International Journal of Research in Computer Applications and Information Technology (IJRCAIT)
Volume 6, Issue 1, Jan-Dec2023, pp. 85-92, Article ID: IJRCAIT_06_01_008
Available online at https://ijrcait.com/index.php/home/issue/view/IJRCAIT_06_01_008
ISSN Print: 2348-0009 and ISSN Online: 2347-5099

LEVERAGING BUSINESS INFORMATION SYSTEMS FOR STRATEGIC DECISION-MAKING IN THE ERA OF BIG DATA

Andertin John
Business Systems Analyst, Australia.

ABSTRACT

In the era of Big Data, organizations are increasingly relying on Business Information Systems (BIS) to make informed strategic decisions. These systems collect, process, and analyze vast quantities of data to provide actionable insights. This paper explores how BIS are transforming strategic decision-making processes, emphasizing the integration of real-time data analytics, AI, and cloud-based infrastructures. Drawing on recent literature and industry practices, it highlights the evolving role of BIS in competitive strategy formulation and performance management.

Keywords: Business Information Systems, Strategic Decision-Making, Big Data, Data Analytics, Cloud Computing, Artificial Intelligence.

Cite this Article: John, A. (2023). Leveraging Business Information Systems for Strategic Decision-Making in the Era of Big Data. *International Journal of Research in Computer Applications and Information Technology (IJRCAIT)*, **6**(1), 85–92.

I. INTRODUCTION

In the digital age, the capacity to transform large-scale data into actionable intelligence is central to achieving competitive advantage. Business Information Systems (BIS) serve as the technological backbone through which data-driven strategies are executed. These systems encompass a range of tools including Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Decision Support Systems (DSS), all of which are increasingly augmented by big data technologies. As data sources multiply—from IoT devices to social media analytics—the role of BIS has evolved from transactional support to strategic enablers.

Big Data amplifies this transformation by introducing dimensions of volume, velocity, and variety that traditional BIS were not originally designed to handle. With innovations in data warehousing, predictive modeling, and real-time analytics, BIS now enable decision-makers to anticipate market shifts, optimize operations, and personalize customer experiences. This paper investigates the intersection of BIS and Big Data technologies in the context of strategic decision-making, offering an integrated framework for leveraging data intelligence.

2. Literature Review

The integration of BIS and Big Data for strategic decision-making has been extensively explored in prior research.

1. **Porter & Heppelmann (2014)** emphasized the strategic implications of smart, connected products and how BIS must evolve to support data-intensive strategies in manufacturing and service sectors.
2. **Laudon & Laudon (2018)** provided foundational insights into MIS infrastructure, advocating for adaptive information systems that can align with organizational strategy and external environment shifts.
3. **Chen et al. (2012)** introduced a three-level Big Data analytics framework (descriptive, predictive, prescriptive) and outlined its implications for decision support systems and corporate strategy.
4. **McAfee & Brynjolfsson (2012)** posited that companies leveraging Big Data outperformed peers, stressing the need for BIS that can integrate diverse and real-time

datasets into decision-making.

5. **Sabherwal & Chan (2001)** explored the alignment between BIS and business strategies, suggesting that strategic fit is essential for performance improvement.
6. **Watson (2014)** examined the evolution of data warehousing into business analytics platforms, asserting the central role of BIS in extracting strategic value from data.

These studies collectively suggest that the strategic utility of BIS is contingent on its ability to manage large, diverse datasets and support agile decision-making frameworks.

3. Strategic Integration of Big Data with BIS

The integration of Big Data technologies with traditional BIS enables firms to support strategic planning and competitive intelligence. This includes integrating cloud computing, AI-driven analytics, and IoT sensors within existing ERP or DSS platforms.

In practice, this involves redesigning BIS architectures to be modular and scalable. Modern BIS platforms now include distributed storage (e.g., Hadoop HDFS), in-memory analytics (e.g., SAP HANA), and visualization tools (e.g., Tableau, Power BI) that provide real-time dashboards for C-suite executives. These allow leaders to monitor key performance indicators (KPIs) and simulate decision outcomes.

4. Data-Driven Strategic Decision-Making Models

Modern decision-making models rely on various analytical processes that are embedded within BIS, including:

Descriptive Analytics: Summarizes historical data to understand patterns.

Predictive Analytics: Uses statistical models to forecast future scenarios.

Prescriptive Analytics: Recommends actions based on predictive outputs.

Decision-making is increasingly automated via AI and ML models that interact with real-time BIS inputs, such as demand forecasts or customer behavior tracking. These systems allow strategic managers to run "what-if" scenarios to evaluate policy changes or market entry strategies.

