

Navigating Digital Transformation: Agile Leadership and Strategic Flexibility in Mid-Sized Manufacturing Firms

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Abstract

This study explores the strategies employed by mid-sized manufacturing firms to leverage digital technologies and harness the vast amounts of data associated with them. It examines the impact of digital transformation on various aspects of firms' operations, including product development, manufacturing processes, product sophistication, and value chain integration. Through an analysis of typical stages in the digital transformation journey, the research aims to assess the significance of agile leadership and strategic flexibility in facilitating this transformation. Findings indicate that agile leadership plays a pivotal role in driving successful digital transformation initiatives. Additionally, strategic flexibility, fostered through workforce transformation and dynamic capability, emerges as a crucial factor in enabling digital transformation. The study highlights the importance of swift leadership responses and adaptable strategies in ensuring the success of digital transformation endeavours.

Furthermore, the study reveals a distinction between mature and less mature digital businesses in their approach to technology integration. Mature digital businesses prioritize the seamless integration of digital technologies, such as social, mobile, analytics, and cloud, to transform their operational frameworks. Conversely, less mature digital businesses tend to focus on addressing isolated business challenges through individual digital technologies.

Introduction

In recent years, a surge in companies adopting digital transformation strategies has been witnessed, marking a significant shift in how businesses create value. This adoption is driven by the recognition of potential advantages such as enhanced efficiency and alignment with customer needs in products and services. Moreover, digital transformation promises a reduction in innovation cycles, faster time-to-market, and the creation of interconnected digital ecosystems. Notably, it facilitates cross-industry collaboration, fostering a more integrated business landscape (Correani, et al., 2020).

CEOs across various industries are increasingly concerned about the impact of the digital revolution on their organizations. However, the dominance of established manufacturing firms, traditionally reliant on vertical integration and technological prowess, has not been significantly challenged (Rossini, et al., 2021). Yet, for these firms to harness the benefits of digital technologies and data, a strategic reevaluation is imperative. While the adoption of new digital technologies is essential, success hinges on the effective utilization of these tools, redefined operational processes, and the creation of novel value propositions (Fachrunnisa, et al., 2020).

Despite the prolonged discourse on digital transformation, a comprehensive approach to digitally transforming business models remains elusive. Key questions regarding the phases, instruments, and enablers of this transformation persist (Egger & Park, 2018). The amalgamation of digital transformation and business model innovation is pivotal in delineating the path toward practical application and understanding the transformative potential of digital technologies in business operations.

The term “digital transformation,” often used interchangeably with “digitization,” has gained prominence, particularly among practitioners. It underscores the profound impact of digital technologies on businesses, encompassing the digitization of sales and communication channels, as well as products and services. Consequently, companies are compelled to revamp their organizational structures and executive roles to adapt to these evolving trends (Haffke, et al., 2016).

Digital innovation necessitates fundamental shifts in strategy, processes, and products, prompting organizations to reconsider their operational paradigms. A well-defined digital transformation strategy encompasses vision, planning, and implementation, catalyzing organizational change (Berghaus & Black, 2016). However, navigating digital transformation is complex, involving multiple stakeholders and diverse areas within the organization. Establishing a shared understanding of digital transformation priorities is crucial for successful execution and organizational alignment (Haffke, et al., 2016).

The integration of digital technologies, internet capabilities, and social media platforms empowers enterprises to enhance innovation and expand market reach globally (Fachrunnisa, et al., 2020). Executives are leveraging analytics, mobility,

and social media alongside traditional technologies like ERP systems to redefine customer relationships and internal processes. Effective leadership is pivotal in synergizing digital initiatives with organizational transformation (Battistoni, et al., 2023).

Despite the potential benefits, the failure rate of digital transformation projects remains alarmingly high, with over two-thirds reportedly unsuccessful (Correani et al., 2020). Effective strategy implementation emerges as a critical factor in mitigating failures, underscoring the importance of execution over formulation. General Electric’s (GE) struggle to execute its digital transformation strategy serves as a poignant example, highlighting the significance of robust implementation processes. In contrast, CNHi’s successful digital transformation journey, supported by Microsoft, serves as a beacon of effective strategy implementation (Correani, et al., 2020).

This case study exemplifies the synergy between strategy formulation and implementation, underscoring the pivotal role of consistency in driving successful digital transformation initiatives. Drawing insights from CNHi’s experience alongside Microsoft, this research study aims to delineate a model for effective digital transformation strategies.

In essence, as businesses navigate the complexities of digital transformation, a holistic approach encompassing strategy formulation, robust implementation, and organizational alignment is imperative to realize its transformative potential and drive sustainable growth.

Research Project Scope

The current operational processes within mid-sized manufacturers are facing inefficiencies exacerbated by technical challenges stemming from a lack of knowledge and resources. Consequently, there is a pressing need for operational transformation across manufacturing, engineering, and the supply chain to ensure the enterprise’s sustained success amidst the current pandemic and beyond (Rossini, et al., 2021).

This research project aims to delineate a comprehensive digital transformation model that interconnects various operational facets, including manufacturing, engineering, and the supply chain. The study is supported by the research grant obtained from NSERC, specifically allocated to investigate

the disruptive changes catalyzed by the pandemic and devise strategies to navigate these challenges effectively.

Digitalization heralds the advent of the fourth industrial revolution, following the eras of steam engines, electricity, and computerization (Bjorkdahl, 2020). While efficiency gains are a common pursuit, the focus must shift towards leveraging digitalization to unlock new value propositions for manufacturing firms.

Key objectives of the research project include:

- Identifying practices, capabilities, and strategies to create and capture value through digitalization.
- Understanding that the adoption of digital technologies is a prerequisite for digital transformation, but success hinges on their effective utilization, data management, and innovative value creation.
- Emphasizing the need for novel approaches in sensing, shaping, and seizing digitalization opportunities.
- Highlighting the risks associated with inadequate control over digitalization endeavours, underscoring the importance of aligning practices, strategies, and organizational structures.
- Recognizing the transformative potential of digitalization across the firm's products and inbound and outbound activities.
- Acknowledging that transitioning from analog to digital formats not only enhances internal efficiency but also adds value for customers.

The anticipated outcomes of digitalization encompass streamlined product development processes, cost-effective

manufacturing operations, the delivery of highly refined products and services, and the integration of value chains for enhanced competitiveness (see Figure 1).

Research Objectives

The first category of research objectives is business operations and processes.

