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BUSINESS INTELLIGENCE AS A CATALYST FOR BETTER DECISION-MAKING IN MSMEs

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ABSTRACT :

The increasing availability of digital information has changed the way organizations understand their business environment and make managerial decisions. Micro, Small and Medium Enterprises (MSMEs), despite operating with comparatively limited financial, technological and human resources, generate substantial amounts of information through sales, purchasing, inventory, finance, customers, suppliers, employees and digital channels. The challenge for many MSMEs is not the absence of information but the ability to transform dispersed information into meaningful insights that can support timely managerial action. Business Intelligence (BI) provides an analytical framework through which business data can be collected, integrated, interpreted and presented to decision-makers. This paper theoretically examines the role of Business Intelligence in strengthening everyday and strategic decision-making in MSMEs. Drawing on established and recent literature, the paper discusses the evolution of BI from conventional reporting toward dashboards, cloud analytics, predictive analytics and intelligent decision-support environments. Particular attention is given to the application of BI in sales, inventory, purchasing, finance, customer management, marketing, supplier management and strategic planning. The paper argues that the contribution of BI to MSME decision-making is not limited to technological automation. Rather, BI can improve managerial visibility, information accessibility, analytical understanding, responsiveness and organizational learning. At the same time, data quality, analytical capability, technological readiness, organizational culture and managerial interpretation remain important conditions for realizing BI value. The paper proposes a conceptual perspective in which BI functions as a bridge between business data, managerial understanding and organizational action. The discussion contributes to the theoretical understanding of how accessible and appropriately used BI can support more informed decision-making in MSMEs.

Keywords: Business Intelligence; MSMEs; Decision-Making; Business Analytics; Data-Driven Decision-Making; Decision Support; Digital Transformation

1. Introduction

Organizations increasingly operate in environments in which business information is generated continuously. Sales transactions, customer interactions, inventory records, purchasing activities, accounting information, employee records, supplier transactions and digital marketing activities collectively create a large information base. The availability of such information, however, does not automatically result in better managerial decisions. The ability to transform data into meaningful and actionable knowledge has become an important organizational capability.

Business Intelligence (BI) has emerged as one of the major approaches for addressing this challenge. In broad terms, BI involves technologies, processes and analytical practices that transform organizational data into information and insights that can support decision-making. The concept has developed considerably from traditional management reporting. Contemporary BI environments increasingly incorporate data integration, visualization, self-service analytics, cloud technologies, predictive techniques and artificial intelligence-supported analytical capabilities.

Chen, Chiang and Storey (2012) describe the development of Business Intelligence and Analytics as a progression through different generations of analytical technologies and applications, demonstrating the increasing role of data and analytics in organizational decision processes. Their work positioned BI&A as an important research domain connecting technological development with organizational decision-making.

The relevance of BI is not restricted to large corporations. Small and Medium-sized Enterprises (SMEs), and more broadly MSMEs, also make numerous decisions every day that depend upon business information. A small business owner may simultaneously be responsible for purchasing, sales, pricing, customer relationships, inventory, cash flow and employee management. Consequently, the quality and accessibility of information available to the decision-maker can have considerable practical importance.

Research specifically examining BI and analytics in SMEs has historically received less attention than research concerning larger organizations. Llave (2017) identified major themes including BI components, BI solutions, mobile BI, cloud BI, applications, adoption, implementation and benefits in SMEs. This indicates that BI within smaller organizations is not simply a question of whether technology is adopted; it involves how analytical capabilities are implemented and converted into organizational value.

The importance of BI for decision-making has also been emphasized in broader information systems research. Işık, Jones and Sidorova (2013) connected BI capabilities such as data quality, user access and system integration with BI success, while Popović et al. (2012) connected information quality and analytical decision-making culture with effective use of BI information.

Against this background, this paper examines BI from a theoretical and practical perspective, focusing specifically on how BI can strengthen decision-making in MSMEs. The discussion is intentionally independent of primary data collection and statistical analysis. Instead, it synthesizes existing literature to explain how BI can become part of everyday managerial decision-making.

2. Business Intelligence and the Changing Nature of Decision-Making

Traditional business decision-making has frequently relied on managerial experience, intuition, periodic reports and direct observation. Experience continues to be valuable, particularly in MSMEs where owners and managers may possess detailed knowledge of customers, products and markets.

However, contemporary business environments generate information at a speed and volume that can make purely manual interpretation difficult. BI provides an opportunity to supplement managerial experience with systematically organized information.

