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From Pipeline to Platform

-- The Evolution of Data-Enabled Business Models

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Abstract

In today's digital economy, data has become a key production factor. The traditional linear 'pipeline model' o f business (product-centric and characterized by one-way value flow) is increasingly transforming into a networked, ecosystem-oriented 'platform model.' This transformation not only affects internet-native firms but also reshapes traditional industries such as manufacturing, finance, and retail. However, existing studies often adopt a single theoretical perspective and lack a cross-industry, multi-level analytical framework to systematically explain the mechanisms through which data enables business model evolution. Based on a systematic literature review of resources from Web of Science, Scopus and CNKI databases from 2010 to 2025, this paper attempts to construct an integrative framework to reveal common pathways and differentiated strategies in data-enabled business model transformation, and to address ethical, governance, and sustainability challenges arising during the process. This paper reveals that successful transformation depends not only on technology adoption but also on strategic alignment across four levels. This integrates perspective addressed the fragmentation of existing theoretical viewpoints, laying a foundation for scholarly research while providing practical management guidance for traditional industries.

Keywords

Data-Enabled; Business Model; Platform Transformation; Systematic Literature Review; Integrative Framework.

1. Introduction

One of the most important strategic changes in the digital economy era is the transition of the pipeline model to the platform model. Data is frequently described as the new oil, however, it has yet to be theorized in terms of its potential to reshape corporate borders, value creation principles, and manufacturing organizations in a systematic and complete manner. The studies conducted previously have tended to address technology, strategy, or behavior dimensions in isolation, e.g., the predictive capacity of artificial intelligence alone, the network effects of platforms or organizational change, without sufficiently modelling the interdependencies between these variables[1,2]. It has led to a disconnect between the ideal of data-driven transformation and its real-world results, especially in conventional businesses that are not within the tech industry.

Examples of practical cases in cross-industry also support this transformational tendency: Haier now becomes a platform-based company having transformed itself into a traditional home appliance manufacturer with its 'COSMOPlat ecosystem that connects both upstream suppliers and downstream users with each other with the help of industrial data; and on the other side, Ant Group uses the information about the behavior of its users to streamline the risk management and individualized services and transform the model of financial services[3].

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These examples demonstrate that the movement of the so-called pipeline model (linear value chain) towards the so-called platform model (ecosystem collaboration, multi-party value co-creation) is not only not restricted to original Internet companies but has also turned out to be a shared practice in all traditional industries, including manufacturing, finance, and retail.

Nevertheless, there are three significant flaws in the existing research on this transformation. Firstly, disconnected theoretical views: certain investigations consider only the internet platforms, ignoring the traditional industries whereas other studies are based on a single theory, including the resource-based theory or the two-sided market theory and they do not elaborate the multidimensional interaction between data, organizations, and ecosystems[4,5]. Secondly, incomplete analytical models: most of the studies focus on one aspect (e.g. on data technologies or organizational cultures) yet fail to have an overall model that incorporates resources, mechanisms, capacities, and governance[6]. Thirdly, inadequate ethics and governance aspects: very few studies have explored these dimensions of data-driven transformation systematically, i.e., algorithmic bias, data monopolies, and stakeholder collaboration[3].

According to this paper, it can be stated that the shift between the pipeline model and the platform model is not an instantaneous technological jump but rather a multi-level reorganization process comprising the combination of data assets, the design of mechanisms, the development of capabilities, and the adjustment of governance. As a response to these gaps, this paper builds an integrated four-layer framework based on a systematic literature review with the purpose of responding to four main research questions (RQs).

- What are the main steps and fundamental processes of the transformation of a data-driven pipeline model into platform model?
- What is a multidimensional integration framework that may be used to explain the logic of this transformation in a systematic fashion?
- What are the similarities and discrepancies between the paths of transformation of traditional and native internet firms?
- What ethical issues and governance problems do they encounter when engaging in the process of change, and what are the effective ways to overcome them?