1. **Enhancing Digital Processes:** Investigate solutions to digitize manufacturing processes for improved information accessibility and communication, enhancing both B2B and B2C experiences. This involves identifying technologies and strategies to streamline internal operations and optimize customer interactions (Erbay & Yildirim, 2022).
2. **ERP System Evaluation:** Provide comprehensive research to facilitate decision-making regarding an Enterprise Resource Planning (ERP) system that is cost-effective and timely to implement. This involves assessing the organization's requirements, evaluating available ERP solutions, and recommending a suitable system aligned with the company's objectives and budget constraints.
3. **Software Tools Implementation:** Assist in researching and implementing new software tools to manage various aspects of the business, including safety protocols, training programs, supply chain management, and database solutions. This involves identifying suitable software solutions, customizing them to meet specific business needs, and ensuring seamless integration with existing systems.

The second category of research objectives relates to customer interface.

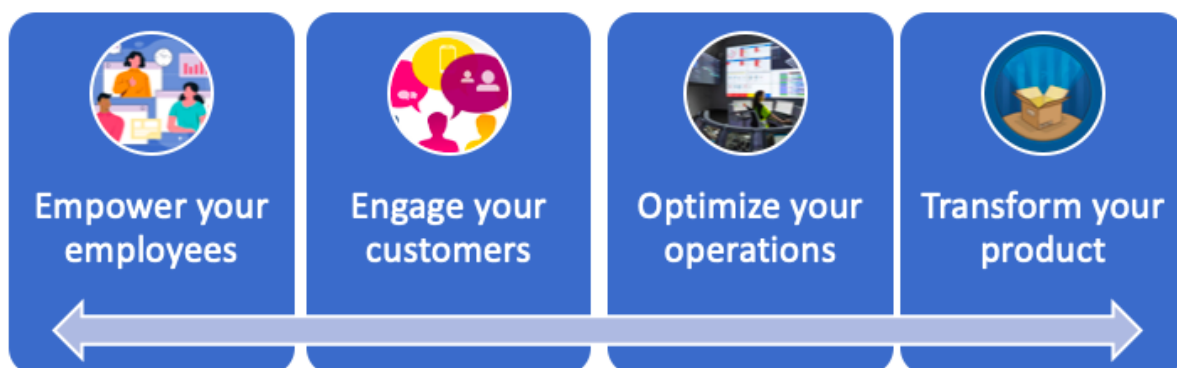


Figure 1: Digital Transformation, Systems of Intelligence

4. **CRM System Optimization:** Explore solutions to enhance the Customer Relationship Management (CRM) system, focusing on better management of marketing strategies and organic lead generation. This includes evaluating existing CRM platforms and proposing enhancements or alternative systems to improve customer engagement and sales effectiveness.
5. **Digital Visibility and Engagement:** Examine strategies to increase the company's visibility and enhance customer engagement through digital channels such as social media, Search Engine Optimization (SEO), and Google Analytics. This includes developing tailored digital marketing strategies and leveraging analytics tools to optimize online presence and customer interactions.

Product Development

The digitalization of product development reduces the need for physical trial products and simplifies design processes through advanced computer-based tools and Artificial Intelligence (AI) applications (Erbay & Yildirim, 2022). Leading manufacturing firms have leveraged AI since 2017 to enhance the effectiveness, efficiency, and cost-effectiveness of product development processes.

Manufacturing

Digitalization enables intelligent manufacturing processes, leading to increased throughput, improved quality, reduced variance, and minimized breakdowns (Jones, et al., 2021). Advanced computer visualization systems, powered by machine learning algorithms, facilitate defect detection and reduce the need for manual quality checks. Additionally, digital twins optimize production settings and enable predictive maintenance, enhancing operational efficiency.

Highly Developed Products and Services

Integration of digital technologies enables firms to gather data on products and applications, facilitating the provision of innovative services and direct sales to end-users (Favoretto, et al., 2022). Digitalization enhances communication between firms and customers, amplifies revenue streams, and drives strategic service innovations.

Integrated Value Chains

Digitalization fosters the integration of value chains, improving coordination, visualization, and planning of critical processes (Bjorkdahl, 2020). Leading firms leverage digital interfaces and AI-powered procurement channels to optimize material

control and reduce inventories. Digitalization enables transparent tracking of activities across the value chain, enhancing operational control and efficiency.

Deliverables

1. **SWOT and PESTEL Analysis:** Conduct research and analysis using SWOT and PESTEL frameworks to identify internal strengths and weaknesses, as well as external opportunities and threats faced by the manufacturer.
2. **Supply Chain Evaluation:** Assess current supply chain issues and system effectiveness, providing recommendations for improvement or implementation of new systems to enhance efficiency and decision-making.
3. **Expanded Social Media Presence:** Establish additional social media platforms to expand the company's reach and engage with potential customers, increasing brand visibility and awareness.
4. **SEO Enhancement and Content Calendar:** Improve SEO ranking through optimization strategies and implement a content calendar to ensure consistent and relevant content distribution across digital channels.

Technical Requirements

Ensure access to necessary information from online sources and key individuals within the manufacturer's organization to facilitate research and analysis effectively. Utilize both online research tools and direct communication channels to gather essential data and insights for the project.

SWOT and PESTEL Analysis SWOT Analysis

The SWOT Analysis serves as a comprehensive tool to evaluate the internal strengths and weaknesses, as well as external opportunities and threats, influencing decision-making within a company. An examination of these factors provides valuable insights into the current business landscape at the B2B manufacturer studied, a Canadian manufacturer with three hundred employees. The analysis was arrived at following interviews with the executive team, a review of the communications available about the enterprise, and a study of the industry sector.

Table 1: SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
Effective communication enhances outreach and customer engagement	Holds a strong competitive position as a leading manufacturer.	Enhance user experience and engagement among bilingual audiences.	Failure to digitize processes results in customer attrition
Active website and social media presence improve visibility and accessibility to customers.	Enjoys a favourable reputation bolstered by leadership and a track record of excellence.	Organizing and tailoring content fosters increased engagement, customer retention, and satisfaction.	Irrelevant content across digital platforms risks alienating customers
Holds a strong competitive position as a leading manufacturer.	Effective market research initiatives yield diverse product offerings, industry insights, and a robust distributor network.	Introduction of new products aligned with evolving customer needs presents opportunities for market expansion and revenue growth.	Shifts in labour force dynamics pose operational challenges
Enjoys a favourable reputation bolstered by leadership and a track record of excellence.	Boasts commendable safety ratings evidenced by decreasing injury rates, reinforcing commitment to employee welfare.	Growing demand for eco-friendly options presents avenues for product diversification and market capture.	Exposure to foreign exchange fluctuations in global markets
Effective market research initiatives yield diverse product offerings, industry insights, and a robust distributor network.		Anticipated rise in demand for bearing products offers prospects for revenue expansion and market dominance.	Intensifying competition necessitates proactive strategies
Boasts commendable safety ratings evidenced by decreasing injury rates, reinforcing commitment to employee welfare.			

