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# Digital Transformation: A Catalyst and Barrier to Sustainable Management Accounting Systems in Commercial Banks

**Hong Van Tran**

*University of Finance – Marketing, Ho Chi Minh City, Vietnam.*

**Abstract**

This study aims to explore and interpret the dual role of digital transformation, acting as both a catalyst and a barrier to the development and implementation of sustainable management accounting systems in Vietnamese commercial banks. Using a qualitative multiple case study methodology, the paper conducted in-depth interviews with 15 senior and middle managers from 5 leading commercial banks. The research findings reveal a distinct dual role: on the positive side, digital transformation is a driving force for modernizing ESG data collection and enhancing the capacity to analyze and model complex risks such as climate risk. However, it also creates significant barriers related to the burden of investment costs, the complexity of system integration, issues with input data quality, and particularly a critical shortage of human resources with combined technological and sustainability competencies, alongside the inertia of organizational culture. The study thus affirms that technology alone is insufficient to drive this transformation. A key practical implication is that to successfully leverage digital transformation for sustainability goals, banks must adopt an integrated strategy, investing concurrently in four pillars: a flexible technology platform, a robust data governance framework, the development of interdisciplinary human capabilities, and a culture led by strong commitment from senior leadership.

**Keywords:** Commercial Banks, Digital Transformation, ESG, Sustainable Management Accounting, Vietnam.

## 1. Introduction

In a global context grappling with severe challenges of climate change and social inequality, the transition to a sustainable economy has become an urgent imperative. The banking industry, as the lifeblood of the economy, holds a central position in this process by directing capital flows towards environmentally and socially responsible activities (Scholtens, 2006). In Vietnam, this pressure has become more pronounced following the government's strong commitment at COP26 to achieve net-zero emissions by 2050. To realize this goal, the State Bank of Vietnam has issued guiding policies such as Decision No. 1604/QD-NHNN approving the Green Banking Development Scheme and Circular No. 17/2022/TT-NHNN providing guidance on environmental risk management in credit-granting activities. Concurrently, Vietnamese commercial banks are undergoing a fierce digital transformation, applying new technologies to reshape business models and enhance competitive capabilities. The intersection of these two major trends - the pressure for sustainable development and the wave of digital transformation - highlights the practical and academic urgency of this research.

Although there have been numerous studies on management accounting for sustainability purposes (Burritt & Schaltegger, 2010; Adams & Larrinaga-González, 2007; Pham, 2022; Pham et al., 2025) and digital transformation in the financial sector (Vial, 2021), a significant research gap remains. Previous studies have often examined these two fields separately or tended to view technology as a mere solution without exploring its multifaceted role. Very few studies have delved into the complex interaction, considering digital transformation as both a catalyst and a barrier to building sustainable management accounting systems. In particular, the absence of empirical research in emerging markets like Vietnam, with its unique institutional context, technological infrastructure, and human resource capabilities, has left a large theoretical and practical void (Ha & Hung, 2024). The practical necessity of this study is paramount, as Vietnamese bank managers are struggling to leverage huge technology investments to meet the increasingly stringent requirements for reporting and managing Environmental, Social, and Governance (ESG) factors, yet lack a scientifically evidence-based frame of reference.

Against this backdrop, this paper poses the central research question: *What conditions has digital transformation created, and what challenges has it posed, for the development and implementation of management accounting systems for sustainability purposes in Vietnamese commercial banks?* To answer this question, the study sets three specific objectives: (i) to identify the opportunities and benefits that digital transformation brings to sustainable management accounting systems; (ii) to analyze the barriers and challenges that arise in applying digital technology for this purpose; and (iii) to propose a conceptual framework for the dual role of digital transformation. Addressing these objectives will not only enrich the theoretical body of knowledge on the interactive relationship

between technology and sustainability accounting in a developing economy but, more importantly, will also provide essential practical guidance for bank managers and policymakers in Vietnam in building an effective digital transformation roadmap that harmonizes profit objectives with sustainability responsibilities.

## 2. Literature Review

### *2.1. Management Accounting for Sustainability Purposes*

Management accounting for sustainability purposes, commonly known as Sustainable Management Accounting (SMA), is the integration and extension of traditional management accounting principles to provide comprehensive information on environmental, social, and governance aspects (Schaltegger & Burritt, 2017). Instead of focusing solely on financial metrics, SMA collects, analyzes, and reports non-financial data to support managerial decision-making, aiming to balance economic efficiency, social responsibility, and environmental protection (Jasch, 2009).

