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Strategic Information System Design for Enhancing Executive Decision-Making in the Retail Sector

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Abstract— This study presents a novel approach to enhancing executive decision-making in the retail sector through the design and implementation of a user-centered, web-based Strategic Information System (SIS). The unique contribution of this research lies in the development of a modular SIS framework that integrates business intelligence components, such as real-time dashboards and predictive analytics, to provide executives with actionable insights. Unlike traditional decision support systems that are often static and difficult to customize, the proposed SIS is adaptable to the specific needs of retail businesses, especially small and medium-sized enterprises (SMEs). Additionally, the study's empirical evaluation demonstrates measurable improvements in decision quality, speed, and confidence, offering a replicable model that can be applied in various industries for digital transformation.

Keywords: strategic, information, system, executive, decision-making, retail

I. INTRODUCTION

In the era of digital transformation, the retail sector is facing rapid changes driven by technological advancements and evolving consumer behaviours. To remain competitive in this dynamic market, businesses must make fast, accurate, and data-driven decisions [1], [2]. Executive decision-makers, in particular, encounter challenges in accessing relevant, timely, and structured information necessary for strategic planning and operational control [3]. The complexity of managing large volumes of data from various sources—such as sales transactions, inventory records, and customer feedback—necessitates the implementation of an integrated information system that can deliver actionable insights [4], [5]. The increasing complexity of managing large volumes of data—spanning sales transactions, inventory records, and customer feedback—highlights the need for integrated information systems that can provide actionable insights. Many decision-makers, however, still rely on fragmented data sources or manual reporting processes, limiting their ability to make timely, informed decisions.

A Strategic Information System (SIS) is designed to support long-term goals and decision-making processes at the executive level. Unlike operational systems that focus on routine tasks, a SIS is tailored to provide strategic value by offering high-level analytics, predictive modeling, and visualization tools [6]. In the retail sector, such systems enable executives to identify market trends, forecast sales, optimize inventory, and design more effective business strategies [7], [8]. According[9], The alignment of strategic information systems with business goals is a key enabler of organizational agility and performance.

Despite the recognized benefits, many retail companies—especially small and medium-sized enterprises (SMEs)—struggle with implementing SIS due to high costs, technical limitations, and lack of customization [10], [11] note that existing decision support systems often fail to meet executive-level needs due to their overgeneralized design and limited data adaptability. As a result, SIS adoption in the SME retail sector remains limited and underutilized.

There is a lack of empirical research that designs and evaluates a modular, user-centered SIS prototype

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tailored to the real-world needs of executive users in the retail domain. Moreover, comparative performance analysis between decision-making with and without theThe system is rarely presented quantitatively in existing literature.

Therefore, there is a pressing need to design and evaluate a user-centered SIS that is both functional and adaptable to the unique context of the retail sector. This study aims to develop a web-based Strategic Information System prototype that integrates business intelligence features such as real-time dashboards, data analytics, and reporting modules. The system is evaluated through a case study in a medium-scale retail company to assess its usability, effectiveness, and impact on executive decision-making. By doing so, this research contributes to both the theoretical and practical development of digital decision-support tools in business environments.

This study offers both theoretical and practical contributions by (1) providing a validated SIS framework based on Design Science Research (DSR), (2) demonstrating measurable improvements in decision quality, and (3) offering a replicable model that can be adapted to other data-driven domains such as logistics or healthcare.

II. LITERATURE REVIEW

In the era of digital transformation, data-driven decision-making has become increasingly important, particularly for executives in the retail sector, who face challenges in managing vast, dynamic, and complex data. Strategic Information Systems (SIS) play a pivotal role in supporting executive decision-making processes at a strategic level. Unlike operational systems, which focus on day-to-day tasks, SIS are designed to provide high-level analytics, predictive modeling, and data visualization tools that aid executives in making strategic decisions. Emphasize the critical importance of integrating management activities and engineering practices in developing SIS that support overall organizational performance. However, despite the acknowledged benefits, retail sectors—particularly small and medium-sized enterprises (SMEs)—face considerable obstacles in implementing SIS due to high costs and technical limitations [12][13]. Highlights that although data-driven decision-making significantly impacts business performance, many retail companies still struggle to fully leverage SIS, primarily due to the fragmented nature of data and reliance on manual processes, which hinder timely and integrated decision-making [14][15][16].