PESTEL Analysis

The PESTEL Analysis evaluates macro-environmental factors impacting company performance, encompassing Political, Economic, Social, Technological, Environmental, and Legal

dimensions. This analysis was arrived at following interviews with the executive team of the Canadian manufacturer studied, a review of the communications available about the enterprise, and a study of the industry sector.

Table 2: PESTEL Analysis

Political Factors	Economic Factors	Social Factors	Technological Factors	Environmental Factors	Legal Factors
COVID-19 Restrictions	Foreign Exchange Fluctuations	B2B Focus	AI and Machine Learning Adoption	Energy Efficiency Demand	Climate Change Regulations
Trade Tariffs	Interest Rate Changes	Regional Sales Concentration	E-commerce Growth	Renewable Energy Adoption	Trade Law Changes

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Political Factors	Economic Factors	Social Factors	Technological Factors	Environmental Factors	Legal Factors
Fiscal Policy Changes	Pandemic Impact	Emerging Market Opportunities	Electric Vehicle Demand		
	Supply Chain Disruption		Digital Currency Trends		

Summary of PESTEL Analysis

The PESTEL Analysis highlights the interplay of government policies, economic trends, societal shifts, technological advancements, environmental concerns, and legal frameworks shaping company operations and strategic decisions.

Government incentives aimed at promoting environmentally friendly digital initiatives present cost-saving opportunities for the company. Additionally, digital strategies require organizational buy-in and customer acceptance to ensure effective implementation and adoption. Moreover, COVID-19 serves as a catalyst for accelerating digital transformations within the company, emphasizing the imperative of agility and resilience in the face of external disruptions.

Stakeholder Analysis

Stakeholders for the manufacturer encompass a diverse range of entities with vested interests in the company's operations and outcomes (see Figure 2).

Manage Closely

Partners: Investors and shareholders who have financially invested in the firm play a critical role in decision-making processes and expect returns on their investments (Dosi, et al., 2020). Ensuring transparent communication and fostering trust with partners is essential for maintaining long-term relationships and securing continued investment.

Suppliers: Suppliers contribute significantly to the availability and quality of products, making them vital stakeholders in the manufacturer's value chain (Blackhurst, et al., 2018). Establishing strong supplier relationships and ensuring timely communication are essential for maintaining operational efficiency and reliability.

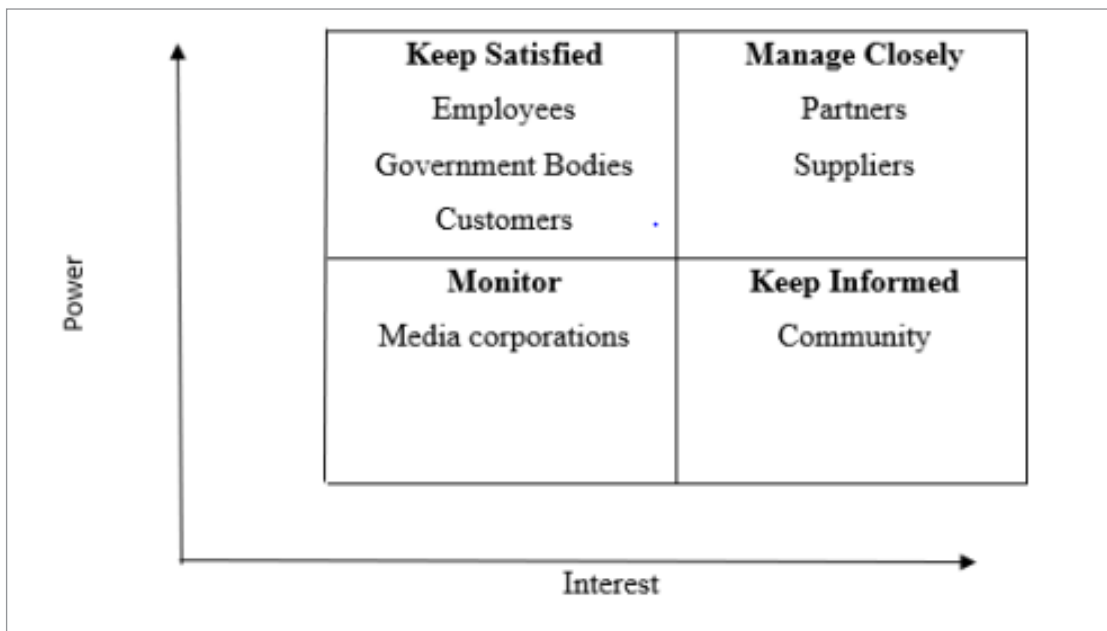


Figure 2: Stakeholders

Keep Satisfied

Employees: The success of the manufacturer relies heavily on the dedication and contributions of its workforce (Deery & Jago, 2015). Providing a supportive work environment, opportunities for skill development, and fair compensation are crucial for employee satisfaction and retention.

Government Bodies: Compliance with legal and regulatory requirements is imperative for the manufacturer to operate ethically and avoid penalties (Czarnitzki, et al., 2019). Building positive relationships with government agencies through adherence to regulations and proactive engagement helps mitigate risks and ensures continued business operations.

Customers: Meeting customer needs and expectations is paramount for sustaining business growth and profitability. Engaging with customers to gather feedback, address concerns, and deliver value-added solutions fosters loyalty and long-term relationships (Favoretto, et al., 2022).

Keep Informed

Community: The local community surrounding the manufacturer's operations expects responsible corporate behaviour and environmental stewardship. Maintaining open communication channels and actively participating in community initiatives help build trust and goodwill.

Monitor

Media and News Networks: Media coverage and public perception can significantly impact the manufacturer's reputation and brand image. Monitoring media channels and proactively addressing any negative publicity or misinformation is essential for safeguarding the company's reputation.

Board of Directors: The board of directors, executive team, and investors hold a vested interest in the success of the digital transformation project. The project's outcomes, including increased productivity and profitability, directly influence shareholder value and corporate governance (Jones, et al., 2021).

