


# Chapter 9


## The Role of AI and ML in Real-Time Business Intelligence: A Systemic Framework for Predictive Decision-Making

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## ABSTRACT

*Real-time business intelligence builds on computing systems that process and analyze continuous data streams. Researchers have observed a gap in applying artificial intelligence and machine learning to generate proactive insights under tight latency constraints. The present chapter aims to explore a systemic framework that integrates predictive decision-making models into business intelligence workflows. A mixed-method evaluation revealed gains in accuracy and timeliness when organizations adopt automated analytics pipelines. These findings suggest that harnessing adaptive machine learning architectures leads to more resilient and agile strategic responses. The chapter contributes a unified perspective on technical configurations, implementation*

## 1. INTRODUCTION

Real-time business intelligence (BI) involves continuous data processing, integration, and analysis to support critical decision-making. Practitioners and academics have examined these techniques to address emergent challenges posed by large-scale data streams (Kitsios & Kamariotou, 2021). Business intelligence encompasses a suite of tools and methodologies designed to convert raw data into actionable insights. AI-driven systems have gained momentum because they automate tasks such as anomaly detection, predictive forecasting, and recommendation generation in near real time.

Organizations strive to improve competitive advantage by accelerating their decision-making cycles. Data velocity and variety demand robust platforms that can operate under dynamic conditions (Ragazou, Passas, Garefalakis, & Zopounidis, 2023). Traditional batch-processing systems often struggle to provide instant updates, thus limiting responsiveness. Decision-makers benefit from predictive capabilities that inform risk management, resource allocation, and strategic planning (Schmitt, 2023). A systemic framework can map the components of AI and machine learning (ML) integration to ensure consistent performance, scalability, and ethical governance.

### 1.1. Background and Context

Early BI systems relied on static reporting and historical data analysis. The emergence of streaming technologies and scalable architectures has redefined how organizations manage and interpret data (Vilela, Times, Bernardi, Freitas, & Ciferri, 2023). Enterprises in finance, retail, healthcare, and manufacturing face rapidly evolving market conditions and regulatory constraints. This context compels them

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