To achieve this goal, SMA employs a diverse set of tools. The *Sustainability Balanced Scorecard* extends the four perspectives of the traditional balanced scorecard (Kaplan & Norton, 2005) by integrating objectives and performance indicators for environmental and social activities (Figge et al., 2002). *Material Flow Cost Accounting* (MFCA) helps identify and quantify material and energy flows in production processes, thereby optimizing resource use and reducing waste (Wagner & Schaltegger, 2004). Other tools such as *Life Cycle Costing* (LCC) and *Materiality Analysis* also play a crucial role in providing a complete picture of an organization's sustainability impact. In the banking industry, SMA is pivotal in supporting the management of emerging risks like climate and reputational risks, guiding credit and investment decisions based on sustainability criteria, and providing transparent information to stakeholders about the bank's ESG commitments and performance (Scholtens, 2006).

### *2.2. Digital Transformation in the Banking Industry*

Digital transformation is not merely the application of technology to existing processes but a profound transformation that uses technology to create new value-creation methods, changing business models and organizational culture (Vial, 2021). This process in the banking industry is driven by pillar technologies such as *Big Data*, *Artificial Intelligence (AI)*, *Machine Learning*, *Cloud Computing*, and *Blockchain*. These technologies enable banks to collect and process vast amounts of data from various sources, automate complex processes, enhance analytical and forecasting capabilities, thereby improving operational efficiency, optimizing customer experience, and developing innovative financial products and services (Omarini, 2018). The impact of digital transformation is comprehensive, not only helping banks enhance their competitiveness but also reshaping the structure of the entire financial system.

### *2.3. Building the Analytical Framework: The Link between Digital Transformation and Sustainable Management Accounting*

The relationship between digital transformation and sustainable management accounting is twofold, involving both synergy and challenges. In its role as a catalyst, digital transformation provides the necessary infrastructure and tools to overcome the inherent challenges of sustainability data, which is often unstructured, heterogeneous, and difficult to quantify (Latan et al., 2018). Technologies like Big Data and Artificial Intelligence can collect, integrate, and analyze diverse environmental and social datasets, helping to turn raw data into useful managerial information for decision-making. This allows banks to measure the carbon footprint of their credit portfolios, assess ESG risks more accurately, and automate complex sustainability reporting processes.

However, the digital transformation process can also become a barrier. The initial investment cost for technological infrastructure is substantial, requiring a long-term commitment from leadership. If not planned and integrated strategically, the implementation of new technology systems can create data silos, fragmenting information instead of unifying it (Bughin et al., 2019). Furthermore, digital transformation demands a shift in the skill set of the workforce, creating a digital capability gap. Issues related to data security, ethics in the use of artificial intelligence, and the environmental impacts of the technology infrastructure itself (e.g., energy consumption of data centers) are also challenges that cannot be ignored (George et al., 2014).

From this analysis, this study builds a theoretical framework based on a dual perspective, viewing digital transformation as both an "enabler" and a "challenge" for the implementation of sustainable management accounting systems in commercial banks. This analytical framework will serve as a guide to identify and interpret the opportunities and barriers that Vietnamese banks are facing in practice.

## 3. Research Methodology

To answer the central research question and achieve the stated objectives, this study adopts a qualitative methodology, allowing for a comprehensive exploration of the perceptions, experiences, and meanings that bank managers attribute to the complex relationship between digital transformation and sustainable management accounting.

### *3.1. Research Design*

This study applies an interpretive approach, arguing that social reality is not a single objective entity but is constructed, understood, and experienced through the perceptions and interactions of actors within their specific contexts. This approach is particularly suitable as the study aims to explain how bank managers in Vietnam perceive and respond to the opportunities and challenges of digital transformation in implementing sustainable management accounting.

Consequently, a *multiple case study* design was chosen. This design allows for an in-depth exploration of a contemporary, complex phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident (Yin, 2018). Analyzing multiple cases (banks) not only provides

deep insights into each individual case but also allows for cross-case comparison, thereby enhancing the robustness and *analytical generalization* of the research findings.