Employees: Employees are key stakeholders in the digital transformation project, as the recommendations aim to streamline processes and enhance productivity (Harel, 2021). Empowering employees with the necessary skills and

resources to adapt to digital changes fosters a culture of innovation and continuous improvement.

Clients: Clients rely on the manufacturer's products and services, making them crucial stakeholders in the project's success. Delivering high-quality products efficiently and enhancing customer service through digital solutions strengthens client relationships and drives business growth.

Technology Considerations

Digital Factory: A digital factory integrates physical machines, data, and human interactions to optimize manufacturing processes. Leveraging digital technologies such as cloud computing, IoT, and big data analytics enables real-time monitoring, predictive maintenance, and data-driven decision-making.

Smart Manufacturing: Smart manufacturing encompasses sensor technology, cloud computing, and advanced analytics to improve operational efficiency and agility. Monitoring production flows, managing processes remotely, and implementing predictive maintenance enhance productivity and responsiveness to market demands.

Digital Transformation Strategy: Despite formulating a digital transformation strategy, companies often struggle with effective implementation and value creation (Schallmo, et al., 2017). Strategic alignment of value propositions, value chains, value appropriation mechanisms, and stakeholder relationships is essential for successful digital transformations (Bharadwaj, et al., 2013).

Microsoft Partnership: Microsoft plays a significant role in facilitating digital transformation initiatives through strategic partnerships and technological solutions (Saldanha, et al., 2020). Collaborating with Microsoft enables firms to leverage data-driven insights, AI capabilities, and digital platforms to drive innovation and competitive advantage.

Case Study: CNHi

CNHi's collaboration with Microsoft exemplifies successful digital transformation in the manufacturing sector. By leveraging AI and digital platforms, CNHi enhanced automation, connectivity, and value-added services in agricultural machinery, demonstrating the transformative potential of digital technologies.

The research aims to explore how the manufacturer can leverage digital technologies to create and capture value, enhance operational efficiency, and drive innovation (Bharadwaj et al., 2013). By engaging stakeholders, implementing advanced technologies, and aligning strategic objectives, the manufacturer can navigate digital transformation challenges and seize opportunities for sustainable growth (Schallmo, et al., 2017).

The Need for Digital Transformation

In the contemporary business landscape, major external forces are propelling the imperative for digital transformation (Verhoef, et al., 2021). The advent of the World Wide Web and subsequent technological advancements, including broadband internet, smartphones, cloud computing, and emerging technologies like artificial intelligence (AI) and blockchain, have catalyzed the evolution of e-commerce (Statista, 2021). Moreover, the proliferation of big data has revolutionized the way businesses operate and interact with customers (Verhoef, et al., 2021). As digital technologies continue to disrupt traditional business models, firms face increasing pressure to adapt and transform digitally to remain competitive (Matt, et al., 2015) (see Figure 3).

The outcomes of digitalization are classified as efficient product development, cost-effective manufacturing, highly developed products, and integrated value chains.

Understanding Digitalization

Digitalization entails the extensive utilization of digital technologies and their integration into the firm's products and operations. This transformative process fundamentally alters how firms create and capture value, driving efficiencies and innovation across various business functions.

Digitalization has revolutionized the product development process, diminishing the reliance on physical prototypes and artifacts. Advanced computer-based design and visualization tools, coupled with numerical computation programs, have streamlined product design processes, making them more efficient and interactive (see Figure 4).

Furthermore, the integration of digital technologies has led to the complexity of products, necessitating rigorous testing procedures. AI and machine learning algorithms enable faster and more effective testing of software, enhancing product quality and accelerating time-to-market. For instance, telecommunications giant Ericsson utilizes AI to optimize the complex filters in its 5G network, a task previously requiring extensive specialist training (Jones, et al., 2021).

Manufacturing

Digitalization is reshaping manufacturing processes, driving improvements in throughput, quality, and efficiency (Battistoni, et al., 2023). Advanced computer visualization

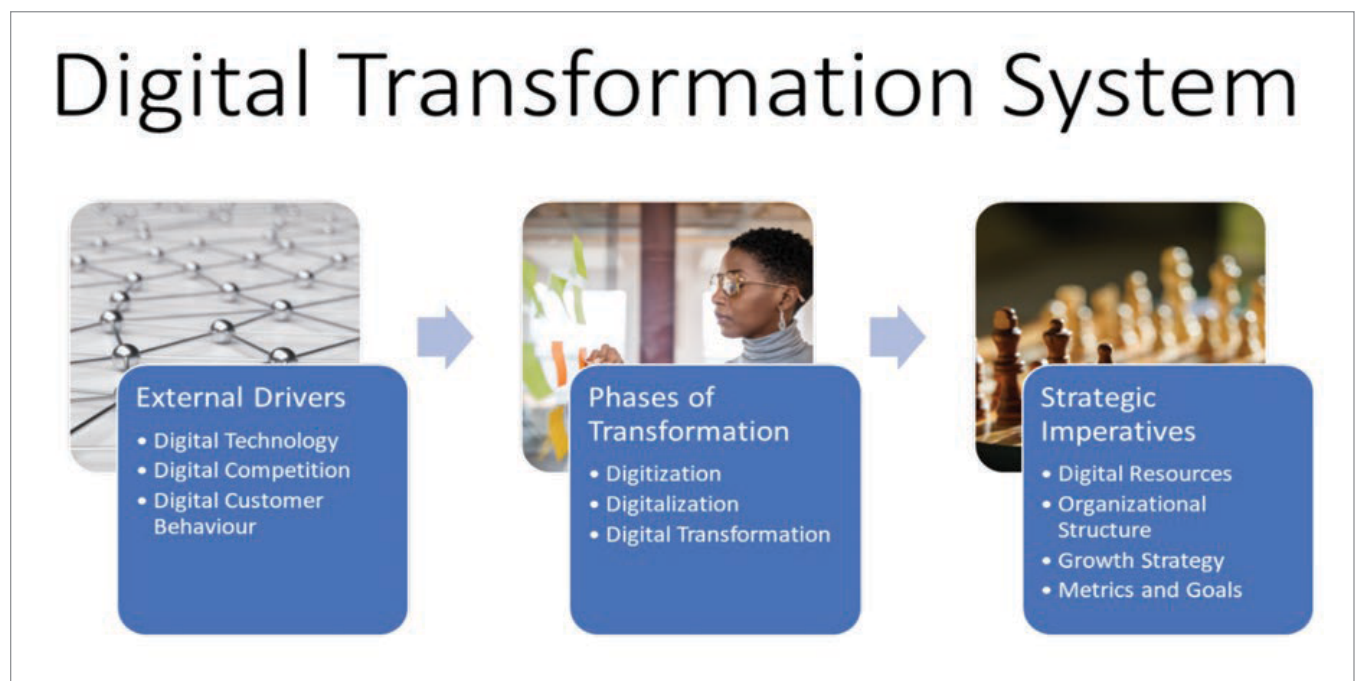


Figure 3: Digital Transformation System (Matt, et al., 2015)

