exclusion 1	Focus on Other Digital Technologies	Studies centered on other technologies (e.g., blockchain, IoT, VR) rather than AI.
Exclusion 2	Industry-Specific focus	Articles limited to one context (e.g., healthcare, cybersecurity) without broader implications for business models.
Exclusion 3	Societal or Cultural Frameworks	Papers focusing on macro-level topics like Industry 4.0, Society 5.0, or the metaverse, without discussing product-service transitions.

The adoption of these criteria ensured that the selected literature remained closely aligned with the research objectives while maintaining a balanced and coherent body of knowledge. Rather than seeking to provide an exhaustive review of all Artificial Intelligence research, the selection process focused on identifying the most relevant publications capable of supporting the development of the proposed conceptual framework and addressing the research questions defined in this dissertation.

2.2 Overview of the Selected Literature

Following the application of the search strategy, screening process, and inclusion and exclusion criteria, a final set of 17 scientific articles was selected for detailed analysis. These studies constitute the theoretical foundation of this dissertation and collectively provide a comprehensive understanding of the relationship between Artificial Intelligence, business model innovation, Product-Service Systems, digital servitization, data-driven value creation, ecosystem collaboration, and organizational transformation.

Rather than focusing on a single research stream, the selected literature covers multiple complementary perspectives. Some studies explore the evolution of Product-Service Systems and performance-based business models (Boucher & Medini, 2016; Cohen, 2012), while others investigate digital servitization, AI-enabled services, ecosystem collaboration, or data-

driven business models. More recent contributions specifically examine the role of Artificial Intelligence as a strategic capability capable of enabling organizational transformation and business model innovation (Kohtamäki et al., 2022; Naeem et al., 2025; Sjödin et al., 2021).

2.2.1 Literature Classification and Comparative Summary

To facilitate the literature review process and ensure the systematic organization of the information collected from each study, a structured article review template, Annex A, was developed and completed for every selected publication. The template was designed to capture the most relevant information in a consistent manner, including the research topic, industry, business model orientation, role of Artificial Intelligence, methodological approach, key findings, limitations, and the article's contribution to this research. This standardized procedure enabled the efficient synthesis of the literature while ensuring consistency throughout the review process.

The information extracted from these individual review templates was subsequently consolidated into a comparative classification matrix (Annex B), allowing the selected studies to be systematically compared across multiple dimensions. This comparison facilitated the identification of recurring concepts, methodological differences, common research streams, and gaps within the existing literature, providing the theoretical foundation for the development of the proposed conceptual framework.

To complement this analysis, Annex C provides a structured summary of each selected study, presenting additional information regarding the research objectives, context, methodology, principal findings, limitations, and future research directions. Together, the individual review templates, the comparative classification matrix, and the structured article summaries established a coherent and efficient process for analysing, organizing, and synthesizing the literature reviewed throughout this dissertation.

2.3 Key Findings

Overall, the analysis demonstrates that AI-enabled business model transformation is a multidisciplinary research field that has attracted increasing attention across different organizational contexts, while simultaneously revealing common challenges and opportunities for future investigation.

Despite these differences, several common patterns emerge. First, most studies recognize data as the fundamental resource enabling Artificial Intelligence. Second, AI is increasingly positioned as a strategic capability rather than a purely technological tool. Third, value creation is progressively shifting from product ownership towards service-oriented and outcome-based business models supported by digital technologies. Finally, the literature consistently highlights the importance of ecosystem collaboration, organizational capabilities, and continuous innovation in enabling successful business model transformation.

Although the selected articles collectively provide a comprehensive understanding of the field, they also reveal important research gaps. Most studies focus on individual aspects of transformation - such as servitization, Artificial Intelligence, ecosystems, or digital business models - without integrating these perspectives into a unified conceptual model. Furthermore, many studies remain conceptual or are based on single case studies, highlighting the need for empirically grounded frameworks capable of explaining how these different dimensions interact in practice. This observation provided the primary motivation for developing the conceptual framework proposed in this dissertation.

2.4 Business Models and Business Model Innovation

Business models have progressively evolved in response to changing market dynamics, technological innovation, and increasing customer expectations. Rather than representing a static description of how organizations operate, contemporary literature increasingly views business models as dynamic systems capable of adapting to continuous environmental, technological, and organizational change. This perspective has become particularly relevant as organizations seek new mechanisms for creating, delivering, and capturing value in increasingly digital and data-driven environments.

The literature reflects a gradual shift from transactional exchanges based primarily on product ownership towards more integrated and customer-oriented approaches. Competitive advantage is no longer achieved solely through superior products but through the organization's ability to generate value throughout the customer lifecycle. Consequently, business model innovation extends beyond the development of new products or services, encompassing the redesign of organizational processes, customer relationships, revenue mechanisms, and value creation logic.

This transformation is particularly evident in the Product-Service Systems (PSS) and servitization literature. Cohen et al. (2012) argue that organizations increasingly move towards performance-based business models, where customers value outcomes rather than product ownership. As a result, firms create value through continuous service provision, long-term customer relationships, and performance-based agreements. Likewise, Medini and Boucher (2016) describe servitization as a comprehensive business model transformation requiring changes to organizational capabilities, operational processes, value networks, and stakeholder interactions.

The growing adoption of digital technologies has further accelerated business model innovation. Access to real-time data generated by connected products, digital platforms, and customer interactions enables organizations to monitor performance, predict maintenance needs, personalize services, and develop new revenue models based on subscriptions, usage, or performance. More recently, Artificial Intelligence (AI) has emerged as a key enabler of this transformation by converting large volumes of data into actionable knowledge that supports decision-making and continuous innovation. Sjödin et al. (2021) highlight the importance of capabilities such as data management, algorithm development, and AI democratization, while Naeem et al. (2025) identify AI-enabled business model innovation as one of the fastest-growing research themes within Product-Service Innovation.

Overall, the literature suggests that business model innovation is increasingly driven by the interaction between organizational capabilities, data resources, Artificial Intelligence, and ecosystem collaboration. However, existing studies tend to examine these dimensions independently, resulting in a fragmented understanding of how they collectively enable organizational transformation. This gap provides the foundation for the following sections, which explore the evolution from Product-Service Systems to Digital Servitization and, ultimately, AI-enabled Business Model Transformation.

2.5 Product-Service System and Servitization

The increasing complexity of customer needs, growing market competition, and the commoditization of products have encouraged organizations to move beyond traditional product-oriented business models. Rather than competing solely through product sales, firms increasingly differentiate themselves by offering integrated product-service solutions capable of generating continuous customer value throughout the product lifecycle. This shift

gave rise to the concepts of Product-Service Systems (PSS) and servitization, which have become fundamental research streams in business model transformation.

Product-Service Systems combine tangible products and intangible services into integrated offerings that better satisfy customer needs than products alone. Instead of treating products and services as separate elements, PSS views them as complementary components of a unified value proposition, shifting the focus from product ownership to value-in-use and customer outcomes. According to Medini and Boucher (2016), implementing PSS represents a comprehensive business model transformation rather than simply adding services to existing products. It requires organizations to redesign value creation processes, organizational structures, stakeholder interactions, and service architectures while aligning products, services, capabilities, and value networks.

Similarly, Cohen et al. (2012) argue that organizations increasingly transition towards performance-based business models, where customers value performance, availability, and outcomes rather than ownership of physical assets. Consequently, firms generate value through long-term service agreements, maintenance contracts, monitoring activities, and performance guarantees instead of relying exclusively on one-time product sales (Cohen, 2012). This transition strengthens customer relationships while fundamentally changing organizational revenue mechanisms, reinforcing the shift from product ownership to value-in-use (Boucher & Medini, 2016).

The literature therefore positions servitization as a strategic transformation rather than a simple service extension strategy (Kohtamäki et al., 2025). Organizations must develop new organizational capabilities, redesign internal processes, and integrate service activities into product development (Mihailović et al., 2024), while strengthening collaboration with customers and external stakeholders to support long-term value creation (Kohtamäki et al., 2024). Consequently, servitization is widely recognized as a business model innovation process requiring significant organizational and cultural change (Mitake et al., 2025).

The emergence of digital technologies further expanded the potential of Product-Service Systems. Connected products, embedded sensors, cloud computing, and advanced communication technologies enabled organizations to monitor product performance and collect operational data in real time (Soheil Zarrin, 2019). These capabilities facilitated predictive maintenance, remote monitoring, and the delivery of personalized services (Chiu

et al., 2024; Manser Payne et al., 2021), giving rise to Digital Servitization, where digital technologies became essential enablers of service innovation and business model transformation (Kohtamäki et al., 2024; Harrington & Srai, 2016).

Overall, the literature suggests that servitization provides the foundation for contemporary business model transformation. While early research focused on integrating services into product offerings, more recent studies extend this perspective towards digital technologies, ecosystem collaboration, and Artificial Intelligence. This evolution positions Product-Service Systems and servitization as the conceptual basis for Digital Servitization and, ultimately, AI-enabled business model transformation.

2.6 Digital Servitization

The continuous advancement of digital technologies has significantly expanded the scope of traditional servitization, giving rise to the concept of Digital Servitization. While servitization focused on integrating products and services to enhance customer value, Digital Servitization introduces technologies such as the Internet of Things (IoT), cloud computing, digital platforms, and advanced analytics as key enablers of value creation, organizational transformation, and business model innovation. These technologies allow organizations to continuously collect operational data, monitor product performance, anticipate customer needs, and deliver proactive, data-driven services.

Kohtamäki et al. (2019) define Digital Servitization as the integration of digital technologies with servitization strategies to develop smart solutions and digitally enabled business models. Their work highlights that digital transformation extends beyond technology adoption, requiring the alignment of organizational capabilities, value propositions, customer relationships, and ecosystem collaboration. Similarly, Harrington and Srai (2016) and Mihailović et al. (2024) emphasize that service innovation increasingly depends on collaborative ecosystems involving manufacturers, suppliers, technology providers, and customers. These partnerships facilitate knowledge sharing, value co-creation, and the development of more flexible and customer-oriented business models.

Another key aspect of Digital Servitization is the strategic use of organizational data. Connected products generate continuous information about product usage, operational performance, and customer behaviour, enabling predictive maintenance, service

personalization, remote diagnostics, and operational optimization. (Mitake et al., 2025) argue that exploiting these opportunities requires more than technological implementation; organizations must align digital technologies with business strategy, organizational capabilities, and customer value through continuous learning and business model adaptation. Recent literature also highlights the growing importance of ecosystems in digital transformation. From a Service-Dominant Logic perspective, Payne et al. (2020) argue that digital technologies enable value co-creation by connecting multiple actors within dynamic service ecosystems. As a result, organizations increasingly rely on collaboration, shared knowledge, and digital platforms to support innovation and long-term value creation.

Overall, the literature suggests that Digital Servitization represents a strategic transformation rather than simply the adoption of digital technologies. While connectivity, platforms, and data provide the technological foundation, sustainable business model innovation depends on an organization's ability to integrate these capabilities into its value creation processes. This evolution also creates the conditions for the emergence of Artificial Intelligence as the next stage of business model transformation. By converting organizational data into knowledge, predictions, and intelligent decision-making, AI extends the principles of Digital Servitization towards more adaptive, autonomous, and data-driven business models, providing the foundation for the following section.

2.7 Artificial Intelligence as a Strategic Capability

Artificial Intelligence (AI) has rapidly evolved from an emerging digital technology into one of the most influential strategic capabilities shaping contemporary organizations. While early applications focused primarily on process automation, recent advances in machine learning, predictive analytics, natural language processing, computer vision, and generative AI have significantly expanded its organizational impact. Today, AI is increasingly viewed as a strategic capability capable of transforming decision-making, customer interactions, operational processes, and business models.

Recent literature supports this perspective. Sjödin et al. (2021) argue that organizations successfully scaling AI develop complementary capabilities such as robust data infrastructures, data governance, algorithm development, organizational learning, and AI democratization. Rather than creating value independently, AI generates competitive

advantage when embedded within organizational processes and strategic decision-making. Similarly, Naeem et al. (2025) identify AI-enabled value creation, intelligent services, data-driven business models, and business model innovation as major research themes, highlighting AI's role in strengthening organizational capabilities and enabling new forms of value creation.

The strategic value of AI is closely linked to its ability to transform data into actionable knowledge. Monroy et al. (2024) demonstrate that AI enhances digital service innovation by converting customer-generated data into strategic insights that support decision-making and improve organizational performance. Likewise, Baek et al. (2021) show that AI improves service quality through personalization, responsiveness, reliability, and continuous adaptation to customer behaviour, strengthening both customer relationships and value creation.

Beyond improving operational efficiency, Artificial Intelligence fundamentally transforms how organizations generate insights, make decisions, and continuously adapt their business models. By analysing large volumes of structured and unstructured data, AI enables predictive analytics, intelligent decision-making, automation, and continuous organizational learning, allowing firms to shift from reactive operations towards more adaptive and data-driven business models (Naeem et al., 2025; Sjödin et al., 2021; Sudaryono et al., 2024). These capabilities also support service personalization, performance optimization, and the continuous delivery of customer value (Baek et al., 2021; Chiu et al., 2024).