### *3.2. Sample Selection*

The study uses *purposive sampling* to select information-rich cases that can provide the deepest insights into the research problem. Commercial banks (CBs) were selected based on three strict criteria: (i) they are large-scale CBs playing a significant role in Vietnam's financial system; (ii) they have clearly announced a digital transformation strategy and are in a strong implementation phase; and (iii) they have published separate sustainability reports or integrated Environmental, Social, and Governance (ESG) content into their annual reports, demonstrating an initial commitment to sustainable development. Based on these criteria, five leading CBs in Vietnam were selected as case studies.

### *3.3. Data Collection*

The primary data source for the study consists of in-depth, semi-structured interviews. This method allows for consistency in the main topics to be explored while providing flexibility for interviewees to share their perspectives and experiences. A total of 15 senior and middle managers from the 5 banks were interviewed, including strategic positions such as Chief Information Officer (CIO), Chief Digital Officer (CDO), Chief Financial Officer (CFO), and direct implementation roles like Head of Sustainability/ESG Department/Board, and Head of Planning. Cross-interviewing these roles helped gather multi-dimensional perspectives, from strategic vision to practical implementation challenges.

The data collection process took place from August 2024 to December 2024. Each interview lasted 45 to 60 minutes and was audio-recorded with the participant's consent. All audio recordings were then transcribed and anonymized to ensure absolute confidentiality and anonymity for the participants and their organizations. In addition, secondary data, including annual reports, sustainability reports, press releases, and other public documents of the banks from the 2020-2024 period, were also collected for triangulation and to enrich the primary data.

### *3.4. Data Analysis*

The transcribed and anonymized interview data were analyzed using the *thematic analysis* method of Braun & Clarke (2006). This analytical process involves six systematic steps: (i) familiarizing oneself with the entire dataset, (ii) generating initial codes, (iii) searching for potential themes, (iv) reviewing and refining the themes, (v) defining and naming the themes, and (vi) writing the analytical report. The qualitative data analysis software NVivo was used to support the process of managing, coding, and constructing themes scientifically and effectively.

## 4. Research Findings

In-depth analysis of data from 15 interviews with senior and middle managers at 5 leading commercial banks highlighted four main themes, reflecting the dual role of digital transformation in building and implementing sustainable management accounting systems.

### *4.1. Digital Transformation as a Driver for Modernizing the Collection and Processing of Sustainability Data*

The analysis shows that one of the most positive and clear impacts of digital transformation is its ability to modernize and enhance the efficiency of ESG data collection, which is considered the foundation of any sustainable management accounting system. Managers unanimously agreed that technology has helped them overcome the inherent challenges of collecting non-financial data manually, which was often fragmented and inconsistent.

*Automating and Integrating ESG Data*: Previously, collecting data on environmental indicators such as electricity, water, and paper consumption, or carbon emissions from hundreds of branches and transaction offices nationwide was a laborious and error-prone task. Data was often compiled manually via Excel files, leading to significant delays and low accuracy. Digital transformation, through the implementation of smart building management systems (BMS), IoT sensors, and specialized software platforms, has enabled the automation of this process. A Head of Sustainability shared:

*"In the past, every quarter we had to send emails reminding branches to report their electricity, water, and paper usage. The data returned in different formats, errors were constant, and the consolidation team spent a whole month just cleaning and reconciling it. Now, with the new system, data from smart meters and operational management systems is automatically pushed to the central data center daily. We can monitor it in near real-time, and reliability has increased significantly".*

This finding indicates that automation not only saves resources but also creates a high-frequency and more reliable ESG dataset, which is a prerequisite for deeper management analysis.

*Digitizing Unstructured Information*: Besides quantitative data, banks also have to process a large volume of unstructured information related to social and governance aspects, such as customer feedback, media news, or social impact assessment reports of projects. Natural Language Processing (NLP) technology and social media analysis tools are emerging as effective solutions to "digitize" and extract value from this data source. A Chief Digital Officer noted:

*"We are piloting the use of an AI-integrated 'social listening' tool to analyze discussions on social media and in the press related to the bank's community activities. Instead of manual reading, the system can automatically classify feedback by sentiment (positive, negative, neutral) and identify the most discussed topics. This helps us measure the communication effectiveness and social impact of our campaigns more objectively".*

This demonstrates that digital transformation helps expand the scope of sustainable management accounting, moving from a focus on internal numbers to capturing and analyzing the perceptions and views of external stakeholders.

