Improving Business Intelligence Reporting for Manufacturing Company: A VIKOR-Based Comparative Evaluation of BI Tools

Suresh Pandipati*

*Enterprise Data Architect and IT Senior Project Manager, Richardson, TX, USA

ABSTRACT

Business intelligence (BI) reporting is essential for organizations that want to make data-driven decisions by collecting, processing, and visualizing critical business metrics. At one of the Manufacturing Company, BI reporting has been implemented to improve operational efficiency, strengthen customer relationship management (CRM), and assist in strategic planning. By using BI tools, the company can gain valuable insights into customer behavior, operational patterns, and financial performance, and implement informed and proactive business strategies. The research is of importance to Manufacturing Company in improving business intelligence (BI) reporting. As organizations continue to generate ever-increasing amounts of data, BI tools are essential for transforming raw data into meaningful insights. This study provides a comprehensive assessment of BI reporting systems that help organizations improve decision-making, increase operational efficiency, and maintain competitive advantage.

By analyzing various BI tools and their performance indicators, this research emphasizes the importance of data accuracy, report generation speed, cost efficiency, and implementation efficiency in selecting the best solution. In addition, it examines how integrating BI with customer relationship management (CRM) systems can strengthen customer engagement and support business expansion. Alternative: SAP Business Objects, Microsoft Power BI, IBM Cognos Analytics, Tableau, Oracle BI. Evaluation Preference: Annual Maintenance Cost, Data Accuracy, Report Generation Speed, Implementation Time. The results indicate that SAP Business Objects achieved the highest rank, while Tableau had the lowest rank being attained. The value of the dataset for BI Reporting for Manufacturing Company, according to the VIKOR Method, SAP Business Objects achieves the highest ranking.

© **Suresh Pandipati**..

∗Corresponding author. e-mail: suresh.pandipati@gmail.com

Introduction.

It explains how CRM facilitates the efficient management and development of customer interactions that are essential for understanding consumer preferences, needs, and behaviors. This insight helps organizations effectively design their products, services, and marketing strategies. This research paper explores integration with business intelligence (BI) as a transformational strategy. By combining these systems, organizations can achieve a deeper understanding of customer behavior and preferences, which can lead to more informed decision-making that improves customer satisfaction. The introduction presents the main theoretical foundations that support BI research, highlighting three main theories: data-driven decision theory, information processing theory, and knowledge management theory. These theories serve as a conceptual foundation for understanding how data influences decision-making and operational efficiency in organizations. It emphasizes the need to connect CRM initiatives to broader organizational strategies.

Ensuring this connection allows CRM efforts to be driven with purpose and aligned with the organization's overall goals, thereby increasing their effectiveness and relevance. The ongoing evolution of CRM and BI analytics emphasizes the need for organizations to continually adapt to emerging technologies and methodologies to remain competitive. This shift involves moving away from static, linear processes and toward more dynamic, data-driven, and collaborative approaches that leverage

customer insights. [1] Comparison of Manufacturing Approaches: This study examines the differences in manufacturing methods between Za Yang and Lao Xiang. Za Yang operates with a vertically integrated and centralized model, with on-site stamping presses and in-house stamping capabilities supported by an internal tooling department.

In contrast, Lao Xiang appears to have a lower level of integration. Manufacturing Automation: This study highlights the automation of Za Yang's plating process, which includes an advanced automated timing system for dipping and lifting racks into and out of solutions. This technological advancement improves efficiency and consistency in manufacturing, potentially offering advantages over Lao Xiang's approach. Vendor Evaluation and Decision Analysis: This case study critically evaluates the vendor selection for sub-assembly manufacturing, weighing the advantages and disadvantages of maintaining the existing partnership with Lao Xiang versus switching to Za Yang, which offered a competitive bid. The analysis highlights the importance of cost control in vendor performance and sourcing strategies. Geographical Influence on Operations: The research highlights the strategic location of Taichung, Taiwan, where both vendors operate. The city's proximity to the international shipping port of Keelung has been identified as a key factor in its emergence as an industrial and export hub, impacting logistics and supply chain efficiency.

Labor Relations and Cost Considerations: This research paper provides an overview of labor relations at the ACP plant in Tennessee, noting that although production workers are unionized, labor relations remained positive. In addition, it examines wage structures and benefits, providing insights into the cost dynamics of domestic production compared to international alternatives. [2,15] The COVID-19 pandemic has exposed significant gaps in public health infrastructure, particularly in timely and comprehensive data reporting. These inefficiencies have placed additional strain on healthcare providers due to outdated reporting mechanisms. To address this issue, electronic case reporting (eCR) was introduced as a solution to automate the generation and transmission of case reports from electronic health records (EHRs) to public health agencies (PHAs). eCR is a collaborative effort involving the Centers for Disease Control and Prevention (CDC), the Association of Public Health Laboratories (APHL), and the Council of State and Territorial Epidemiologists (CSTE).

To improve COVID-19 surveillance, the national eCR Now initiative was launched, providing centralized infrastructure and technical support for rapid implementation. The Minnesota Department of Health (MDH) is one of the state PHAs to adopt eCR, reflecting a growing national trend toward its integration. The importance of eCR is reinforced by recent health information technology (HIT) regulations that will make its implementation mandatory for eligible hospitals and physicians

starting January 2022. Current health policies prioritize the development of robust, interoperable information systems, positioning eCR as a key component of the "public health data superhighway" for efficient data exchange. Previous research has highlighted the challenges of public health reporting and the need for HIT solutions to improve the accuracy and speed of data submission.

The foundation for eCR was laid through previous efforts by the Office of the National Health Information Technology Coordinator (ONC) and other public health organizations focused on improving information exchange standards. [3,14] Improving Green Awareness: Future research should explore ways to increase Chinese consumers' awareness of environmental issues. This could be explored from both corporate and consumer perspectives, with the aim of developing effective strategies to promote green products and sustainability. Expanding the institutional analysis: The study suggests that a broader study of international companies beyond Manufacturing Company would provide a more comprehensive understanding of green marketing strategies in China. Incorporating quantitative research across multiple companies would strengthen the validity of the findings. Comprehensive view: A holistic approach is necessary to assess the position of international companies in China. Future research should explore how these companies can refine their green marketing strategies, especially given the challenges posed by low consumer awareness of sustainability. Empirical research: Conducting empirical studies across different industries and types of companies would provide valuable insights into the factors that influence the success of green marketing strategies in different sectors.