Despite its growing importance, the literature consistently emphasizes that AI alone does not generate organizational value. Its successful implementation depends on complementary organizational capabilities, including high-quality data, digital infrastructures, human expertise, and organizational readiness (Sjödin et al., 2021; Kohtamäki et al., 2025). Furthermore, organizations increasingly rely on collaboration with external partners and digital ecosystems to capture, share, and exploit data effectively, reinforcing AI's role as part of a broader organizational transformation rather than an isolated technological solution (Manser Payne et al., 2020; Mihailović et al., 2024; Harrington & Srai, 2016).

This perspective underpins the framework proposed in this dissertation, which positions Artificial Intelligence as a Transformation Engine that converts organizational data into strategic knowledge capable of supporting value creation, customer engagement, ecosystem integration, and continuous business model evolution. Rather than representing the starting

point of transformation, AI acts as the organizational capability through which firms exploit data resources, coordinate ecosystem relationships, and continuously redesign their business models in increasingly digital and competitive environments (Kohtamäki et al., 2024; Kohtamäki et al., 2025; Sudaryono et al., 2024; Naeem et al., 2025).

2.8 Data-Driven Value Creation

The increasing digitalization of organizations has transformed data into one of the most valuable strategic resources supporting competitiveness and business model innovation. Connected products, digital platforms, enterprise systems, and customer interactions continuously generate large volumes of information, enabling organizations to better understand customer behaviour, optimize operations, anticipate market changes, and develop new sources of value. As a result, value creation increasingly depends on an organization's ability to collect, manage, analyse, and exploit data effectively.

Within the business model transformation literature, data is no longer viewed as a by-product of organizational activities but as a strategic asset that supports innovation, organizational learning, and competitive advantage. The availability of real-time information enables organizations to move beyond reactive decision-making towards more predictive, adaptive, and customer-oriented business models. In the context of Digital Servitization, connected products generate continuous operational and customer data that support predictive maintenance, service personalization, operational optimization, and continuous product improvement. Kohtamäki et al. (2019) argue that these capabilities fundamentally reshape value creation by enabling continuous interactions between products, services, customers, and digital infrastructures.

The strategic importance of data is further reinforced by research on Artificial Intelligence. Sjödin et al. (2021) identify robust data infrastructures, governance, and data pipelines as essential capabilities for successfully scaling AI, arguing that AI performance depends directly on data quality, accessibility, and integration. Similarly, Naeem et al. (2025) identify data-driven capabilities as a core element of AI-enabled Product-Service Innovation, highlighting their role in supporting customer understanding, operational efficiency, and business model innovation.

Monroy et al. (2024) further demonstrate that AI enhances Digital Service Innovation by transforming customer-generated data into actionable knowledge that supports strategic decision-making and organizational performance. Likewise, Baek et al. (2021) show that data enables AI-based services to personalize recommendations, anticipate customer needs, improve responsiveness, and continuously adapt service delivery. These findings emphasize that competitive advantage depends not on data availability alone but on an organization's ability to convert data into valuable knowledge.

Despite its strategic importance, data alone does not create organizational value. Its effectiveness depends on analytical capabilities, organizational knowledge, and decision-making processes capable of transforming raw information into actionable insights. This complementary relationship between data and Artificial Intelligence forms the basis of the conceptual framework proposed in this dissertation. Within the framework, Data Capabilities represent the foundational layer of business model transformation, providing the conditions for AI to operate as a Transformation Engine that supports value creation, ecosystem collaboration, organizational learning, and business model evolution. Consequently, organizations seeking to leverage AI must first develop mature data capabilities that ensure data quality, governance, accessibility, and continuous learning.

2.9 Ecosystems and Value Co-Creation

The increasing complexity of contemporary business environments has fundamentally changed how organizations innovate and create value. Rather than relying solely on internally controlled resources and linear value chains, organizations increasingly operate within interconnected ecosystems involving customers, suppliers, technology providers, universities, research institutions, startups, and digital platforms. As a result, competitive advantage increasingly depends on an organization's ability to collaborate, share knowledge, and co-create value across organizational boundaries.

Within the servitization and Digital Servitization literature, ecosystem collaboration is recognized as a key enabler of business model transformation. Harrington and Srai (2016) argue that service innovation depends on integrating multiple actors capable of combining complementary resources and expertise to deliver complex solutions. Similarly, Kohtamäki et al. (2019) describe Digital Servitization as a transformation that simultaneously reconfigures technologies, organizational capabilities, customer relationships, and ecosystem

interactions. Digital technologies facilitate this process by enabling continuous information exchange, shared platforms, and real-time collaboration among stakeholders.

The growing adoption of Artificial Intelligence has further reinforced the importance of ecosystems. AI-based solutions require access to diverse data sources, technological expertise, and continuous feedback from multiple stakeholders, resources that few organizations possess internally. Consequently, organizations increasingly collaborate with technology providers, universities, consultants, startups, and research centres to support AI implementation and innovation. Payne et al. (2020), drawing on the Service-Dominant Logic perspective, argue that value is co-created through continuous interactions among organizations, customers, partners, and digital technologies, with AI strengthening these interactions through real-time communication, intelligent decision-making, and personalized services.

Likewise, Mihailović et al. (2024) demonstrate that collaborative servitization enables organizations to accelerate innovation, share investments, reduce implementation risks, and develop more comprehensive customer solutions. Ecosystems also promote organizational learning by facilitating knowledge exchange, best practices, and continuous innovation. Customers, suppliers, research institutions, and technology partners each contribute complementary knowledge that supports business model evolution and long-term competitiveness.

Despite these benefits, ecosystem collaboration also introduces challenges related to governance, trust, data ownership, cybersecurity, and the alignment of strategic objectives, particularly in AI-enabled environments where data sharing and algorithm transparency are critical. Therefore, organizations must develop not only technological capabilities but also governance mechanisms that support long-term collaboration and responsible value creation.

These findings underpin the conceptual framework proposed in this dissertation, which positions Ecosystem Integration as a key dimension linking Artificial Intelligence and Business Model Transformation. Rather than acting as external support structures, ecosystems provide the environment in which organizations combine data, technological capabilities, organizational knowledge, and customer interactions to create new forms of value. Overall, the literature suggests that sustainable AI-enabled business model

transformation increasingly depends on collaborative ecosystems capable of supporting innovation, knowledge sharing, and continuous value creation.

2.10 AI-enabled Business Model Transformation

Business model transformation has become one of the most significant organizational challenges in the digital era. While earlier research focused on improving products, services, or digital technologies, recent literature increasingly recognizes that sustainable competitive advantage depends on an organization's ability to redesign how it creates, delivers, and captures value. In this context, Artificial Intelligence (AI) has emerged as a strategic capability capable of transforming organizational processes, customer relationships, value propositions, and business models.

The concept of AI-enabled Business Model Transformation reflects this evolution by positioning AI as a catalyst that integrates data, digital technologies, organizational capabilities, and ecosystem collaboration into new forms of value creation. Rather than representing isolated technological implementations, business model transformation is increasingly understood as a continuous organizational process that enables firms to adapt to changing market conditions while leveraging intelligent technologies to create competitive advantage.

The literature reviewed in this dissertation illustrates this progression. Early research on Product-Service Systems (PSS) and servitization focused on the transition from product ownership to integrated service offerings and performance-based value creation (Cohen et al., 2012; Medini & Boucher, 2016). This evolved into Digital Servitization, where connected products, digital platforms, and continuous data generation became central to organizational transformation (Kohtamäki et al., 2019; Harrington & Srai, 2016; Mitake et al., 2025). More recently, AI has emerged as the key capability linking these research streams and enabling organizations to redesign their business models through intelligent, data-driven decision-making.

Recent studies consistently show that AI enables new mechanisms of value creation based on data, prediction, personalization, and continuous learning. Naeem et al. (2025) identify AI-enabled business model innovation as a major research theme, highlighting its role in intelligent services, predictive maintenance, customer engagement, and new revenue models.

Likewise, Sjödin et al. (2021) argue that successful AI adoption depends on complementary capabilities such as data governance, organizational learning, and cross-functional collaboration. Monroy et al. (2024) further demonstrate that AI enhances organizational performance by transforming customer data into actionable knowledge that supports service innovation and strategic decision-making.

The literature also emphasizes the importance of ecosystem collaboration, as AI-enabled transformation increasingly relies on technology providers, research institutions, customers, suppliers, and other strategic partners to co-create value and facilitate knowledge exchange (Manser Payne et al., 2020; Mihailović et al., 2024; Harrington & Srai, 2016). Similarly, the successful deployment of AI depends on the integration of organizational capabilities, data resources, and collaborative digital infrastructures that extend beyond firm boundaries (Kohtamäki et al., 2025; Chiu et al., 2024). However, despite the growing maturity of these research areas, existing studies tend to examine servitization (Boucher & Medini, 2016; Cohen, 2012), digital transformation and digital business models (Kohtamäki et al., 2024; Mitake et al., 2025), Artificial Intelligence (Naeem et al., 2025; Sudaryono et al., 2024), data capabilities (Sjödin et al., 2021), and ecosystems (Manser Payne et al., 2020; Mihailović et al., 2024) separately, providing only limited understanding of how these dimensions interact to enable business model transformation.

To address this gap, this dissertation adopts a holistic perspective that positions AI as the Transformation Engine connecting Human and Organizational Factors, Data Capabilities, Ecosystem Integration, and Business Model Transformation. Rather than viewing AI as the starting point of transformation, the proposed framework argues that organizations must first develop the organizational and data capabilities that enable AI to generate knowledge, support decision-making, strengthen collaboration, and drive business model evolution. Consequently, AI-enabled business model transformation is understood as a multidimensional process that integrates technology, organizational capabilities, data, and ecosystems to support sustainable value creation and long-term competitive advantage.

2.11 Research Gap

The literature reviewed throughout this chapter demonstrates that business model transformation has evolved considerably over the last two decades. Initial research focused on Product-Service Systems (PSS) and servitization, emphasizing the transition from

product-oriented business models towards integrated product-service offerings (Cohen et al., 2012; Medini & Boucher, 2016). This perspective later evolved into Digital Servitization, highlighting the role of connected products, digital platforms, IoT, and data-driven services (Kohtamäki et al., 2019; Harrington & Srai, 2016; Mitake et al., 2025). More recently, Artificial Intelligence has emerged as a strategic capability supporting organizational innovation, intelligent services, customer personalization, and business model innovation (Sjodin et al., 2021; Naeem et al., 2025; Monroy et al., 2024).

Despite these advances, the comparative analysis of the selected literature reveals that these research streams remain fragmented. Most studies examine specific dimensions - such as servitization, digital servitization, Artificial Intelligence, data capabilities, ecosystem collaboration, or business model innovation - in isolation, providing only a partial understanding of how these elements interact to enable business model transformation (Medini & Boucher, 2016; Cohen, 2012; Kohtamäki et al., 2019; Payne et al., 2021; Sjodin et al., 2021; Monroy-Osorio, 2024; Naeem et al., 2025). In addition, much of the existing research focuses on technology adoption and operational improvements, while giving less attention to broader organizational changes involving value propositions, customer relationships, revenue models, governance, and strategic decision-making (Baek et al., 2023; Chiu et al., 2024; Mihailović et al., 2024; Monroy-Osorio, 2024; Sudaryono et al., 2024; Zinke-Wehlmann et al., 2023).

The review also identifies important theoretical and empirical gaps. Existing studies rarely integrate Human and Organizational Factors, Data Capabilities, Artificial Intelligence, and Ecosystem Integration into a single conceptual framework. Furthermore, most empirical research is limited to specific industries or organizational contexts, making it difficult to compare how organizations with different business model orientations approach AI-enabled transformation.

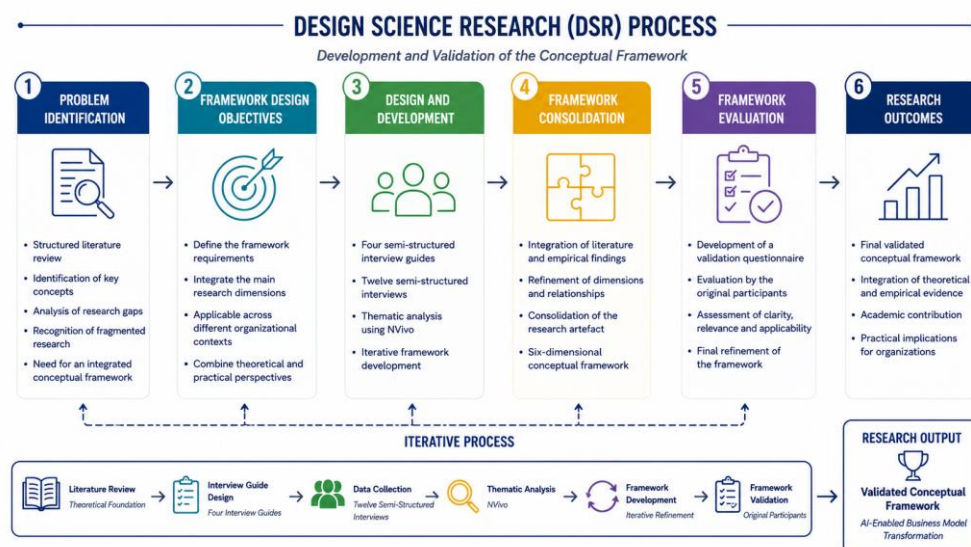
To address these limitations, this dissertation proposes a holistic conceptual framework that positions Artificial Intelligence as the central Transformation Engine connecting Human and Organizational Factors, Data Capabilities, Ecosystem Integration, and Business Model Transformation. The framework is subsequently validated through qualitative evidence collected from product-centric firms, service-centric firms, servitizing firms, and AI & Transformation Enablers. By combining insights from the literature with empirical findings,

this research contributes to both theory and practice by providing an integrated perspective on how AI enables sustainable business model transformation across different organizational contexts.

