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ARTICLE

COMPETITIVE INTELLIGENCE AS A STRATEGIC CAPABILITY: EVIDENCE FROM HIGHER VOCATIONAL EDUCATION ADMINISTRATION

INTELIGÊNCIA COMPETITIVA COMO UMA CAPACIDADE ESTRATÉGICA: EVIDÊNCIAS DA ADMINISTRAÇÃO DA EDUCAÇÃO PROFISSIONAL DE NÍVEL SUPERIOR

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ABSTRACT

Purpose: This study conceptualizes Competitive Intelligence (CI) as a strategic capability to support intelligence-based decision-making in higher vocational education administration. It examines the extent to which CI practices enhance decision quality, operational efficiency, and institutional competitiveness, addressing the gap between data use and strategic intelligence in educational management.

Methodology/approach: A mixed-methods design was employed, combining quantitative survey data (n = 75) with qualitative semi-structured interviews (n = 15) involving institutional administrators. Quantitative analysis included descriptive statistics, correlation, and regression models, while qualitative data were analyzed through thematic coding to capture decision-making dynamics and contextual insights.

Originality/Relevance: The study advances CI research by extending its application to vocational education administration and by reframing CI as a decision-support capability rather than a purely informational process. It contributes to bridging the gap between data analytics and strategic intelligence use in institutional governance.

Key findings: CI practices particularly environmental scanning and data-driven decision making demonstrate strong positive effects on decision quality (r = 0.85) and competitiveness (r = 0.78). Regression results confirm CI as a significant predictor of decision effectiveness (β = 0.62), operational efficiency (β = 0.48), and competitiveness (β = 0.55). However, strategic intelligence functions such as competitor analysis and forecasting remain underutilized.

Theoretical/methodological contributions: The study positions CI as a dynamic capability embedded in decision processes and proposes a framework linking intelligence practices to data-driven governance and sustainable competitive performance.

Keywords: Competitive Intelligence. Vocational Education. Administrative in Practice. Data-Based Decision Making. Institutional Competitiveness.

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RESUMO

Objetivo: Este estudo conceitualiza a Inteligência Competitiva (CI) como uma capacidade estratégica para apoiar a tomada de decisão baseada em inteligência na administração da educação profissional de nível superior. Examina em que medida as práticas de CI melhoram a qualidade das decisões, a eficiência operacional e a competitividade institucional, abordando a lacuna entre o uso de dados e a inteligência estratégica na gestão educacional.

Metodologia/abordagem: Foi adotado um desenho de métodos mistos, combinando dados quantitativos de survey (n = 75) com entrevistas qualitativas semiestruturadas (n = 15) envolvendo administradores institucionais. A análise quantitativa incluiu estatística descritiva, correlação e modelos de regressão, enquanto os dados qualitativos foram analisados por meio de codificação temática para captar dinâmicas decisórias e insights contextuais.

Originalidade/Relevância: O estudo avança a pesquisa em CI ao estender sua aplicação à administração da educação profissional e ao reposicionar a CI como uma capacidade de suporte à decisão, em vez de um processo meramente informacional. Contribui para reduzir a lacuna entre análise de dados e uso de inteligência estratégica na governança institucional.

Principais resultados: As práticas de CI especialmente varredura ambiental e tomada de decisão orientada por dados apresentam fortes efeitos positivos sobre a qualidade das decisões (r = 0,85) e a competitividade (r = 0,78). Os resultados de regressão confirmam a CI como preditora significativa da eficácia decisória (β = 0,62), eficiência operacional (β = 0,48) e competitividade (β = 0,55). Entretanto, funções de inteligência estratégica, como análise de concorrentes e previsão, permanecem subutilizadas.

Contribuições teóricas/metodológicas: O estudo posiciona a CI como uma capacidade dinâmica incorporada aos processos decisórios e propõe um framework que conecta práticas de inteligência à governança orientada por dados e ao desempenho competitivo sustentável.

Palavras-chave: Inteligência Competitiva. Educação Profissional. Práticas Administrativas. Tomada de Decisão Baseada em Dados. Competitividade Institucional.

1. INTRODUCTION

As the international education scene is becoming increasingly competitive, increasing competition, rapid technological change, and additional requirements of quality and relevance are adding up to the challenges of the higher vocational education institutions, both in its administration and in its academic practice as well. These pressures force educational administrators to adopt strategic tools that will enable them make informed decisions, enhance institutional performance, and match the offerings of the institutions with the needs in the market and in the society (Mgweba et al., 2024). Competitive intelligence (CI) is an organizational science phenomenon that has taken a structured process of collecting, analyzing, and using actionable information about the external environment, competition, and stakeholder needs to make strategic decisions (Jones et al., 2025). CI has been shown to enhance organizational responsiveness, anticipation of changes and creation of competitive advantage in fast changing environments (Mohammad et al., 2022). CI, which was initially developed within the business context, includes the examination of the environment, competitor analysis, analysis of market trends, and strategic foretelling (Ojinaga et al., 2026). Although such methods have developed into the core of corporate strategic planning, their use in the educational setting, specifically in the higher vocational education administration, is a relatively untapped field. Available research suggests that CI may be used to complement student recruitment approaches and institutional decision making in higher education, but there is little evidence of its influence on the fundamental improvement of the quality of administration (Ernest Mwandumbya, 2026).