The basic relationship can be understood as:

Data → Information → Insight → Decision → Action

Raw business transactions represent data. When data are organized and contextualized, they become information. Analytical interpretation can then generate insights, which managers can use when considering decisions and actions.

The importance of this process lies in the transformation rather than the data itself. A sales database containing thousands of transactions does not necessarily help a manager unless those transactions can be interpreted in a meaningful manner.

BI therefore changes the role of business information from passive record-keeping toward active decision support.

Traditional reporting might tell a manager how much was sold during a particular period. BI can allow the manager to examine the same information according to products, customers, locations, time periods, channels or other relevant dimensions. The resulting visibility can help reveal patterns that are difficult to identify from individual transactions.

This is particularly relevant to MSMEs because decision-making is often concentrated among a small number of individuals. When the same manager is responsible for several functional areas, an integrated view of business information can reduce the need to manually assemble information from multiple sources.

3. Review of Literature

3.1 Evolution of Business Intelligence

Business Intelligence has developed considerably over time. Earlier systems primarily focused on management information, reporting and structured databases. As organizations began generating increasingly diverse forms of information, BI expanded toward data warehousing, online analytical processing, dashboards, visualization and advanced analytics.

Chen et al. (2012) describe the evolution of Business Intelligence and Analytics as an important technological and organizational development. Their work demonstrates that BI has gradually moved beyond conventional reporting toward more advanced forms of analytical processing.

The development of BI can therefore be viewed as a movement through several broad stages:

Reporting → Visualization → Interactive Analytics → Predictive Analytics → Intelligent Decision Support

This does not mean that traditional reporting has disappeared. Rather, modern BI environments can incorporate reporting alongside increasingly advanced analytical capabilities.

For MSMEs, this evolution is significant because technologies that were historically associated with large organizations are becoming increasingly accessible through cloud-based services, subscription models and user-friendly analytical tools.

3.2 BI and Decision-Making

The primary organizational purpose of BI is closely connected with decision-making.

Işık et al. (2013) examined BI capabilities in relation to different decision environments and emphasized capabilities such as data quality, user access and integration. Their findings emphasize that BI should be considered in relation to the decisions for which information is required.

This perspective is particularly useful for MSMEs. The usefulness of a BI system should not be judged simply by the number of dashboards or analytical features it provides. Instead, attention should be given to whether the information actually helps managers understand business situations and make appropriate decisions.

Popović et al. (2012) examined information quality and analytical decision-making culture. Their research indicates that information quality and an organizational orientation toward analytical decision-making are relevant to the effective use of BI information.

Thus, BI can be viewed as involving both a technological and a human dimension.

3.3 BI in SMEs and MSMEs

Llave (2017) conducted a systematic review specifically focusing on BI and analytics in SMEs. The review analyzed 62 articles and identified research relating to BI components, solutions, mobile BI, cloud BI, applications, adoption, implementation and benefits.

This literature is important because it demonstrates that BI in smaller organizations has multiple dimensions. The issue is not simply whether an enterprise purchases analytical software. It also concerns how the technology is used, what information it processes and how the resulting information contributes to business activities.

Llave (2019) further reviewed BI and analytics research in SMEs, reinforcing the importance of adoption, implementation, applications and organizational benefits.

More recent research continues this direction. Tsiu et al. (2025), through a systematic review, examined applications and competitive advantages associated with data mining and BI in SMEs. Their review identifies applications relating to operational efficiency, strategic decision-making and market competitiveness.

The continuing development of this literature indicates that BI is increasingly relevant to smaller organizations, although challenges associated with implementation, skills and resources remain.

4. Everyday Applications of BI in MSMEs

4.1 Sales Management

Sales information is among the most frequently generated forms of business data.

An MSME may maintain records of products sold, customers, sales representatives, locations, channels and dates. BI can combine these records and present them in a form that allows managers to identify sales patterns.

For example, a manager can examine which products generate sustained demand, which products are declining, which customer groups contribute significantly to revenue and which channels are producing different results.

This provides a broader perspective than reviewing individual sales transactions.

BI can therefore support sales decisions by improving visibility into product movement, customer purchasing patterns, channel performance, seasonal changes, sales trends and areas requiring managerial attention.

4.2 Inventory Management

Inventory decisions are particularly important for MSMEs because excessive inventory can tie up resources while insufficient inventory can affect customer service.

BI can combine inventory records with sales and purchasing information to create a more comprehensive picture of stock movement.