3. Research Design and Development Process

The primary objective of this dissertation is to develop and validate a conceptual framework that explains how Artificial Intelligence enables business model transformation across organizations with different business model orientations. Given the exploratory nature of the research and the objective of producing a practical artefact grounded in both theory and empirical evidence, a qualitative research design based on the Design Science Research (DSR) methodology proposed by Hevner et al. (2004) was adopted.

Figure 2- Design Science Research Process Adopted for the Development and Validation of the Proposed Conceptual



A qualitative approach was considered the most appropriate because AI-enabled business model transformation involves complex organizational processes, managerial perceptions, technological readiness, and strategic decision-making that require an in-depth understanding of how organizations create, deliver, and capture value. Design Science Research was selected because it supports the development and evaluation of artefacts that address practical problems while simultaneously contributing to scientific knowledge. In this study, the

proposed conceptual framework represents the central research artefact, developed and progressively refined throughout the research process.

The research followed the six interconnected phases commonly associated with the Design Science Research process, which were adapted to the specific context of this dissertation and did not occur as entirely isolated or strictly linear stages. Instead, the framework was developed through an iterative process in which theoretical knowledge, empirical evidence, and continuous reflection informed successive revisions of the artefact.

3.1 Problem Identification

The research process began with a structured literature review to establish the theoretical foundations of the study and identify the main concepts related to business model transformation, servitization, Digital Servitization, Artificial Intelligence, data capabilities, ecosystem collaboration, and organizational readiness. Each selected article was analysed using a standardized review template (Annex A), followed by a comparative analysis (Annex B) to identify recurring themes, methodological approaches, and research gaps.

The review showed that Artificial Intelligence plays an important role in supporting decision-making, automation, personalization, service innovation, and new value creation. At the same time, it highlighted the importance of complementary dimensions such as data capabilities, organizational readiness, and ecosystem collaboration. However, these dimensions are typically examined in isolation, resulting in limited understanding of how they collectively enable business model transformation across different organizational contexts.

This fragmentation constituted the main research problem and motivated the development of an integrated conceptual framework capable of connecting these dimensions into a coherent representation of AI-enabled business model transformation.

3.2 Framework Design Objectives

Based on the gap identified in the literature, the characteristics required of the proposed artefact were defined. The framework needed to integrate the principal dimensions identified during the literature review and explain how they collectively contribute to AI-enabled business model transformation.

It was also considered important for the framework to reflect different organizational realities rather than being applicable exclusively to technologically advanced firms or organizations already using Artificial Intelligence extensively. For this reason, the empirical research was designed to include organizations with different business model orientations, levels of digital maturity, technological capabilities, and experience with AI.

The intended solution was therefore a conceptual framework capable of combining theoretical knowledge with practical organizational perspectives and representing the relationships between Artificial Intelligence, data capabilities, organizational readiness, ecosystem collaboration, value creation, and business model evolution.

3.3 Design and Development

The knowledge obtained from the literature review provided the foundation for the empirical research. The concepts and relationships identified in the selected studies were translated into thematic areas that guided the development of four semi-structured questionnaire protocols, each tailored to a specific organizational perspective:

- Product-centric firms;
- Service-centric firms;
- Servitizing firms;
- AI and Transformation Enablers.

Although adapted to each context, all questionnaires(Annex D, Annex E, Annex F and Annex G) followed a common structure to ensure comparability across participants. The main themes explored included Value Proposition, Data and AI Capabilities, Business Model Logic, Ecosystem Integration, and Business Model Transformation. Open-ended questions and follow-up prompts encouraged participants to discuss their organizational practices, AI adoption, data use, strategic decisions, external partnerships, transformation challenges, and future perspectives.

A total of twelve semi-structured interviews were conducted, involving three organizations from each business model perspective. The participating organizations were Quad Sports, Ice Care, and FS Cerâmica Amaro de Macedo (product-centric); Braval, Kaizen, and Top-Padel Braga (service-centric); Cromópolis, DST, and UPK (servitizing); and InCentea, LTP

Labs, and Online (AI and Transformation Enablers). A purposive sampling strategy was adopted to ensure diversity in business models, industries, digital maturity, and AI experience.

The questionnaire transcripts were analysed in NVivo using a thematic analysis approach. An initial coding structure was derived from the literature review and included categories such as Artificial Intelligence, Data, Business Model Evolution, Ecosystem and Partnerships, Value Proposition and Customer Relationships, Pricing and Revenue, Benefits, Barriers and Challenges, and Future and Transformation. Additional subcodes were created throughout the analysis to capture emerging themes, combining deductive coding with inductive insights from the empirical data.

The coded data were compared both within and across the four organizational perspectives, allowing common patterns, contextual differences, and relationships between themes to be identified. These findings were integrated with the literature review to iteratively develop the conceptual framework. As new evidence emerged, the framework was repeatedly refined, with theoretical relationships being reinforced, adjusted, or extended according to the empirical findings.

The framework therefore evolved progressively until its principal dimensions and relationships were considered sufficiently coherent and representative of both the theoretical foundations and the organizational evidence collected throughout the study.

3.4 Framework Consolidation

Following the analysis of the interview data and the iterative refinement process, the conceptual framework reached a sufficiently stable structure to be consolidated as the research artefact. Rather than representing a single outcome of the literature review, the framework emerged through the continuous integration of theoretical evidence and qualitative insights collected from the participating organizations.

Throughout the empirical analysis, the framework was repeatedly reviewed and refined as new relationships, patterns, and organizational perspectives emerged from the interview data. This iterative process ensured that the proposed artefact reflected not only the concepts identified in the literature but also the practical experiences and challenges described by organizations operating in different business model contexts.

The resulting framework was organized around six interrelated dimensions:

- Human and Organizational Factors;
- Data Capabilities;
- Artificial Intelligence as a Transformation Engine;
- Ecosystem Integration;
- Business Model Transformation;
- Business Model Evolution.

Together, these dimensions provide an integrated representation of how Artificial Intelligence supports business model transformation across different organizational contexts. A detailed description of each framework dimension and the relationships established between them is presented in the following chapter.

3.5 Framework Evaluation

After the conceptual framework had been consolidated, a second questionnaire (Annex H) was developed specifically to validate the proposed artefact. Unlike the initial exploratory questionnaires, which were designed to collect the empirical evidence used to develop the framework, this questionnaire aimed to assess the validity and applicability of the final conceptual model.

The validation questionnaire was distributed to the same participants involved in the initial empirical phase, allowing the framework to be evaluated by experts who had previously contributed to its development. Each framework dimension was presented individually, accompanied by a brief explanation, and participants were asked to evaluate its clarity, relevance, coherence, and practical applicability. In addition, the complete framework was presented to enable an overall assessment of the relationships established between its dimensions.

The questionnaire combined Likert-scale items with open-ended questions, enabling participants to provide both quantitative evaluations and qualitative suggestions for improvement. Rather than statistically testing the framework, the objective of this phase was to verify whether the proposed artefact accurately represented the role of Artificial Intelligence in business model transformation and whether it was considered coherent, understandable, and applicable across different organizational contexts.

The feedback collected during this validation process supported the final refinement of the framework, resulting in the version presented in this dissertation.

3.6 Research Outcomes

The final phase of the Design Science Research process consisted of communicating the research outcomes through this dissertation. The document presents the theoretical foundations established through the literature review, the empirical research conducted with organizations from different business model perspectives, the development of the conceptual framework, and its subsequent validation.

The validated framework represents the main outcome of this research, integrating theoretical knowledge with empirical evidence collected throughout the study. By combining literature analysis, qualitative data collection, thematic analysis, framework development, and expert validation, this research provides an integrated perspective on how Artificial Intelligence supports business model transformation across different organizational contexts.

4. Proposed Conceptual Framework

The conceptual framework presented in this chapter represents the main outcome of the research process described in the previous chapter. Developed through a structured literature review and subsequently refined through qualitative evidence collected from twelve organizations, the framework provides an integrated perspective on how Artificial Intelligence enables business model transformation across different organizational contexts.

As illustrated in Figure 2, the framework brings together six interconnected dimensions that collectively explain the transformation process: Human and Organizational Factors, Data Capabilities, Artificial Intelligence as a Transformation Engine, Ecosystem Integration, Business Model Transformation, and Business Model Evolution. Rather than viewing Artificial Intelligence as an isolated technology, the framework positions AI as the mechanism that converts organizational data into actionable knowledge, enabling organizations to redesign their value propositions, strengthen ecosystem collaboration, and continuously evolve their business models.

Artificial Intelligence as a Driver of Business Model Transformation: Developing and Validating an AI-Enabled Business Transformation Framework

The framework should be understood as an iterative process rather than a linear sequence of activities. The dimensions are interconnected and continuously influence one another, reflecting the dynamic nature of organizational transformation. The following sections describe each dimension in detail and explain its role within the proposed framework.

Figure 3- Proposed Conceptual Framework



4.1 Human and Organizational Factors

The proposed framework begins with Human and Organizational Factors, reflecting the assumption that business model transformation is fundamentally an organizational process rather than a purely technological one. Although Artificial Intelligence represents the central technological capability of the framework, its successful implementation depends on an organization's readiness to embrace change, develop new competencies, and establish appropriate governance mechanisms.

This dimension encompasses the internal conditions that enable organizations to successfully adopt Artificial Intelligence and redesign their business models. These conditions include leadership commitment, organizational culture, employee skills, digital literacy, strategic vision, governance structures, and change management capabilities. Together, these elements determine an organization's ability to integrate Artificial Intelligence into strategic decision-making processes and everyday operations.

The empirical findings strongly reinforced the importance of this dimension. Across different organizational contexts, participants repeatedly identified technical knowledge, employee capabilities, and continuous learning as fundamental prerequisites for successfully implementing Artificial Intelligence. Several organizations highlighted the existence of "technical knowledge gaps", while others emphasized that "training courses are essential to fully exploit the potential of AI." More broadly, participants stressed that developing organizational "knowledge" is critical to ensuring that AI can be effectively integrated into business processes and decision-making.

Human resource availability also emerged as a recurring challenge. Several organizations referred to a "lack of human resources" and "limited availability of human resources" as significant barriers to AI implementation. One participant specifically noted the "lack of human resources and dedicated teams to develop essential cross-selling initiatives required to complete the customer experience," illustrating how organizational capabilities directly influence the ability to transform business models through Artificial Intelligence.

Within the proposed framework, this dimension represents the starting point of the transformation process by establishing the organizational conditions required for developing robust data capabilities and embedding Artificial Intelligence into business model innovation.

4.2 Data Capabilities

Data constitutes the primary organizational resource supporting Artificial Intelligence and represents the second dimension of the proposed framework. As organizations increasingly digitalize their operations, products, and services continuously generate large volumes of information regarding customer behaviour, operational performance, and organizational processes. However, the strategic value of these data depends on the organization's ability to collect, organize, integrate, and analyse them effectively.

Within the proposed framework, Data Capabilities encompass all activities related to data acquisition, storage, governance, analytics, monitoring, and continuous learning. Rather than viewing data as an operational by-product, the framework conceptualizes data as a strategic organizational asset capable of supporting intelligent decision-making and business model innovation.

The empirical findings strongly reinforced the strategic role of data across all organizational contexts. Participants consistently emphasized that "data collection is crucial" and that continuous "monitoring is essential for an industry that works with data." Organizations highlighted that Artificial Intelligence can only generate meaningful insights when supported by reliable, comprehensive, and continuously updated data.

Several participants also described the breadth of information required to support their operations. One organization explained that "the company's entire value proposition depends on the collection, processing, and analysis of large volumes of operational, meteorological, geospatial, and sensor data." Others reported analysing customer information across multiple business functions, stating that "we analyse all customer data, including sales, purchasing, finance, production, and logistics, and these data are considered highly important and are analysed frequently." These findings demonstrate that effective data capabilities extend beyond data collection, requiring organizations to establish robust processes for integrating and transforming data into actionable knowledge.

Within the proposed framework, Data Capabilities provide the informational foundation required for Artificial Intelligence to operate effectively, acting as the bridge between organizational readiness and AI-enabled business model transformation.

4.3 Artificial Intelligence as a Transformation Engine

Artificial Intelligence represents the central component of the proposed conceptual framework. Unlike traditional perspectives that consider AI primarily as a technological innovation, this framework conceptualizes Artificial Intelligence as a Transformation Engine responsible for converting organizational data into strategic knowledge capable of supporting business model transformation.

Within the framework, AI performs multiple complementary functions. It supports predictive decision-making, automates operational activities, identifies hidden patterns within organizational data, personalizes customer interactions, and enables continuous service innovation. More importantly, Artificial Intelligence acts as the mechanism that connects organizational capabilities with strategic business outcomes.

