Navigating Digital Transformation:
Crafting Tailored Data Strategies for Organizational Adaptability

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ABSTRACT

In the digital transformation era, companies must foster adaptability and invest in modernizing their technological infrastructure. A key component of this shift is developing a robust data strategy, which presents implementation challenges in large organizations. We outline criteria for senior management to consider when crafting a data strategy, covering both offensive and defensive measures. While a hybrid approach is common among successful organizations, there's no one-size-fits-all strategy. Instead, companies should tailor their approach to their unique business needs. Our ongoing project, using Design Science methodology, aims to create a tool aiding senior management in selecting the most suitable strategy. This involves assessing sector-specific requirements, improving data management practices, and ensuring alignment across departments.

Keywords: Data Strategy, Design Science, Organizational Needs, Hybrid Strategy

INTRODUCTION

In the digital transformation era, corporations must foster adaptability by investing in technological infrastructure. Developing a robust data strategy is crucial, yet challenging, as departments often have divergent needs, requiring a blend of offensive and defensive approaches. Offensive strategies focus on data valuation and modernization, while defensive strategies emphasize control implementation and information management.

Large organizations often succeed by adopting a hybrid approach, integrating technology systems and prioritizing data quality within allocated budgets. Senior management's governance oversight is vital across projects and business sectors, facilitating digital transition with sector-specific data strategies. A comprehensive understanding of data is essential to ensure each organizational action adds value.

Adept project management and organizational process refinement facilitate the transition to digitalization. Integration projects should align with business needs and use artifacts to refine data strategies continually. Strategic choices hinge on the organization's commitment to leveraging data as an asset, fueling advanced analytics like machine learning and artificial intelligence. Therefore, we propose a Design Science-based tool to identify the most suitable data strategy tailored to organizational requirements.

Our approach is in line with industry standards and best practices [1]. The proposed tool helps senior management identify the right strategy by asking targeted questions about department-specific business needs. The proposed tool emphasizes a commitment to continuous improvement in data management practices. The choice of this strategy primarily relies on the organization's willingness to use this data as an asset and will continuously fuel various advanced analytics approaches such as machine learning and artificial intelligence."

RESEARCH OBJECTIVES

The importance of digital transformation in businesses is on the rise worldwide [2, 3]. Substantial budgets are being allocated to enhance technological infrastructure to drive value in services, customer engagement, and organizational processes. It is projected that global spending on digital transformation will reach 3.4 trillion

U.S. dollars by the year 2026 [4]. Considerable investments aim to promote a data-centric culture in institutions. Senior management must establish a governance framework to support digital transformation, covering strategic aspects. Companies need to understand business realities for effective data strategy implementation, tailoring strategies to meet diverse business needs and achieve high-value outcomes. This project outlines essential tools and criteria for senior management to choose an appropriate data strategy using a structured methodology.

Our main goal is to establish criteria for defining data strategies in large organizations and implement a tool for identifying these strategies by addressing departmental business needs. This involves using various criteria, including a scorecard (our artefact), to help senior management effectively address elements related to the data strategy. We begin by exploring the literature to identify the criteria that allow for the identification of organizational data strategies.

LITERATURE REVIEW

The term "digital transformation" lacks a universally agreed-upon definition, with scholars offering diverse perspectives [1, 5-12]. We align ourselves with several authors and define digital transformation as the strategic integration of emerging digital technologies—such as social media, mobile technology, analytics, and embedded devices—alongside innovative business models with an aim of significantly enhancing enterprise performance, engage digital customers across all touchpoints, and drive organizational change by fusing digital technologies and processes. Digital transformation uses digital innovations to create new business structures and practices, changing how organizations operate. It encourages economic interconnectedness and helps stakeholders adjust to the digital world. It's more than just automation—it focuses on putting customers first, fostering innovation, and being adaptable to build new organizational strengths.

Successful digital transformation hinges on establishing an effective, well-planned data strategy. Without this, organizations often face failure [13]. Developing data strategies for digital transformation faces challenges like data silos and decentralized data, making it a difficult task [14].