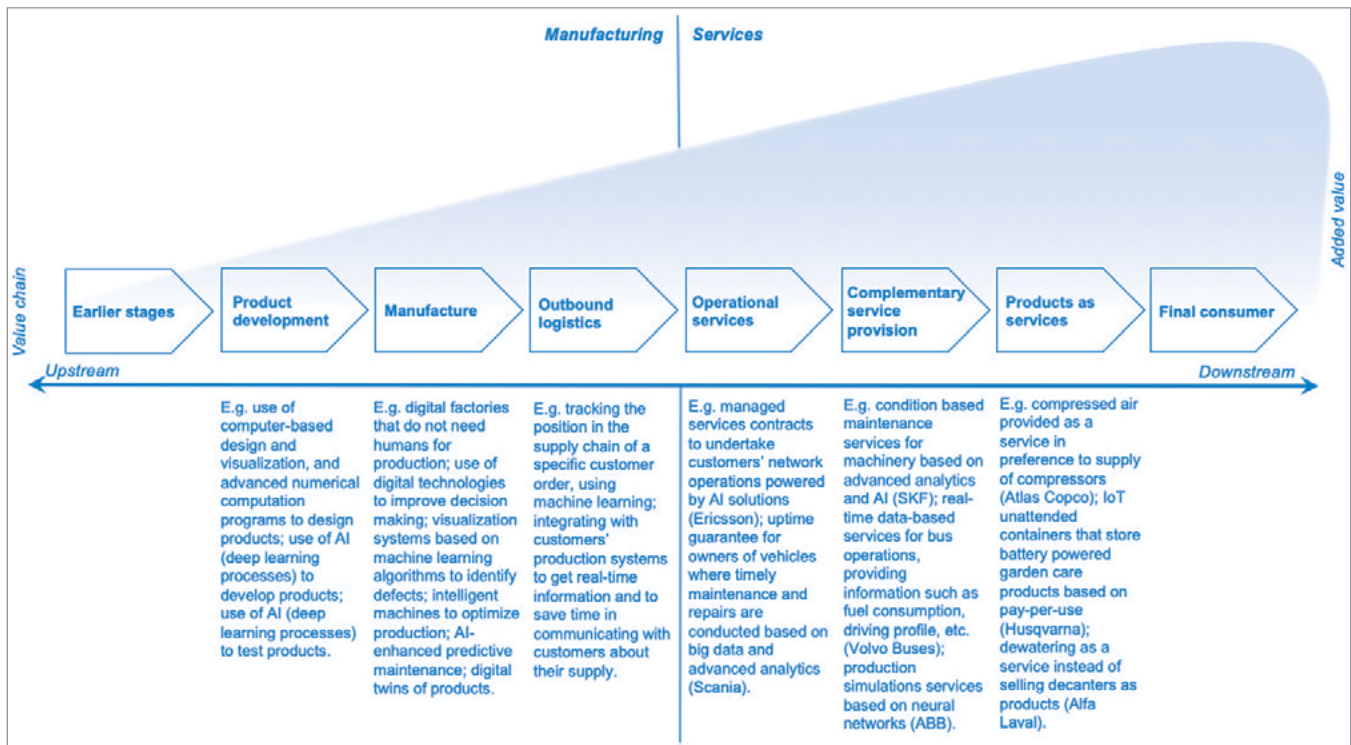


Figure 4: Digitalization among manufacturers (Bjorkdahl, 2020)

systems, powered by machine learning algorithms, facilitate real-time defect detection, reducing the need for manual inspections and optimizing production workflows.

Moreover, the adoption of “digital twins” enables manufacturers to create virtual models of products, reflecting the entire manufacturing process. AI-driven predictive maintenance systems leverage real-time data from sensors and digital sensors, minimizing costly production stoppages and maintenance expenses.

The emergence of fully digital factories represents a significant milestone in manufacturing (Rossini, et al., 2021). Companies like SKF have embraced digitalization to enhance production planning, flexibility, and quality control. By leveraging digital technologies, firms can achieve higher levels of competitiveness and produce superior quality goods at reduced costs.

Digital technologies are increasingly integrated into products, rendering them more intelligent and interconnected (Correani, et al., 2020). Manufacturing firms leverage data generated by products to enhance performance, introduce new functionalities, and optimize user experiences.

Integrated Value Chains

Digitalization facilitates the integration of value chains, enhancing operational efficiency and coordination. By sharing information across systems and functions, firms can streamline production processes, reduce lead times, and improve resource planning.

Leading firms are leveraging machine learning algorithms to optimize supplier interfaces and streamline procurement processes (Bjorkdahl, 2020). This digitization of supply chain management enables better control over materials, reduces inventory costs, and fosters closer collaboration between firms and their suppliers.

In summary, the imperative for digital transformation in manufacturing is underscored by the profound impact of digital technologies on product development, manufacturing processes, and value chain integration. By embracing digitalization, firms can enhance competitiveness, drive innovation, and capitalize on emerging opportunities in the digital economy.

The Phases of Digital Transformation

Understanding digital transformation requires a multidisciplinary approach that integrates insights from

various fields, including manufacturing, marketing, engineering, information systems, innovation, supply chain, and human resources (Verhoef et al., 2021). Digital transformation encompasses organizational-wide changes and strategic imperatives that necessitate a holistic understanding to optimize opportunities and address relevant aspects effectively.

Three Phases of Digital Transformation:

1. **Digitization:** Digitization involves converting analog information into digital formats (Verhoef et al., 2021). It primarily focuses on encoding analog data into digital ones, facilitating storage, processing, and transmission via computers. Examples include digital forms in ordering processes and the digitization of internal financial declarations. While digitization streamlines documentation processes, it does not inherently alter value creation activities.
2. **Digitalization:** Digitalization entails leveraging IT or digital technologies to modify existing business processes (Verhoef et al., 2021). It facilitates the creation of new online or mobile communication channels, transforming traditional firm-customer interactions. Digitalization optimizes business processes, enhances coordination, and improves customer experiences, thereby driving efficiency and adding value beyond cost savings.
3. **Digital Transformation:** Digital transformation represents a company-wide change that results in the development of new business models (Verhoef et al., 2021). It introduces novel approaches to creating and capturing value, often through innovative business logic. Digital transformation encompasses process digitization, focusing on efficiency, and digital innovation, enhancing products with digital capabilities. It aims to improve product quality, services, and overall organizational performance.