2. Literature Review

2.1. Data is a Fundamental Factor Influencing the Change of Business Models

According to research conducted across the world, the most advanced technologies like artificial intelligence (AI), the Internet of Things (IoT) and big data have been identified as key enablers shifting the business models. They completely change the way value is created as they facilitate data driven decision making, automated procedures and better customer experience [7]. AI has since become more than just an aid, an engine to strategy, allowing optimization of operations, prediction of market tendencies, and highly personalized interaction with clients, which leads to the development of data-oriented corporate paradigms [8].

Organizational transformation should be matched by technological change. The adoption of data-driven culture is also important because the company needs to fully embrace data and analytics in its decision-making process so as to improve the quality of management and organizational effectiveness [9]. Creating positions, including Chief Data Officer (CDO), can go a long way in ensuring that data strategy is aligned with the overall business strategy.

Regarding the aspect of data value extraction, the creation and membership in collaborative data ecosystems have been a major avenue. Fair and trustful data activities could enable organizations to increase their ability to innovate with data, eliminate data silos and cross-boundaries innovations [3].

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In order to realize systematic transformation, businesses may choose to adopt certain data-driven innovation models, like transformation models that help to ensure the transition between the product-oriented and service-oriented mindsets via collaborative value innovation or customer-focused innovation, and so on [10].

Both business intelligence and analytics (BI&A) systems improve managers' decisions through the provision of deep and prompt information on businesses and help to develop a data-driven mindset in organizations [9].Maturity models can be used by organizations to evaluate their capabilities and come up with roadmaps that may help them migrate over to data-driven business models [5].

2.2. From Pipeline to Platform: Evolutionary Pathways and Mechanisms

The transformation process usually takes place in three steps, i.e., establishment step (infrastructure building, attracting the first customers), platform implementation (functionality extension and growth of the customer base, integration of value creation mechanisms), and ecosystem activation (developing as a holistic ecosystem that enables multi-parties exchange of values) [1].

The main mechanisms are: servitization and value co-creation, network connectivity (network effect) and platform architecture design (enabling a variety of interactions) [2,4]. The critical success factors are: internal digital transformation and innovation culture, specific accurate strategic decisions (platform design, user rewards), and efficient user acquisition strategies [1,2].

The greatest issues are found when it comes to integrating business models including synergy of pipeline and platform components [6], and a fundamental change in digital mindset and capability.

The platform design must be dynamically flexible to changing conditions and demands of users, and cross industry partnership is equally essential to spur innovation as well as efficacy of the ecosystem.

3. Theoretical Framework: A Four-Layer Analytical Model

The study builds on the existing literature on the systematic review of literature by suggesting a four-layer analytical framework (as shown in Figure 1) that will deconstruct internal logic and paths associated with the evolution of data-enabled business models in terms of the shift between pipeline to platform. The framework will conceptualize the transformation process in four dimensions (interrelated and progressively advanced):

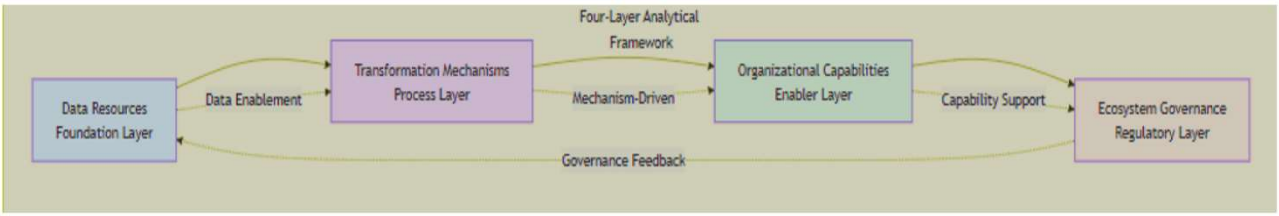

Figure 1. Four-Layer Analytical Framework

- Data Resources Layer (Foundation): The physical and digital basis of transformation, including data assets within the organization, external data acquisition capabilities, data infrastructure, and data governance maturity.
- Layer Transformations (Process) : The central processes and interactive logic that determine the development, major mechanisms include, but are not limited to servitization, value co-creation, network effects activation, and platform architecture design.