Data silos and decentralized data make it hard to ensure good data quality for successful digital transformation. Silos come from different sources with different interfaces and storage methods. Decentralized data makes it tough to get a full, real-time view of operations, which makes it hard to make decisions and worsens problems when employees leave. Even when organizations fix data accessibility issues, they often don't get value from their data because it's not used well [15, 16].

Fragmented data obscures an organization's data holdings and increases vulnerability to data breaches, eroding customer trust and incurring significant financial costs [17, 18]. DalleMule and Davenport [16] propose a business-oriented data strategy framework that balances defensive and offensive data usage, control, and flexibility, helping companies align data management with their overall strategy.

Defensive strategies aim to minimize risks by ensuring regulatory compliance, detecting fraud through analytics, and maintaining data integrity to prevent theft. They involve identifying and governing authoritative data sources, like customer and sales data, to create a unified "single source of truth" (SSOT). An SSOT ensures data reliability and consistency, which can save costs by helping managers identify suppliers serving multiple business units and negotiate discounts.

On the other hand, offensive strategies focus on achieving business goals like revenue growth and customer satisfaction. They involve activities such as generating customer insights and integrating market data to support decision-making. Offensive approaches require "multiple versions of the truth" (MVOTs), where different groups within an organization use tailored data versions to meet their specific needs. These versions provide consistent, customized responses aligned with each group's requirements.

Balancing offense and defense is crucial for organizational success, yet challenging due to resource and attention competition. Some companies equally prioritize both aspects, while others favour one based on their unique needs and industry context, such as regulation intensity or customer competition [16].

This alignment also shapes data management practices. Data standardization and control support defensive strategies, ensuring regulatory compliance and secure data access. Conversely, data flexibility benefits offensive strategies, enabling tailored data utilization for various stakeholders.

Achieving a balance between offense and defense involves finding the right mix between Single Source of Truth (SSOT) and Multiple Versions of the Truth (MVOTs). Most organizations lean toward either prioritizing defense with SSOT or emphasizing offense with MVOTs, rather than equally focusing on both. While some industries, like insurance and finance, prioritize defense due to heavy regulation, others, like retail, prioritize offense for customer analytics. Assessing a company's offense-defense position requires considering factors such as regulatory environment and customer focus [16]. These factors were taken to design our artefact which we describe in the following sections.

METHODOLOGY

Design science is a problem-solving approach that aims to create innovative solutions for practical problems. It involves systematically designing, developing, and evaluating artifacts or systems to address specific needs or challenges. Researchers follow a structured process that includes defining the problem, creating a solution, evaluating its effectiveness, and refining it based on feedback. The focus is on producing tangible outcomes like prototypes or frameworks that can be implemented to bring about positive change in real-world settings. This method is commonly used in fields such as engineering, information systems, and business management to improve efficiency, effectiveness, and innovation [19].

Peffers, Tuunanen, Rothenberger, and Chatterjee's [20] framework for conducting research based in Design Science provides a structured approach for researchers to develop and evaluate innovative solutions to practical problems. This framework is commonly accepted in the field of Information Systems and Design Science research. It consists of six steps:

Problem Identification and Motivation involves identifying a real-world problem or opportunity. Researchers seek to understand the context and motivation behind the problem and its significance. *Define Objectives for a Solution* requires researchers to define clear objectives for a proposed solution which align with achieving desired outcomes. *Design and Development* entails designing and developing an artifact/solution (e.g., prototypes, models, or conceptual frameworks) to address the identified problem. *Demonstration* is when the artifact is demonstrated to stakeholders or users to assess its effectiveness and feasibility in addressing the problem. Stakeholder feedback is used to refine the artifact. *Evaluation* requires that the artifact be rigorously evaluated to assess its performance, usability, and impact. Appropriate evaluation methods can include experiments, case studies, or simulations. Finally, in the *communication* phase, findings and outcomes of the research are communicated to the relevant stakeholders, academia, and the broader community.

DATA COLLECTION

Data collection took place at a prominent cooperative financial institution in Canada. For the purposes of this paper, this institution will be referred to as "*the bank*".

Various techniques outlined in design science methodology were utilized, including observation, documentation review, and semi-structured interviews [20, 21].

Observation was conducted by the primary author, leveraging their professional background and daily insights to enhance the research's reflective aspects.