The empirical findings strongly support this central role of Artificial Intelligence. Across the different organizational contexts, participants consistently described AI as a strategic capability rather than simply a technological tool. Several organizations stated that "AI is at the centre of the company," while others highlighted that "AI brings value to the execution of customer implementation projects." Participants also emphasized that Artificial Intelligence is already "present in data processing," providing valuable support for analysing large volumes of organizational information and improving operational efficiency.

Another recurring theme was the contribution of AI to decision-making. Organizations repeatedly referred to its importance as "decision support," enabling faster and more informed strategic and operational decisions. At the same time, participants expressed a strong future-oriented perspective, recognising that Artificial Intelligence "has enormous future potential" and highlighting their ambition to "implement it as quickly and effectively as possible." These findings reinforce the view that organizations increasingly perceive AI as a strategic enabler capable of accelerating innovation and transforming the way value is created, delivered, and captured.

Rather than representing the final objective of transformation, Artificial Intelligence functions within the proposed framework as the engine that connects organizational capabilities, data resources, and ecosystem relationships, enabling the subsequent changes associated with business model transformation and continuous business model evolution.

4.4 Ecosystem Integration

The fourth dimension recognizes that contemporary business model transformation increasingly extends beyond organizational boundaries. Organizations rarely possess all the technological capabilities, knowledge, and resources required to successfully implement Artificial Intelligence independently. Consequently, collaboration with external actors becomes an essential component of organizational transformation.

Within the proposed framework, Ecosystem Integration refers to the organization's ability to establish collaborative relationships with customers, suppliers, technology providers, research institutions, startups, and other strategic partners. These relationships facilitate knowledge exchange, technological development, data sharing, and collaborative innovation, strengthening the organization's capacity to continuously improve its business model.

The empirical findings clearly demonstrated the importance of ecosystem collaboration across all organizational contexts. Several participants explained that they "work with partners throughout the value chain, particularly in the supply of ingredients, packaging, and distribution," highlighting that collaboration extends across multiple stages of value creation. Others emphasized that "without our suppliers, it would not be possible to deliver our value proposition in the same way," reinforcing the strategic role of external partners in sustaining organizational performance.

Participants also described partnerships as a critical enabler of Artificial Intelligence adoption and digital transformation. One organization stated that "our partners are fundamental," while another noted that "it would be very difficult to survive without this digital ecosystem." Collaboration with telecommunications companies, hardware providers, and technology partners was frequently identified as essential, particularly because it enables greater speed and scalability. Several organizations further highlighted that "this ecosystem already exists within the company, and without it we would face much greater difficulties in operating effectively."

Within the proposed framework, Ecosystem Integration therefore represents the mechanism through which Artificial Intelligence extends organizational capabilities beyond internal boundaries, enabling organizations to access complementary knowledge, technologies, and resources that support continuous innovation and business model transformation.

4.5 Business Model Transformation

Business Model Transformation represents the principal organizational outcome generated through the interaction of the previous framework dimensions. As organizations strengthen their human capabilities, develop robust data infrastructures, leverage Artificial Intelligence, and integrate collaborative ecosystems, they become capable of fundamentally redesigning how value is created, delivered, and captured.

Within the proposed framework, business model transformation encompasses changes to value propositions, customer relationships, revenue models, pricing strategies, operational processes, and service offerings. Rather than representing isolated organizational improvements, these changes collectively redefine the organization's competitive positioning and long-term strategic direction.

The empirical findings indicate that business model transformation is perceived as a continuous process rather than a one-time organizational change. One participant explained that "the changes happen through the continuous improvement that we constantly seek to introduce into our organization," emphasizing that transformation is an ongoing effort embedded in the organization's strategy and daily operations.

Consequently, business model transformation is conceptualized within the framework as a dynamic organizational capability, supported by Artificial Intelligence and continuously strengthened through organizational learning, innovation, and adaptation.

4.6 Business Model Evolution

The final dimension recognizes that business model transformation should not be interpreted as a finite process with a predefined endpoint. Instead, organizations continuously adapt their business models in response to technological developments, customer feedback, market dynamics, and organizational learning.

Business Model Evolution therefore represents the continuous refinement of organizational strategies, value propositions, and operational capabilities over time. Through ongoing data collection, Artificial Intelligence, and ecosystem interactions, organizations progressively accumulate knowledge that supports continuous innovation and organizational adaptation.

The empirical findings reinforce this perspective by showing that organizations are already planning future developments aligned with their strategic objectives. One participant highlighted the intention to "expand our portfolio of products and services," while another identified "introducing a subscription-based model" as a natural step in the company's evolution. Other organizations also described opportunities such as "introducing a material delivery service supported by a digital system that functions as a communication channel with the customer," illustrating how business model evolution is driven by the continuous search for new ways of creating and delivering value.

Consequently, Business Model Evolution closes the transformation cycle while simultaneously generating new organizational knowledge that feeds back into Human and Organizational Factors, Data Capabilities, and Artificial Intelligence, reinforcing the iterative and continuous nature of the proposed framework.

4.7 Relationships Between Framework Dimensions

The proposed conceptual framework should not be interpreted as a collection of independent dimensions, but rather as an integrated system in which each component contributes to and influences the overall business model transformation process. The relationships established between the six dimensions reflect the sequential yet iterative nature of organizational transformation, emphasizing that Artificial Intelligence creates value only when supported by complementary organizational capabilities and continuously reinforced through learning and ecosystem interactions.

The framework begins with Human and Organizational Factors, which constitute the foundation of the transformation process. Organizational culture, leadership commitment, employee competencies, digital readiness, governance, and change management create the conditions necessary for organizations to successfully adopt and leverage Artificial Intelligence. Without these organizational capabilities, technological investments alone are unlikely to generate sustainable business model transformation.

Building upon this organizational foundation, firms develop Data Capabilities, representing their ability to collect, integrate, manage, analyse, and exploit data generated across products, services, customers, and internal operations. Within the proposed framework, data represents the essential resource that enables Artificial Intelligence to function effectively.

Consequently, the relationship between Human and Organizational Factors and Data Capabilities reflects the organization's ability to establish the informational infrastructure required to support intelligent decision-making.

The interaction between Data Capabilities and Artificial Intelligence as a Transformation Engine represents the core relationship within the framework. Artificial Intelligence depends directly on the availability of reliable, high-quality, and continuously updated data. In return, AI transforms these data into actionable knowledge by identifying patterns, generating predictions, supporting decision-making, and enabling operational optimization. Rather than functioning as an isolated technology, Artificial Intelligence acts as the mechanism that converts organizational information into strategic value.

The framework subsequently extends beyond internal organizational processes through Ecosystem Integration. AI-generated knowledge enhances collaboration with customers, suppliers, technology providers, research institutions, and strategic partners by facilitating information sharing, collaborative innovation, and value co-creation. At the same time, ecosystem interactions continuously generate new organizational knowledge and additional data, reinforcing previous dimensions of the framework. Consequently, ecosystem collaboration should be understood both as an outcome of AI-enabled capabilities and as a source of continuous organizational learning.

These interactions collectively enable Business Model Transformation, where organizations redesign their value propositions, customer relationships, operational processes, pricing strategies, and revenue mechanisms. Business model transformation therefore emerges as the organizational consequence of successfully integrating organizational capabilities, data resources, Artificial Intelligence, and collaborative ecosystems. Rather than representing a single transformation initiative, it reflects the continuous reconfiguration of how organizations create, deliver, and capture value.

Finally, the framework culminates in Business Model Evolution, recognizing that transformation is not a finite process but an ongoing organizational capability. As organizations accumulate new data, strengthen ecosystem relationships, improve AI models, and continuously learn from customer interactions, they progressively refine their business models and adapt to changing market conditions. This final dimension closes the transformation cycle while simultaneously generating new knowledge that feeds back into

Human and Organizational Factors, Data Capabilities, and Artificial Intelligence, reinforcing the iterative nature of the framework.

Overall, the proposed framework should therefore be interpreted as a dynamic system of interconnected dimensions rather than a linear sequence of activities. Although each dimension performs a distinct role within the transformation process, their interactions collectively explain how organizations leverage Artificial Intelligence to continuously innovate, adapt, and evolve their business models. This integrated perspective constitutes one of the principal theoretical contributions of the present research.

5. Validation of the Proposed Framework

This chapter presents the validation of the conceptual framework proposed in the previous chapter. It describes the validation process adopted, explains how the framework was assessed through the empirical evidence collected from the participating organizations, and presents the resulting refinements that led to the final version of the framework.

5.1 Validation Method

To evaluate the proposed conceptual framework, a structured validation questionnaire was developed and distributed to the same participants from the four organizational groups involved in the initial qualitative research. By involving the same participants, the validation process benefited from respondents who were already familiar with the research topic, the objectives of the study, and the practical challenges associated with Artificial Intelligence and business model transformation. This approach ensured that the evaluation was supported by participants with relevant knowledge and practical experience in the subject under investigation.

The questionnaire was designed directly from the dimensions of the proposed conceptual framework, ensuring that each section evaluated one of the main components of the model. Respondents were asked to express their level of agreement with a series of statements using a five-point Likert scale, ranging from 0 (Strongly Disagree) to 5 (Strongly Agree). This scale enabled a straightforward assessment of the perceived relevance and consistency of each framework dimension.

In addition to the quantitative assessment, the questionnaire also included two open-ended questions aimed at collecting qualitative feedback regarding the completeness of the framework and identifying possible improvements or additional dimensions that should be considered. These open questions provided participants with the opportunity to complement the numerical evaluation with practical recommendations based on their professional experience.

The responses obtained through the questionnaire were analysed using descriptive statistics, including the average score obtained for each statement and for each framework dimension. The qualitative comments collected through the open-ended questions were analysed separately to identify recurring suggestions, complementary perspectives, and potential improvements to the framework. The combination of quantitative and qualitative feedback provided a comprehensive evaluation of the proposed conceptual framework, supporting its final validation and refinement

5.2 Human and Organizational Factors Validation

The Human and Organizational Factors dimension obtained an overall average score of 4.25 out of 5, indicating a high level of agreement among participants regarding its relevance within the proposed framework. The evaluation focused on the importance of organizational readiness, leadership commitment, employee competencies, and the organization's ability to adapt to technological change.

The respondents consistently recognized that successful AI adoption extends beyond technological implementation and depends heavily on organizational culture, employee capabilities, and management support. In particular, the statements related to workforce skills and organizational preparedness received strong agreement, reinforcing the assumption that AI initiatives require an appropriate organizational environment to generate meaningful business transformation.

These findings provide empirical support for positioning Human and Organizational Factors as the foundational dimension of the framework. The results suggest that organizations are unlikely to successfully exploit Artificial Intelligence without simultaneously investing in people, organizational learning, and change management processes. Consequently, the

validation confirms the literature's perspective that organizational capabilities constitute the necessary starting point for AI-enabled business model transformation.

5.3 Data Capabilities Validation

Among all framework dimensions, Data Capabilities achieved the highest level of agreement, with an average score of 4.75 out of 5. This result demonstrates a strong consensus among the respondents regarding the central role of data in enabling Artificial Intelligence and supporting business model transformation.

Participants consistently acknowledged the importance of collecting, managing, and analysing organizational data to support strategic decision-making, operational efficiency, and continuous organizational learning. High ratings were observed across all statements included within this dimension, suggesting that respondents perceive data not merely as an operational resource but as a strategic organizational asset.

The validation strongly reinforces one of the principal assumptions of the proposed framework: Artificial Intelligence cannot create value independently but relies on robust data capabilities as its primary source of knowledge. These findings further support the framework's structure, where Data Capabilities act as the bridge between organizational readiness and AI-driven transformation.

5.4 Artificial Intelligence as a Transformation Engine Validation

The Artificial Intelligence as a Transformation Engine dimension received an average evaluation of 4.62 out of 5, representing one of the highest-rated components of the framework. The results indicate a strong consensus that Artificial Intelligence plays a central role in supporting organizational transformation and business model innovation.

Respondents particularly agreed that AI enhances decision-making, improves operational efficiency, enables process automation, and facilitates the creation of new value propositions. Rather than being perceived solely as an operational technology, Artificial Intelligence was consistently evaluated as a strategic capability capable of influencing multiple aspects of organizational performance.

These findings directly support the central premise of this dissertation. The validation confirms that Artificial Intelligence should be understood as the transformation engine

connecting organizational capabilities, data resources, ecosystem collaboration, and business model innovation. The high level of agreement observed among respondents further strengthens the positioning of AI at the centre of the proposed conceptual framework.

5.5 Ecosystem Integration Validation

The Ecosystem Integration dimension achieved an overall average score of 4.25 out of 5, demonstrating that respondents recognize the importance of collaboration and external partnerships in supporting AI-enabled business model transformation.

The evaluation focused on the contribution of strategic partnerships, digital platforms, and collaborative networks to organizational innovation. Participants generally agreed that Artificial Intelligence extends beyond organizational boundaries by facilitating knowledge sharing, value co-creation, and collaboration among customers, suppliers, technology providers, and other ecosystem actors.