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- Organizational Capabilities Layer (Enabler): Internal enablers that help in the achievement of transformation are data-driven culture, strategic leadership, dynamic capabilities, digital talent, and collaborative processes.
- External Coordination and Regulation System (Regulatory): External regulation and coordination mechanisms that provide sustainable and responsible change, including platform governance mechanisms, stakeholder coordination, ethics, compliance with data laws, and ecosystem co-governance.

4. Case Studies and Empirical Research on Data-Driven Business Model Transformation

Amazon is one of the best examples of how a company may evolve over a period becoming a pipeline to a platform business model. Originally, Amazon was like any other retailer and sold books directly to people. Gradually, it became a marketplace as it developed the Amazon Marketplace where independent sellers could market and sell goods. The move enabled Amazon to grow the size of its operations exponentially because of the network effects associated with its platform [4,11].

4.1. Key Aspects of Amazon's Platform Model

- Openness: The platform of Amazon is opened to the third party seller; increasing the range of goods offered to the customers and adding more value to the whole platform.
- User Attraction Strategy: With a significant variety of products and competitive pricing rates, Amazon attracts plenty of users, which later leads to having more sellers creating a positive feedback loop 1.
- The acquisitions of technology: Among the strategic acquisitions made by Amazon in order to improve the capacity of its platform is the purchase of Whole Foods which will combine the experience of physical and digital retailing 1.

4.2. Data-Driven Business Model

The platform offered by Amazon is also very data-driven. Data is used by the company to optimize its supply chain, customize its customer experience and recommend a product. This data-oriented attitude is not just efficient in terms of operations but also in terms of customer happiness and brand loyalty[4,12].

- Scalability: In the platform model, Amazon is able to scale their operations without growing their costs proportionally since the cost of the inventory and logistics are borne by a third party seller [4,11].
- Network effects: The value of the platform increases as the number of users and sellers on the network rises, and this creates a self-enforcing cycle of growth [4,13].
- Innovation: Amazon is always innovative with its services by utilizing both data and technology, including the launch of Amazon Web Services (AWS) which has since grown to be one of the key sources of revenue [4,12].

4.3. Challenges and Synergies

The shift between a pipeline and a platform model presents various issues, including the management of the complexity involved in running platforms and the need to address the issue of data privacy and security. Nevertheless, the advantages that are derived through the transition, including more extended coverage of the market and improved customer interaction, are usually more beneficial compared to these challenges[6,12].

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5. Summary

The present research is building an integrated analytical model of the multi-level analysis that will help to systematically review and reveal the internal mechanisms and transformation paths under which data causes the changing of business models starting with pipeline to platform. The research begins on the basis of theoretical background of data being a strategic asset and examines the three main phases and fundamental mechanisms of movement between "pipeline" and "platform". It also examines, across industries, how data can be used to redesign more particular procedures like R&D, manufacturing, and marketing.

On the aspect of innovation, the given study makes breakthroughs in several aspects. Theoretically speaking, it synthesizes various viewpoints, namely, the resource-based approach, dynamic capabilities concept, and two-sided market concept to form an all-encompassing framework covering both the areas of data resources, transformation mechanisms, organizational capabilities, and ecosystem governance. In terms of the scope of research, it goes further than the prior emphasis on the phenomenon of internet platform businesses, extending to more conventional industries, i.e., manufacturing, finance, and retail, and showing similarities as well as discrepancies in cross-industry transformation. It is methodological in nature because it systematizes the review and critical assessment of applicability and constraints of research approaches including case studies, empirical analysis, and simulation modeling. In terms of problem orientation, it foresees the future consideration of the ethical and social concerns of algorithmic bias, data monopolies, and governance of ecosystems, and suggests changing the research paradigm into a composite one of a technology-governance-society viewpoint. In practical terms, it does not just supply theoretical interpretation but also constructs a tool-oriented model that may serve in the diagnosis, assessment, and planning of the process of digital transformation, presenting the sources of corporate strategy development and policy formulation.

The current paper explores the topic in question through a systematic literature review and a comparative analysis thus enhancing the knowledge concerning the role of data in the evolution of a business model. It is an academic contribution that has a theoretical dimension as well as practical insight into the changes in traditional businesses, platform control, and sustainability in the digital age.

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