Maturity Models, Dynamic Capability, and Agile Leadership:

Maturity models serve as tools for assessing the current status quo of digital maturity within organizations (Berghaus & Black, 2016). These models comprise dimensions, criteria, and maturity stages, enabling organizations to evaluate their digital readiness and identify areas for improvement.

Dynamic capability refers to an organization's ability to adapt

to changing environments by reconfiguring internal and external processes and resources (Fachrunnisa et al., 2020). It involves analyzing data and disseminating knowledge across the organization to facilitate agile responses to uncertainties. Strategic flexibility complements dynamic capability by enabling organizations to adjust objectives in response to changing internal and external factors, supporting future strategy development and rapid adaptation (Fachrunnisa et al., 2020).

Agile leadership plays a crucial role in fostering successful strategic flexibility and digital transformation (Fachrunnisa et al., 2020). Agile leaders guide teams, influence behaviours, and maintain organizational vision, emphasizing customer-centric approaches and value creation. In agile organizations, every member aligns with customer needs, ensuring that work contributes to delivering value.

Strategic Imperatives, Organizational Structure, and Growth Strategies:

Digital transformation necessitates strategic imperatives focused on digital resources, including digital assets, digital agility, digital networking capability, and big data analytics capability (Verhoef et al., 2021). These imperatives underscore the importance of leveraging digital technologies, adapting to market opportunities, fostering digital partnerships, and harnessing data-driven insights to drive organizational growth and competitiveness.

Organizational structure plays a pivotal role in facilitating digital change, favouring flexible structures that support agility and innovation (Eggers & Park, 2018). Separate business units enable experimentation and rapid learning, agile organizational forms enhance responsiveness to digital change, and digital functional areas drive innovation and collaboration.

Digital firms leverage various growth strategies, with digital platforms being prominent drivers of growth (Verhoef et al., 2021). Platforms enable scalability and foster network effects, attracting users and creating value through ecosystem expansion. Successful growth strategies prioritize user acquisition, platform management, and ecosystem development to sustain competitive advantages.

Measuring performance improvements via key performance indicators (KPIs) is essential for assessing the effectiveness

of digital transformation efforts (Verhoef et al., 2021). While outcome-related metrics like ROI remain relevant, process-related metrics track intermediate results and gauge value creation. Traditional incumbents and digital entrants may differ in their focus on profitability versus growth, reflecting distinct business objectives and strategies.

Approach to Digital Transformation of Business Models:

A roadmap for digital transformation encompasses phases such as Digital Reality, Digital Ambition, Digital Potential, Digital Fit, and Digital Implementation (Schallmo et al., 2017). This approach involves assessing the current state, setting transformation objectives, identifying enablers, designing digital solutions, and implementing new business models to achieve organizational goals.

In summary, digital transformation requires a comprehensive understanding of its phases, strategic imperatives, organizational dynamics, growth strategies, and measurement frameworks to navigate the evolving digital landscape successfully. By adopting a holistic approach and embracing digital innovation, organizations can unlock new opportunities, enhance competitiveness, and drive sustainable growth in the digital age.

Findings

Digital transformation is a multifaceted journey for companies, encompassing various elements such as data management, technological innovation, strategic partnerships, and organizational adaptation. This section distills key findings from the case studies and literature review, highlighting critical aspects and best practices for successful digital transformation.

Scope of Digital Transformation

At the heart of any digital transformation initiative lies a clear definition of objectives and scope. CNHi's transformation focused on developing new services centred around predictive maintenance and intelligent logistics through digitalizing its fleet. This strategic clarity ensured alignment between transformation efforts and overarching business goals.

Data Management. People and Skills Development. Partnerships.

Effective data management serves as the cornerstone of

digital transformation. CNHi leveraged both internal and external data sources to drive its digital strategy. Internal sensors provided crucial insights into product status, while external data enriched analyses with additional context. Moreover, robust data platforms facilitated secure storage, processing, and utilization of data, ensuring compliance with regulatory standards.

Empowering employees with the requisite skills is pivotal for realizing the potential of digital technologies. CNHi invested in upskilling its workforce to navigate the digital landscape effectively. Collaboration with external partners like Microsoft further augmented expertise, enabling CNHi to transition into a software-centric model and offer innovative services.

Strategic partnerships play a vital role in augmenting organizational capabilities and driving innovation. CNHi's collaboration with Microsoft exemplifies how external partnerships can catalyze digital transformation efforts. By leveraging Microsoft's expertise, CNHi successfully navigated technological complexities and accelerated its digital journey.

Artificial Intelligence. Customer-Centric Approach. Operational Efficiency and Growth.

Harnessing the power of AI is indispensable for deriving actionable insights from data. CNHi embraced AI technologies, particularly those offered by Microsoft, to develop and deploy machine learning models. This agile approach to data exploration empowered CNHi to drive continuous improvement and deliver enhanced value to customers.

Understanding and catering to evolving customer needs is fundamental for sustainable growth. CNHi's digital transformation aimed to create enhanced value for both existing and new customers. By leveraging data-driven insights, CNHi enhanced customer experiences and expanded revenue streams, underscoring the importance of customer-centricity in digital initiatives.

Digitalization offers opportunities for both operational efficiency and revenue growth. Firms often begin with upstream digitalization activities to optimize operations and enhance product functionality. However, sustained growth necessitates a holistic approach encompassing new income streams and business model reinvention. See [Table 3](#) for a summary of cost-cutting versus growth.