1.1 Problem Statement

Although the importance of CI in strategic management has been acknowledged in the various fields, it has not been adequately studied as a systematic means of enhancing quality in the administration of higher vocational education. Numerous vocational establishments still use the old administrative traditions that do not have well-organized systems of collecting and analyzing competitive intelligence (Silveira Junior, 2015). This leads to lack of chances to predict environmental changes, address the needs of stakeholders and enhance internal functions that have direct impact on education results. In addition, extant studies regarding CI in higher education tend to design research too small to conclude the impacts of CI on larger aspects of administrative quality improvement and performance management (Naranjo et al., 2026). This disconnect is especially concerning in the context of vocational education where institutional competitiveness is highly tied to the relevance of the labor market, employer collaboration, and an adaptive administrative system that helps to minimize the quality assurance and ongoing improvement. In the absence of a strategic CI framework, the institutions of higher vocational education will be prone to failing even in an environment where education has become highly competitive.

1.2 Gap in Research

The gaps in the literature that are critical are observed in the following aspects:

Deficiency of Empirical Research in Vocational Education: Although CI could be effective in improving decision-making in administration, no empirical research has been found to substantiate its use in vocational education of higher level. Most research concentrates on universities or secondary education and has not touched on vocational institutions as much as it has not investigated any form of CI in improving administration (Ojinaga et al., 2026).

Lack of Cohesive CI and BI Models: Although both CI and BI have been studied separately on their own in education, there is no coherent model that could be used to implement both CI and BI in enhancing vocational education management. This integration may offer some important insights into the information-based decision-making and enhance the efficiency of the institutions.

Neglected Implementation of CI in Quality Improvement: CI is considered to be the competitive strategy tool, but the possibility of CI to enhance quality and operational efficiency of the administrative work in vocational institutions has not been examined. Existing studies do not explore the way through which CI practices can be coupled with quality management systems to enhance service delivery and internal operations (Tafuro et al., 2026). Although Competitive Intelligence (CI) is of growing interest, the research conducted has mostly been carried out in corporate and university settings and few empirical studies have been conducted in higher vocational institutions. Moreover, CI is commonly viewed as a practical instrument as opposed to a strategic asset that could improve the administrative performance, and competitiveness of an institution. This poses a critical theoretical and empirical gap in the knowledge of the role of CI in improving quality in administration within the vocational education context.

1.3 Research Question and Objectives.

In order to fill the identified gap, the research questions that will guide this study are as follows:

What is the current state of use of competitive intelligence in higher vocational education administration?

How are the application of competitive intelligence and administrative quality improvement related to each other in vocational education institutions?

Which frameworks or models are possible to emerge to strategically merge competitive intelligence into the practices of administrative quality improvement?

In line with these questions, the research will set the following research objectives:

Determine the existing practice and the maturity of CI application in the administrative sector of vocational education, strengths, and weaknesses.

Assess the effect of competitive intelligence on vital quality measures, such as decision-making efficiency, environmental responsiveness and administrative effectiveness.

Develop a conceptual framework of embedding the competitive intelligence strategically in higher vocational education administration in order to enhance the quality outcomes and institutional competitiveness.

1.4 Significance of the Study

The study is valuable to both theory and practice in a number of ways. First, it expands

the use of competitive intelligence theory to the domain of higher vocational education where there is limited empirical and conceptual research (Saleem, 2026). The study improves the comprehension of how information strategic processes might impact the vocational administration of institutions in terms of their effectiveness and competitiveness by connecting CI activities with any quality improvement results. Second, it offers useful suggestions to administrators and policymakers. The findings can be used by the educational leaders to design and deploy CI based systems that can improve the quality of operations, increase stakeholder satisfaction, and make sure that the administrative strategies are aligned with the market needs and expectations of the society. Lastly, the given study is a groundwork leading to the creation of other future studies as the concept model is rather strong and can be empirically tested in various settings and education systems. This kind of progress is essential in formulating evidence based administrative strategies within the vocational education that are resilient, adaptive and competitive intelligence informed.

1.5 Research Contribution

The study will be of benefit to the field through filling the gaps that have been detected in the literature. First, it will offer empirical data on the strategic deployment of competitive intelligence in management of higher vocational education institutions that would address the void in the research on CI practices in the same context. The research will also be able to associate CI practices with quality improvement outcome to prove that intelligence can aid in decision-making, resource management, and institutional performance (Rane et al., 2026). Besides, this study will combine CI and quality management approaches to come up with a conceptual model which is specific to vocational education administrators. The model suggested will provide a practical contribution to the implementation of CI systems that will lead to an improvement in the quality of administration and competitiveness of the institution. This research will also be significant in terms of its theoretical contribution as it will elaborate on the CI and BI models and practically provide specific measures that should be taken by vocational education institutions to improve their administration and strategic vision. This paper frames CI as a strategic competence based on decision-making theory and organizational intelligence viewpoints, which can guide institutions to convert information into a practical insight to enhance performance. The research is useful in that (1) it gives empirical data on vocational institutions, (2) it constructs a CI-based model of administrative performance, and (3) it has strategic implications on the competitiveness of institutions.

2. THEORETICAL FRAMEWORK

2.1 Competitive Intelligence as a Strategic Capability

Competitive Intelligence (CI) has developed beyond its basic operational information-gathering system into a strategic organizational ability that allows an institution to foresee the environmental changes, minimize uncertainty and maximize the effectiveness of decision making. Conventionally, CI has been utilized in the corporate setting to aid in competitive positioning by carrying out systematic environmental scanning, competitor analysis, and

strategic forecasting (Pradeepa et al., 2026; Variyar and Karangara, 2026). Nonetheless, its theoreticalization as a strategic capability implies that CI does not just cover data gathering to the process of converting information into practical intelligence that can be used to achieve organizational performance. Strategically, it is possible to view CI as an inherent organizational process that increases the adaptive capacity and the response to changing external conditions. This ability is essential in higher education, especially in vocational institutions because of the high correlation of the performance of the institution and the requirements of the labor market (Li, 2026). CI in contrast to the traditional methods of administration allows institutions to actively detect the new trends, expectations of the stakeholders, and competitive pressures and, thus, makes it easier to make more informed and timely decisions. Although the importance of CI in education has been acknowledged, it has mostly been perceived as an auxiliary role and not as a strategic one. This restricts its possible influence on the quality of administration and institutional competitiveness. Thus, this paper takes a strategic capability approach, postulating CI as one of the main sources of administrative performance and institutional success in the long term.