Although slightly lower than the technological dimensions, the results confirm that organizations increasingly perceive ecosystem collaboration as an important component of digital transformation initiatives. The findings therefore validate the inclusion of Ecosystem Integration as a complementary dimension within the proposed framework, highlighting the growing importance of collaborative innovation in AI-enabled business environments.

5.6 Business Model Transformation Validation

The Business Model Transformation dimension obtained an average score of 3.92 out of 5, representing the lowest average among the framework dimensions while still indicating a generally positive level of agreement. This result suggests that respondents recognize the relevance of business model transformation but also acknowledge that its implementation depends on organizational context, industry characteristics, and strategic priorities.

The evaluated statements addressed the influence of Artificial Intelligence on value propositions, customer relationships, pricing mechanisms, and organizational value creation. While participants generally agreed that AI contributes to business model innovation, responses exhibited slightly greater variation compared to the other framework dimensions.

This finding is consistent with the complexity of business model transformation described throughout the literature. Unlike organizational capabilities or data management practices,

business model transformation is inherently context-dependent and influenced by multiple internal and external factors. Consequently, the slightly lower average should not be interpreted as a limitation of the framework but rather as evidence that organizations experience different transformation pathways depending on their strategic context and digital maturity.

Overall, the results provide empirical support for the inclusion of Business Model Transformation as the final organizational outcome of the proposed framework while simultaneously reinforcing the iterative and context-specific nature of organizational transformation.

5.7 Business Model Evolution Validation

The Business Model Evolution dimension received indirect support through the overall validation results, reflecting the respondents' recognition that AI-enabled transformation is a continuous process rather than a one-time organizational change. Although no specific questions were exclusively dedicated to this dimension, several responses highlighted the importance of continuously adapting business models through data-driven decision-making, organizational learning, and Artificial Intelligence.

The consistently positive evaluations of the preceding framework dimensions-particularly Data Capabilities, Artificial Intelligence as a Transformation Engine, and Business Model Transformation-reinforce the idea that business model evolution emerges from the interaction of these capabilities. This finding supports the framework's assumption that organizations progressively refine their business models as they develop greater organizational maturity and AI capabilities.

Overall, the validation confirms the relevance of including Business Model Evolution as the final dimension of the proposed framework, emphasizing that AI enables organizations not only to transform their business models but also to continuously adapt and evolve them over time.

5.8 Overall Framework Evaluation

The overall evaluation of the proposed conceptual framework indicates a high level of agreement among the participating experts regarding its clarity, coherence, completeness,

and practical relevance. Across all evaluated dimensions, respondents consistently assigned positive scores, confirming that the framework adequately represents the key organizational factors influencing AI-enabled business model transformation.

As presented in Table 4, all framework dimensions achieved average scores above 3.9 on a five-point Likert scale. Data Capabilities received the highest evaluation (4.75), followed by Artificial Intelligence as a Transformation Engine (4.62), reinforcing the central premise of this research that data and Artificial Intelligence represent the primary enabling capabilities supporting business model transformation. Human and Organizational Factors and Ecosystem Integration both obtained an average score of 4.25, highlighting the recognized importance of organizational readiness, leadership, employee capabilities, and collaborative networks. Although Business Model Transformation received the lowest average score (3.92), respondents still expressed a high level of agreement regarding its inclusion within the framework, suggesting that business model transformation is inherently influenced by organizational context, industry characteristics, and digital maturity.

The qualitative feedback collected through the open-ended questions further strengthened these findings. Participants did not identify any missing dimensions or significant conceptual limitations, with responses such as "No", "None", and "The framework appears to be quite complete" demonstrating a broad consensus regarding the framework's completeness. Likewise, respondents did not propose substantial structural modifications, instead confirming the coherence of the relationships established between the different dimensions and the overall applicability of the framework.

From a Design Science Research perspective, the convergence between the quantitative evaluation and the qualitative feedback provides strong evidence of the conceptual robustness and practical relevance of the proposed artefact. Rather than identifying weaknesses requiring structural refinement, the validation process confirmed that the selected dimensions and their interrelationships adequately represent the mechanisms through which organizations leverage Artificial Intelligence to transform and continuously evolve their business models.

Table 4- Validation Summary

Expert Feedback Summary	
Additional Dimensions Suggested	None
Structural Modifications Proposed	None
Overall Perception	Comprehensive and Coherent Framework
Practical Applicability	Confirmed by Experts
Final Decision	Framework maintained without structural changes

Overall, the validation results support the proposed framework as a coherent and comprehensive conceptual model that successfully integrates the principal dimensions identified throughout the literature. The combination of high agreement scores and positive expert feedback provides confidence in the framework's potential to support both future academic research and managerial practice in the field of AI-enabled business model transformation.

6. Discussion

6.1 Discussion of the Main Findings

This research aimed to understand how Artificial Intelligence enables business model transformation and to develop a conceptual framework capable of explaining this process across different organizational contexts. The findings demonstrate that AI should be understood as a strategic organizational capability rather than simply as a technological innovation. Instead of generating value independently, Artificial Intelligence creates value through its interaction with organizational capabilities, data resources, ecosystem collaboration, and business model innovation.

The combination of the structured literature review, the qualitative research conducted with organizations, and the validation process confirmed the relevance of the six dimensions

proposed in the framework. The empirical evidence showed that successful AI adoption depends not only on technological investment but also on organizational readiness, the development of robust data capabilities, and collaboration with external partners. Together, these elements enable organizations to redesign how they create, deliver, and capture value.

Another important finding concerns the role of Artificial Intelligence as a transformation engine rather than the final objective of organizational change. The participating organizations consistently viewed AI as a capability that supports decision-making, improves operational efficiency, and enables continuous innovation. Consequently, business model transformation emerged as a continuous process driven by organizational learning, technological development, and the ongoing refinement of business strategies.

Overall, the proposed framework provides an integrated perspective of AI-enabled business model transformation by bringing together research streams that have traditionally been examined independently. This integration represents one of the principal outcomes of the research and provides a structured foundation for understanding the role of Artificial Intelligence in organizational transformation.

6.2 Answering the Research Questions

The research questions defined at the beginning of this dissertation guided the literature review, the development of the conceptual framework, and its empirical validation.

The first research question examined how Artificial Intelligence contributes to business model transformation across different organizational contexts. The findings demonstrate that AI acts as a strategic capability that supports organizational transformation through improved decision-making, process optimization, innovation, and the creation of new forms of value.

The second research question focused on identifying the organizational dimensions required to support AI-enabled business model transformation. The research resulted in a conceptual framework composed of six interconnected dimensions: Human and Organizational Factors, Data Capabilities, Artificial Intelligence as a Transformation Engine, Ecosystem Integration, Business Model Transformation, and Business Model Evolution.

The third research question explored the relationships between these dimensions. The findings confirmed that the framework operates as an integrated and iterative system in

which organizational readiness supports the development of data capabilities, enabling Artificial Intelligence and ecosystem collaboration to drive business model transformation and continuous business model evolution.

Finally, the fourth research question evaluated whether the proposed framework accurately represents the mechanisms through which organizations leverage Artificial Intelligence to transform their business models. The validation process confirmed the relevance and coherence of the framework, supporting its conceptual consistency and practical applicability across different organizational contexts.

Overall, the findings successfully address all research questions and demonstrate that the proposed framework provides a comprehensive representation of AI-enabled business model transformation.

7. Conclusions

7.1 Research Contributions

This dissertation contributes to the growing body of knowledge on Artificial Intelligence and business model transformation by proposing and validating an integrated conceptual framework that combines organizational capabilities, data resources, Artificial Intelligence, ecosystem collaboration, and business model innovation within a single model.

From a theoretical perspective, the study extends existing research by integrating concepts that have traditionally been analysed separately, including servitization, Digital Servitization, Artificial Intelligence, data capabilities, and ecosystem collaboration. The resulting framework provides a more holistic understanding of how these dimensions interact to support business model transformation.

From a methodological perspective, the research demonstrates the applicability of Design Science Research as a suitable methodology for developing and validating conceptual frameworks through the combination of a structured literature review, qualitative research, thematic analysis, and empirical validation.

From a managerial perspective, the framework offers organizations a structured tool for understanding the factors that influence AI-enabled business model transformation and may

support managers in assessing organizational readiness, identifying strategic priorities, and guiding future transformation initiatives.

7.2 Research Limitations

Although this research achieved its objectives, several limitations should be acknowledged.

First, the study adopted a qualitative approach involving a relatively small number of participating organizations. Consequently, the findings should be interpreted through analytical rather than statistical generalization.

Second, the organizations involved represent a limited range of industries and organizational contexts. Although this diversity contributed to the development of a broadly applicable framework, future studies involving additional sectors and geographical regions may provide further validation.

Finally, the proposed framework was validated through expert evaluation rather than practical implementation over time. Longitudinal applications of the framework would provide additional evidence regarding its effectiveness in supporting organizational transformation.

7.3 Future Research

The findings of this dissertation provide several opportunities for future research.

Future studies could quantitatively test the relationships proposed within the conceptual framework using larger organizational samples. Such research would allow the statistical validation of the framework and provide further evidence regarding the relative importance of each dimension.

Additional research could also investigate the applicability of the framework across different industries, organizational sizes, and geographical contexts. Comparative studies may contribute to a better understanding of how contextual factors influence AI-enabled business model transformation.

Furthermore, the rapid evolution of Artificial Intelligence technologies, particularly Generative AI, Large Language Models, and autonomous AI systems, offers opportunities to refine and extend the proposed framework. Future research may also explore the

framework as a practical managerial tool for assessing organizational AI readiness and supporting strategic decision-making.

7.4 Final Conclusions

Artificial Intelligence is reshaping how organizations create, deliver, and capture value. However, the findings of this research demonstrate that successful business model transformation depends on considerably more than technological adoption alone. Organizational readiness, data capabilities, ecosystem collaboration, and continuous learning all play fundamental roles in enabling Artificial Intelligence to generate sustainable organizational value.

Through the application of Design Science Research, this dissertation developed and validated a conceptual framework that integrates these dimensions into a coherent representation of AI-enabled business model transformation. The framework not only contributes to academic knowledge by bringing together previously fragmented research streams but also provides organizations with a structured perspective for supporting strategic transformation initiatives.

Ultimately, this research demonstrates that Artificial Intelligence should be viewed not simply as a technological resource, but as a strategic capability that enables organizations to continuously evolve their business models in increasingly digital and data-driven environments.

8. United Nations Sustainable Development Goals

This dissertation contributes to several of the United Nations Sustainable Development Goals (SDGs) by exploring how Artificial Intelligence can support organizational innovation and business model transformation. Although the primary objective of this research is to develop and validate a conceptual framework for AI-enabled business model transformation, its findings also promote more innovative, resilient, and sustainable organizational practices.

The research is particularly aligned with SDG 9 – Industry, Innovation and Infrastructure, as it proposes a framework that supports organizations in adopting Artificial Intelligence as a strategic capability to foster innovation, strengthen digital transformation, and improve

organizational competitiveness. By highlighting the role of data capabilities, organizational readiness, and technological integration, the framework contributes to the development of more resilient and innovation-driven organizations.

The dissertation also supports SDG 8 – Decent Work and Economic Growth by emphasizing the importance of organizational capabilities, employee skills, and continuous learning in enabling successful AI adoption. Rather than replacing human capabilities, the proposed framework highlights the complementary relationship between Artificial Intelligence and organizational competencies, promoting productivity, innovation, and sustainable economic growth.

Furthermore, the framework contributes to SDG 12 – Responsible Consumption and Production by demonstrating how Artificial Intelligence and data-driven decision-making can improve operational efficiency, optimize resource utilization, and support more sustainable business processes. Through better monitoring, predictive analytics, and informed decision-making, organizations can reduce inefficiencies and enhance the responsible use of resources.

Finally, the inclusion of Ecosystem Integration as one of the framework dimensions aligns with SDG 17 – Partnerships for the Goals, recognizing that collaboration between organizations, technology providers, research institutions, and other stakeholders is fundamental for accelerating innovation and enabling successful business model transformation.

Overall, this research contributes to the development of organizations that are more innovative, digitally mature, and capable of creating sustainable value through the strategic adoption of Artificial Intelligence.

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ANNEX A

TEMPLATE — FICHA TÉCNICA DE ARTIGO

Classificação Temática do Artigo (Muito Importante)

Tema Principal

- ☐ AI / AI Capabilities
 - ☐ AI as a Service (AlaaS)
 - ☐ Digital Servitization
 - ☐ Product → Service Business Model Transition
 - ☐ Business Model Innovation
 - ☐ Product-Service Systems (PSS)
 - ☐ Digital Transformation
 - ☐ Platform-based Business Models
 - ☐ Data-driven Business Models
 - ☐ Outro: _____
-

Tema Secundário (se aplicável)

- ☐ AI
 - ☐ Servitization
 - ☐ Business Model Innovation
 - ☐ Organizational Change
 - ☐ Value Creation
 - ☐ Strategic Management
 - ☐ Outro: _____
-

Grau de Alinhamento com a Minha Tese

- ☐ Muito alto (core article)
 - ☐ Alto
 - ☐ Complementar
 - ☐ Contextual
-

Foco do Artigo na Relação AI + Servitization

- ☐ Não relaciona
- ☐ Menciona AI mas não aprofunda
- ☐ Integra AI na transformação do modelo
- ☐ AI é elemento central da mudança

Identificação do Artigo

Referência completa (APA):

Autores (Ano). Título. Journal.