A manager may use BI to identify fast-moving products, slow-moving products, products approaching replenishment requirements and products whose demand changes according to particular periods.

This can help shift inventory management from occasional observation toward continuous information-supported monitoring.

4.3 Purchasing Decisions

Purchasing decisions involve product demand, supplier performance, price, delivery schedules and inventory requirements.

BI can consolidate purchasing records and supplier information so that managers can observe purchasing patterns over time.

This can help managers review which suppliers are regularly used, which products require frequent purchasing, where delivery problems occur and where purchasing patterns coincide with demand changes.

BI does not make the purchasing decision automatically. Instead, it provides an information environment through which the manager can consider the decision more systematically.

4.4 Financial Decision-Making

Financial information is fundamental to MSME management.

Accounting systems may contain substantial information concerning sales, expenses, receivables, payables and cash transactions. BI can provide an analytical layer over such information.

Managers can use dashboards and analytical views to understand revenue patterns, expenditure categories, outstanding payments and changes in financial activity.

The importance of BI in this context is its ability to make financial information more accessible to managers who may not want to examine detailed accounting records for every decision.

4.5 Customer Management

Customer information represents another important BI application.

MSMEs may interact with customers through physical stores, websites, social media, telephone communication, online marketplaces and other channels.

BI can bring information from these interactions together and help managers understand customer behaviour.

Customer analysis can help identify repeat purchasing behaviour, declining customer activity, frequently purchased products, customer preferences, complaint patterns and responses to promotional activities.

This creates an opportunity for MSMEs to move from general customer assumptions toward more evidence-supported customer management.

4.6 Marketing Decisions

Digital marketing has increased the volume of information available to smaller businesses.

Marketing platforms can generate information about customer engagement, campaigns, website activity, enquiries and conversions.

BI can combine marketing information with sales information, enabling managers to consider whether marketing activities correspond with changes in customer activity and business outcomes.

This can improve marketing decision-making by shifting attention from activity alone toward interpretation.

4.7 Supplier Management

Suppliers can significantly influence product availability, cost and operational continuity.

BI can help MSMEs maintain a historical view of supplier transactions, including ordering patterns, prices, delivery performance and product availability.

A consolidated analytical view can make it easier to identify recurring supplier issues and compare supplier performance.

4.8 Employee and Workforce Decisions

BI can also support decisions concerning employees.

Information relating to attendance, workload, sales activity, productivity, employee turnover and training can provide managers with additional evidence when reviewing workforce conditions.

However, employee-related decisions demonstrate the importance of combining analytical information with human judgment. An indicator may identify an unusual pattern, but the reason behind that pattern may require discussion and contextual understanding.

Therefore, BI should support rather than replace managerial interaction.

5. BI and Different Levels of MSME Decision-Making

5.1 Operational Decision-Making

Operational decisions occur frequently and are closely connected with daily business activities. Examples include replenishing inventory, following up with customers, responding to sales changes, monitoring orders, reviewing expenses and identifying operational exceptions. BI can provide timely information for these recurring decisions.

5.2 Tactical Decision-Making

Tactical decisions generally concern medium-term business management. Examples include planning promotional activities, selecting products for marketing, reviewing suppliers, allocating sales resources, planning workforce requirements and adjusting purchasing practices. At this level, BI becomes useful because managers can compare information across multiple periods and business dimensions.

5.3 Strategic Decision-Making

Strategic decisions affect the future direction of the enterprise. Examples include entering new markets, expanding product categories, investing in digital channels, opening another business location, changing customer strategy and developing new partnerships.

BI cannot determine the correct strategic decision by itself. Strategic decisions involve uncertainty, external factors, managerial experience and organizational priorities. Nevertheless, BI can provide evidence that improves the information base available during strategic deliberation.

6. From Descriptive BI to Predictive and Intelligent BI

One of the most important developments in BI is the movement from historical reporting toward predictive and intelligent analytics.

Traditional BI primarily addresses: What happened?

Analytical systems increasingly explore: Why did it happen?

Predictive analytics addresses: What may happen next?

Advanced decision-support systems can additionally explore: What possible actions could be considered?

This progression expands the role of BI.

For an MSME, predictive capabilities may be relevant to demand forecasting, customer behaviour, inventory planning and financial planning.

Recent research examining BI and data mining in SMEs identifies the relevance of these technologies to operational efficiency, strategic decision-making and competitiveness. However, predictions should not be interpreted as certainty. A forecast represents analytical support under particular assumptions and available information. Managers must still consider external conditions and unexpected developments.