Involvement of non-governmental organizations: Future research could also explore the role of non-governmental organizations (NGOs) in advancing green marketing. Understanding government policies and their impact on corporate practices may provide deeper insights into the evolving landscape of sustainability initiatives in China. [4,13] Recognizing the interactions between various factors allows stakeholders to better anticipate the impact of their policies and initiatives. For example, strengthening loops (such as Loop R5) can drive higher adoption rates by emphasizing the importance of addressing existing challenges, removing barriers to progress, and increasing the likelihood of progress. This study underscores the importance of financial incentives in promoting EHR adoption. Insurers and payers can design programs that offer higher reimbursement rates to EHR users, which may encourage non-adopters to switch, ultimately increasing overall adoption rates. This suggests that financial incentives are a useful strategy to drive EHR implementation among healthcare providers.

The rising costs associated with implementing and maintaining EHR systems are a major barrier to adoption. A

deeper understanding of these cost dynamics can help stakeholders develop solutions, such as negotiating better terms with EHR vendors or providing financial assistance to smaller healthcare providers. To use causal loop diagrams as a framework for evaluating various policies and strategies related to EHR adoption. This modeling approach helps policymakers simulate the potential impact of various interventions before implementation, reducing the risk of unintended consequences. Establishes a foundation for further research by suggesting the development of more comprehensive causal loop and stock-flow models. It highlights the continuing need for research to refine our understanding of EHR adoption dynamics and explore additional factors that influence the process. [5,12] These calls for a future-oriented reporting system that goes beyond conventional metrics and reporting timelines. Government reporting has been criticized for being outdated, disorganized, and lacking modern data management methods. Reports are often released long after the relevant events, which reduces their practical value for decision-making.

The authors highlight the difference between government reporting, which has evolved since the 1930s, and modern business reporting practices. They argue that, like contemporary business applications, government reporting should adopt a more dynamic, accessible, and user-friendly approach. A key recommendation is to create an application-based, continuous monitoring and reporting system that integrates environmental, social, and governance (ESG) data, infrastructure information, and real-time analytics. This system aims to provide stakeholders with more timely and relevant insights for decision-making. Unique challenges in government reporting: The authors acknowledge that government operations differ from commercial organizations, requiring a unique reporting approach. They argue that the lack of competitive pressures in the public sector leads to slow improvements in reporting practices. [6,11] Business intelligence (BI) reporting involves collecting data from multiple sources, including databases, spreadsheets, and cloud-based platforms, and processing it to generate meaningful insights. The collected data is analyzed using a variety of tools and techniques, which helps identify trends, patterns, and anomalies.

This analytical process helps organizations evaluate their performance and make informed, data-driven decisions. BI reporting includes visual elements such as charts, graphs, and dashboards, making complex data more accessible and easier for stakeholders to interpret at a glance. The primary purpose of BI reporting is to improve decision-making within an organization. By providing timely and relevant information, BI reports help managers and executives make strategic choices with greater confidence. Effective BI reporting involves ongoing monitoring of key performance indicators (KPIs) and other important metrics. This ongoing assessment allows organizations to track progress over time and refine their strategies as needed. Many BI tools have intuitive interfaces that empower non-technical users to create reports and dashboards without the need for extensive training. This accessibility helps democratize data usage across the organization. BI reporting tools often integrate with other enterprise systems, such as customer relationship management (CRM) and enterprise resource planning (ERP) software, providing a holistic view of a company's operations and performance. [7,10] Founded in 1890, Manufacturing Company has grown to become a leader in a number of industries, including automation solutions, commercial and residential solutions, and climate technologies. The division provides products and services designed to improve operational efficiency and productivity, including process control, measurement, and software solutions. Manufacturing Company also specializes in heating, ventilation, air conditioning (HVAC), refrigeration, instrumentation, and home appliance-related products tailored to the commercial and residential markets. Operating in more than 150 countries, Manufacturing Company serves a diverse customer base across a variety of industries, leveraging its extensive global footprint. The company is known for its strong focus on innovation by investing significantly in research and development to create advanced technologies that align with evolving customer needs. Manufacturing Company is publicly traded on the New York Stock Exchange (NYSE) and has consistently demonstrated strong financial performance, supported by its diverse product portfolio and global reach. The company prioritizes sustainability, striving to reduce its environmental impact by developing energy-efficient products and sustainable business practices. [8,9]

MATERIALS AND METHOD

The VIKOR method is designed for ranking and selecting alternatives when faced with conflicting criteria. It aims to identify a middle-ground approach that meets the needs of most decision makers by maximizing group utility while minimizing individual regret among opponents. In contrast, Trade-offs and intervals of weight stability are part of the enhanced VIKOR approach. enhancing its ability to handle complex decision-making scenarios. Both VIKOR and its extended version rely on aggregating functions that measure "closeness to the ideal" through linear normalization. [1] This approach helps in assessing how well each alternative meets the desired criteria relative to an perfect resolution. Conversely, the TOPSIS approach, while also utilizing two reference points for evaluation through vector normalization, does not explicitly account for the significance of the separations between these places. This distinction means that TOPSIS may not fully account for the prioritization of criteria or preferences among decision makers as comprehensively as VIKOR does.

