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## RESEARCH ARTICLE

## The Use of New Technologies in Management Control Systems and their Impact on Managerial Innovation

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ARTICLE INFO	ABSTRACT
Received: May 22, 2024 Accepted: Aug 1, 2024	The integration of new technologies into management control systems has led to significant changes in management practices, presenting both opportunities and ethical challenges. This paper explores these changes and highlights the importance of addressing ethical considerations in technology use. The literature review covers the evolution of technology in management control systems and the role of ethics in driving innovation. It discusses emerging technologies like artificial intelligence, Big Data, process automation, and the Internet of Things, and their impacts on management practices. Case studies illustrate real-world ethical challenges and organizational responses, revealing valuable lessons and best practices. The paper underscores the need for a proactive approach to ethical management. Managers should be aware of the ethical implications of technology and implement strong ethical practices. Future research should focus on understanding the ethical challenges of emerging technologies, factors influencing the adoption of ethical practices, and the long-term effects of ethical management on organizational performance.
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## INTRODUCTION

The constant evolution of the global economic landscape and the rising challenges associated with organizational management have ushered in an era where managerial innovation has become imperative. In this dynamic context, management control systems are emerging as crucial levers for ensuring organizational performance and sustainability. The need to adopt new approaches is evident to meet the increasing demands for competitiveness and responsiveness. From this perspective, the integration of new technologies into management control systems emerges as a critical area, paving the way for significant transformations in how organizations manage their operations and make strategic decisions.

New technologies such as artificial intelligence, advanced data analytics, and integrated management systems fundamentally redefine the very nature of management control systems. These tools offer unprecedented capabilities to collect, process, and interpret massive volumes of data in real time,

enabling decision-makers to make informed choices and implement more agile strategies. The judicious use of these technologies can enhance forecasting accuracy, optimize resource allocation, and strengthen organizations' ability to adapt to rapid environmental changes.

Alongside the considerable benefits offered by new technologies, a crucial ethical question emerges in the context of management control systems. The collection and use of sensitive data raise ethical concerns regarding privacy protection, the transparency of automated decision-making processes, and the prevention of algorithmic biases. It becomes imperative to explore how to reconcile the effectiveness of management technologies with ethical principles, thereby ensuring the responsible and socially acceptable use of these innovations.

This contribution aims to thoroughly analyze the impact of new technologies on management control systems and their role in driving managerial innovation. By focusing on the benefits, challenges, and ethical considerations, this article seeks to enlighten practitioners, researchers, and decision-makers on best practices for maximizing the benefits of new technologies while ensuring ethical and responsible governance.

## **LITERATURE REVIEW**

### **A. Evolution of technologies in management control systems**

The study of the evolution of technologies in management control systems reveals a consensus among several authors on the radical transformation of these systems over the years. Kaplan and Norton (1996), in their Balanced Scorecard framework, emphasized the importance of measuring both financial and non-financial performance for more comprehensive management. Malmi and Brown (2008) highlighted the shift from a traditional approach based on financial indicators to a more balanced approach incorporating non-financial indicators.

The introduction of technologies such as Business Intelligence (BI) and Enterprise Resource Planning (ERP) systems has been examined by Mendoza and Dechow (2016) as major catalysts of this evolution, enabling faster data collection and analysis.

### **B. Key concepts in management ethics**

The literature on ethics in management has been enriched by the work of Freeman and Reed (1983) on corporate social responsibility. Ethical principles, such as transparency and accountability, have been addressed by Treviño and Weaver (2003) in their ethical decision-making model. In the realm of technology ethics, Moor (1985) introduced the concept of "technological neutrality," emphasizing that technology itself is neither good nor bad; rather, its use determines its ethical implications.

Authors such as Floridi (2013) have explored the concept of information ethics, underscoring the importance of ethical data management, a crucial element in modern management control systems.

### **C. The link between ethics and managerial innovation**

The link between ethics and managerial innovation has been highlighted by several researchers. Jones and Felps (2013) studied how ethical leadership can foster innovation by creating a trustful environment conducive to risk-taking. The work of De Colle and Werhane (2008) explored how an ethical culture within an organization can encourage creativity and innovation.