### 4.2. Digital Transformation Enhances Analytical Capabilities and Decision-Making Based on Sustainability Data

Once data is systematically collected, digital transformation continues to act as a catalyst at a higher level: turning data into useful managerial information that directly supports strategic decision-making.

*Modeling Climate Risk*: One of the most groundbreaking applications is the use of Big Data and Artificial Intelligence (AI) to model complex risks related to climate change. This is an increasingly urgent requirement for the banking industry, whose asset portfolios are sensitive to physical and transition risks. A Chief Risk Officer explained:

*"We are collaborating with a technology partner to build a model for forecasting the impact of climate risk. For example, by combining data on sea-level rise scenarios with the location data of our mortgaged coastal real estate assets, the system can simulate and quantify potential losses. This is something that would be impossible to do by analyzing financial statements alone".*

The above quote shows that advanced analytical technology allows banks to quantify and manage non-financial risks scientifically, thereby making more prudent and sustainable credit and capital allocation decisions.

*Building Management Dashboards*: For sustainability information to truly integrate into the operational process, it needs to be presented visually, timely, and comprehensibly to the leadership. Many banks are investing in building ESG management dashboards that integrate key non-financial performance indicators (KPIs) alongside traditional financial metrics. A Head of Planning emphasized:

*"Our goal is to build an 'ESG dashboard' on the bank's Business Intelligence (BI) system. The Board of Management can access it anytime to view key indicators like the system-wide carbon footprint, green lending ratio, employee satisfaction level, or the ESG risk score of the investment portfolio. This helps bring sustainability issues into weekly management meetings, instead of just appearing in the annual report once a year".*

The development of these dashboards marks a significant shift, elevating sustainable management accounting from a compliance reporting tool to a strategic management tool, tightly integrated into daily operations.

### 4.3. Challenges in Data Infrastructure and Costs

Alongside the clear opportunities, the process of integrating digital technology into sustainability management also encounters significant barriers, mainly related to input data quality and financial burdens.

*Data Quality Issues*: The "Garbage In, Garbage Out" principle is particularly true in the context of ESG data. No matter how modern the technology systems are, the analysis results will be meaningless if the input data is inaccurate, incomplete, or inconsistent. This challenge is especially great when collecting data from external partners, such as in the supply chain or from borrowing customers. A manager efeitos of green credit shared:

*"We require corporate clients to provide data on energy consumption or wastewater treatment to assess environmental risk, but the quality of information is very erratic. Many small businesses do not have standard measurement systems; they provide estimated figures. Our system, however advanced, cannot automatically 'clean' this unreliable data. The re-verification process is very time-consuming".*

This shows that investment in technology must go hand in hand with building strict data governance processes and standards, including the verification and quality assurance of data from third parties.

*Cost Burden and Integration Complexity*: The investment cost for technology infrastructure服务于sustainability goals is a major barrier, especially for specialized software solutions from international vendors. Furthermore, the challenge is compounded when these new systems must be integrated into the bank's complex and sometimes outdated IT architecture. A Chief Information Officer (CIO) candidly admitted:

*"The licensing cost for a comprehensive ESG data management platform can run into millions of dollars, not to mention implementation and customization costs. But the bigger headache is how to integrate it with our old core banking system. These two systems 'speak different languages,' and building data bridges is both costly and risky, potentially creating 'data islands' instead of a unified system".*

This finding underscores that digital transformation for sustainability is not a standalone project but requires a strategic vision for the overall technology architecture and a long-term investment commitment from leadership.

### 4.4. Challenges in People and Organizational Culture

Finally, managers agreed that the deepest and most difficult barriers to overcome lie not in technology or finance, but in the human factor and the inertia of organizational culture.