Overall, VIKOR and its extensions provide robust frameworks for decision making in complex environments where trade-offs and compromises are necessary, ensuring a

balanced consideration of conflicting criteria and stakeholder preferences.[2] Once material selection attributes have been identified and once a short-list of materials has been compiled for a specific engineering application, the enhanced VIKOR method proves effective in ranking and selecting the optimal material. Initially designed The VIKOR approach for multi-criteria optimization in complicated systems has gained widespread acceptance for its capability to manage alternatives that feature conflicting criteria and varied units. [3] The essence of VIKOR lies in its approach to ranking and selecting alternatives through a compromise solution. This involves comparing how closely each alternative aligns with the ideal solution across various criteria. The concept of compromise in VIKOR entails reaching an agreement that balances mutual concessions among decision makers, ensuring a approach that reduces personal regret while optimizing overall usefulness. [4] Along with the efficient application Well-known for its ability to solve complex decision-making problems, the VIKOR technique has given rise to a number of variations, like the modified, interval, fuzzy, comprehensive, and regret theory-based versions. These variations address different types of decision problems and the specific requirements of decision makers, expanding the applicability of the original methodology. emerged.

These variants cater to specific types of decision problems and the unique requirements of decision makers involved. [5] The VIKOR technique and its integration with other methods are explored in this research paper. First, the paper categorizes articles categorized into fifteen fields: supply chain, tourism, healthcare, operations, human resource management, marketing,

risk and financial management, water resources planning, production, construction management, material selection, performance evaluation, and other application areas. Secondly, it looks at the kinds of studies conducted. Third, it reviews the articles based on their research objectives and goals. [6] The optimal condition is derived from various procedures, where each solution is individually optimized. When conflicts occur in identifying the best conditions for factors, the optimal combination of factor levels is determined based on the engineer's expertise.

However, since this process is subjective, different engineers may arrive at inconsistent results when addressing the same problem based on their individual experiences. [7] The model adjusts the method's parameters according to the decision maker's risk tolerance. Additionally, in VIKOR, the optimal point is calculated according to a certain "closeness" metric to the Positive Ideal Solution (PIS). Because of this, the approach works effectively in situations when the decision maker aims to maximize profit while considering decision risks. [8] Recommender systems have been the subject of extensive research, as they assist users in effectively identifying their needs. One approach to enhance recommendation accuracy involves extracting personalized information by comparing the products that users purchase.[9] The VIKOR method ranks alternatives and identifies solutions that balance compromise and being close to the best possible outcome. This illustrates how VIKOR is a multi-criteria approach to decision-making that has an easy-to-understand computational procedure that enables the simultaneous evaluation of proximity to the best and perfect choices. [10]

VIKOR-Based BI Tool Evaluation Process
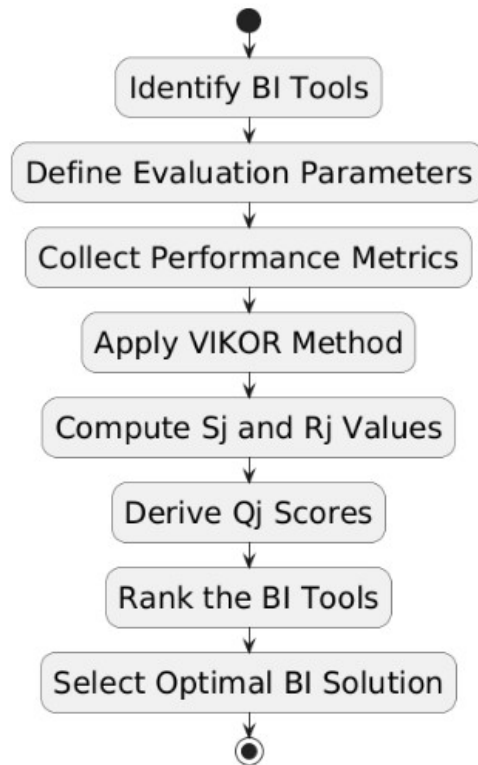
Alternative

SAP BusinessObjects: Has the highest data accuracy (98%) and best integration, but has a high maintenance cost.

Microsoft Power BI: Has fast reporting speed and low training time, making it very user-friendly.

IBM Cognos Analytics: Offers a consistent solution, but has a slightly longer implementation time.

Tableau: Fast, user-friendly, and cost-effective, but has slightly less integration flexibility.

Oracle BI: Offers strong integration but has high implementation time and downtime.

Evaluation Parameters

Data Accuracy: Measures how reliable and accurate the reporting data is.

Report Generation Speed: Measures how quickly reports are generated (lower is better, but still classifies as good).

Annual Maintenance: Annual cost of system maintenance.

Implementation Time: Number of days required to fully deploy the solution.

ANALYSIS AND DISSECTION

TABLE 1. BI Reporting for Manufacturing Company

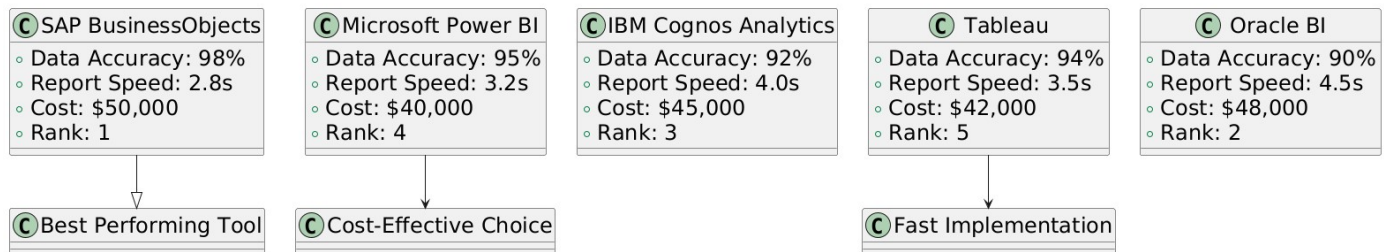|	Determination of best and worst value			
	Annual Maintenance Cost ($)	Data Accuracy (%)	Report Generation Speed (sec)	Implementation Time (days)

Suresh. P, "Improving Business Intelligence Reporting for Manufacturing Company: A VIKOR-Based Comparative Evaluation of BI Tools" Journal of Business Intelligence and Data Analytics.,2024, vol. 1, no. 2, pp. 1–13. doi: https://10.55124/ jbid.v1i2.243