Additionally, a thorough literature review and analysis of industry best practices were undertaken to identify historical elements relevant to defining a data strategy and prioritizing target solutions for the department or institution under study.

Semi-structured interviews were also carried out by the primary author with seven stakeholders involved in the bank modernization program. These stakeholders represented diverse roles and managerial levels within the organization (refer to table 1).

Table 1. Stakeholders with Whom Semi-Structured Interviews were Conducted.

Role/Function of Interviewee at the bank
Vice-President of Business Sectors Monitoring for *the bank*'s Group Monitoring Office
Vice President, Market Risk and Risk Quantification at *the bank*
Chief Data Officer, *the bank*'s Movement and Vice President of Analytics for Members and Clients
Director of Credit Risk Quantification Tools
Director, Data and Analytics Transversal/Cross-Sector
Strategic Advisor for Data and Analytics at *the bank* / Chief Data Officer
Internal Auditor for the Main Directorate of Surveillance, Compliance, Governance, and Support Function

Questions asked during our semi-structured interviews are presented in table 2 below.

Table 2. Questions asked during interviews.

Questionnaire	Question
Introduction	What is your current role within the company?
	Can you provide an overview of your role and the responsibilities it entails?
	From your perspective, what factors led the company to consider implementing a data strategy?
	Could you outline the processes involved in defining the company's data strategy, and identify the key stakeholders involved?
Questions tapping into offensive dimension	How actively is senior management engaged in leveraging data to create value, and what specific criteria guide their involvement?
	What is the process for generating proposals for data strategies throughout the organization?
	How does the organization articulate its ambitions for modernization?
	How does senior management ensure successful implementation and execution of the data strategy?
Questions tapping into defensive dimension	What is the high-level management's commitment to ensuring data quality is sufficient?
	How does the organization ensure adequate information management?
	To what extent is the organization committed to addressing disclosed elements of information quality?
Questions tapping into desired improvements	Improve IT infrastructure and reducing data-related costs
	Process optimization and strengthening of data-related practices
	Generate return on investment in infrastructure
	Respond quickly to competitors and market changes

In the upcoming sections, we discuss the development of the artifact and share conclusions drawn from our interviews and literature review.

ARTEFACT DEVELOPMENT

The artifact (figure 1 below) created in this study is an analysis scorecard. Companies using this scorecard need to assess each criterion and assign it a level of importance: (1) for less important, (2) for somewhat important, and (3) for very important. By considering all criteria together, companies can determine an overall score for each unit or department involved in developing a data strategy. This overall score indicates the importance of adopting either an "Offensive" or "Defensive" strategy for that unit/department. The criteria in the scorecard were borrowed from DalleMule and Davenport [16].

Strategy	Criteria	Score [1 … 3]
Defensive	Respond to industry regulatory requirements	
	Enhance controls related to data quality	
	Monetize the value of company data; use internal data as a product or service	
	Enhance operational efficiency through business processes	
	Ensure better management and access to data	
	Monetize the value of company data and leveraging internal data as a product or service	
	Prevent cyberattacks and data breaches	
	Enhance the quality of information published in internal and external reports	
Offensive	Create new products and services	
	Improve revenue through cross-selling, pricing, and expanding the customer base	
	Optimize the existing strong group of analysts and data scientists	
	Streamline multiple sources of the same data and information	
	Improve IT infrastructure and reducing data-related costs	
	Process optimization and strengthening of data-related practices	
	Generate return on investment in infrastructure	
	Respond quickly to competitors and market changes	

Figure 1. Proposed Artefact

Once each department completes the scorecard, senior management needs to use the following formula to determine the target strategy for each department:

Strategy Score = Sum of offensive criteria / Sum of defensive criteria

The resulting ratio indicates the range of strategies to consider and is based on three scenarios:

1. Ratio greater than 1: Department prefers an offensive strategy.
2. Ratio equal to 1: Department equally values offensive and defensive strategies.
3. Ratio less than 1: Department prefers a defensive strategy.

To ensure the right data strategy, organizations must define a control environment for digital transformation. This includes setting up frameworks for data use, migration, and decommissioning to maintain business continuity [15]. They also need to prioritize business sectors for investment, forming a senior management committee to identify synergies and high-value projects [15].