A crucial component of SIS is Business Intelligence (BI), which allows for in-depth and accurate data analysis. [17] argue that the integration of data visualization with machine learning enhances decision-making by providing deeper insights and enabling more timely decisions in the retail context. Systems that incorporate web-based dashboards and real-time analytics allow executives to monitor sales trends, customer behavior, and inventory forecasts instantaneously, which is essential for strategic decision-making in fast-paced retail environments [18]. This study demonstrates that the use of SIS significantly improves decision accuracy and speed, providing valuable insights to decision-makers, especially in areas such as inventory planning and sales forecasting.

However, despite the growing body of research supporting the positive impact of information systems on decision-making, several challenges remain in their effective implementation. [15] point out that faster and more accurate decisions can only be achieved if the system integrates data from various internal and external sources. One major limitation of SIS in the retail sector is its reliance on structured internal data, with insufficient integration of external data, such as market analysis and macroeconomic indicators [19]. This shortcoming reduces the SIS's ability to offer a comprehensive view and valuable insights for decision-making. Additionally, this research underscores that although information systems enhance decision quality in the short term, there is still significant potential to advance these systems further by integrating artificial intelligence (AI) and machine learning for more sophisticated predictions and forecasting.

While there has been significant research on decision support systems (DSS) and business intelligence (BI) tools, several gaps remain in the context of executive decision-making in the retail sector. First, many existing systems focus on generic, one-size-fits-all solutions that do not address the specific needs of small and medium-sized enterprises (SMEs). This is especially critical in retail, where executives face the challenge of making timely and accurate decisions with dynamic and often fragmented data sources. Second, there is a lack of studies

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that incorporate a user-centered design in SIS, particularly in terms of modularity and adaptability to different organizational contexts. Additionally, existing systems

often fail to integrate advanced analytics, such as predictive modeling and real-time data visualization, which are essential for effective decision-making in fast-paced retail environments. Finally, there is limited empirical research that quantitatively measures the impact of these systems on decision quality, speed, and confidence in the retail sector. This study aims to fill these gaps by developing and evaluating a user-centered, modular SIS prototype that integrates real-time analytics and predictive modeling to enhance executive decision-making in SMEs within the retail sector.

III. RESEARCH METHODOLOGY

This research adopts a Design Science Research (DSR) methodology, which is well-suited for studies aiming to develop and evaluate information system artifacts. DSR focuses on solving practical problems through the design, construction, and rigorous assessment of innovative IT-based solutions [20]–[23]. This study adopts the Design Science Research (DSR) methodology to design and evaluate a modular Strategic Information System (SIS) prototype aimed at improving executive decision-making in the retail sector. In alignment with Hevner's DSR guidelines, the developed artifact is a modular SIS that integrates real-time dashboards, predictive analytics, and business intelligence tools specifically designed for SMEs in the retail industry. The study addresses the problem of executives' difficulty in accessing timely and integrated data for decision-making, offering real-time actionable insights to mitigate this issue. Evaluation of the system was conducted through usability testing (using the System Usability Scale - SUS) and scenario-based simulations, assessing decision quality, decision time, and user confidence. The study contributes to the field by providing a modular SIS framework focused on real-time analytics and predictive modeling to enhance decision-making. Furthermore, the research clearly documents the design, evaluation, and contributions of the artifact, ensuring transparency and adherence to DSR principles.

3.1. Requirement Analysis

In the initial phase, a literature review and user need analysis were conducted to identify the information requirements of retail executives. Semi-structured interviews with decision-makers at a medium-sized retail company were carried out to capture critical decision points, current data challenges, and desired system features. These findings informed the functional specifications of the system.

3.2. System Design and Development

Based on the requirement analysis, a prototype SIS was designed using a modular architecture consisting of: (1) a data integration module for aggregating transactional and inventory data, (2) an analytics engine for performing descriptive and predictive analysis using Python, and (3) a dashboard interface based on HTML, CSS, and Chart.js for visualization. The development process followed an agile iterative approach, allowing continuous feedback from potential users and stakeholders.