2.2 Competitive Intelligence and Administrative Performance.

The administrative performance of vocational education institutions is directly connected with the quality of decisions making, efficiency of operations and responsiveness to external requirements. CI can add value these dimensions by offering systematic insights that can be used in the planning, resource allocation, and policy formulation. Previous studies prove that CI improves the process of decision-making, making it less uncertain and allowing making evidence-based strategic decisions (Hussein et al., 2026). Data-driven decision-making and environmental scanning, as the major features of CI, enable administrators to track the tendencies in the industry and adjust the strategies of the institutions (Abdelaziz et al., 2026). This applies especially in vocational education where the administration of the institution is determined by the capacity of the institution to react to the dynamism in the labor market. On the same note, competitor analysis and market intelligence offer standards, which can be used in improving performance and strategic positioning. Nevertheless, the success of CI in enhancing the administrative performance is determined by the extent of its incorporation into the institutional processes. Research studies have indicated that the existence of the intelligence practices in a partial or fragmented form restricts their effectiveness in influencing operational efficiency and organizational performance (Roy, 2025). Thus, the process of CI adoption should be addressed comprehensively to bring maximum benefits to the administrative life.

2.3 Integration of Competitive Intelligence and Business Intelligence and Quality Management

The combination of Competitive Intelligence (CI) with Business Intelligence (BI) and quality management systems is a more detailed method of enhancing administrative performance. Whereas CI is concerned with the external information and strategic foresight, BI is concerned with the internal data analysis and monitoring of the performance (Roy, 2025; Cruz et al., 2015). Collectively, these systems can help institutions to have comprehensive

insights about internal practices and external environments. The main application of BI in higher education has been in the area of academic performance and student analytics, and little has been done on administrative processes (Wang, 2025). CI on the other hand has not been fully exploited in vocational education especially in the areas of quality management and operational efficiency (Abdelaziz et al., 2026). This disjointed use of intelligence systems makes the systems less effective. Quality Management Theory emphasizes the essence of continuous improvement, benchmarking, and data-driven decision-making in improving institutional performance. CI assists in the upholding of these principles by giving external benchmarks and strategic advice whereas BI supplies internal performance metrics (Shawyun, 2020). When these systems are integrated, vocational institutions are able to match their administrative strategies with the internal capabilities and external demands, which enhance the delivery of services and competitiveness of the institution (Tafuro et al., 2026).

2.4 Conceptual Model and Hypotheses Development.

Based on the provided arguments, this paper introduces a conceptual framework, within which Competitive Intelligence (CI) is a strategic resource that determines administrative performance by enhancing decision-making and operational effectiveness. The direct effects of CI on the competitiveness of the institution are also taken into consideration in the model.

Environmental scanning, monitoring market trends, and decision making based on data are some of the CI practices that offer important inputs to strategic decisions. The practices result in improvement in quality of administrative decisions that in turn increases efficiency of operations and responsiveness of the institutions. Moreover, CI is directly related to the competitiveness of the institutions as it allows the organizations to forecast the changes in the market and align themselves with it (Ojinaga et al., 2026; Rane et al., 2026).

The hypotheses that can be formulated within the frames of this framework are as follows:

H1: The adoption of Competitive Intelligence has a positive effect on the quality of the decisions made in the administration of vocational education.

H2: Competitive Intelligence use has a positive impact on the efficiency of operations in vocational education organizations.

H3: Competitive Intelligence adoption has a positive effect on institutional competitiveness.

H4: Competitive Intelligence has mediating effect on institutional competitiveness through decision making quality.

This theoretical framework is a systematic basis of empirical research, and it can fill in the gaps in the literature by incorporating CI, administrative performance, and competitiveness in the framework of higher vocational education.

3. METHODOLOGY

3.1 Research Design

The research design embraced in this study is a mixed-methods one, meaning it

combines both quantitative and qualitative methods of conducting research to ensure the development of a unified view of Competitive Intelligence (CI) application in the strategic improvement of the administrative quality within higher vocational education institutions. The reason behind the adoption of a mixed-method design will be to capitalize on the merits of the two methods, which will offer a strong and multi-faceted study of the research issue (Júnior et al., 2026).

The quantitative part will entail gathering of numerical data via structured surveys in a bid to explore the use of CI in the administrative decision-making process and the perceived effects of CI on administrative outcomes. The quantitative data can be used to determine the patterns, correlations, and statistical relationships between the CI adoption and the enhancement of the administrative efficiency, quality of decision-making, and institutional competitiveness within the vocational education institutions (Rahmi et al., 2020).

The qualitative aspect, in its turn, enables gaining a more sophisticated and more in-depth picture of the context within which CI practices are put into practice. The administrators, faculty members, and policymakers will be semi-structured interviewed to reveal their experiences, views, and issues surrounding the use of CI. This element is necessary to place the quantitative results in context and offer details regarding the factors that are involved to ensure the successful implementation of CI in vocational education administration. The qualitative approach was used to clarify and contextualize the quantitative findings, ensuring methodological integration via sequential explanatory design.