Data strategy should adapt to the organization's changing needs and priorities. Senior management can use a standardized artifact to approve and align the strategy across stakeholders [22]. Implementing this artifact through policies ensures consistency throughout the organization. Creating a strong data utilization framework is a key focus for large organizations. The operationalization of a data strategy involves several sectors, as outlined by Enterprise Data Management [22]: (1) Business planning; (2) Data collection; (3) Assessing data quality; (4) Data storage; (5) Data analysis; (6) Data usage; and (7) Backup and deletion.

These categories cover different stages of the data life cycle and will help us develop a structured framework for the organization's data strategy across various business sectors [22].

EVALUATING OF ARTIFACT

This section primarily focuses on evaluating the artifact's effectiveness. It aims to showcase the artifact's utility and feasibility [23]. To conduct validation within the bank, direct observations and semi-structured interviews were conducted with various members of the bank's senior management. Our assessment focused on three (3) departments: (1) Marketing and digital solutions; (2) Risk management; and (3) Internal audit and monitoring office. Due to confidentiality considerations, only higher-level results are presented herein.

Table 3 lists the business needs from interviews and our artefact's predicted data strategy. Semi-structured interviews helped us grasp the organization's requirements, implement departmental data strategies, and assess our artefact's performance.

Table 3. Departmental Strategy with Regards to Business Needs

Department	Business needs identified through our interviews	Evaluation of the data strategy to adopt using our artefact
Marketing and digital solutions	Sales optimization, value creation, infrastructure modernization	Offensive
Risk management	Management of the organization's financial and non-financial risks	Hybrid
Internal audit and Monitoring Office	Internal Audit	Defensive

Our research confirms that larger organizations lack a singular data strategy, with each department needing to tailor its approach to specific business needs. Early insights from senior management interviews at the bank suggest our tool effectively identifies suitable data strategies for different departments. Varied data usage across departments necessitates careful budget allocation aligned with business objectives [15]. A hybrid approach, combining offensive and defensive strategies, suits the diverse needs of large institutions. Conversely, smaller businesses may prefer a more focused approach congruent with their technological and business strategies [13]. In such cases, our tool could be applied at the organizational level.

IMPORTANCE OF CONSIDERING DEPARTMENTAL DATA STRATEGIES

Our interviews underscored the importance of distinguishing between offensive and defensive data strategies for organizations to align initiatives with business goals, allocate resources efficiently, and manage risks effectively, thus gaining a competitive edge [24]. By better aligning with overarching business objectives, organizations ensure that data efforts drive growth and innovation or safeguard assets and ensure compliance. Differentiating between offensive and defensive strategies enhances resource allocation, enabling organizations to prioritize investments based on strategic goals and risk tolerances. Recognizing associated risks empowers proactive risk management, balancing the benefits and drawbacks of data initiatives. Leveraging offensive strategies fosters differentiation and innovation, while defensive strategies enhance trust and credibility with customers through improved data security and compliance. Combining both approaches enables organizations to create value, mitigate risks, and maintain

competitiveness in a data-driven landscape while ensuring regulatory compliance.

BENEFITS OF A HYBRID APPROACH

Hybrid approaches offer great benefits when different departments pursue different data strategies within the same organization. They balance risk and opportunity, providing flexibility, maximizing value, and promoting alignment across departments. Defensive strategies focus on data safeguarding and compliance, while offensive strategies prioritize data leverage for growth and innovation. Hybrids allow organizations to mitigate risks while capitalizing on growth opportunities, creating a balanced risk profile [25]. They also offer better flexibility and adaptability, accommodating various departmental needs and objectives. Hybrids promote alignment and collaboration, fostering a shared understanding of the organization's data strategy. This collaboration drives cross-functional innovation and value creation, ensuring that data initiatives support overarching business goals effectively.