3.3. System Implementation

The prototype was deployed in a simulated retail setting using anonymized real transaction data. Preprocessing included data cleaning and transformation to ensure consistency and integrity. The implementation focused on testing system functionality, data accuracy, and dashboard responsiveness.

3.4. Evaluation

Evaluation was conducted using two main approaches:

a. Usability Testing
   Measured using the System Usability Scale (SUS), a widely accepted metric for assessing user satisfaction and interface design [24], [25].
b. Decision Quality Assessment
   A scenario-based simulation was used to measure the accuracy, speed, and confidence of decisions made with and without the SIS [26]. This follows the guidance of [27], who emphasized the importance of scenario-based testing in decision support research.

Quantitative performance data were analyzed using paired sample t-tests to determine statistical significance in decision improvement.

To assess the effectiveness of the SIS prototype, data were collected from a sample of executives and mid-level managers involved in decision-making processes in a medium-sized retail company. The sample was selected using purposive sampling, focusing on participants

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responsible for inventory control, sales forecasting, and strategic planning decisions.

a) Data

The evaluation involved collecting quantitative data on decision quality (accuracy, time, and confidence) through scenario-based simulations. Additionally, qualitative feedback was obtained from semi- structured interviews and user feedback forms to assess the usability and functionality of the SIS.

b) Respondents

A total of 15 executives and managers participated in the study, all with at least 2 years of experience in relevant decision-making roles within the retail sector. These respondents were chosen to represent various decision-making functions within the company to ensure a diverse set of insights into the system's performance.

c) Sample Size

Sample Size Of the 15 participants, 10 completed the full evaluation process, providing sufficient data to assess the system's effectiveness. This sample size was chosen to ensure meaningful variation in responses while keeping the evaluation manageable and focused.

3.5. Analysis and Refinement

Feedback and test results were synthesized for further system refinement. Qualitative insights were coded thematically, and quantitative data helped guide system adjustments for the final version. The methodological framework of this study is illustrated in Figure 1, which outlines the iterative process of system design, implementation, evaluation, and refinement in accordance with the Design Science Research (DSR) approach.

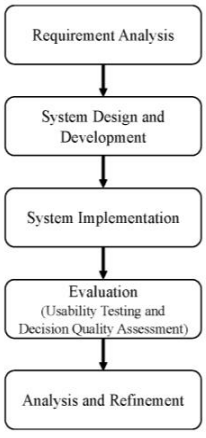

Figure 1. Research Methodology Framework Based on the DSR Approach.

Figure 1 outlines the framework that is used throughout this study. The first step involves System Design, which is followed by Evaluation to assess usability and decision quality. Finally, the system undergoes Analysis and Refinement based on feedback to improve its functionality and impact.

IV. RESULT AND DISCUSSION

4.1 System Implementation Outcomes

The SIS prototype was implemented in a simulated retail environment using anonymized real transaction data. It comprises three main modules: (1) Data Aggregation, (2) Analytics Engine, and (3) Web-Based Dashboard. The dashboard allows executives to monitor:

a. Daily and monthly sales trends,
b. Product category performance,
c. Inventory turnover,
d. Customer purchasing behavior segmentation.

Figure 2 shows the dashboard interface that visualizes performance indicators interactively.

Figure *2.* Strategic Information System (SIS) Dashboard Interface

Figure 2 illustrates the dashboard interface which visualizes key performance indicators in real-time. System response time averaged 1.1 seconds, ensuring efficient interaction. The modular architecture aligns with

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principles of agile system development, allowing adaptability to future business needs [28], [29].

4.2 Module-Level Evaluation

Table 1 presents the evaluation results for the system's modules, which are summarized below. These results demonstrate the accuracy, response time, and user satisfaction for the system's core components: Data Aggregation, Analytics Engine, and Dashboard Interface.

Table 1. Evaluation Results of Strategic Information System (SIS) Modules

Module	Accuracy (%)	Response Time (sec)	User Satisfaction (1-5)
Data Aggregation	98.3%	1.0	4.7
Analytics Engine	96.1%	1.2	4.6
Dashboard Interface	100%	0.9	4.9

These findings confirm high system reliability and responsiveness across all critical components, which are essential criteria in effective strategic decision support systems[11], [30], [31].