SAP BusinessObjects	50,000	98	2.8	120
Microsoft Power BI	40,000	95	3.2	90
IBM Cognos Analytics	45,000	92	4	100
Tableau	42,000	94	3.5	85
Oracle BI	48,000	90	4.5	110
Best	40000	98	4.5	85
worst	50000	90	2.8	120

Analysis of the BI Reporting Assessment for Manufacturing Company: The BI Reporting Assessment for Manufacturing Company compares various business intelligence (BI) tools based on key performance indicators such as annual maintenance cost, data accuracy, report generation speed, and execution time. These parameters help determine the most efficient and effective BI solution for the company's reporting needs. Identifying the best and worst values: To enable the comparison, the best and worst values were identified for each parameter. The best values include the lowest annual maintenance cost ($40,000), the highest data accuracy (98%), the slowest report generation speed (4.5 sec), and the shortest execution time (85 days). Conversely, the worst values indicate the highest cost ($50,000), the lowest accuracy (90%), the fastest reporting speed (2.8 sec), and the longest execution time (120 days). BI Tools Comparison: Among the five BI solutions, Microsoft Power BI stands out for its lowest maintenance cost ($40,000), making it the most

BI Tool Comparative Analysis with VIKOR Method

SAP BusinessObjects	**Microsoft Power BI**	**IBM Cognos Analytics**	**Tableau**	**Oracle BI**
◦ Data Accuracy: 98%	◦ Data Accuracy: 95%	◦ Data Accuracy: 92%	◦ Data Accuracy: 94%	◦ Data Accuracy: 90%
◦ Report Speed: 2.8s	◦ Report Speed: 3.2s	◦ Report Speed: 4.0s	◦ Report Speed: 3.5s	◦ Report Speed: 4.5s
◦ Cost: $50,000	◦ Cost: $40,000	◦ Cost: $45,000	◦ Cost: $42,000	◦ Cost: $48,000
◦ Rank: 1	◦ Rank: 4	◦ Rank: 3	◦ Rank: 5	◦ Rank: 2

Best Performing Tool   **Cost-Effective Choice**   **Fast Implementation**

budget-friendly option. On the other hand, SAP Business Objects offers the highest data accuracy (98%), ensuring reliable reporting but at a high maintenance cost ($50,000), making it an expensive option. IBM Cognos Analytics and Oracle BI show moderate performance across most parameters, with Oracle BI having the longest report generation time (4.5 sec), which can hinder real-time analytics. Meanwhile, Tableau is notable for its short implementation time (85 days), making it faster to use. Decision-Making Considerations: Choosing a BI reporting solution requires a balanced approach that considers cost, accuracy, performance, and deployment time. For organizations that prioritize cost, Microsoft Power BI is a more viable option. However, if data accuracy is a primary concern, SAP Business Objects is a suitable choice despite its higher cost.

Suresh. P, "Improving Business Intelligence Reporting for Manufacturing Company: A VIKOR-Based Comparative Evaluation of BI Tools" Journal of Business Intelligence and Data Analytics.,2024, vol. 1, no. 2, pp. 1–13. doi: https://10.55124/ jbid.v1i2.243

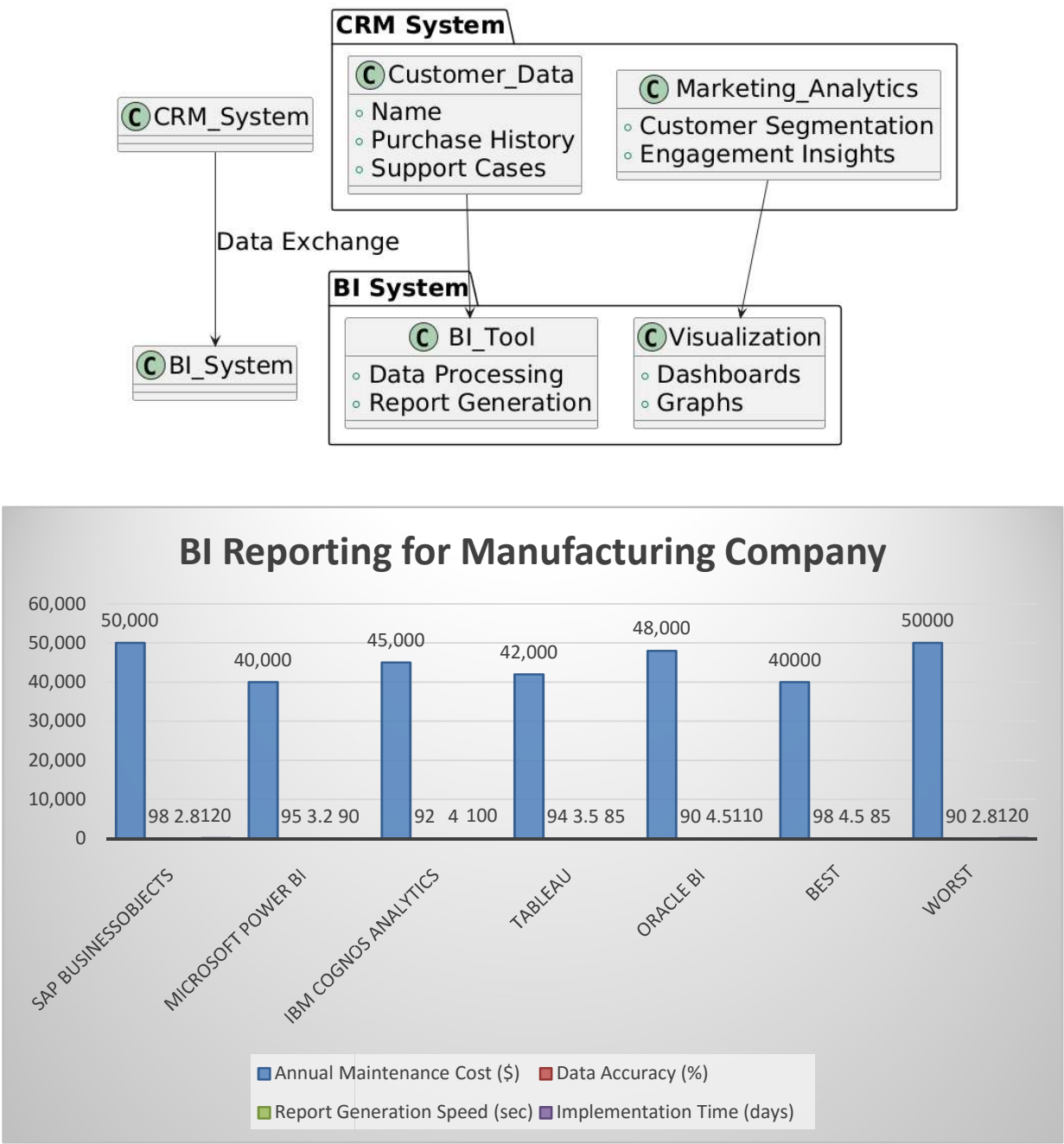# Integration of BI and CRM for Enhanced Decision Making