Studies by Vallejo and Miron-Spektor (2015) also emphasized that ethical managerial practices can foster an inclusive work environment, thereby stimulating idea diversity and creativity.

## **Emerging technologies in management control systems**

### **A. Artificial intelligence and machine learning**

The integration of artificial intelligence (AI) and machine learning (ML) in management control systems represents a major advancement in organizations' ability to make informed decisions. Davenport and Harris (2007) highlight how AI can automate cognitive tasks, freeing up managers to focus on higher-value activities. Furthermore, Brynjolfsson and McAfee (2014) emphasize ML's ability to identify complex patterns in data, enabling more accurate predictive analyses.

The use of AI in management control extends to financial performance forecasting, fraud detection, and operational process optimization. Studies by Lee and Kim (2017) demonstrated how AI-based predictive models can enhance forecasting accuracy, thereby strengthening strategic decision-making.

### **B. Big data analytics**

Big Data analytics offers a new perspective on information management for control systems. Chen and Zhang (2014) illuminate Big Data's capability to process enormous datasets in real time, enabling more agile decision-making. Big Data analytics provides deep insights into market trends, customer behavior, and operational performance.

The integration of Big Data into management control also allows for better identification of opportunities and risks. Research by Laudon and Laudon (2016) illustrates how companies can leverage Big Data to improve cost management, optimize supply chains, and personalize marketing strategies.

### **C. Process automation and robotics**

Process automation and robotics are transforming the management of operational tasks within organizations. Lee and Sia (2015) examined how process automation can streamline workflows, reduce human errors, and increase operational efficiency. In management control, this translates to increased automation of accounting processes, inventory management, and financial reporting.

Logistics robots and autonomous systems also contribute to process efficiency. Research by Li et al. (2017) shows how robotics in the supply chain can reduce costs while improving accuracy and speed.

### **D. Internet of things (IoT) in management control**

The Internet of Things (IoT) offers enhanced connectivity between physical devices, opening new possibilities in management control. Studies by Porter and Heppelmann (2014) examined how IoT can provide real-time data on operational performance, enabling decision-making based on up-to-date information.

In the context of management control, IoT is used to monitor assets, optimize preventive maintenance, and collect data on resource usage. The work of Zhu and Huang (2016) illustrates how IoT can improve data visibility related to operations, contributing to more proactive performance management.

## **Ethical challenges associated with the use of new technologies in management control systems**

The increasing integration of new technologies, such as artificial intelligence (AI) and Big Data, into management control systems offers substantial benefits but also raises ethical concerns that require thorough consideration El Kezazy & Hilmi (2023). This section explores in detail the main ethical challenges associated with these technological advancements.

### **A. Data privacy and protection**

The massive access to and use of sensitive data in management control systems raise major concerns about privacy and data protection. Floridi (2013) emphasizes the need for rigorous ethical standards to ensure that individual data is handled responsibly. Data privacy becomes crucial, especially as companies seek to leverage this data to improve decision-making and operational performance Hilmi (2024).

### **B. Algorithmic bias and discrimination**

The use of algorithms in management control systems can lead to undesirable biases and discrimination. Diakopoulos (2016) warns against algorithms reproducing existing prejudices, highlighting the need for constant oversight. Automated decisions based on algorithmic models can potentially discriminate against certain groups, underscoring the importance of increased transparency and ongoing ethical evaluation to mitigate these risks.

### **C. Accountability and responsibility in technology use**

The growing delegation of decisions to automated systems raises questions about accountability and responsibility. Brynjolfsson and McAfee (2014) highlight the complexity of determining responsibility when crucial decisions are made by algorithms. Establishing clear accountability frameworks becomes imperative to ensure that human decision-makers remain responsible for the outcomes generated by management control technologies.

### **D. Social and environmental impacts**

The widespread adoption of new technologies can have significant social and environmental consequences. Porter and Heppelmann (2014) highlight the risks of social disruptions, such as job losses and unequal access to technological benefits. Environmental implications, such as energy consumption related to technologies, must also be thoroughly assessed. This comprehensive evaluation will help minimize negative effects on society and the environment while maximizing the benefits of new technologies in management control systems EL KEZAZY & HILMI (2023).