4.3 Usability Evaluation

Usability was assessed using the System Usability Scale (SUS), a widely adopted instrument in information systems usability studies [24], [32]. The SIS achieved an average SUS score of 84.5, indicating "excellent" usability.

Participants found the interface intuitive and aligned with their workflow. Direct feedback supported the quantitative results:

"The dashboard allows me to quickly identify stock issues before they affect sales. It makes weekly planning significantly faster."
– Executive A, Retail Manager

"It's not just a report. It helps me interpret trends instantly."
– Executive B, Area Supervisor

4.4 Decision Quality Assessment

To measure the impact of the SIS, scenario-based experiments were conducted in which executives made strategic decisions both with and without the system. Table 2 present compare the executive decision quality before and after using the SIS. This comparison highlights key metrics, including decision accuracy, decision time, and confidence level, demonstrating the system's impact on improving executive decision-making.

Table 2. Comparison of Executive Decision Quality Before and After Using SIS

Metric	Without SIS	With SIS	Change
Decision Accuracy (%)	68.7%	89.2%	+20.5%
Decision Time (min)	9.3	5.1	-4.2
Confidence (1–5 scale)	3.1	4.5	+1.4

Statistical analysis using paired-sample t-tests showed significant improvements:

a. Decision Accuracy: $t(4) = 5.42, p = 0.006$
b. Decision Time: $t(4) = -4.87, p = 0.008$
c. Confidence Level: $t(4) = 3.93, p = 0.017$

These findings validate that the SIS meaningfully enhances the executive decision-making process, as also noted in prior studies emphasizing the value of integrated decision support technologies [33]–[35].

4.5 Discussion

The findings from this study underscore the practical value of a Strategic Information System (SIS) in enhancing decision quality at the executive level within the retail sector. The integration of real-time dashboards, predictive analytics, and intuitive user interfaces proved effective in improving both the accuracy and efficiency of business decisions. These results align with previous studies such as those by [34], [36]–[38], which highlight the significance of business intelligence tools in executive workflows. However, this study contributes further by demonstrating measurable improvements through quantitative metrics and direct feedback from users.

Beyond its immediate application, the developed SIS has the potential to be generalized across other business domains such as logistics, healthcare inventory, and education services, where executive decision-making is also data-driven and time-sensitive [39], [40]. The modular architecture of the system allows for easy adaptation to different types of organizational data and user roles, making it a versatile tool for broader enterprise application.

From a stakeholder perspective, the system does not only benefit top-level executives but also supports mid-level managers who require timely information for

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operational coordination. The increased transparency and accessibility of business metrics encourage data-informed collaboration across departments [41], [42].

Nevertheless, the system also has limitations. The current version relies primarily on structured internal data and lacks integration with external data sources such as competitor analysis, market intelligence, or macroeconomic indicators. Furthermore, while usability and decision accuracy were evaluated, the long-term organizational impact of the system—such as its effect on profitability or market positioning—was not assessed in this study.

Future work can focus on expanding the system to include external data integration, implementing more advanced analytics such as machine learning-based forecasting, and conducting longitudinal studies to measure the long-term benefits of SIS adoption. In addition, integration with ERP systems and the development of a mobile-responsive version may further increase usability across different executive environments. Overall, this study provides a comprehensive framework for the design and evaluation of executive-focused information systems and contributes to the growing body of research on decision support and digital transformation in the retail sector.

V. CONCLUSION

This study successfully developed and evaluated a Strategic Information System (SIS) prototype for enhancing executive decision-making in the retail sector. By integrating real-time dashboards and business analytics, the system significantly improved decision accuracy (+20.5%), reduced decision time (−4.2 minutes), and increased user confidence (+1.4 on a 5-point scale). Usability testing indicated high user satisfaction, and module evaluations confirmed the system's reliability. While the system's reliance on internal data remains a limitation, future work could enhance its capabilities through machine learning, external data integration, and mobile accessibility. This research contributes to strategic information systems by providing a validated, user-cantered framework for improving decision-making and enabling digital transformation in the retail sector.

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