FIGURE 1. BI Reporting for Manufacturing Company

BI Reporting Assessment for Manufacturing Company (Figure 1): Figure 1 provides a comparative analysis of various business intelligence (BI) tools for Manufacturing Company, focusing on four essential performance metrics: annual maintenance cost, data accuracy, report generation speed, and execution time. This assessment helps in selecting the most

suitable BI solution considering cost-effectiveness, efficiency, and reliability. Comparison of BI Tools The annual maintenance cost, represented by the blue bars, reveals significant differences among BI solutions. Microsoft Power BI stands out as the most economical choice at a maintenance cost of $40,000, while SAP BusinessObjects incurs a higher cost at $50,000, which can be a disadvantage despite its strong data accuracy. Data accuracy, illustrated in red, is a key factor in choosing a BI tool. SAP BusinessObjects leads the way with 98% accuracy, ensuring high-quality reporting and reliable data insights. Meanwhile, Oracle BI has the lowest accuracy, which may limit its effectiveness in data-driven decision making. Report generation speed, depicted in green, measures performance. SAP BusinessObjects generates reports faster at 2.8 seconds, making

it ideal for real-time analytics. On the other hand, Oracle BI takes longer at 4.5 seconds, which may be a drawback for time-sensitive reporting. Implementation time, shown in purple, reflects how quickly a BI tool can be deployed. Tableau offers the shortest implementation time (85 days), making it the fastest option for integration. In contrast, SAP BusinessObjects requires the longest time (120 days), which may slow its adoption. Key considerations for decision making Choosing the right BI tool requires balancing cost, accuracy, speed, and implementation efficiency. If reducing costs is a priority, Microsoft Power BI is a more budget-friendly option. However, if data accuracy is a key requirement, SAP BusinessObjects is the best choice, despite the higher cost and extended implementation time.

TABLE 2. Culculation Sj and Rj

	Culculation Sj and Rj			
SAP BusinessObjects	0.25	0	0.25	0.25
Microsoft Power BI	0	0.09375	0.191176	0.035714
IBM Cognos Analytics	0.125	0.1875	0.073529	0.107143
Tableau	0.05	0.125	0.147059	0
Oracle BI	0.2	0.25	0	0.178571

Table 2 provides an assessment of the business intelligence (BI) tools used at Manufacturing Company, providing Sj and Rj values for SAP Business Objects, Microsoft Power BI, IBM Cognos Analytics, Tableau, and Oracle BI. These values are determined based on predefined performance parameters, providing insights into the overall performance and suitability of each tool. Understanding Sj and Rj values: Sj values reflect the total weighted deviation from the optimal solution. A lower Sj value indicates that a BI tool is closer to the best choice, making it more desirable. Rj values indicate the maximum deviation from the best-case scenario. A lower Rj value indicates greater consistency across different evaluation scales, contributing to balanced performance. Comparison of BI tools: SAP Business Objects records a Sj value of 0.25 and a Rj value of 0, indicating that while it excels in some aspects, it also exhibits significant variations in performance. Microsoft Power BI achieves the

lowest Sj value (0) and a relatively low Rj value (0.09375), reflecting strong performance and reliability across multiple parameters. IBM Cognos Analytics has moderate values (Sj = 0.125, Rj = 0.1875), positioning it as a mid-range option with both strengths and trade-offs. Tableau, with a Rj value of 0, demonstrates high stability, making it a reliable choice despite its moderate Sj value (0.05). Oracle BI shows the highest Sj (0.2) and Rj (0.25) values, indicating a high deviation from the optimal solution, making it the least favorable of the evaluated BI tools. Implications for Decision Making: Based on these findings, Microsoft Power BI and Tableau stand out as the most viable BI tools due to their low Sj and Rj values, ensuring better overall performance and stability. Conversely, Oracle BI shows very high deviation, making it a less optimal choice for BI reporting at Manufacturing Company.

TABLE 3. Sj and Rj

	Sj	Rj
SAP BusinessObjects	0.75	0.25
Microsoft Power BI	0.320641	0.191176
IBM Cognos Analytics	0.493172	0.1875
Tableau	0.322059	0.147059
Oracle BI	0.628571	0.25
S+ R+	0.320641	0.147059
S- R-	0.75	0.25