Table 1: Comparison of Analytics Models in Strategic BIS

Model Type	Key Technique	Strategic Application	Tools Used
Descriptive Analytics	Data aggregation, data mining, reporting	Identifying historical trends, monitoring KPIs	SQL, Excel, Tableau, Power BI
Predictive Analytics	Statistical modeling, machine learning, forecasting	Anticipating customer behavior, risk assessment, demand forecasting	Python (scikit-learn), R, SAS, IBM SPSS
Prescriptive Analytics	Optimization algorithms, simulation, decision rules	Recommending optimal strategies, scenario analysis	IBM Decision Optimization, Gurobi, SAP HANA

5. Sectoral Applications and Case Studies

Business Information Systems, when integrated with Big Data analytics, are transforming industries such as healthcare, finance, retail, and manufacturing. For example:

Healthcare: BIS-enabled analytics optimize patient care through Electronic Health Records (EHRs) and predictive diagnostics.

Retail: Real-time inventory systems powered by Big Data help firms like Amazon and Walmart personalize marketing and reduce stockouts.

Finance: Risk assessment models in BIS platforms use real-time transaction monitoring to detect fraud or credit risk.

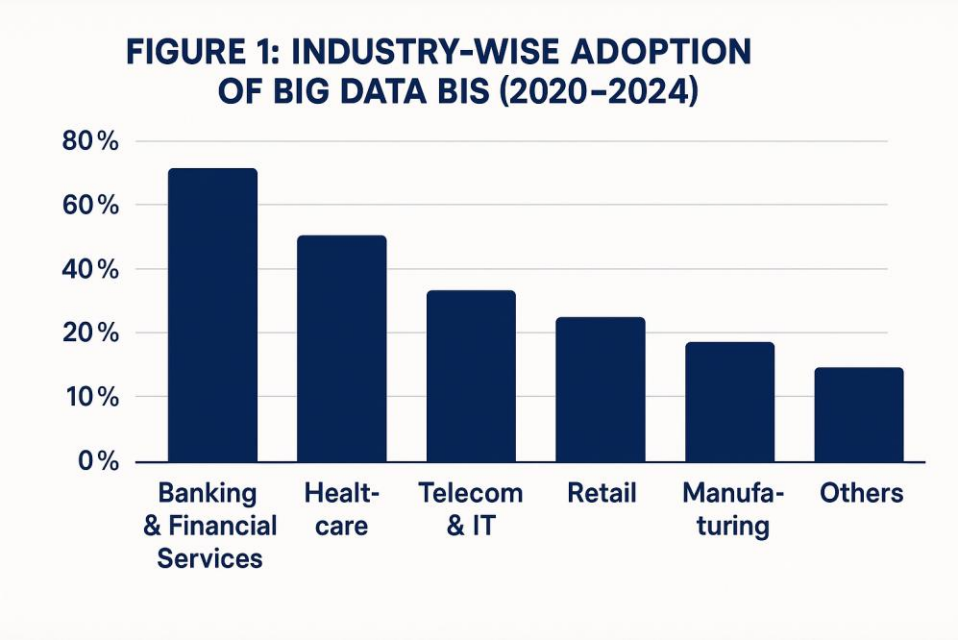

Figure 1: Industry-wise Adoption of Big Data BIS (2020–2024)

These implementations reflect a trend where strategic decision-making is decentralized and increasingly data-informed, leading to quicker and more responsive business actions.

6. Challenges and Ethical Considerations

Despite the potential, integrating Big Data with BIS presents several challenges. These include issues of **data governance**, **data quality**, **interoperability**, and **cybersecurity**. Organizations must also address **algorithmic biases** in AI-based systems and ensure **transparency** in decision outcomes.

Ethical considerations are paramount when BIS process sensitive personal or financial data. Compliance with regulations such as **GDPR** or **HIPAA** is necessary to maintain trust and avoid litigation. Additionally, there is a risk of over-reliance on automation, which can limit human judgment in strategic decisions.

Table 2: Key Risks and Mitigation Strategies in BIS-Big Data Integration

Risk	Description	Mitigation Strategy	Compliance Standard
Data Quality Issues	Inaccurate, incomplete, or inconsistent data affecting analytical outcomes	Implement data cleansing, validation rules, and quality audits	ISO 8000, DAMA-DMBOK
Cybersecurity Threats	Vulnerability to data breaches and unauthorized access	Employ encryption, firewalls, multi-factor authentication	ISO/IEC 27001, NIST CSF
System Interoperability	Incompatibility between legacy BIS and modern Big Data platforms	Use middleware, APIs, and cloud-native architectures	TOGAF, ITIL
Algorithmic Bias	Biased outputs due to skewed training data or model design	Audit models regularly, ensure diverse datasets, use fairness tools	AI Fairness 360, OECD AI Principles
Regulatory Non-Compliance	Failure to meet data protection and privacy requirements	Conduct regular compliance audits, appoint data protection officers	GDPR, HIPAA, CCPA
Over-Reliance on Automation	Strategic decisions made without human oversight	Define escalation rules, include human-in-the-loop	ISO 22989 (AI systems), SOC 2