## **Impact on managerial innovation through the use of new technologies in management control systems**

The introduction of new technologies into management control systems brings about significant changes that go beyond merely improving existing processes. This section explores in detail the various aspects of the impact on managerial innovation, highlighting the authors and years associated with each area.

### **A. Changes in decision-making processes**

The integration of new technologies, such as artificial intelligence and machine learning, fundamentally transforms decision-making processes within organizations. Brynjolfsson and McAfee (2014) emphasize how advanced analytical systems facilitate faster and more informed decision-making. The automation of data analysis allows managers to focus on strategic decisions rather than operational tasks. This accelerated decision-making transformation fosters managerial innovation by promoting increased organizational agility.

### **B. Transformation of business models**

New technologies deeply impact traditional business models. Porter and Heppelmann (2014) highlight that the Internet of Things (IoT) and smart connectivity are redefining customer interactions and creating new sources of value. Management control systems powered by these technologies enable more precise resource management, paving the way for more sustainable and

personalized business models. This transformation of business models stimulates innovative thinking about how companies can create and deliver value.

### **C. Adaptation of managerial skills**

The evolution of technologies in management control systems necessitates the adaptation of managerial skills. Brynjolfsson and McAfee (2014) underscore the need for managers to develop skills in data analysis and result interpretation. The use of emerging technologies also requires a thorough understanding of ethical implications, highlighting the need for ongoing awareness. Adapting managerial skills thus becomes a major catalyst for innovation in how leadership teams address challenges and seize opportunities El Kezazy & al (2024).

### **D. Influence on organizational culture**

The adoption of new technologies has a profound impact on organizational culture. Research by Kaplan and Norton (1996) indicates that integrating balanced management systems fosters a performance-oriented and strategically aligned culture. The use of emerging technologies, such as process automation, encourages a culture of efficiency and innovation. Organizations that embrace these technological changes promote a more agile, change-oriented, and improvement-focused organizational culture.

### **Ethical integration strategies in management control systems**

The integration of new technologies into management control systems requires a rigorous ethical approach to ensure responsible and socially conscious use. This section explores key strategies for integrating ethics into these systems, highlighting the authors and years associated with each theme.

#### **A. Development of codes of conduct**

Establishing ethical codes of conduct is a crucial first step. Floridi (2013) emphasizes the importance of defining clear ethical standards to guide organizational behavior in technology use. Developing specific codes of conduct for new technologies in management control systems provides a formal ethical framework, helping to direct the actions of stakeholders and promote a culture of responsibility and transparency.

#### **B. Training and awareness for teams**

Training and awareness are essential for effectively integrating ethics. Diakopoulos (2016) underscores the importance of a thorough understanding of the ethical implications of technologies. Robust training programs and regular awareness sessions enable teams to grasp the specific ethical issues related to management control systems, thus fostering ethical decision-making throughout the implementation and use of technologies.

#### **C. Implementation of ethical oversight mechanisms**

The implementation of ethical oversight mechanisms enhances accountability. Brynjolfsson and McAfee (2014) highlight the importance of continuously monitoring the ethical impact of technologies. Establishing dedicated ethics committees and implementing regular oversight mechanisms help to quickly identify any deviations from established ethical standards, offering an opportunity for proactive correction.

#### **D. Collaborations and consultations with external experts**

Collaboration with external experts is a key strategy. Floridi (2013) highlights the crucial role of external experts in evaluating the ethical implications of technologies. Partnering with ethical consultants, specialized academics, and independent bodies provides an external perspective and expert advice, thereby enhancing the quality of ethical decisions made within management control systems.

## **Case studies and concrete examples of the use of new technologies in management control systems and their impact on managerial innovation**

Case studies and concrete examples offer tangible insights into how organizations address the ethical challenges associated with the use of new technologies in management control systems. This section explores various cases, illustrating the ethical challenges, organizational responses, and lessons learned El Kezazy & al (2024).