The purpose of this study is to be able to conduct an exhaustive examination of the general trends and the personal experience of CI practices in higher vocational education organizations with combining these two methods. For analytical clarity and theoretical fit, this study will use a systematic research model as in Figure 1 that connects Competitive Intelligence (CI) practices and administrative performance outcomes. In particular, the adoption of CI is the conceptualized independent variable, which has a positive impact on the quality of decision-making, operational efficiency, and institutional competitiveness as dependent variables. The quality of decisions is also considered as a mediating variable. This research utilizes a mixed-methods design for explanation sequence. The quantitative phase focused on identifying relationships between CI and administrative outcomes using the trend analysis method. Next, more explanations and interpretations of these results were done with qualitative phase. The combination of quantitative and qualitative methods strengthens and validates the findings.

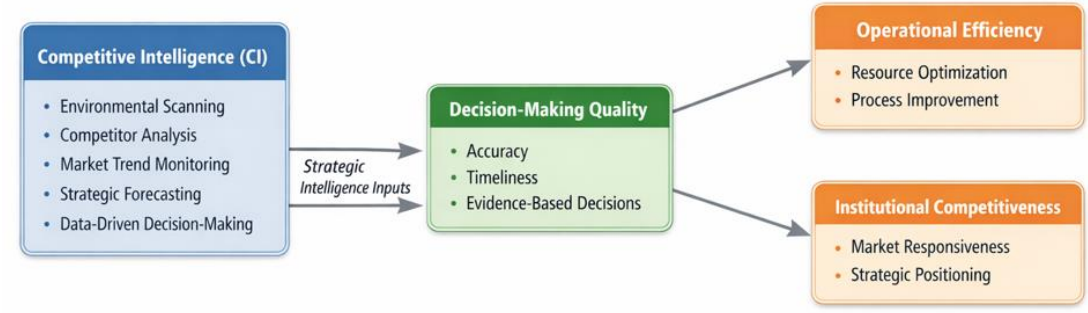


Figure 1. Conceptual research model to depict the connection between Competitive Intelligence (CI) practice, the quality of decision making, and administrative performance outcomes in institutions of higher vocational education.

3.2 Data Collection

3.2.1 Quantitative Data Collection

In the case of the quantitative component, a survey questionnaire was specifically created in relation to this research study. The survey instrument was created on the basis of following the good literature review of CI in the educational facilities, and consultations with professionals in the field of vocational education administration. Measurement of Constructs shown in Table 1.

Table 1. Measurement of Constructs

Construct	Description	No. of Items	Scale
CI Adoption	Environmental scanning, competitor analysis	5	5-point Likert
Decision-Making Quality	Accuracy, speed, effectiveness	4	5-point
Operational Efficiency	Resource use, process improvement	4	5-point
Institutional Competitiveness	Market responsiveness, positioning	4	5-point

The survey will contain a combination of Likert-scale and closed-ended questions in the form of measuring:

The level of CI application: The part evaluates the prevalence of CI application (in terms of frequency) among the administrators in vocational learning institutions with regards

to the use of CI practices (environmental scanning, competitor analysis, and monitoring of market trends).

The effect of CI: This section will investigate how CI practices are seen to influence the administrative decision-making, operational efficiency, and quality improvement.

Barriers to CI adoption: The respondents were requested to name barriers to the implementation of CI like lack of resources, training, or organizational resistance(Romero et al., 2021).

The questions in the survey were designed to reflect attitudes, perception, and behavior towards the adoption of CI and the answers were taken in a 5-point Likert scale between strongly agree and strongly disagree. The survey was set in such a way that the number of variables covered was wide and CI adoption related and demands statistical data analysis of trends, correlations and important connections.

Process of Distribution and Data Collection:

Administrative personnel of 10 vocational education institutes (both technical colleges and vocational universities) in various regions were given the survey to 200 administrative personnel The 200 questionnaires were sent out, with 75 valid responses, which is the response rate of 37.5 % that is acceptable in the survey-based studies in educational research. The questionnaire was done online to make it easy and undertaken to motivate respondents. Invitations to the participants were done using email and follow-up reminders were done at regular time intervals to ensure a response was done. In order to improve the response rate, confidentiality was assured to the respondents and participation was voluntary. The data collection was over a period of about 4 weeks after which the final data was condensed to be analysed.

3.2.2 Qualitative Data Collection.

The qualitative aspect of the research was based on the semi-structured interviews with the major stakeholders in the vocational education field. These interviews were aimed at getting an in-depth understanding of how CI could be applied in the field of vocational education administration into practice. The interviews sought to find out the challenges, success, and best practices related to the application of CI in the enhancement of the quality of administration.

Interview Protocol:

The interview questions were aimed at investigating the following themes:

The application of CI in vocational education management currently, the kind of intelligence practice (e.g. competitor analysis, market intelligence) is in use.

reported advantages of CI in relation to better decision-making, resources management, and organizational competitiveness.

Obstacles to CI adoption such as organizational resistance, absence of technological infrastructure, absence of training or resources (Carvajal-Pérez, 2025).

Recommendations on enhancing the use of CI in vocational learning institutions.

The semi-structured nature of the interviews enabled the respondents to give detailed answers without any form of restrictions but the interviews still ensured the coverage of the main issues. Face-to-face and video conferencing (where the participants were available) were used to conduct the interviews and each of the interviews took an average of 30-45 minutes. Tapes were recorded (with the consent of the participants) so as to be accurate and the interviews transcribed to be examined later.

The final sample on the qualitative interviews was composed of about 15 respondents' different positions in the vocational education institutions, including:

- Administrative managers
- Faculty members
- The decision-makers and policymakers.

The selection of the participants involved purposive sampling, the type of sampling that was employed to select the participants who were well versed with the use of CI and its implementation on administrative practices. The participants were selected according to the experience, being involved in the decision-making processes, and being familiar with CI practices.