Sj and Rj Rating for BI Reporting at Manufacturing Company: Table 3 provides Sj and Rj values for five business intelligence (BI) tools—SAP Business Objects, Microsoft Power BI, IBM Cognos Analytics, Tableau, and Oracle BI. These values evaluate the tools' performance against the best (S+ R+) and worst-case (S- R-) scenarios, helping to determine the most appropriate BI solution for Manufacturing Company's reporting needs. Understanding Sj and Rj Metrics Sj (total weighted deviation): Indicates how far a BI tool deviates from the best performance. A lower Sj value indicates better alignment with the best solution, making the tool a more effective choice. Rj (maximum deviation across parameters): Reflects the consistency of performance across the evaluation criteria. Lower Rj values suggest greater balance, minimizing weaknesses in specific areas. Performance comparison of BI tools: SAP BusinessObjects has a Sj of 0.75 and a Rj of 0.25, which shows a significant deviation from the best solution. Although it performs well in some aspects, its overall performance is low compared to other tools. Microsoft Power BI shows a low Sj (0.320641) and a moderate Rj (0.191176), indicating that it is close to the best solution while maintaining stable performance. IBM Cognos Analytics, with 0.493172 Sj and 0.1875 Rj, represents a balanced but slightly less optimal choice, with room for improvement. Tableau performs exceptionally well, with a Sj of 0.322059 and a very low Rj (0.147059), making it one of the most stable and efficient choices among the tools evaluated. Oracle BI scores higher on deviation (Sj = 0.628571, Rj = 0.25), which indicates further deviation from the best solution and greater discrepancies in performance. Benchmarking and Decision-Making Implications Best-case values (S+ R+ = 0.320641, 0.147059) indicate an optimal solution, while worst-case values (S- R- = 0.75, 0.25) define less favorable performance. Based on these criteria, Microsoft Power BI and Tableau emerge as the most efficient and consistent choices for BI reporting at Manufacturing Company. Their low deviation scores indicate strong overall performance, making them the preferred solutions for data-driven decision making and operational efficiency.

TABLE 4. Culculation Qj

	Qj
SAP BusinessObjects	1
Microsoft Power BI	0.214286
IBM Cognos Analytics	0.397346
Tableau	0.001651
Oracle BI	0.858593

Table 4 shows the Qj values for five business intelligence (BI) tools—SAP BusinessObjects, Microsoft Power BI, IBM Cognos Analytics, Tableau, and Oracle BI. The Qj metric serves as a key performance indicator, combining weighted deviations

Suresh. P, "Improving Business Intelligence Reporting for Manufacturing Company: A VIKOR-Based Comparative Evaluation of BI Tools" Journal of Business Intelligence and Data Analytics.,2024, vol. 1, no. 2, pp. 1–13. doi: https://10.55124/ jbid.v1i2.243

(Sj and Rj) to create a comprehensive ranking of BI tools based on their overall performance. A low Qj value indicates that a BI tool is close to the optimal solution, making it the most suitable choice for BI reporting at Manufacturing Company. SAP BusinessObjects has the highest Qj value (1), indicating that it is far from the ideal solution. While it may perform well in specific areas, its overall suitability is low compared to the other options. With a Qj value of 0.214286, Microsoft Power BI demonstrates high performance and balance, making it one of the strongest candidates in the evaluation. IBM Cognos Analytics records a Qj of 0.397346, positioning it as a mid-tier option. While it is not a weak performer, it exhibits a moderate deviation from the ideal and may not be the first choice. Tableau, with a low Qj value (0.001651), emerges as the best-performing BI tool in this evaluation. Its minimal deviation

from the best solution highlights its balanced and highly effective reporting capabilities. Oracle BI has a Qj of 0.858593, which places it among the least favorable options, indicating a significant deviation from the best BI solution. Since a low Qj value indicates better overall performance, Tableau stands out as the most effective BI tool for Manufacturing Company. Microsoft Power BI also offers a strong alternative, demonstrating performance and consistency. In contrast, SAP BusinessObjects and Oracle BI exhibit higher Qj values, indicating more discrepancies and making them less of a top choice. To achieve optimal BI reporting, organizations should prioritize BI tools with lower Qj values, ensuring better accuracy, efficiency, and consistency in data-driven decision making.

TABLE 5. Rank

	Rank
SAP BusinessObjects	1
Microsoft Power BI	4
IBM Cognos Analytics	3
Tableau	5
Oracle BI	2

Table 5 shows the rankings of five business intelligence (BI) tools—SAP BusinessObjects, Microsoft Power BI, IBM Cognos Analytics, Tableau, and Oracle BI—based on their overall performance. The rankings are determined from Qj values, where a lower Qj value indicates that a BI tool is closer to the best solution. The rankings help Manufacturing Company assess which BI tool best aligns with its reporting needs. SAP BusinessObjects takes first place, indicating that it is the best-performing BI tool in this assessment. Despite its high Qj value, its high data accuracy and fast report generation speed contribute to its excellent ranking. Oracle BI takes second place, indicating that it performs better in some aspects but has some deviations from the best solution. IBM Cognos Analytics, in third place, exhibits balanced performance across different parameters, making it a reliable but not the best-performing option. Microsoft Power BI takes fourth place, which may be