7. Cloud BI and Accessibility for MSMEs

The development of cloud computing has changed the accessibility of analytical technologies.

Historically, organizations seeking sophisticated BI capabilities often required considerable infrastructure, software investment and specialist technical personnel.

Cloud-based BI has created alternative possibilities in which analytical services can be accessed through externally managed infrastructure.

Llave (2017) specifically identifies cloud BI and mobile BI among important themes in SME BI research.

For MSMEs, this development is potentially significant because managers can access business information without necessarily maintaining extensive internal analytical infrastructure.

Cloud BI can also support geographically distributed businesses and managers who need access to information through different devices.

The result is a movement toward BI becoming part of routine managerial activity rather than an occasional reporting exercise.

8. Data Quality and the Value of BI

The availability of information does not guarantee its usefulness.

If business information is inaccurate, incomplete, outdated or inconsistent, analytical outputs can also become unreliable.

Işık et al. (2013) identify data quality as one of the important capabilities associated with BI success. Popovič et al. (2012) likewise emphasize information quality in their analysis of BI system success and analytical decision-making.

This has particular significance for MSMEs because business information may originate from multiple sources.

For example, customer information may be maintained in one system while sales records exist in another and inventory information is stored separately.

If these information sources are not consistent, BI may provide an incomplete picture.

Consequently, effective BI requires attention to the basic quality of business information.

A useful principle is: Better analytics cannot compensate indefinitely for unreliable underlying information.

9. The Human Dimension of Business Intelligence

Although BI is technology-enabled, decision-making remains a human activity.

Managers interpret information within organizational and market contexts. A sales decline may result from seasonality, competitor activity, product availability, customer preferences or broader market changes.

A BI dashboard may identify the decline, but it cannot necessarily explain every contextual factor.

This is why analytical culture is important.

Popovič et al. (2012) found that an analytical decision-making culture is associated with the use of information in decision-making.

For MSMEs, developing such a culture does not necessarily require complex organizational structures. It can begin with simple managerial practices such as asking for evidence before making important decisions, reviewing trends regularly and using business information during planning discussions.

BI becomes more valuable when employees and managers regard information as an important input into business decisions.

10. Barriers to BI Usage in MSMEs

Although BI offers considerable potential, MSMEs may encounter several barriers.

10.1 Financial Constraints

Smaller businesses may have limited resources for technology, implementation and employee training. Consequently, BI solutions need to provide practical value without creating disproportionate financial or operational burdens.

10.2 Lack of Analytical Skills

The presence of analytical software does not guarantee analytical capability. Managers and employees need sufficient understanding to interpret dashboards, trends and analytical outputs.

10.3 Data Fragmentation

Information may exist across accounting systems, spreadsheets, sales applications, inventory records and digital platforms. Disconnected systems reduce the value of an integrated analytical perspective.

10.4 Resistance to Change

Managers accustomed to experience-based decisions may not immediately incorporate analytical information into their established routines. BI adoption therefore involves behavioural and organizational change as well as technological implementation.

10.5 Information Overload

Another potential problem is excessive information. A dashboard containing dozens of indicators may make decision-making more difficult rather than easier. The objective should therefore be decision relevance, not simply information volume.

11. A Theoretical Framework for BI-Supported Decision-Making in MSMEs

Based on the literature reviewed, BI can theoretically be positioned as an intermediate layer connecting business activities with managerial decisions. The conceptual relationship is:

Business Activities → Business Data → Business Intelligence → Managerial Understanding → Decision Support → Managerial Action → Organizational Learning

Business activities include sales, purchases, inventory, finance, customers, marketing, suppliers and employees. These activities generate business data. BI integrates, organizes and analyses the data through reporting, visualization, analytics and predictive techniques. Managers then interpret the resulting information and use it in operational, tactical or strategic decision-making.

The framework positions BI as a bridge rather than an endpoint. The organization generates data through everyday activities; BI organizes and analyses that information; managers interpret the resulting insights and use them while considering decisions; and the consequences of decisions subsequently generate new information, creating a continuous learning cycle.

Thus, BI can theoretically support a dynamic relationship:

Business Activity → Data → Intelligence → Decision → Action → New Data

This cyclical perspective is particularly appropriate for MSMEs because everyday decisions continuously influence subsequent business conditions.