The qualitative data were employed to supplement and interpret quantitative data, which was possible and allowed methodological triangulation. This combination enhances the strength of the research work as it gives statistical data as well as background knowledge of CI implementation.

3.3 Sample/Participants

This study will target administrative personnel, faculty members and policymakers in higher institutions of vocational learning. A stratified random sampling coupled with purposive sampling was the sampling technique used to spread the sample and have diversity in terms of different institutional roles. The sample size is quite small, but it fits the exploratory research in the developing setting like vocational education. Moreover, the quantitative and qualitative data is combined to make the findings more profound and accurate.

3.3.1 Quantitative Sample:

A total of 200 questionnaires were distributed among 10 vocational institutes. Of these, 75 valid responses were received, yielding a response rate of 37.5%.

The qualitative phase involved 15 participants who were purposively chosen for having administrative decision-making experience and were familiar with the CI.

3.3.2 Qualitative Sample:

In the case of the qualitative interviews, purposive sampling enabled the researchers to select 15 participants that had first-hand experience with CI practices, and that were involved in making important decisions in their institutions, faculty, and policymakers.

Inclusion Criteria:

- The respondents should possess a minimum of 2 years of experience in administrative positions in vocational institutions of education.
- The participants should have participated in the decision-making processes concerning CI or quality improvement (Sahu & Shrivastava, 2013).

Exclusion Criteria:

- Patients who are not directly involved in the administrative decision-making or CI practices.
- Those participants who knowledgeably or experience-wise were less familiar with vocational education administration (Bordeleau et al., 2018).

3.4 Data Analysis

3.4.1 Quantitative Data Analysis

The information gathered in the surveys was compared with the descriptive statistics and inferential statistics to determine patterns, trends, and correlations. The data was summarized by descriptive statistics including mean scores, standard deviations and frequency distributions which helped to give an overview of the CI practices in the institutions (Gonçalves et al., 2007).

Inferential statistics were used to analyze hypotheses and establish relationships among CI adoption, and administrative results. The level of strength and direction of relationships between variables such as the relationship between the frequency of CI use and the perceived improvements in administrative efficiency were also tested using the instruments such as Pearson correlation. Also, the regression analysis was employed to examine the type of contributions made by CI practices towards institutional competitiveness and quality of decision-making. The proposed hypotheses and predictive relationships between CI practices and administrative outcomes were tested by regression analysis. P-values (< 0.05) were determined as the statistical significance of relationships and the strength of the effects was determined by standardized beta coefficients.

The analysis of the data was carried out with the help of the SPSS (Statistical Package for the Social Sciences) software that is widely used in educational research to conduct a statistical analysis. The analysis was done in a systematic manner: (1) descriptive statistics, (2) correlation analysis, and (3) regression modeling. This is an analytical design that provides both explanatory and exploratory information.

3.4.2 Qualitative Data Analysis

Thematic analysis was used to analyze the qualitative data obtained in the semi-structured interviews. This method consists in determining the common themes and patterns

within the transcripts of the interviews and putting them in larger categories. Qualitative data analysis was conducted in the following way:

- Familiarization as Reading and re-reading of the interview data
- The coding of the data in order to determine the important ideas, themes, and concepts.
- Seeking themes by combining codes, those related to each other, into the broader themes.
- Revising and tidying of themes to make them be more representative of the data and research questions.
- To clarify and label the research objectives that are most pertinent to the research objectives.

The NVivo software was also used in the qualitative data analysis to help in handling and analyzing the qualitative data. Such software can help to do efficient coding and identification of the themes so that the analysis becomes systematic and complete.

Coding consistency was done to guarantee the credibility and the trustworthiness of the qualitative results, and to ensure that the themes were reviewed several times. Interpretations were supported with quotations of participants, which adds to the transparency and validity.

3.5 Reliability, Validity, and Sample Size Justification

Cronbach alpha was used to test the reliability of the survey instrument and all the constructs showed higher values than the acceptable threshold of 0.70, which means that they had a high level of internal consistency.

Content validity (literature-based design and expert review), construct validity (congruence between variables and measurement items), and face validity (pilot testing to enhance clarity and consistency) were all used to ensure validity. The sample size of 75 respondents is deemed sufficient to conduct regression analysis considering the standard methodological requirements (e.g., Hair et al., 2019). Moreover, 37.5% is a satisfactory response rate of survey-based educational research. Mixed methods are also used, which also makes the findings more robust. Reliability Analysis of Constructs depicts in Table 2.

Table 2. Reliability Analysis of Constructs

Construct	Number of Items	Cronbach's Alpha (α)
CI Adoption	5	0.82
Decision-Making Quality	4	0.85
Operational Efficiency	4	0.79
Institutional Competitiveness	4	0.83

Convergent validity was evaluated using factor loading and Average Variance

Extracted (AVE). All constructs are more than 0.50. According to Fornell–Larcker's criterion, the square root of the AVE for each construct is greater than all inter-construct correlations.

4. RESULTS

4.1 Quantitative Findings

The results of the survey that was conducted on 75 administrative staff members in 5 vocational institutions provide important information on how Competitive Intelligence (CI) practices are implemented, as well as how the practices are perceived to have affected the administrative performance. The detailed findings are as below:

4.1.1 Extent of CI Adoption

According to quantitative analysis Competitive Intelligence (CI) practices is being adopted and it has an effect on administrative performance at higher technical educational institutes.

Extent of CI Adoption (Table 3). Vocational institutes have started adopting CI practices, which are increasingly being run on intelligent processes. Finding suggested that environmental scanning and data-driven decision-making are the leading practices showing institutions focus first and foremost on their external environment and grounding their decisions in evidence. The most popular practices of CI are environmental scanning and data-driven decision making, whose mean scores are 4.2 and 4.3, respectively.