Journal Ranking / Qualidade (se relevante):

(Q1, ABS, etc.)

Tipo de artigo:

- ☐ Conceptual
 - ☐ Empírico qualitativo
 - ☐ Empírico quantitativo
 - ☐ Case study
 - ☐ Review
 - ☐ Mixed-method
-

Objetivo do Artigo

Qual é a pergunta central?

O que os autores estão a tentar explicar ou desenvolver?

Contexto do Estudo

Setor(es):

Tipo de empresa: (SME, multinacional, industrial, digital, etc.)

País/Região:

Nível de maturidade digital (se referido):

Conceitos-Chave Trabalhados

(Listar 5–10 principais conceitos)

Ex:

- Digital servitization
 - AI capabilities
 - Product-Service Systems
 - Business Model Innovation
 - Value co-creation
 - Platformization
-

Modelo / Estrutura Proposta no Artigo

O artigo propõe:

- ☐ Fases de transição
- ☐ Framework conceptual
- ☐ Modelo causal
- ☐ Dimensões analíticas
- ☐ Roadmap
- ☐ Nenhum modelo explícito

Descrever resumidamente a estrutura apresentada.

Drivers da Transformação

Segundo o artigo, o que desencadeia a mudança?

- ☐ Pressão competitiva
 - ☐ Commoditização do produto
 - ☐ Mudança nas expectativas do cliente
 - ☐ Digital disruption
 - ☐ Oportunidade tecnológica (AI, data)
 - ☐ Estratégia de crescimento
 - ☐ Outros: _____
-

Fases Identificadas (se existirem)

O artigo descreve um processo faseado?

Exemplo:

- 1.
- 2.
- 3.
- 4.

A transição é descrita como:

- ☐ Incremental
 - ☐ Radical
 - ☐ Iterativa
 - ☐ Não especificado
-

Capabilities Necessárias

Que capacidades são consideradas críticas?

- ☐ Data capability
- ☐ AI capability
- ☐ Digital infrastructure
- ☐ Organizational flexibility
- ☐ Strategic alignment
- ☐ Partnership capability
- ☐ Change management
- ☐ Cultura orientada a serviço

Outras mencionadas:

Mudanças no Business Model

O que muda segundo o artigo?

Value Proposition:

Revenue Model:

Customer Relationship:

Key Activities:

Cost Structure:

Partnerships:

Papel da AI no Artigo (Muito Importante)

A AI é apresentada como:

- ☐ Driver inicial da transformação
- ☐ Enabler da servitização
- ☐ Componente central do novo modelo
- ☐ Ferramenta operacional
- ☐ Mecanismo de escala
- ☐ Fonte de vantagem competitiva
- ☐ Não é foco principal

Descrever como é conceptualizada.

Barreiras e Desafios

- ☐ Resistência organizacional
- ☐ Falta de competências
- ☐ Complexidade tecnológica
- ☐ Investimento elevado
- ☐ Problemas de integração
- ☐ Falta de alinhamento estratégico
- ☐ Dependência de parceiros

Fatores Contingenciais

O artigo sugere que a transformação depende de:

- ☐ Setor
- ☐ Dimensão da empresa
- ☐ Maturidade digital
- ☐ Grau de internacionalização
- ☐ Cultura organizacional
- ☐ Estrutura de mercado

Metodologia do Artigo (se empírico)

- Número de casos / empresas:
- Método de recolha:
- Método de análise:

Isto ajuda-te depois na comparação metodológica.

Principais Contributos

Teóricos:

Práticos:

Limitações Identificadas pelos Autores

Muito importante para encontrares research gap.

O que este artigo acrescenta à minha tese?

(Resposta estratégica)

Exemplos:

- Ajuda a definir fases
- Ajuda a clarificar papel da AI
- Introduz conceito relevante
- Mostra lacuna na validação empírica

Citações Importantes (guardar para usar depois)

Copiar frases-chave com número de página.

ANNEX B

#	Author	Year	Title	Theme	Sector	AI Role	Business Model Type	Value Focus	Method	Limitations
1	Boucher & Medini	2016	Towards Meta-Modelling PSS Scenarios Modelling and Analysis	Meta-modelling	Multi	Low	Structured PSS	Integration and modelling	Conceptual	Lack of standardization
2	Cohen	2012	Product Performance Based Business Models: A Service Based Perspective	Performance-based contracts	Industrial	Medium	Pay-per-performance	Reliability and efficiency	Empirical / Models	Complexity and risk
3	Sudaryono	2024	Leveraging Artificial Intelligence for Innovative Technopreneurial Business Models	AI Business Models	Startups	High	Data-driven BM	Data as an asset	Taxonomy	Only startups
4	Zarrin	2019	Strategic Technology Planning in Product-Service Systems with Embedded Customer Experience Requirements	Roadmapping + CX	Industrial	Low	Product + Service	Customer experience	Conceptual	Lack of validation
5	Zinke-Wehlmann	2023	Simulating the Enhanced Value-Capturing by Using Digitalization in Monetary and Non-monetary Collaborative Networks	PSS Simulation	Digital Services	Medium	Digital PSS	Triple Bottom Line impact	Simulation	Assumption dependency
6	Nacem	2025	Artificial Intelligence enabled product-service innovation: past achievements and future directions	AI + PSI	Multi	High	AI-enabled Innovation	Innovation	Literature Review	No empirical evidence
7	Monroy	2024	Assessing the impact of digital service innovation (DSI) on business performance: the mediating effect of Artificial Intelligence (AI)	DSI + Performance	Industrial	Medium	Data-driven Services	Business performance	Quantitative	Cross-sectional data
8	Back	2021	Quality evaluation model of artificial intelligence service for startups	AI Service Quality	Digital Services	High	AI Services	User experience	Survey	Limited sample
9	Mihailović	2024	Collaborative servitization in service-oriented company: The case study of telco company	Collaborative Servitization	Telecom / ICT	Low	Ecosystem-based	Co-creation	Qualitative	Single case
10	Kohtamäki	2024	Conceptualizing digital business models (DBM): Framing the interplay between digitalization and business models	Digital Business Models	Multi	Medium	Digital BM	Conceptual structure	Bibliometric	Lack of consensus
11	Harrington	2016	Designing a 'concept of operations' architecture for nextgeneration multi-organisational service networks	Service Networks	Industrial	Low	Network-based	Integration	Conceptual	Limited validation
12	Mitake	2025	Digital Servitization Roadmapping: A Case Study of Well-Being and Productivity Management Service in the Construction Industry	Servitization Roadmap	Industrial	Low	Digital Servitization	Customer value	Case Study	Limited generalization
13	Manser Payne	2020	Digital Servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems	AI in Ecosystems	Digital Financial Services	High	AI-enabled Services	Value Co-creation	Conceptual	No validation
14	Sjödin	2021	How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops	AI Capabilities	Industrial	High	Data-driven BM	Scaling and transformation	Qualitative	Small sample
15	Kohtamäki	2019	Managing digital servitization toward smart solutions: Framing the connections between technologies, business models, and ecosystems	Smart Solutions	Industrial	Medium	Outcome-based	Customer value	Literature Review	Lack of empirical evidence
16	Chiu	2024	Integrating object detection and natural language processing models to build a personalized attraction recommendation agent in a smart product service system	AI Multimodal PSS	Tourism / Digital	High	Personalization	Recommendation	Experimental	Technical complexity
17	Kohtamäki	2025	Managerial practices shaping the transformation towards artificial intelligence-enabled product-service systems technologies, business models, and ecosystems	AI-enabled PSS Transformation	Industrial	High	AI-enabled PSS	Organizational transformation	Longitudinal	Single case