Table 3: Digitalization Aimed at Cost-Cutting versus Growth (Bjorkdahl, 2020)

Factor	Cost-Cutting and Operational	Growth and Innovation
Efficiency	Growth and Innovation	No established mechanisms to allocate capital needed by several functions to build a growth agenda.
Culture	Well-established culture to reduce waste through better methods. Collective ability across functions to transform output markets.	There is no established culture to develop and sell services or to use data to build new businesses.
Coordination between functions	Dependent on excellence in individual functions.	Dependent on several functions.
Data management	Data are generated internally, and usually, fewer variables need to be considered to identify efficiency improvements.	Data are generated from customer applications, and many variables need to be considered to identify growth options
Demand	Internal demand and the firm's responsibility to decide if it would be productive.	Uncertain market demand.
External cooperation	Well-established partners and suppliers for implementing efficiency improvements.	Partnerships are context-dependent, and there is a strong dependence on the complementors in the ecosystem to create value.
Investments	Relatively easy to estimate.	Difficult to estimate.
Managerial processes	Established managerial processes are working.	Dependent on new managerial processes to become flexible
Return on investments	Easy to estimate.	Very uncertain
Strategy	Well-established procedures to invest in solutions that are critical for competitiveness and that have high rates of return on investment.	No established strategy. Need to make trade-offs among many uncertain alternatives
Time to implementation	Relatively easy to estimate.	Difficult to estimate.
Transferability	High between firms.	Low between firm

Strategic Challenges

Overcoming organizational inertia and fostering a culture conducive to digital transformation pose significant challenges. Establishing data governance structures, cultivating analytical capabilities, and aligning internal processes are imperative for successful digitalization. Companies like Scania exemplify how proactive organizational restructuring can facilitate adaptation to digital disruptions (Erbay & Yildirim, 2022).

Supporting Long-Term Digital Transformation

Simultaneously, firms must chart a course for long-term digital transformation to remain viable in evolving landscapes. This entails a strategic evaluation encompassing the 'why, where, what, and how' of digitalization. Understanding the value proposition of digitalization, identifying areas of maximum impact, and leveraging enablers such as data management, automation, and advanced analytics are critical components of this process.

For instance, companies like Scania exemplify how strategic utilization of data management and innovative working methods facilitates digital transformation initiatives. By embracing a culture of consistent innovation and fostering organizational alignment, firms can navigate the complexities of digital transformation and position themselves for long-term success (Bjorkdahl, 2020).

Best Practices for the Digital Transformation of Business Models

ThyssenKrupp's transformation journey serves as a paradigm for successful business model digitization. Facing challenges in elevator maintenance due to increasing demand, ThyssenKrupp developed the MAX Elevator Monitoring System to predict and prevent failures, thereby improving maintenance services and customer satisfaction (Schallmo et al., 2017).

Through digitalization, ThyssenKrupp enhanced customer relationships by delivering clear communication on maintenance repairs, thereby augmenting the customer dimension of its business model. Moreover, by harnessing real-time data insights, ThyssenKrupp created value for both internal and external stakeholders, underscoring the transformative potential of digital technologies (Schallmo et al., 2017).

Additionally, the role of the Chief Digital Officer (CDO) emerges as a pivotal enabler of digital transformation. CDOs assume diverse roles, from driving digital innovation to orchestrating digitization initiatives across organizational functions. By aligning digital strategies with business objectives and fostering a culture of digital advocacy, CDOs play a crucial role in steering organizations toward digital maturity (Haffke et al., 2016).

The emergence of Chief Digital Officer (CDO) positions reflects the growing importance of digital leadership. CDOs assume various roles, from driving digital innovation to orchestrating transformation initiatives. While not essential for every company, CDOs can play a pivotal role in navigating the complexities of digital transformation (Haffke et al., 2016).

Digital transformation unfolds through distinct stages, from strategic prioritization to data-driven enterprise. Each stage represents a progression toward organizational agility

and innovation. Companies must prioritize user-centricity, embrace data-driven decision-making, and cultivate a culture of continuous improvement to succeed in their digital endeavours (Berghaus & Black, 2016).

During this phase, digital innovation takes center stage, driving strategic initiatives and product innovation. Emphasizing the strategic significance of innovation involves actively promoting digital innovation and systematically exploring the potential of emerging technologies.

As organizations progress to stage 3, the focus shifts towards cultural transformation, expertise development, and organizational restructuring. Digital transformation permeates internal culture and shapes organizational structures, reflecting a commitment to embracing digitalization.

In stage 4, emphasis is placed on user-centric approaches and refined processes. User involvement in innovation processes, personalized customer experiences, and data-driven interaction design underscore the importance of user-centricity. Furthermore, the tangible outcomes of digital transformation initiatives begin to manifest during this phase.

The most challenging aspects of digital transformation are encountered in stage 5, characterized by the establishment of a data-driven enterprise. This stage involves leveraging advanced data analytics technologies for various purposes, including expenditure planning, customer data aggregation, real-time analysis, and personalized customer interactions.

Transforming Customer Experience, Operational Processes, and Business Models

Enhancing customer experiences through digital initiatives yields substantial benefits. Leveraging data analytics, companies gain insights into customer preferences and behaviours, enabling personalized interactions and targeted marketing efforts. Digitalization also streamlines customer touchpoints, improving service delivery and fostering customer loyalty.

Digital transformation extends beyond customer-facing activities to internal process optimization. Automation and digitization enhance operational efficiency, enabling resource reallocation toward strategic initiatives. Moreover,

performance management systems powered by data analytics facilitate informed decision-making and drive continuous improvement.

Digital transformation fundamentally reshapes traditional business models, fostering innovation and globalization. Companies augment physical offerings with digital solutions, introduce new digital products, and embrace global synergies facilitated by digital technologies. These transformations not only drive revenue growth but also enhance organizational agility and competitiveness in a digital ecosystem.

In summary, successful digital transformation requires a strategic and holistic approach encompassing technological innovation, organizational agility, and customer-centricity. By leveraging data-driven insights, fostering a culture of innovation, and forging strategic partnerships, companies can navigate the complexities of digital disruption and emerge as leaders in the digital economy.

Discussion

In this discussion, the author offers a comment on the findings of the research study.

Management Leadership and Workforce Culture

The findings underscore the significance of fostering digital commitment and affinity among employees. Several indicators, such as utilizing digital tools for collaboration, appointing internal digital experts, ensuring employee familiarity with digital products, and promoting digital innovation internally, reflect an organization's digital readiness (Berghaus & Black, 2016).

Early-stage digital transformation initiatives primarily focus on acknowledging digital transformation's importance and experimenting with digital innovation. Establishing a strategic vision, delineating roles and responsibilities, setting measurable goals, and continually reviewing transformation roadmaps typically follow these initial exploratory steps.

Research demonstrates a positive correlation between workforce transformation and strategic flexibility. Organizations that frequently undergo workforce transformation are better positioned to adapt strategically, emphasizing the pivotal role of workforce evolution in fostering strategic agility (Fachrunnisa, et al., 2020).