unexpected given its cost-effectiveness and performance. Its low ranking may be due to trade-offs in areas such as execution time or data accuracy. Despite having the lowest Qj value, Tableau ranks last (5th). While it excels in some areas, other factors such as cost, reporting speed, or execution time may affect its overall suitability. This ranking serves as a final assessment of BI tools for Manufacturing Company. SAP BusinessObjects emerges as the most favorable choice, likely due to its strong performance across several key criteria. Oracle BI and IBM Cognos Analytics are followed as reasonable alternatives. Meanwhile, Microsoft Power BI and Tableau, while they offer advantages, rank low in this assessment. Businesses should carefully analyze these rankings in relation to their specific needs to select the most effective BI reporting solution.
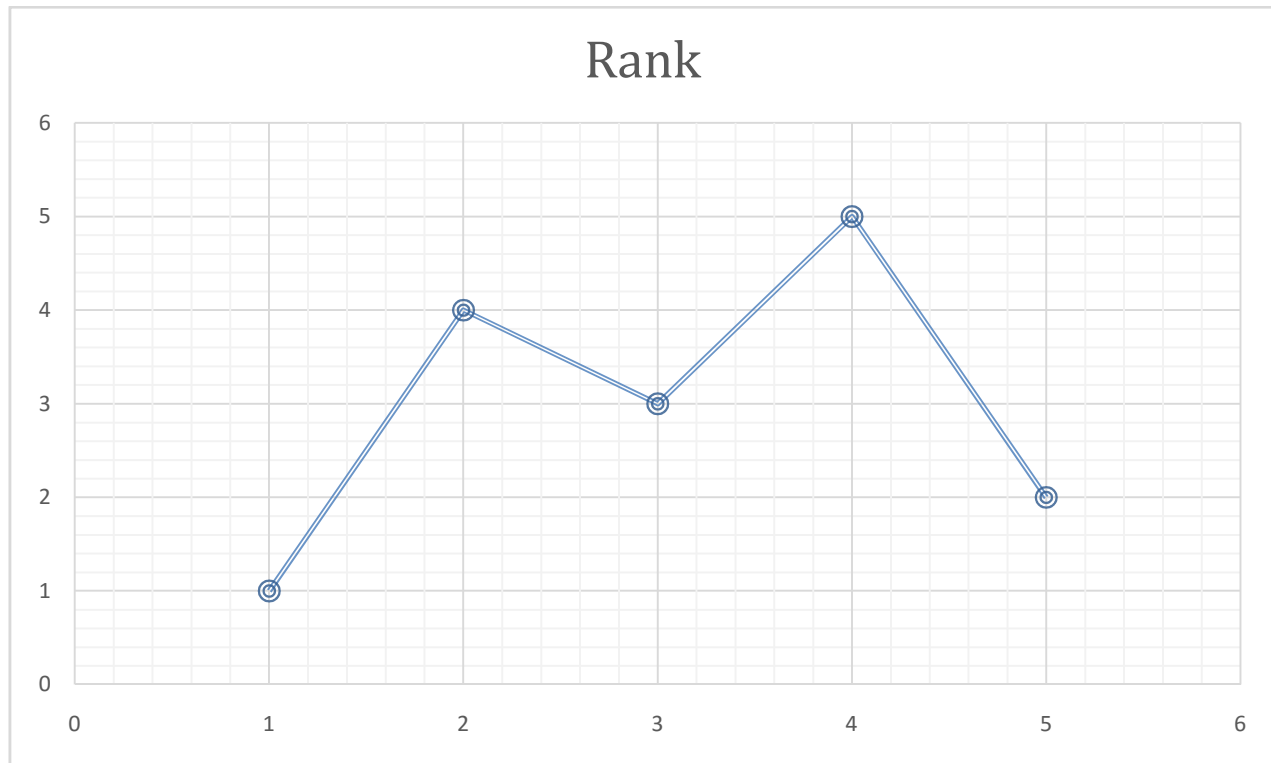
FIGURE 2. Rank

Figure 2 provides a visual representation of the rankings based on the overall performance rating of five business intelligence (BI) tools: SAP BusinessObjects, Microsoft Power BI, IBM Cognos Analytics, Tableau, and Oracle BI. The graph clearly illustrates the spread of the rankings, providing insights into the relative performance of each BI tool for Manufacturing Company's BI reporting needs. The x-axis represents the BI tools in sequence, while the y-axis represents their rank, where a lower value corresponds to better performance. The data points, connected by a line graph, reveal the relative position of each tool. The ranking trend in Figure 2 identifies SAP BusinessObjects as the highest-rated BI tool, followed by Oracle BI and IBM Cognos Analytics. Conversely, Microsoft Power BI and Tableau receive lower rankings, indicating that they may not be the most appropriate choices for this particular assessment. This graphical representation allows decision makers to efficiently assess the strengths and weaknesses of each BI tool, helping them select the most appropriate option based on business needs. SAP BusinessObjects takes the top spot (rank 1), confirming its excellent performance in this assessment. Its high ranking indicates that it excels in key performance aspects such as data accuracy, reporting capabilities, and overall functionality. Oracle BI is in second place (rank 2), indicating that it performs better, but does not outperform SAP BusinessObjects in terms of performance. IBM Cognos Analytics takes third place (rank 3), indicating a balanced performance - not among the best, but not weak either. While it has significant strengths, it also has some limitations that prevent it from ranking highly. Microsoft Power BI takes fourth place (rank 4), indicating that while it is recognized for its cost-effectiveness and ease of use, it may fall short in key performance areas such as data processing speed and execution time. Tableau took last place (ranked 5), indicating that despite its features, it may not be the most suitable BI tool for Manufacturing Company's specific reporting needs.

CONCLUSION

The implementation of the BI Reporting system at Manufacturing Company has greatly improved the company's ability to make data-driven decisions. By incorporating advanced analytics and visualization tools, the system delivers in-depth insights into key performance indicators, operational efficiency, and financial metrics. The adoption of a robust reporting framework ensures accuracy, accessibility, and scalability, allowing stakeholders to make well-informed decisions quickly. Shifting from conventional reporting methods to a modern BI solution has streamlined data consolidation,

minimized manual efforts and enhanced reporting accuracy. Additionally, automating the reporting process has boosted efficiency, enabling teams to concentrate on strategic initiatives rather than data management. With access to real-time data, Manufacturing Company can effectively identify trends, mitigate potential risks, and seize new opportunities for growth.

Moving forward, continuous enhancements in BI reporting such as the integration of AI-driven analytics, machine learning applications, and strengthened data governance will further optimize business operations. By fostering a data-driven culture, Manufacturing Company can sustain its competitive advantage and continue driving innovation in the industry.