ANNEX C

Author(s); Title (Year)	Objective	Country	Methodology	Main Outcomes	Limitations	Future Research
R. Naem; M. Kohtamäki; V. Parida; Artificial intelligence enabled product-service innovation: past achievements and future directions (2025)	To systematically structure and analyse the literature on the role of Artificial Intelligence in Product-Service Innovation, identifying major research streams, theoretical developments, research gaps, and future directions.	Not applicable – international literature review	Bibliometric review using bibliographic coupling of 159 Scopus-indexed articles, supported by VOSviewer mapping and qualitative content analysis.	Identifies five research clusters: technology adoption and transformation barriers; data-driven capabilities; digitally enabled business model innovation; smart design and sustainability; and sectoral applications. AI enables new value propositions, personalization, automation, and data-driven decision-making.	Single-database dependence, possible selection bias, reliance on citation relationships, and a sample limited to publications available up to May 2023.	Cross-country and cross-industry comparisons, longitudinal studies, human-AI collaboration; ethical and organizational barriers; scalability of AI-enabled servitization; and research in less-explored sectors.
J. C. Monroy-Osorio; Assessing the impact of digital service innovation on business performance: the mediating effect of Artificial Intelligence (2024)	To examine the relationship between Digital Service Innovation, AI, and business performance, particularly whether AI mediates the effect of DSI on firm performance.	Spain	Quantitative empirical study using generalized structural equation modelling, combining SABIM firm data with a Qualtrics survey of Spanish manufacturing firms.	DSI has a direct positive impact on business performance and structural AI adoption. AI creates stronger value when strategically integrated with contextual customer-use and feedback data.	Geographically limited to Spain, focused mainly on medium-sized manufacturing firms, and based on cross-sectional data.	Test the model across countries, sectors, firm sizes, and B2B/B2C settings; use longitudinal designs and examine data quality, governance, digital maturity, privacy, and organizational capabilities.
J. Mihailović; B. Stojić; R. Milutinović; Collaborative servitization in service-oriented company: The case study of telco company (2024)	To investigate how a service-oriented telecommunications company develops Product-Service Systems and how collaboration contributes during idea generation, development, and go-to-market phases.	Serbia / international telecommunications context	Qualitative single-case study conducted in an international telecommunications organization, using interviews and case-based analysis.	Shows that service firms can expand into complex product-service bundles through collaboration with internal units, suppliers, technology partners, and customers. It identifies benefits, challenges, and five customer profiles based on willingness to participate in PSS development.	Single-company and single-sector case limits generalizability. Findings depend on the specific organizational and market context.	Conduct comparative studies across service industries and countries; test the customer profiles quantitatively; examine governance, partner selection, and collaboration over the full PSS lifecycle.
M. Kohtamäki; S. Leminen; V. Parida; Conceptualizing digital business models: Framing the interplay between digitalization and business models (2024)	To structure and conceptualize the Digital Business Model literature, clarify the interplay between digitalization and business models, and propose a future research agenda.	Not applicable – international literature review	Bibliometric and conceptual review of 101 studies from AJG3 and AJG4 journals, using clustering and qualitative synthesis.	Identifies four clusters: digital business model innovation, IoT business models, digital platform business models, and digital servitization. Digital technologies reshape value creation, delivery, and capture through platforms, ecosystems, AI, and smart solutions.	Restricted to highly ranked journals and therefore excludes relevant conference papers and other outlets. The study is conceptual rather than an empirical test.	Clarify DBM concepts; investigate antecedents, processes, and performance effects; study platform governance, ecosystem configurations, dynamic capabilities, AI, and longitudinal transformation processes.
T. S. Harrington; J. S. Srai; Designing a 'concept of operations' architecture for next-generation multi-organisational service networks (2023)	To develop a unified architecture for designing and operating complex multi-partner service networks supported by digital technologies.	United Kingdom / conceptual and industrial network context	Conceptual design study grounded in literature, network theory, and illustrative industrial service-network examples.	Proposes a Concept of Operations architecture that aligns partners, data, processes, governance, operating principles, and digital technologies to improve viability, coordination, agility, and customer experience.	Primarily conceptual, with limited large-scale empirical validation and dependence on selected network examples.	Empirically test the architecture across sectors; study governance, interoperability, data sharing, trust, cybersecurity, and performance measurement in digitally connected service networks.
Y. Mitake et al.; Digital Servitization Roadmapping: A Case Study of Well-Being and Productivity Management Service in the Construction Industry (2025)	To develop and demonstrate a roadmapping framework for planning digital servitization strategies that align customer value, digital capabilities, and organizational capabilities.	Japan	Design-oriented case study applying a digital servitization roadmapping framework in a mining and construction equipment manufacturer.	The framework supports systematic planning of digital services by connecting customer value propositions with technology, organizational change, partnerships, and implementation steps. The case demonstrates practical applicability.	Single-company case and context-specific application limit generalizability. Long-term performance effects were not fully assessed.	Apply and compare the framework in other industries; conduct longitudinal evaluations; study ecosystem coordination, capability development, sustainability outcomes, and implementation barriers.
E. H. M. Payne; A. J. Dahl; J. Peltier; Digital servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems (2021)	To develop a conceptual framework explaining how AI-enabled financial services influence value perceptions, customer engagement, and firm performance.	Not applicable – financial services conceptual context	Conceptual literature review integrating digital servitization, service-dominant logic, disruptive innovation, and AI literature.	Proposes a framework linking AI-service exchange antecedents, usage context, and consequences for customers and firms. It emphasizes trust, personalization, engagement, perceived value, and ecosystem relationships.	Conceptual paper without empirical testing and focused primarily on financial service ecosystems.	Empirically test the proposed relationships; examine trust, transparency, privacy, bias, adoption, customer vulnerability, human-AI interaction, and comparisons across financial-service settings.
D. Sjödin; V. Parida; M. Palmié; J. Wincent; How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops (2021)	To explain how industrial firms develop and scale AI capabilities to enable business model innovation.	Sweden / Nordic industrial context	Qualitative multiple-case study of manufacturing firms developing and scaling AI-enabled solutions, using interviews and process analysis.	Identifies co-evolutionary processes and feedback loops between AI technology, organizational capabilities, customer value propositions, and ecosystem relationships. Successful scaling requires experimentation, data access, cross-functional collaboration, and continuous business-model adaptation.	Limited number of industrial cases and geographical concentration restrict generalizability. The study focuses on early scaling processes.	Test the process model quantitatively and longitudinally; examine failure cases, ecosystem governance, AI monetization, data ownership, ethical issues, and differences across sectors and firm sizes.
M.-C. Chiu; C.-Z. Tsai; Y.-C. Huang; Integrating object detection and natural language processing models to build a personalized attraction recommendation agent in a smart product service system (2024)	To develop a Smart PSS method that integrates object detection and natural language processing to provide personalized attraction recommendations.	Taiwan	Design science and experimental case study. The system combines image-based object detection, NLP-based feedback analysis, recommendation logic, and iterative optimization.	Demonstrates that integrating image and text data enables more accurate customer profiling and real-time personalization. User feedback can continuously improve the recommendation service.	The experiment is limited to a tourism-attraction recommendation context and a specific dataset and user sample.	Validate the approach with larger and more diverse samples; compare alternative AI models; test other industries and examine privacy, explainability, real-time deployment, and commercial scalability.
Sudaryono et al.; Leveraging Artificial Intelligence for Innovative Technopreneurial Business Models (2024)	To analyze how startups integrate AI into innovative technopreneurial business models and compare them with traditional IT organizations.	Indonesia / international startup examples	Comparative and exploratory study based on literature, secondary data, and examples of AI-oriented startups and established technology firms.	AI-centered startups use automation, prediction, personalization, and scalable digital platforms to create differentiated value and attract investment. AI changes cost structures, revenue logic, and innovation speed.	Reliance on secondary data and illustrative examples, limited empirical depth, and rapidly changing startup conditions.	Use primary data and longitudinal startup studies; compare sectors and countries; examine financing, governance, ethical risks, workforce impacts, and long-term business-model sustainability.
M. Kohtamäki; T. Bräkke; R. Naem; D. Sjödin; V. Parida; Managerial practices shaping the transformation towards artificial intelligence-enabled product-service systems (2025)	To explore the managerial practices that support a manufacturer's transformation toward AI-enabled and increasingly autonomous Product-Service Systems.	Nordic industrial context	In-depth longitudinal single-case study of a leading manufacturer developing integrated and autonomous AI-enabled solutions.	Identifies managerial practices related to experimentation, capability building, data and technology integration, organizational coordination, customer engagement, and ecosystem partnerships. Transformation occurs through iterative alignment between products, services, software, and AI.	Single-case design limits generalizability, and the study spans multiple analytical levels, making causal separation difficult.	Conduct comparative and longitudinal studies; examine different PSS maturity levels, organizational structures, ecosystem roles, monetization approaches, AI governance, and barriers to autonomous solutions.
M. Kohtamäki et al.; Managing digital servitization toward smart solutions: Framing the connections between technologies, business models, and ecosystems (2022)	To frame how manufacturers can manage digital servitization toward smart solutions by aligning technologies, business models, and ecosystems.	Not applicable – international conceptual review	Conceptual and configurational literature review using smart mobility and moving vehicles as illustrative contexts.	Defines smart solutions as advanced product-service-software systems and proposes that transformation depends on coherent configurations of digital technologies, value-creation and revenue models, and ecosystem structures.	Conceptual framing with limited direct empirical validation and a strong focus on manufacturing and mobility-related illustrations.	Test alternative configurations empirically; study micro-macro ecosystem interactions, modularity, profitability, platform governance, institutional conditions, and the evolution of product-service-software offerings.
M. A. Cohen; Product Performance Based Business Models: A Service Based Perspective (2012)	To explain product-performance-based business models in which customers purchase access, use, availability, or outcomes rather than product ownership.	United States / international examples	Conceptual analysis supported by examples of servitization and performance-based service models.	Shows how manufacturers can align supplier and customer incentives through usage- or outcome-based contracts. These models encourage lifecycle optimization, reliability, service differentiation, and recurring revenues.	Mainly conceptual and based on illustrative cases; limited empirical testing of performance, risk allocation, and implementation conditions.	Investigate contract design, pricing, risk sharing, lifecycle data, customer adoption, profitability, and sector-specific conditions for performance-based models.
C. H. Baek; S.-Y. Kim; S. U. Lim; J. Xiong; Quality evaluation model of artificial intelligence service for startups (2021)	To develop a quality evaluation model for AI-based products and services that can be used by startups.	South Korea / France	Literature review and model development followed by an empirical customer-satisfaction survey involving AI speakers.	Develops seven quality dimensions and 24 evaluation items for AI services. The model captures AI-specific characteristics and helps startups assess customer satisfaction and service quality.	Validation is based on a single type of AI service and a limited customer sample, reducing generalizability.	Validate the model across AI service categories, cultures, and customer groups; refine dimension weights; and examine longitudinal links between AI service quality, trust, loyalty, and firm performance.
C. Zinke-Wehlmann; J. Friedrich; S. Frericks; A. Kluge; Simulating the Enhanced Value-Capturing by Using Digitalization in Monetary and Non-monetary Collaborative Networks (2023)	To examine how simulation can support prediction of social, economic, and ecological value capture in smart Product-Service Systems.	Germany	Use-case-driven Design Science Research using two exploratory cases and a simulation method for monetary and non-monetary collaborative networks.	Shows that simulation can make complex value flows visible and support comparison of alternative digital and AI-enabled service configurations before implementation.	Exploratory cases, simplified simulation assumptions, limited empirical validation, and uncertain transferability to other network structures.	Validate with real operational data; extend environmental and social indicators; model dynamic actor behavior; compare governance and revenue configurations; and apply the method across sectors.
S. Zanin; T. U. Daim; Strategic Technology Planning in Product-Service Systems with Embedded Customer Experience Requirements (2019)	To develop a strategic technology-planning approach for Product-Service Systems that integrates advanced technologies and customer-experience requirements.	United States	Conceptual and method-development study using technology roadmapping and structured planning techniques for PSS design.	Provides an integrated planning approach linking customer value, product and service functions, technologies, and long-term strategic decisions. It helps reduce siloed development and complexity.	Limited empirical validation, dependence on expert judgment, and a conference-paper scope.	Apply the approach in real industrial projects; compare sectors; integrate quantitative prioritization, AI, IoT, uncertainty analysis, and dynamic customer-experience data.
X. Boucher; K. Medini; Towards a generic meta-model for PSS scenarios modelling and analysis (2016)	To propose an iterative procedure for developing reusable generic meta-models for Product-Service System scenario modelling and analysis.	France	Conceptual and design-oriented modelling study that synthesizes existing PSS concepts and applies an iterative meta-modelling procedure.	Develops an initial generic PSS meta-model intended to improve reproducibility and support decision-making across different PSS modelling contexts.	The proposed meta-model is preliminary and requires broader validation. Some context-specific concepts may not be fully represented.	Validate and refine the meta-model through multiple industrial cases; develop supporting tools; test interoperability with existing modelling languages; and extend lifecycle, stakeholder, value, and sustainability dimensions.

Annex D - Transformação de Modelos de Negócio: O Papel da Servitização e da Inteligência Artificial - Empresas centradas na IA e agentes de transformação

O meu nome é Afonso Antunes e sou aluno do Mestrado em Inovação e Empreendedorismo Tecnológico na Faculdade de Engenharia da Universidade do Porto.

No âmbito da minha dissertação, encontro-me a desenvolver um estudo sobre a transformação dos modelos de negócio, em particular no contexto da servitização - ou seja, a transição de modelos centrados em produto para modelos orientados a produtos + serviços - e o papel da inteligência artificial como ferramenta complementar neste processo. Em concreto, o trabalho procura compreender de que forma a IA pode atuar como um elemento facilitador da criação de valor, permitindo novas formas de interação com o cliente, suportando modelos de receita inovadores e potenciando a integração em ecossistemas digitais.

A sua participação nesta entrevista tem como objetivo recolher perspetivas práticas e experiências reais que contribuam para a validação do framework desenvolvido no âmbito deste estudo. Importa salientar que todas as informações recolhidas serão tratadas de forma confidencial e utilizadas exclusivamente para fins académicos.

Agradeço desde já a sua disponibilidade e contributo para este trabalho. Caso tenha alguma dúvida ou pretenda obter mais informações, não hesite em contactar: up202302808@up.pt.

* Indicates required question

1. Nome da Empresa *

2. Cargo na Empresa *

3. Como descreveria a vossa **proposta de valor**? *

A **proposta de valor** sofreu alterações ao longo do tempo?

4. A vossa **proposta de valor** é baseada em **dados**? *

5. Na vossa empresa, a IA é: *

Mark only one oval.

☐

Central

☐

Complementar

☐

Nula

☐

Outra

6. Se seleccionou "**Outra**" na pergunta anterior, explique por palavras qual o papel da IA na vossa empresa

7. Qual o **problema** que resolvem e como é que medem o vosso **impacto**?

8. Que tipo de **soluções** desenvolvem? *

9. Como descreveriam os vossos **clientes**?

10. Que tipo de **ferramenta** usam na maior parte dos clientes? *

Mark only one oval.

- ☐ Análise de Dados
- ☐ Machine Learning
- ☐ Automação
- ☐ Outro

11. Se selecionou "**Outro**" na pergunta anterior, explique por palavras que ferramenta usam com a maioria dos clientes

12. Qual é o processo adotado quando adquirem um **novo cliente**? *

13. Que **áreas analisam** (operações, cliente, dados, receita)?

14. Como definem a **estratégia de transformação**? *

15. Como passam da **estratégia para a execução**? *

16. Qual a maior **dificuldade** que têm ao longo de todo o processo? *

17. Já exploraram o uso de **inteligência artificial**? *
Em que **áreas** acham que a **IA** poderia trazer-vos mais valor?

18. Quais são as **principais barreiras** à sua adoção (custo, conhecimento, proteção de dados)? *

19. Como transformam **dados em valor**? *

Que dados são mais **críticos**?

20. O vosso modelo é baseado em: *

Mark only one oval.

- ☐ SaaS
- ☐ Projetos/Contratos
- ☐ Híbrido
- ☐ Outro

21. Se seleccionou "**Outro**" na pergunta anterior, explique por palavras como operam com os clientes

22. Como definem **pricing**? *

23. O tipo de **dados** e a sua quantidade influenciam **pricing** ? *

24. Trabalham com múltiplos **parceiros**? *

De que forma são inseridos estes parceiros?

25. Existe colaboração com **empresas digitais ou tecnológicas**? *

Se sim, qual o seu papel?

26. O vosso modelo poderia funcionar **sem esse ecossistema**? *

27. Vêem **valor** em integrar-se num **ecossistema mais digital**? *

Que tipo de **parcerias seriam necessárias**?

28. Que **riscos** associam a essa transformação? *

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Annex E - Transformação de Modelos de Negócio: O Papel da Servitização e da Inteligência Artificial - Empresas que migraram para modelos de servitização

O meu nome é Afonso Antunes e sou aluno do Mestrado em Inovação e Empreendedorismo Tecnológico na Faculdade de Engenharia da Universidade do Porto.

No âmbito da minha dissertação, encontro-me a desenvolver um estudo sobre a transformação dos modelos de negócio, em particular no contexto da servitização - ou seja, a transição de modelos centrados em produto para modelos orientados a produtos + serviços - e o papel da inteligência artificial como ferramenta complementar neste processo. Em concreto, o trabalho procura compreender de que forma a IA pode atuar como um elemento facilitador da criação de valor, permitindo novas formas de interação com o cliente, suportando modelos de receita inovadores e potenciando a integração em ecossistemas digitais.

A sua participação nesta entrevista tem como objetivo recolher perspetivas práticas e experiências reais que contribuam para a validação do framework desenvolvido no âmbito deste estudo. Importa salientar que todas as informações recolhidas serão tratadas de forma confidencial e utilizadas exclusivamente para fins académicos.

Agradeço desde já a sua disponibilidade e contributo para este trabalho.
Caso tenha alguma dúvida ou pretenda obter mais informações, não hesite em contactar: up202302808@up.pt.

* Indicates required question

1. Nome da Empresa *

2. Cargo na Empresa *

3. Como descreveria a vossa **proposta de valor**? *
- A **proposta de valor** sofreu alterações ao longo do tempo?

4. A vossa empresa enquadra-se em alguma destas **transformações de modelo de negócio**? *

Mark only one oval.