Agile leadership moderates the relationship between strategic flexibility and digital transformation positively, underlining the importance of agile leadership in facilitating adaptive responses to digital challenges (Fachrunnisa, et al., 2020).

A coherent digital strategy drives digital maturity, distinguishing between operational focus and transformative business objectives. Mature digital organizations prioritize holistic digital strategies aimed at business transformation (Fachrunnisa, et al., 2020).

Digitally mature organizations prioritize skill development to realize their digital strategies effectively. Employees in these organizations are provided with necessary digital skills, reflecting the alignment between skill enhancement and strategic objectives (Fachrunnisa, et al., 2020).

Leadership plays a pivotal role in driving the digital agenda, with digitally mature organizations typically led by individuals or groups with strong digital fluency. Confidence in leadership's digital capabilities correlates with organizational digital maturity (Fachrunnisa, et al., 2020).

Mature organizations foster a culture conducive to digital transformation, characterized by risk-taking, innovation promotion, and collaborative work environments. Cultivating such a culture accelerates digital adoption and adaptation (Fachrunnisa, et al., 2020).

Digitally mature organizations exhibit a higher tolerance for risk, viewing failure as a stepping stone to success. Encouraging risk-taking behaviours facilitates innovation and agility in digital environments (Fachrunnisa, et al., 2020).

Strategic Flexibility, Collaboration, and Innovation

Strategic flexibility significantly impacts digital transformation, highlighting the importance of adaptive strategies in navigating digital transitions effectively (Fachrunnisa, et al., 2020).

While digital tools for collaboration are relatively easy to implement, utilizing digital data strategically presents challenges. Incorporating big data analytics and real-time customer insights into decision-making processes remains a hurdle for many organizations, indicating the

need for enhanced strategic collaboration in data utilization (Battistoni, et al., 2023).

Digital maturity enables organizations to leverage collaborative efforts for generating new ideas and solutions. Cultivating a collaborative culture fosters innovation and propels digital transformation initiatives forward (Fachrunnisa, et al., 2020).

Charting Transformation in Digitally Mature Organizations

Digitally mature organizations adopt transformative strategies supported by collaborative cultures and a risk-tolerant environment. These distinctive attributes shape their approach to digital transformation, setting them apart from less digitally mature peers (Fachrunnisa, et al., 2020) (see [Table 4](#)).

Table 4: Digital Transformation and Strategy Questions (adapted from Verhoef et al. 2021)

Major Topic	Relevant Disciplines	Research Questions
Phases of Digital Transformation	Information systems, strategic management, innovation	<p>How should the manufacturer move through multiple digital transformation phases?</p> <p>How can we measure digital transformation phases and digital readiness?</p> <p>How resilient is the manufacturer against digital competition and digital change?</p> <p>To what degree should the manufacturer transform digitally?</p> <p>What is the impact of digital transformation on performance?</p> <p>What firm and market variables moderate the relationship between digital transformation and performance?</p>
Digital Resources	Information systems, strategic management, innovation	<p>How can the manufacturer develop specific digital resources?</p> <p>What is the relative impact of identified assets and capabilities on digital transformation and performance?</p> <p>What are digital networking capabilities and how can the manufacturer develop them?</p> <p>How can digital resources facilitate digital transformation?</p>
Organization Structure	Strategic management, innovation	<p>Which organizational structures enhance the manufacturer’s digital agility?</p> <p>What organizational structures are most effective for digital transformation?</p> <p>How to balance agility with the need for control and efficiency?</p> <p>How to construct self-organizing teams to attain digital transformation?</p> <p>How can transforming firms benefit from new organizational structures and management styles?</p>

Table continued to next page...

Major Topic	Relevant Disciplines	Research Questions
Digital Growth Strategies	Strategic management, marketing	<p>What should be the diversification strategy of digital platforms?</p> <p>What is driving the success of specific digital growth strategies?</p> <p>Which growth strategies should the manufacturer use when digital transforming their firm?</p>
Metrics and Goals	Strategic management, marketing, operations management	<p>Which metrics are essential for the different phases of digital transformation?</p> <p>How does the manufacturer's use and importance of metrics evolve across the different phases of digital transformation?</p> <p>Which metrics are important for digital platforms, given the increasing reliance on networks and ecosystems?</p>

Conclusion

The rapid advancement of technology, exemplified by products like Oculus, promises to revolutionize personal and professional experiences. Computing will soon be seamlessly integrated into our clothing, and data will become intrinsic to every process. Organizations must cultivate cultures that embrace analytics and data-driven decision-making. X's (formerly known as Twitter) acquisition of Gnip underscores the importance of integrating social and mobile data with analytics to drive real-time business intelligence. Business models, particularly in the sharing economy, are evolving rapidly, challenging traditional notions of ownership (Fachrunnisa, et al., 2020). Leaders must anticipate these changes to remain competitive in their industries.

CNHi's successful digital transformation journey, supported by Microsoft, highlights the importance of a structured framework for implementing digital strategies. This framework guides companies through the complexities of digital transformation, ensuring that strategy formulation aligns with implementation. It serves as a practical tool for senior executives embarking on digital strategy implementation, providing a comprehensive checklist to address key elements of the strategy.

Strategic flexibility and agile leadership are crucial for navigating digital transformation (Fachrunnisa, et al., 2020). Organizations must foster work transformation and dynamic capabilities to manage digital disruption effectively. Agile leadership, as a moderating variable, enhances the impact of strategic flexibility on digital transformation. Visionary

leadership, coupled with strategic decision-making and modern methodologies, fosters organizational agility.

Further research is needed to explore the manufacturer's journey through digital transformation phases. Is the traditional path of digitization, digitalization, and then digital transformation always optimal? Investigating digital readiness in facilitating digital transformation and exploring concepts like digital resilience are crucial. Understanding the contextual factors influencing digital transformation's impact on performance, including firm and market characteristics, is essential for guiding strategic decision-making.

Digital transformation is inevitable, but its scope and pace must be carefully considered. Organizations must adapt their strategies, cultures, and leadership styles to thrive in the digital age. Continued research will provide valuable insights into navigating the complexities of digital transformation and maximizing its benefits for organizational performance. Additionally, attention should be given to concepts like digital resilience and the optimal path toward digital transformation, considering variations in firm size, market dynamics, and industry characteristics.

In conclusion, the journey towards digital transformation is not without its challenges, but the rewards are immense. Organizations that embrace digital innovation, foster a culture of agility, and invest in strategic flexibility will position themselves as leaders in the digital age, driving sustainable growth and competitive advantage.

Note on Contributor

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