Table 3. Mean Scores **for the adoption of various** CI practices

CI Practice	**Mean Score (1=Strongly Disagree to 5=Strongly Agree)**	**Standard Deviation**	**Frequency of Adoption (%)**
Environmental Scanning	4.2	0.75	90%
Competitor Analysis	3.8	0.85	70%
Market Trend Monitoring	4.1	0.80	85%
Strategic Forecasting	3.5	0.90	60%
Data-Driven Decision Making	4.3	0.70	95%

The institutions monitor the market and don't take administrative action without using administrative data, the findings suggest. Competitive assessment and strategic forecasting are, however, less widespread in use which suggests that long-term strategic intelligence capabilities are less developed. In sum, the findings reveal moderate levels of CI maturity, where institutions show CI maturity at an operational level, but not at a strategic level (Figure 2a ,2b).

4.1.2 Impact of CI on Administrative Outcomes

The results indicate that CI has a significant positive effect on administrative results (Table 4). Finding depicts decision quality is one of the most significant influences. This reveals that CI has the capability to improve the accuracy, adaptability and efficacy of administrative decision-making.

Table 4. Impact of CI on Key Administrative Outcomes

Outcome	Mean Score (1=No Impact to 5=High Impact)	Standard Deviation	Frequency of Positive Impact (%)
Decision-Making Quality	4.5	0.68	93%
Operational Efficiency	4.1	0.77	85%
Institutional Competitiveness	4.2	0.72	87%

In comparison, CI's impact on operational efficiency and institutional competitiveness is moderate in nature, suggesting that it has not been fully anchored in all functional domains of administration. The finding demonstrated substantiates that CI improves decision makings, however, the systems integration is partial (Figure 2c). The results indicate that CI is used more as a decision-support system but not essentially as a strategic system.

4.1.3 CI Practices and Administrative Outcomes Correlations.

The CI practices show strong positive correlations with key administrative outcomes, a findings conclusive analysis (Table 5). Pearson correlation indicates that there are some important relationships between CI practices and administrative outcomes. The quality of decision-making is positively correlated with decision-making decisions on environmental scanning and the use of data-driven decisions ($r = 0.85$). The quality of organizational competitiveness is also positively correlated with the two ($r = 0.78$). Competitor analysis, on the other hand, exhibited moderate positive correlation on the operation efficiency ($r = 0.65$) but a lesser correlation with the institutional competitiveness ($r = 0.42$). These results demonstrate the significance of CI in improving the processes of decision-making and institutional competitiveness.

The Finding indicated that environmental scanning and data-driven decision making have shown the highest association with decision making quality and institutional competitiveness.

Table 5. Pearson Correlations Between CI Practices and Administrative Outcomes

CI Practice	Decision-Making Quality (r)	Operational Efficiency (r)	Institutional Competitiveness (r)
Environmental Scanning	**0.85** (Strong Positive)	0.65 (Moderate Positive)	0.78 (Strong Positive)
Competitor Analysis	0.55 (Moderate Positive)	**0.65** (Moderate Positive)	0.42 (Weak Positive)
Market Trend Monitoring	0.70 (Strong Positive)	0.68 (Moderate Positive)	0.71 (Strong Positive)
Strategic Forecasting	0.62 (Moderate Positive)	0.58 (Moderate Positive)	0.60 (Moderate Positive)
Data-Driven Decision Making	**0.90** (Strong Positive)	0.75 (Strong Positive)	0.83 (Strong Positive)

It shows that organizations as their structured intelligence processes are boosted with better administrative effectiveness and strategic responsiveness. Conversely, competitor analysis and strategic forecasting are less closely linked to competitiveness, indicating either their ineffectuality or non-integration into institutional decision-making in these countries. So, the strength relationships between each of the different CI practices and performance outcomes (Figure 2d). Findings suggested that the effectiveness of CI hinges on the depth and scope of implementation, with certain practices contributing more significantly than others.