CONCLUSION AND FUTURE RESEARCH - FROM ARTEFACT TO CHOOSING THE IT SOLUTION

Successfully navigating digital transformation presents numerous challenges, particularly in selecting appropriate technology solutions. The artifact under development aims to assist companies in making informed decisions regarding IT solutions, resource allocation, and more, leveraging insights from departmental data strategies and business requirements. Knowing whether different departments should adopt a defensive or offensive data strategy helps organizations choose better IT solutions by ensuring alignment with strategy, tailoring solutions to departmental needs, optimizing resource allocation, managing risks effectively, and accommodating scalability and flexibility requirements. This approach enables organizations to maximize the value of their IT investments and achieve their strategic objectives more effectively.

Offensive data strategies may require IT solutions that prioritize analytics, scalability, and innovation to support growth and competitive advantage. In contrast, defensive data strategies may necessitate solutions focused on data security, compliance, and risk mitigation [25, 26].

IT solutions can also be made to better match the specific needs of each department's data strategy, leading to more effective allocation of resources.

Departments with offensive data strategies may require more resources for data analytics platforms, cloud infrastructure, and emerging technologies to support growth and innovation, while departments with defensive strategies may prioritize investments in cybersecurity tools, data encryption, and compliance management systems [25, 26].

Some IT solutions that can help an organization interested in implementing a defensive data strategy include encryption tools such as Symantec Encryption, BitLocker, or VeraCrypt. These technologies can help organizations encrypt sensitive data at rest and while in transit to prevent unauthorized access and protect confidentiality. Identity and Access Management (IAM) Systems like Okta, Microsoft Azure Active Directory, or IBM Security Identity Governance and Intelligence (IGI) provide centralized control and management of user identities, access rights, and privileges. Single sign-on (SSO) solutions enable users to securely authenticate once and access multiple applications and resources without the need to re-enter credentials, improving user experience and security. Data Loss Prevention (DLP) solutions such as Symantec DLP, McAfee DLP, or Digital Guardian help organizations prevent the unauthorized disclosure of sensitive data by monitoring, detecting, and blocking the transmission of sensitive information across networks, endpoints, and cloud services. Data governance platforms like Collibra, Alation, or Informatica Axon help organizations establish policies, processes, and controls for managing data assets, ensuring data quality, and maintaining regulatory compliance. Compliance management solutions automate the process of assessing, documenting, and reporting compliance with regulations and standards such as GDPR, HIPAA, PCI DSS, and SOX.

By implementing such IT solutions, organizations can strengthen their defensive data strategy, protect sensitive information, mitigate risks, and ensure compliance with regulatory requirements and industry standards.

When it comes to offensive data strategy, IT will be chosen to drive growth, innovation, and promote competitive advantage. IT solutions that enable advanced data analytics, insights generation, and decision-making capabilities will be favoured. Advanced analytics platforms such as Microsoft Power BI, Tableau, or QlikSense enable organizations to analyze large volumes of data, uncover insights, and visualize trends and patterns.

Predictive analytics tools like SAS Analytics, IBM SPSS, or Python's scikit-learn library allow organizations to forecast future trends, identify opportunities, and optimize business processes. Big data technologies like Apache Hadoop, Apache Spark, or Amazon EMR enable organizations to process and analyze massive datasets efficiently. Distributed computing frameworks such as Apache Kafka or Apache Flink facilitate real-time data processing and streaming analytics, allowing organizations to make timely decisions based on up-to-date information. Machine learning frameworks like TensorFlow, PyTorch, or scikit-learn enable organizations to build and deploy predictive models for various use cases such as customer segmentation, churn prediction, or

demand forecasting. AI-powered solutions such as natural language processing (NLP) for text analysis, computer vision for image recognition, or recommendation engines for personalized content delivery can help organizations extract valuable insights from unstructured data sources. Cloud computing platforms like Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP) provide scalable infrastructure and services for storing, processing, and analyzing data. Data integration tools such as Informatica, Talend, or IBM DataStage help organizations consolidate data from disparate sources, ensuring data consistency and quality.

Finally, CRM systems like Salesforce, Microsoft Dynamics 365, or Oracle CRM enable organizations to manage customer interactions, track sales activities, and analyze customer data to improve marketing, sales, and customer service processes. By choosing the right IT solutions to effectively execute offensive data strategies, organizations can uncover valuable insights, drive innovation, and gain a competitive advantage in the market.

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