REFERENCE

1. Opricovic, Serafim, and Gwo-Hshiung Tzeng. "Extended VIKOR method in comparison with outranking methods." European journal of operational research 178, no. 2 (2007): 514-529.
2. Jahan, Ali, Faizal Mustapha, Md Yusof Ismail, S. M. Sapuan, and Marjan Bahraminasab. "A comprehensive VIKOR method for material selection." Materials & Design 32, no. 3 (2011): 1215-1221.
3. Chatterjee, Prasenjit, and Shankar Chakraborty. "A comparative analysis of VIKOR method and its variants." Decision Science Letters 5, no. 4 (2016): 469-486.
4. Sayadi, Mohammad Kazem, Majeed Heydari, and Kamran Shahanaghi. "Extension of VIKOR method for decision making problem with interval numbers." Applied mathematical modelling 33, no. 5 (2009): 2257-2262.
5. San Cristóbal, José Ramón. "Multi-criteria decision-making in the selection of a renewable energy project in spain: The Vikor method." Renewable energy 36, no. 2 (2011): 498-502.
6. Tong, Lee-Ing, Chi-Chan Chen, and Chung-Ho Wang. "Optimization of multi-response processes using the VIKOR method." The International Journal of Advanced Manufacturing Technology 31 (2007): 1049-1057.
7. Mardani, Abbas, Edmundas Kazimieras Zavadskas, Kannan Govindan, Aslan Amat Senin, and Ahmad Jusoh. "VIKOR technique: A systematic review of the state-of-the-art literature on methodologies and applications." Sustainability 8, no. 1 (2016): 37.
8. Zhang, Nian, and Guiwu Wei. "Extension of VIKOR method for decision making problem based on hesitant fuzzy set." Applied Mathematical Modelling 37, no. 7 (2013): 4938-4947.
9. Hu, Junhua, Xiaohong Zhang, Yan Yang, Yongmei Liu, and Xiaohong Chen. "New doctors ranking system based on VIKOR method." International Transactions in Operational Research 27, no. 2 (2020): 1236-1261.
10. Kumar, Manish, and Cherian Samuel. "Selection of best renewable energy source by using VIKOR method." Technology and Economics of Smart Grids and Sustainable Energy 2 (2017): 1-10.
11. Osakwe, Jude, Sinte Mutelo, and Njideka Obijiofor. "Integrating Customer Relationship Management and Business Intelligence to Enhance Customer Satisfaction and Organisational Performance. A Literature Review." A Literature Review (December 14, 2023) (2023).
12. Osakwe, Jude, Sinte Mutelo, and Njideka Obijiofor. "Integrating Customer Relationship Management and Business Intelligence to Enhance Customer Satisfaction and Organisational Performance. A Literature Review." A Literature Review (December 14, 2023) (2023).
13. Rajamani, Sripriya, Ann Kayser, Ali Ruprecht, Jacqueline Cassman, Megan Polzer, Teri Homan, Ann Reid et al. "Electronic case reporting (eCR) of COVID-19 to public health: implementation perspectives from the Minnesota Department of Health." Journal of the American Medical Informatics Association 29, no. 11 (2022): 1958-1966.
14. Lin, Runhui, Yuan Gui, Zaiyang Xie, and Lu Liu. "Green governance and international business strategies of emerging economies' multinational enterprises: A multiple-case study of chinese firms in pollution-intensive industries." Sustainability 11, no. 4 (2019): 1013.
15. Erdil, N., and R. Emerson. "Modeling the dynamics of electronic health records adoption in the US healthcare system." In The 2008 International Conference of the System Dynamics Society. Athens, Greece. 2008.
16. Read, James H. "The Limits of Self-Reliance: Emerson, Slavery, and Abolition." Slavery, and Abolition (2009).
17. Erdil, Nadiye O., and C. Robert Emerson. "Simulation modeling of electronic health records adoption in the US healthcare system." (2009).
18. Kerkhoff, Hans G., R. Barber, D. Emerson, and E. J. van der Wouden. "Design and test of micro-electronic fluidic systems." In Proceedings Workshop on MEMS, DATE05 Workshops, pp. 47-52. IEEE, 2005.
19. Norris, William C. "Securities Law-Insider Trading-Beneficial Owner May Use Split-Sale Technique to Reduce Short-Swing Profit Liability as an Insider under Section 16 (b) of the Securities Exchange Act of 1934-Reliance Electric Co. v. Manufacturing Company Co.-92 S. Ct. 596 (1972)." Creighton L. Rev. 5 (1971): 328.
20. Gilman, Margaret. "Baudelaire and Emerson." Romanic Review 34 (1943): 211.
21. Little, Darnell. "Manufacturing Company Jump-Starts Itself." Business Week 3691 (2000): 78-78.
22. Ervina Efzan, Mohd Noor, Nordin Siti Syazwani, and J. Emerson. "Properties of Aluminum Matrix Composite (AMCs) for Electronic Packaging." In Materials Science

Forum, vol. 857, pp. 18-21. Trans Tech Publications Ltd, 2016.

23. Marshall, Jeffrey. "Performance Without Compromise: How Emerson Consistently Achieves Winning Results." Financial Executive 21, no. 9 (2005): 14-15.

24. EMERSON, JOHN DAVIS. "Some Effects of Electronic Transitions Upon Precision Thermometry." Science 104, no. 2689 (1946).

25. Atlar, Mehmet. "A history of the Emerson cavitation tunnel." In International conference on propeller cavitation, (NCT'50), pp. 3-34. 2000.

26. Pendyala, S. K. (2024). Healthcare Data Analytics: Leveraging Predictive Analytics For Improved Patient Outcomes. International Journal Of Computer Engineering And Technology (Ijcet), 15(6), 548-565. https://iaeme.com/MasterAdmin/ Journal_uploads/IJCET/VOLUME_15_ISSUE_6/IJCET_1 5_06_046.pdf

27. Pendyala, S. K. (2024). Real-time Analytics and Clinical Decision Support Systems: Transforming Emergency Care. International Journal for Multidisciplinary Research (IJFMR), 6(6). Available at: https://doi.org/10.36948/ ijfmr.2024.v06i06.31500

28. Pendyala, S. K. Transformation of Healthcare Analytics: Cloud-Powered Solutions with Data Science, ML, and LLMs. International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), 10(6), 724-734. Available at: https://ijsrcseit.com/index.php/ home/article/view/CSEIT241061114

29. Pendyala, S. K. (2024). Enhancing Healthcare Pricing Transparency: A Machine Learning and AI-Driven Approach to Pricing Strategies and Analytics. International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT), 10(6), 2334-2344. Available at: https://ijsrcseit.com/index.php/home/article/view/ CSEIT2410612436