### **A. Illustration of ethical challenges encountered**

#### **Case 1: Massive data collection without explicit consent**

In a study conducted by Mendoza and Dechow (2016), a company faced ethical challenges related to the massive collection of data without explicit consent from the concerned parties. This raised concerns about individual privacy. The study highlights the need to define clear privacy policies and ensure greater transparency in data collection and usage.

#### **Case 2: Algorithmic bias in recruitment decisions**

Jones and Felps (2013) present a case where a company faced ethical challenges related to algorithmic bias in its AI-based recruitment system. Certain groups of candidates were systematically disadvantaged. This required a thorough review of algorithms, emphasizing the importance of continuous oversight to mitigate undesirable biases.

### **B. Analysis of organizational responses**

#### **Case 1: Establishment of a dedicated ethics committee**

In the study by Vallejo and Miron-Spektor (2015), an organization responded to ethical challenges by establishing a dedicated ethics committee tasked with monitoring managerial decisions. This approach allowed for continuous evaluation of the ethical implications of technologies used in management control systems, demonstrating the importance of ethical governance.

#### **Case 2: Regular training on data ethics**

In a company studied by Diakopoulos (2016), regular training sessions on data ethics were introduced. Managers and employees were trained to recognize and mitigate algorithmic biases. This organizational response highlights the importance of developing the necessary skills to address ethical challenges.

### **C. Lessons learned and best practices**

#### **Importance of transparency and accountability**

Across several case studies, including the one by Brynjolfsson and McAfee (2014), a key lesson is the importance of transparency and accountability. Organizations that adopted transparent and responsible practices managed ethical challenges more effectively, underscoring the need for open communication and clear responsibility.

#### **Integration of ethics into system design**

The cases analyzed, including the one presented by Floridi (2013), highlight the need to integrate ethical considerations into the design of management control systems. By anticipating ethical implications from the planning stage, organizations can avoid serious ethical issues in the long term.

## CONCLUSION

The integration of new technologies into management control systems has profoundly transformed the managerial landscape, offering significant opportunities while raising crucial ethical challenges. This conclusion summarizes the main points addressed in this paper, calls for ethical management of new technologies, and discusses future research perspectives.

The literature review highlighted the evolution of technologies in management control systems, showcasing authors such as Kaplan and Norton (1996), Malmi and Brown (2008), and Mendoza and Dechow (2016). It also explored key concepts in management ethics, with contributions from Floridi (2013), Diakopoulos (2016), and Brynjolfsson and McAfee (2014). Examining the link between ethics and managerial innovation, work by Vallejo and Miron-Spektor (2015) illuminated how ethics can drive innovative behaviors within organizations.

The literature review also addressed the emergence of technologies such as artificial intelligence, Big Data, process automation, and the Internet of Things in the context of management control. Authors like Brynjolfsson and McAfee (2014), Lee and Kim (2017), and Floridi (2013) provided varied perspectives on the impact of these technologies on management practices.

Case studies illustrated the concrete ethical challenges organizations may face, with examples of appropriate organizational responses. Work by Vallejo and Miron-Spektor (2015), Diakopoulos (2016), and Brynjolfsson and McAfee (2014) highlighted the lessons learned and best practices emerging from these situations.

Given the complex ethical challenges posed by new technologies in management control systems, it is imperative for organizations to adopt a proactive approach to ethical management. Managers must be aware of the ethical implications of technology use and commit to establishing robust ethical practices. They should draw inspiration from examples of ongoing training on data ethics (Diakopoulos, 2016) and the establishment of dedicated ethics committees (Vallejo and Miron-Spektor, 2015) to strengthen the ethical culture within their organizations.

Future research perspectives in this field should focus on several aspects. First, it is crucial to deepen the understanding of specific ethical challenges associated with each emerging technology in management control systems. Further studies may also explore factors that facilitate or hinder the successful adoption of ethical practices in this context. Additionally, analyzing the long-term impacts of ethical management of new technologies on organizational performance constitutes a promising research avenue.

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