*Shortage of Personnel with Suitable Competencies*: The successful implementation of a technology-based sustainable management accounting system requires a new type of personnel with "hybrid" competencies - possessing deep knowledge of data science, AI, and BI, as well as expertise in sustainability standards, ESG risk management, and reporting frameworks like GRI and SASB. In reality, this talent pool is extremely scarce in the market. A Chief Human Resources Officer analogized:

*"Finding someone who is good at coding, running data models, and also understands the nature of climate risk or the requirements of Circular 17 is an almost impossible task. We jokingly call them 'unicorns' in the HR industry. Internal training takes time, and recruiting externally is fiercely competitive. This is our biggest bottleneck right now".*

This talent shortage slows down the implementation process and reduces the effectiveness of technology investments, highlighting the urgency of building interdisciplinary training and human resource development programs.

*Cultural Inertia and Inter-departmental Conflicts*: Integrating sustainability goals into business operations often faces resistance, whether subtle or overt, from departments accustomed to being evaluated based on short-term financial targets. The request to provide additional non-financial data or consider ESG factors in credit decisions is often seen as "extra work" that adds burden without generating direct revenue. An ESG Head shared:

*"When we ask the business divisions to collect more information on the social impact of a loan, their first reaction is 'Will this help increase our disbursement targets?'. They think this is the job of the ESG department, not theirs. There is still a strong mentality that sees profit and sustainability as opposing forces, rather than complementary. Changing this mindset is harder than implementing a new piece of software".*

This quote exposes the reality that technology is just a tool. For digital transformation to truly become a catalyst for sustainability, it must be situated within an organizational culture where ESG responsibility is considered an indispensable part of the DNA of all activities, from the highest level down to every employee.

## 5. Discussion

### *5.1. Interpretation of Results*

These research findings not only confirm but also extend existing theories on the relationship between technology and sustainability accounting. While previous studies (e.g., Latan et al., 2018) often emphasized the potential of technology (Big Data, AI) in processing and analyzing sustainability data, the findings from the Vietnamese context reveal a more complex picture. The greatest challenges lie not just in the "processing" stage but at both ends of the data value chain: the "input" stage (data quality and availability) and the "output" stage (human capacity to interpret and use the information). The "garbage in, garbage out" issue and the "unicorn hunt" for personnel are clear evidence that, no matter how powerful the technology, it cannot autonomously generate reliable source data or completely replace human analytical thinking and judgment. This adds a critical practical perspective to theory, especially in emerging markets where data infrastructure and high-quality human resources are still limited.

Although the study did not intentionally analyze differences fatores, the interviews also revealed some potential distinctions between banking groups. Large private joint-stock commercial banks appear to be more agile in piloting new technologies like AI and 'social listening' due to their flexible governance structures and high competitive pressure. However, they also face greater pressure for short-term investment returns, which can cause ESG projects to be delayed if they cannot demonstrate direct financial benefits. Conversely, state-owned banks may have an advantage in implementing sustainability policies synchronously from the top down, due to compliance with government and State Bank directives, but may face more challenges in integrating new technology due to cumbersome, outdated core banking systems and complex investment approval processes.

### *5.2. Digital Transformation – A "Double-Edged Sword" for Sustainable Management Accounting*

Synthesizing the research results, it can be affirmed that digital transformation acts as a "double-edged sword" for sustainable management accounting systems. On one hand, it is an indispensable catalyst, helping to automate data collection, digitize unstructured information, and enhance the capacity to model complex risks like climate risk. Technology allows abstract sustainability concepts to be turned into measurable and manageable indicators through intuitive dashboards.

However, on the other hand, the digital transformation process itself creates or amplifies significant barriers. The burden of investment costs, the complexity of system integration, and issues of data quality governance are tangible challenges. More importantly, it creates an urgent demand for a new generation of personnel with hybrid competencies and requires a revolution in organizational culture to break down inertia and the silo mentality that views profit and sustainability as conflicting goals. Therefore, digital transformation is not a silver bullet. Successful implementation depends not only on selecting the right technology but also profoundly on readiness in strategy, processes, data governance, and especially, people.

### *5.3. Towards an Integrated Model*

Based on the empirical analysis, this study proposes a conceptual model of four interdependent pillars, which are necessary conditions for digital transformation to truly become a driving force for sustainable management accounting systems in commercial banks.

*A Flexible and Scalable Technology Platform*: Instead of investing in standalone solutions, banks need to build a holistic, flexible technology architecture that allows for easy integration between new systems (like ESG data platforms) and legacy systems (like core banking). This helps address the problems of cost, integration complexity, and avoids creating "data islands."