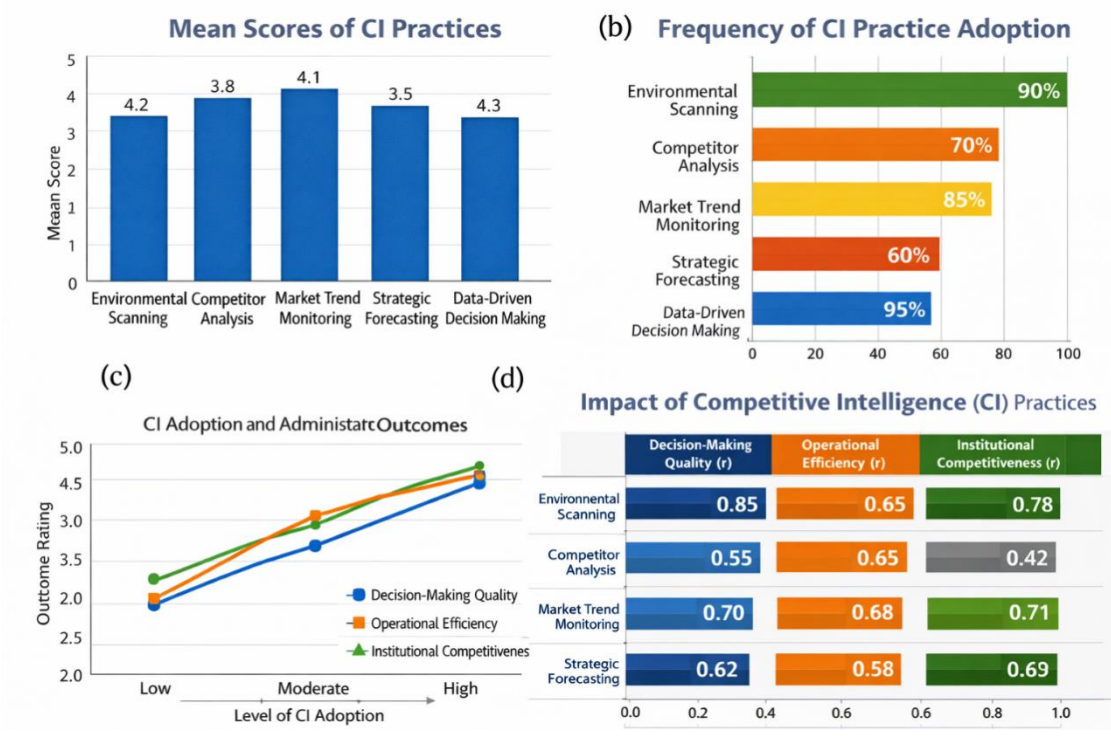


Figure 2. CI Adoption and Impact on Administrative Outcomes (a) Mean scores for the adoption of various CI practices. (b) Frequency of adoption for each CI practice. (c) Relationship between CI adoption levels and administrative outcomes. (d) Pearson correlation coefficients showing the impact of CI practices **on decision-making quality, operational efficiency, and institutional competitiveness.**

4.1.4 Regression Analysis

In an attempt to further test the predictive relationship between Competitive Intelligence (CI) practices and administrative performance outcomes, regression analysis was conducted **(Table 6)**. Such analysis gives more in-depth information than correlation as it determines how strong and significant causal relationships are between variables.

Table 6. Regression Analysis Results

Variable	Beta (β)	p-value
CI → Decision-Making Quality	0.62	< 0.01
CI → Operational Efficiency	0.48	< 0.05
CI → Institutional Competitiveness	0.55	< 0.01

According to the regression findings, Competitive Intelligence is a strong predictor of the quality of decision making (= 0.62, $p < 0.01$), which supports H1. This implies that organizations that employ CI have a better chance of making evidence-based and informed strategic decisions.

Moreover, CI demonstrates positive impact on the operational efficiency ($\beta = 0.48$, $p < 0.05$), which proves H2. This observation means that CI practices lead to effective resource management and administration.

Moreover, CI is also a major driver of institutional competitiveness (= 0.55, $p < 0.01$), which proves H3. This brings out the importance of CI as a strategic resource that improves institutional positioning and sensitivity to market needs.

Such results help answer the research question of measuring the role of Competitive Intelligence in the outcomes of administrative performance in institutions of higher vocational education.

4.2 Qualitative Findings

The semi-structured interviews conducted in the qualitative analysis showed that there were a number of common themes pertaining to how CI is applied in administrative practices in vocational education institutions. The major findings of the interviews are:

4.2.1 Challenges in CI Adoption:

Most of the interviewees mentioned lack of resources as one of the greatest challenges

to the implementation of CI in their institutions such as lack of funds to purchase CI tools and data analysis programs. Also, a few respondents mentioned the organizational resistance of implementing CI particularly among the unfamiliar staff to its advantages. One of the administrators noted that we know the possible potential of CI but the obstacles of some departments have slowed its implementation in the daily running of the organization. **Figure 3a,** the word cloud, brings out the most spoken advantages of CI that include superior strategic decision-making and increased market responsiveness.

4.2.2 Benefits of CI:

The positive influence of CI on strategic decision-making and the capacity of the institution to react to the market trends were noted by many participants. A member of the faculty stated that CI has proved extremely helpful to discover the skills our students require in the labor market and allow us to create more pertinent training programs. Another administrator observed that CI assisted in predicting the changes in an industry enabling the institution to be ahead of individuals in the industry. The thematic map of barriers and benefits of CI adoption **Figure 3b** demonstrates that one of the constraints is the resources.

4.2.3 Improvement Areas:

Some of the participants observed that CI implementation might be enhanced through enhanced integration with the regular running of administration in the institution. One of the most recurrent proposals was that the staff personnel should be provided with training that would allow them to learn how to use CI tools to their advantage.



Figure 3. CI Adoption: Benefits and Challenges (a) Word cloud showing the benefits and challenges of CI adoption, with larger words representing more frequently mentioned themes, such as strategic decision-making and resource constraints. (b) Heat map displaying the intensity of challenges by institutional type, highlighting lack of training and skills gap as major obstacles.

4.3 Interpretation of Results

By combining quantitative and qualitative results, researchers gain an enhanced understanding of CI's adoption and its impact. According to the study, the findings show a

consistent impact of CI on decision-making quality which is backed by statistical findings and qualitative insights. Organisations that consciously engage in environmental scanning and data usage achieve greater administrative effectiveness. CI implementation unevenness reveals by the findings too. The areas of operational practice are well developed, however the strategic aspects like competitor analysis and forecasting require further attention. Qualitative evidence shows that resource limitations, inertia, and other similar obstacles hinder complete institutionalization. Simultaneously, it indicates clear areas for improvement through training, leadership support and system-wide integration. Findings on Competitive Intelligence shows that it is a useful strategic capability but is highly underutilised by vocational education administration.

4.4 Discussion

The findings of the research reveal that CI has a rol es that strategically in enhancing the administrative performance of higher vocational education institution. CI is a helpful asset because it improves both decision-making and institutional efficiency and competitiveness. Instead of merely serving as a supportive tool, CI emerges as a mechanism that enables institutions to respond to an evolving environment and internal needs.