7. Conclusion

The convergence of Business Information Systems and Big Data technologies is redefining strategic decision-making. As organizations face increasingly complex, data-rich

environments, BIS must evolve to provide not only operational support but strategic foresight. Through real-time analytics, cloud integration, and AI augmentation, modern BIS platforms empower decision-makers to navigate uncertainty with agility and precision. However, these benefits come with challenges that require careful governance, ethical foresight, and robust technical frameworks.

References

1. Chen, Hsinchun, Roger H. L. Chiang, and Veda C. Storey. "Business Intelligence and Analytics: From Big Data to Big Impact." MIS Quarterly, vol. 36, no. 4, 2012, pp. 1165–1188.
2. Amuda, K. K., Kumbum, P. K., Adari, V. K., Chunduru, V. K., & Gonepally, S. (2020).Applying design methodology to software development using WPM method. Journal ofComputer Science Applications and Information Technology, 5(1), 1–8.https://doi.org/10.15226/2474-9257/5/1/00146
3. Laudon, Kenneth C., and Jane P. Laudon. Management Information Systems: Managing the Digital Firm. 15th ed., Pearson, 2018.
4. McAfee, Andrew, and Erik Brynjolfsson. "Big Data: The Management Revolution." Harvard Business Review, vol. 90, no. 10, 2012, pp. 60–68.
5. Porter, Michael E., and James E. Heppelmann. "How Smart, Connected Products Are Transforming Competition." Harvard Business Review, vol. 92, no. 11, 2014, pp. 64–88.
6. Adari, V. K., Chunduru, V. K., Gonepally, S., Amuda, K. K., & Kumbum, P. K. (2020). Explain ability and interpretability in machine learning models. Journal of Computer Science Applications and Information Technology, 5(1), 1–7. https://doi.org/10.15226/2474-9257/5/1/00148
7. Sabherwal, Rajiv, and Yolande E. Chan. "Alignment Between Business and IS Strategies: A Study of Prospectors, Analyzers, and Defenders." Information Systems Research, vol. 12, no. 1, 2001, pp. 11–33.
8. Vinay Kumar Ch, Srinivas G, Kishor Kumar A, Praveen Kumar K, Vijay Kumar A. (2021). Real-time optical wireless mobile communication with high physical layer reliability Using GRA Method . J Comp Sci Appl Inform Technol. 6(1): 1-7. DOI:

10.15226/2474-9257/6/1/00149

9. Watson, Hugh J. "Tutorial: Big Data Analytics: Concepts, Technologies, and Applications." Communications of the Association for Information Systems, vol. 34, no. 1, 2014, pp. 65–85.
10. Davenport, Thomas H. Big Data at Work: Dispelling the Myths, Uncovering the Opportunities. Harvard Business Review Press, 2014.
11. Vinay Kumar Ch, Srinivas G, Kishor Kumar A, Praveen Kumar K, Vijay Kumar A. (2022) Evaluation of Human information processing: an overview for human-computer interaction using the EDAS Method. SOJ Mater Sci Eng 9(1): 1-9.
12. Wixom, Barbara H., Binny Yen, and Michael Relich. "Maximizing Value from Business Analytics." MIS Quarterly Executive, vol. 12, no. 2, 2013, pp. 111–123.
13. Sharma, Rajeev, Peter Reynolds, Rens Scheepers, and Peter B. Seddon. "The Business Value of IT: A Synthesis and Framework of Research." Information Systems Journal, vol. 24, no. 3, 2014, pp. 235–268.
14. George, Gerard, Martine R. Haas, and Alex Pentland. "Big Data and Management." Academy of Management Journal, vol. 57, no. 2, 2014, pp. 321–326.
15. Gonepally, S., Amuda, K. K., Kumbum, P. K., Adari, V. K., & Chunduru, V. K. (2022). Teaching software engineering by means of computer game development: Challenges and opportunities using the PROMETHEE method. SOJ Materials Science & Engineering, 9(1), 1–9.
16. Zeng, Daniel, Hsinchun Chen, Robert Lusch, and Shu-Hsing Li. "Social Media Analytics and Intelligence." IEEE Intelligent Systems, vol. 25, no. 6, 2010, pp. 13–16.