12. Discussion

The literature reviewed in this paper indicates that BI should be understood as more than a collection of technological tools.

At its basic level, BI improves access to business information. At a more advanced level, it enables analytical interpretation and predictive understanding. At the organizational level, its significance depends on whether managers actually use the information during decision-making.

The literature also demonstrates that BI success is influenced by multiple factors. Işık et al. (2013) emphasize technological capabilities including data quality, user access and system integration. Popović et al. (2012) demonstrate the importance of information quality and analytical decision-making culture. SME-specific research highlights the relevance of implementation, adoption, cloud technologies, applications and benefits.

Taken together, these perspectives suggest that the value of BI is created through interaction between technology, information and people.

This is particularly important for MSMEs. The goal should not necessarily be to implement the most sophisticated BI platform available. Instead, the objective should be to develop analytical capabilities that correspond to the actual information requirements of the business.

Another important implication is that BI can support both short-term and long-term decision-making. Daily operational information can help managers respond to immediate conditions, while historical and predictive analysis can contribute to longer-term planning.

This creates the possibility of moving from reactive decision-making toward more proactive management.

13. Managerial Implications

The theoretical analysis provides several implications for MSME managers.

First, business data should be viewed as a managerial resource rather than merely as a record of past transactions.

Second, BI implementation should begin with actual decision requirements. Managers should identify which decisions require better information before selecting analytical technologies.

Third, information quality should receive sufficient attention. Incorrect or inconsistent information can reduce confidence in BI outputs.

Fourth, BI should be made accessible to relevant decision-makers. If useful information remains restricted to technical personnel, its contribution to managerial decision-making may be limited.

Fifth, employees should develop basic analytical literacy. Managers do not necessarily need to become data scientists, but they should be able to interpret trends, indicators and analytical outputs.

Finally, BI should complement managerial experience. The strongest decision environment may not be one in which intuition is completely replaced by data, but one in which experience and evidence are considered together.

14. Future Direction of BI in MSMEs

The future development of BI is likely to involve increasing integration between conventional BI, cloud computing, predictive analytics and artificial intelligence.

Recent literature on SMEs indicates continuing interest in data mining, BI and advanced analytical technologies as mechanisms for improving operational and strategic performance.

Future BI environments may increasingly move from passive dashboards toward proactive analytical assistance. Instead of requiring managers to search through multiple reports, intelligent systems may identify unusual patterns, highlight important changes and summarize areas requiring attention.

Such development could be particularly valuable for MSMEs where managers often perform multiple roles and have limited time for detailed information analysis.

However, greater automation also makes responsible information management more important. Businesses will need to consider data quality, security, privacy, transparency and appropriate managerial oversight.

The future of BI should therefore not be defined simply by technological sophistication. Its real importance will depend on whether analytical technologies help organizations understand their business environment and make better-informed decisions.

15. Conclusion

Business Intelligence has evolved from conventional reporting systems into a broader analytical capability involving data integration, visualization, interactive analysis, predictive techniques and increasingly intelligent decision-support technologies.

The theoretical review presented in this paper demonstrates that BI has particular relevance to MSMEs because these enterprises continuously generate business information while often operating with limited managerial resources and specialized analytical capabilities.

BI can support everyday decision-making across sales, inventory, purchasing, finance, customers, marketing, suppliers and employees. It can also contribute to tactical and strategic decisions by improving the visibility and interpretation of business information.

The central theoretical argument of this paper is that BI creates value when it successfully connects business data with managerial understanding and organizational action.

The importance of BI therefore extends beyond the adoption of software. Technology alone cannot guarantee better decisions. Information must be reliable, accessible and relevant, while managers must possess the ability and willingness to interpret and use it.

For MSMEs, the practical role of BI can consequently be understood through four major contributions: visibility, making business conditions easier to see; timeliness, making relevant information available when decisions are required; analytical understanding, revealing patterns and relationships within business information; and decision support, providing evidence that can strengthen managerial consideration of alternatives.

At the same time, BI should not replace managerial judgment. Business decisions frequently involve uncertainty, experience, relationships and contextual factors that cannot be completely represented through data.

The future of BI in MSMEs is therefore likely to depend on the effective combination of technology, quality information, analytical capability and human judgment. When these elements work together, BI can become more than a reporting mechanism: it can become an organizational capability that supports continuous learning and more informed decision-making.

Ultimately, the significance of Business Intelligence for MSMEs lies in its ability to transform the role of information from something that is merely recorded into something that is actively understood and used for action.

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