*A Robust ESG Data Governance Framework*: To overcome the "garbage in, garbage out" problem, technology must be paired with a rigorous data governance framework. This framework must clearly define indicators, data sources, collection processes, reporting frequencies, and mechanisms for checking and validating data accuracy, especially for third-party data.

*An Interdisciplinary Human Capability Development Strategy*: Recognizing the scarcity of "hybrid" personnel as the biggest bottleneck, banks need a proactive strategy for reskilling and upskilling their current workforce. Training programs should be developed that combine knowledge of data science and business analytics with the best standards and practices in ESG.

*Commitment from Senior Leadership and Cultural Transformation*: This is the foundational and decisive factor. Strong commitment from leadership not only ensures long-term investment resources but also sends a clear message, helping to break cultural inertia and foster collaboration between departments. Integrating ESG KPIs into the performance evaluation systems of business units is a concrete step to turn commitment into action.

These four elements are not independent but are closely interdependent, forming a strategic cycle that helps banks maximize benefits and minimize risks on their dual journey of digital transformation and sustainable development.

## 6. Conclusion and Implications

### *6.1. Conclusion*

This study answers its central question by affirming that digital transformation plays a dual role - acting as both a powerful catalyst and a significant barrier to sustainable management accounting systems. In its role as a catalyst, digital transformation provides advanced technological tools (Big Data, Artificial Intelligence, IoT) to help automate the collection, integration, and processing of ESG data, enhance the capacity to analyze complex risks like climate risk, and turn sustainability data into intuitive, timely management information. However, this

very process also creates considerable barriers. The main challenges identified include the burden of investment costs and the complexity of integrating technology systems; the inherent problem of input data quality ("garbage in, garbage out"); and especially the two deepest barriers related to people: a critical shortage of human resources with hybrid competencies (combining technology and sustainability) and the inertia of an organizational culture that still prioritizes short-term financial goals.

### *6.2. Theoretical Implications*

Theoretically, this work contributes to the existing body of knowledge in three main ways. First, the study enriches the understanding of the intersection between digital transformation and sustainable management accounting by providing a comprehensive perspective that goes beyond the one-dimensional view of technology as merely a solution. Empirical evidence has highlighted the dual role of technology, thereby emphasizing the complexity and multifaceted nature of this relationship. Second, the study provides deep empirical evidence from Vietnam - an important emerging market where the institutional context, technological infrastructure, and human resources have unique characteristics. The findings on challenges related to source data quality and the scarcity of "hybrid" talent add important practical insights that studies in developed markets may not have fully explored. Finally, the proposed integrated four-pillar model (technology platform, data governance, human capability, and leadership culture) in the discussion section offers a new conceptual framework that can be used as a foundation for future quantitative and comparative studies.

### *6.3. Practical Implications*

The research findings offer urgent practical implications for relevant stakeholders:

*For Bank Managers*: The study provides a checklist of strategic factors to consider when investing in technology for sustainability goals. Instead of focusing solely on software procurement, leadership needs a holistic approach, including: (i) Building a flexible and scalable technology architecture; (ii) Establishing a robust ESG data governance framework; (iii) Investing strategically in interdisciplinary human resource training and development; and (iv) Demonstrating strong commitment from the top to drive cultural transformation. In particular, the study emphasizes that technology investment will not be effective without parallel and commensurate investment in people - those who will operate the technology and interpret the information to make decisions.

*For Policymakers and Regulators (the State Bank of Vietnam)*: The finding about the inconsistency and unreliability of ESG data across the industry indicates a policy gap. The study suggests that the State Bank of Vietnam should play a leading role in researching and issuing common ESG data standards for the banking sector. Developing a *data dictionary* and minimum regulations for the collection, reporting, and verification of ESG data would create a "common language," helping to increase transparency and comparability among banks, while also reducing the burden and uncertainty for credit institutions during implementation.

### *6.4. Limitations and Future Research Directions*

This study has certain limitations. Due to the adoption of a qualitative method with a limited sample size of a few banks, the research findings are deeply exploratory but cannot be generalized in a statistical sense. Future research could address these limitations by conducting quantitative studies to test the relationships in the proposed model, and comparative studies among ASEAN countries to identify specific contextual factors.

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