- ☐ produto → serviço
- ☐ serviço → produto
- ☐ produto → produto+serviço
- ☐ serviço → produto+serviço
- ☐ Outro

5. Se seleccionou "**Outro**" na pergunta anterior, explique por palavras como se deu a transformação efetuada

6. O que motivou essa **mudança**? *

Como os **clientes** reagiram?

7. Que **mudanças** foram críticas? *

8. Que **riscos** associam a essa transformação? *

9. Houve adoção de **tecnologia ou dados** ao longo do tempo? *

10. Fazem algum tipo de **recolha de dados**? *

Qual o **método** de recolha desses dados (ferramentas de análise ou é mais intuitivo/manual)?

11. Caso tenha havido essa adoção, que **papel/utilidade** tiveram os **dados** que tinha recolhido durante esta transição?

12. Que **tipo de análise e com que frequência** tratam os dados que recolhem? *

13. Já exploraram o uso de **inteligência artificial**? *

Em que **áreas** acham que a **IA** poderia trazer-vos mais valor?

14. Quais são as **principais barreiras** à sua adoção (custo, conhecimento, proteção de dados)? *

15. Como mudou o **modelo de receita** e como definem **pricing**?

16. O vosso **modelo** é baseado em: *

Mark only one oval.

- ☐ SaaS
- ☐ Projetos/Contratos
- ☐ Híbrido
- ☐ Outro

17. Se seleccionou "**Outro**" na pergunta anterior, explique por palavras como operam com os clientes

18. Como medem o **valor entregue ao cliente**? *

19. Os **dados** influenciam **pricing ou retenção**? *

20. Estão satisfeitos com o vosso **modelo de negócio**? *

21. A **transformação** que sofreram, exigiu novos parceiros? *

22. Existe colaboração com **empresas digitais ou tecnológicas**? *

Se sim, qual o seu papel?

23. O vosso modelo poderia funcionar **sem esse ecossistema**? *

24. Vêem **valor** em integrar-se num **ecossistema mais digital**? *

Que tipo de **parcerias seriam necessárias**?

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Annex F - Transformação de Modelos de Negócio: O Papel da Servitização e da Inteligência Artificial - Empresas centradas no produto

O meu nome é Afonso Antunes e sou aluno do Mestrado em Inovação e Empreendedorismo Tecnológico na Faculdade de Engenharia da Universidade do Porto.

No âmbito da minha dissertação, encontro-me a desenvolver um estudo sobre a transformação dos modelos de negócio, em particular no contexto da servitização - ou seja, a transição de modelos centrados em produto para modelos orientados a produtos + serviços - e o papel da inteligência artificial como ferramenta complementar neste processo. Em concreto, o trabalho procura compreender de que forma a IA pode atuar como um elemento facilitador da criação de valor, permitindo novas formas de interação com o cliente, suportando modelos de receita inovadores e potenciando a integração em ecossistemas digitais.

A sua participação nesta entrevista tem como objetivo recolher perspetivas práticas e experiências reais que contribuam para a validação do framework desenvolvido no âmbito deste estudo. Importa salientar que todas as informações recolhidas serão tratadas de forma confidencial e utilizadas exclusivamente para fins académicos.

Agradeço desde já a sua disponibilidade e contributo para este trabalho.

Caso tenha alguma dúvida ou pretenda obter mais informações, não hesite em contactar:
up202302808@up.pt.

* Indicates required question

1. Nome da Empresa *

2. Cargo na Empresa *

3. Como descreveria o **valor principal** que o vosso produto oferece ao cliente? *

Esse **valor** está mais associado a **características físicas, qualidade, marca ou experiência?**

4. O **valor** termina no momento da venda ou prolonga-se após a compra? *

5. Existe algum tipo de **serviço associado ao produto** (apoio, manutenção, comunidade)? *

Já consideraram evoluir a proposta de valor para **incluir serviços ou resultados** (ex: performance do cliente)?

6. O que impediria essa **evolução**? *

Que **oportunidades** identificam nessa mudança?

7. Atualmente, recolhem dados sobre: *

Check all that apply.

- ☐ Comportamento do cliente
- ☐ Utilização do produto
- ☐ Feedback pós-venda
- ☐ Produção (número de peças produzidas, tempo de produção, defeitos)
- ☐ Outro

8. Se selecionou "**Outro**" na pergunta anterior, explique por palavras sobre que recolhem dados

9. Qual o **método de recolha** desses dados (ferramentas de análise ou é mais intuitivo/manual)? *

10. Que **papel/ utilidade** têm os dados no vosso modelo de negócio? *
Que **tipo de análise e com que frequência** tratam os dados que recolhem?

11. Já exploraram o uso de **inteligência artificial**? *

Em que **áreas** acham que a **IA** poderia trazer-vos mais valor?

12. Quais são as **principais barreiras** à sua adoção (custo, conhecimento, proteção de dados)? *

13. O vosso **modelo** utiliza modelos como: *

Check all that apply.

- ☐ Subscrição
- ☐ Pay-per-use
- ☐ Bundles produto + serviço
- ☐ Produto apenas
- ☐ Outro

14. Se seleccionou "**Outro**" na pergunta anterior, explique por palavras que modelo utilizam

15. Estão satisfeitos com o vosso **modelo de negócio**? *

16. Que **implicações** teriam ao mudar o modelo de receita? *

Isso **afetaria a relação com o cliente**?

17. Trabalham com **parceiros ao longo da cadeia de valor**? Se sim, em que fases? *

18. Existe colaboração com **empresas digitais ou tecnológicas**? *

Se sim, qual o seu papel?

19. O vosso modelo poderia funcionar **sem esse ecossistema?** *

20. Vêem **valor** em integrar-se num **ecossistema mais digital?** *

Que tipo de **parcerias seriam necessárias?**

21. O **modelo** sempre foi de venda de produto ou evoluiu? *

22. Caso tenha evoluído, que **mudanças** foram **críticas?**

23. Houve adoção de **tecnologia ou dados** ao longo do tempo? *

24. Pretendem continuar focados em **produto ou evoluir**? *

Já iniciaram alguma **mudança nesse sentido**?

25. O que seria necessário para evoluir para um modelo de **produtos + serviços, com maior utilização de dados**? *

Que **riscos** associam a essa transformação?

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Annex G - Transformação de Modelos de Negócio: O Papel da Servitização e da Inteligência Artificial - Empresas centradas no serviço

O meu nome é Afonso Antunes e sou aluno do Mestrado em Inovação e Empreendedorismo Tecnológico na Faculdade de Engenharia da Universidade do Porto.

No âmbito da minha dissertação, encontro-me a desenvolver um estudo sobre a transformação dos modelos de negócio, em particular no contexto da servitização - ou seja, a transição de modelos centrados em produto para modelos orientados a produtos + serviços - e o papel da inteligência artificial como ferramenta complementar neste processo. Em concreto, o trabalho procura compreender de que forma a IA pode atuar como um elemento facilitador da criação de valor, permitindo novas formas de interação com o cliente, suportando modelos de receita inovadores e potenciando a integração em ecossistemas digitais.

A sua participação nesta entrevista tem como objetivo recolher perspetivas práticas e experiências reais que contribuam para a validação do framework desenvolvido no âmbito deste estudo. Importa salientar que todas as informações recolhidas serão tratadas de forma confidencial e utilizadas exclusivamente para fins académicos.

Agradeço desde já a sua disponibilidade e contributo para este trabalho.
Caso tenha alguma dúvida ou pretenda obter mais informações, não hesite em contactar: up202302808@up.pt.

* Indicates required question

1. Nome da Empresa *

2. Cargo na Empresa *

3. Como descreveria o **valor principal** que o vosso serviço oferece ao cliente? *
- Como garantem a **entrega contínua de valor** ao cliente ao longo do tempo?

4. O **valor** está associado a **acesso, conveniência, performance ou resultados**? *

5. Existe algum tipo de **produto** associado ao serviço ? *
- Existe **personalização** na oferta?

6. Já consideraram evoluir a proposta de valor para incluir **produtos**? *
- O que impediria essa **evolução** e que **oportunidades** identificam nessa mudança?

7. Atualmente, recolhem dados sobre: *

Mark only one oval.

- ☐ Comportamento do cliente
- ☐ Utilização do produto
- ☐ Feedback pós-venda
- ☐ Outro

8. Se seleccionou "**Outro**" na pergunta anterior, explique por palavras sobre que recolhem dados

9. Qual o **método de recolha** desses dados (ferramentas de análise ou é mais intuitivo/manual)? *

10. Que **papel/ utilidade** têm os dados no vosso modelo de negócio? *
Que **tipo de análise e com que frequência** fazem aos dados que recolhem?

11. Já exploraram o uso de **inteligência artificial**? *
- Em que **áreas** acham que a **IA** poderia trazer-vos mais valor?

12. Quais são as **principais barreiras** à sua adoção (custo, conhecimento, proteção de dados)? *

13. O vosso **modelo** utiliza modelos como: *

Mark only one oval.

- ☐ Subscrição
- ☐ Pay-per-use
- ☐ Bundles produto+serviço
- ☐ Serviço apenas
- ☐ Outro

14. Se selecionou "**Outro**" na pergunta anterior, explique por palavras que modelo utilizam

15. Como definem **pricing**? Existe **diferenciação de planos**? *

16. Como medem o **valor entregue ao cliente**? *

17. Os **dados** influenciam **pricing ou retenção**? *

18. Estão satisfeitos com o vosso **modelo de negócio**? *

19. Que **implicações** teriam ao mudar o modelo de receita? *
Isso **afetaria a relação com o cliente**?

20. O serviço depende de outros **parceiros ou plataformas**? Se sim, em que fases? *

21. Existe colaboração com **empresas digitais ou tecnológicas**?
Se sim, qual o seu papel?

22. O vosso modelo poderia funcionar **sem esse ecossistema?** *

23. Vêem **valor** em integrar-se num **ecossistema mais digital**?
Que tipo de **parcerias seriam necessárias**?

24. O **modelo** sempre foi de serviço ou evoluiu? *

25. Caso tenha evoluído, que **mudanças** foram **críticas**?

26. Houve adoção de **tecnologia ou dados** ao longo do tempo? *

27. Pretendem continuar focados em **serviço ou evoluir**? *

Já iniciaram alguma **mudança nesse sentido**?

28. O que seria necessário para evoluir para um modelo de **produtos + serviços**,
com maior utilização de dados? *

Que **riscos** associam a essa transformação?

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Annex H - Validação de um Framework Conceptual sobre Inteligência Artificial e Transformação dos Modelos de Negócio

Este questionário tem como objetivo validar um framework conceptual desenvolvido no âmbito de uma dissertação de mestrado, baseada na revisão da literatura e na análise qualitativa realizada junto de empresas com diferentes modelos de negócio.

O framework procura representar a forma como as capacidades de dados, a Inteligência Artificial, os modelos de negócio, os ecossistemas de parceiros e os fatores humanos e organizacionais contribuem para a transformação digital e para a evolução dos modelos de negócio.

Solicita-se que avalie o seu grau de concordância com cada uma das afirmações apresentadas, utilizando uma escala de 1 (Discordo totalmente) a 5 (Concordo totalmente), tendo por base a sua experiência profissional e a realidade da sua organização.

Não existem respostas certas ou erradas. O objetivo é recolher a sua perceção sobre a adequação e relevância das diferentes dimensões propostas.

A participação é voluntária, as respostas são anónimas e serão utilizadas exclusivamente para fins académicos no âmbito desta investigação.

Tempo estimado de resposta: 5–7 minutos.

Muito obrigado pela sua colaboração.

* Indicates required question

Capacidades de Dados

1. A recolha sistemática de dados é essencial para a transformação do modelo de negócio. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

2. A monitorização contínua melhora a tomada de decisão organizacional. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

3. A análise de dados permite identificar oportunidades de criação de valor. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

Gestão da Inteligência Artificial

4. A Inteligência Artificial melhora a eficiência operacional. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

5. A Inteligência Artificial apoia a tomada de decisão. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

6. A Inteligência Artificial permite desenvolver novas formas de criação de valor. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

7. A Inteligência Artificial deve ser vista como um mecanismo de transformação organizacional e não apenas como uma ferramenta tecnológica. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

Ecossistema e Redes de Colaboração

8. As parcerias tecnológicas são fundamentais para a transformação digital. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

9. As plataformas digitais e os ecossistemas facilitam a adoção de soluções baseadas em IA. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

10. A colaboração com parceiros externos acelera a inovação. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

Transformação do Modelo de Negócio

11. Os dados e a IA influenciam a proposta de valor da organização. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

12. Os dados e a IA influenciam a relação com os clientes. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

13. Os dados e a IA influenciam os modelos de receita da organização. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

Fatores Humanos e Organizacionais

14. As competências dos colaboradores são determinantes para o sucesso da transformação digital. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

15. A resistência à mudança constitui uma barreira relevante à adoção de IA. *

Mark only one oval.

- ☐ 1- Discordo Totalmente
- ☐ 2- Discordo Parcialmente
- ☐ 3- Neutro
- ☐ 4 - Concordo Parcialmente
- ☐ 5 - Concordo Totalmente

Framework Desenvolvido



Questões Abertas

16. Existe alguma dimensão importante que considere estar ausente do framework?

*

17. Que alterações sugeriria ao framework proposto? *

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