This study extends Competitive Intelligence theory by positioning CI as a strategic capability within vocational education administration, representing its direct and indirect effects on institutional performance resultys. The study reinforces the theoretical point of view regarding CI being a capability rather than a process. The findings suggest that, in conjunction with decision-making theory, timely access to intelligence helps to reduce uncertainty and improve the quality of decisions. Moreover, the findings of this study corroborate the resource-based view which regards CI as an intangible organizational resource that enhances institutional adaptability and competitive positioning. The impact of environmental scanning and data-driven decision-making underlines the importance of information processing capabilities for effective administration (Andrés Puerta-Guardo et al., 2026).

The study also makes an important factual contribution. Data from both performance-based and perception-driven approaches produce objective proof of the contribution of Competitive Intelligence to the administrative efficacy of vocational education. By combining quantitative correlation with qualitative insight **(**Önden, 2026)**,** the study shows that CI is associated with positive outcomes and is also supported by administrative experience. This increases the credibility of the results, while simultaneously bridging the gap of studies within the field.

Despite the positive results, CI implementation is still not consistent across institutions. Although organizations have operational practices such as environmental scanning, more sophisticated strategic practices like competitor analysis and forecasting are less well developed. This indicates that organizations lean towards decision support in the short term versus strategic intelligence developments. This means that the realization of CI as an integrated system has not yet been achieved(Prihatin & Hartini, 2018).

From a practical point of view, the study has several implications for administrators. Institutions must commit to funding staff training programs for effective application of CI tools and intelligence data interpretation. Moreover, leadership support is needed to build a culture with the data-consciousness and strategic awareness. Including CI in everyday administrative

activities will enhance efficiency and responsiveness of institution even more (Garcia-Alsina et al., 2016).

According to the findings, the education authorities should actively promote the use of intelligence-based management systems in vocational institutions. Policies aimed at developing the digital infrastructure, data management systems, and capacity building can help implement CI effectively. It is especially the case in vocational education, as institutions rely on demands from the labour market for success.

This study has not come without limitations. The limited number of participants of the sample size and nature of the institutions may impact the findings. Furthermore, the research combines certain aspects of self-report data which may introduce response bias. In future research, perhaps larger, more diverse samples as well as longitudinal designs could help to uncover the long-term effect of CI on institutional performance (Pailingan, 2029). Future research could examine the relationship between CI and advanced analytics and artificial intelligence for improved decision-making.

All in all, Competitive Intelligence is an important strategic capability that can make a positive contribution to administrative performance in vocational education. Nonetheless, the success of the plan is realised only to the extent that it is fully integrated into institutional systems. Strengthening both operational and strategic dimensions of CI will make decision-making easier, lower costs, and ensure that institutions are competitive and adaptive to change.

5. FINAL CONSIDERATION

5.1 Summary of Findings:

This paper discussed how Competitive Intelligence (CI) may be used to enhance the administrative practice of higher vocational institutions. The main results may be summed up as follows:

CI Adoption: The most commonly adopted types of CI practices are environmental scanning and data-driven decision-making, which are highly institutionalized, and have a great influence on the quality of decision-making and institutional competitiveness.

Implication on Administrative Outcomes: CI practices, in particular, decision-making based on data, has a significant positive influence on decision-making quality (mean = 4.5), a moderate one on operational efficiency (mean = 4.1) and institution competitiveness (mean = 4.2).

CI Adoption Barriers: The barriers to CI Adoption have been identified as resources (funding and tools) and resistance to change in some departments within the institutions. Irrespective of these obstacles, organisations that have already adopted CI have reported high levels of improvement in strategic decision making as well as responsiveness to market trends.

Correlations: It was established that environmental scanning and quality of decision-making ($r = 0.85$), data-driven decision-making and institutional competitiveness ($r = 0.90$) have strong positive correlations, indicating the importance of CI in determining administrative practices.

5.2 Contributions to the Field:

The research provides contributions towards the VEA and Competitive Intelligence (CI) in the following ways:

Reflections on Expanding CI Research: the research is one of those that are rare to discover, as it examines CI practices in comparison to vocational education, a process that has been under researched in the field of CI in the past (Sanni & Atima, 2021). It creates new information regarding how CI tools may assist in enhancing operational decision-making, augment resource distribution, and institutional competitiveness in the field of vocational educational settings (Adewusi et al., 2024).

Empirical Evidence: The study provides empirical support of the positive impact of CI on essential administrative results in tertiary vocational administration of education. This is required to teachers, administrators and policymakers who wish to discover how they can make their institution more efficient and effective by means of data-driven approaches (Mazumder, 2014).

Practical Recommendations: The study has practical implications on the leaders of the institutions towards facilitating the uptake of CI, the implications of which include need of training programs, improved distribution of resources and strategic incorporation of CI practices in regular administrative activities.

5.3 Final Thoughts:

In conclusion, Competitive Intelligence is a needed tool of enhancing administrative practice within vocational education establishments. The CI practice, such as environmental scanning and data-driven decision making, is highly beneficial in enhancing the quality of decision making and increasing operational effectiveness and competitiveness of the institutions. The pitfalls, however, include scarcity of resources and opposition to implementation of CI that have to be overcome such that there is widespread implementation of CI in all aspects of administration.

The study suggests that the CI tools and training program enable the learning institutions to offer the vocational education more in accordance with the industry demands, better their resource management, and compete. Additional research is to be conducted in order to know how CI may be applied to make institutions grow and prosper in the rapidly changing education field and the long-term impact of CI in vocational education through cross-institutional differences in the application of CI.

REFERENCES

Abdelaziz, N. M., Abdo, S. M., Naguib, S. M., & Ali, A. H. (2026). Methodological advances of AI and business intelligence in nutrition: Techniques, applications, and future directions. *International Journal of Computers and Informatics (Zagazig University), 10*, 56–77. https://www.ijci.zu.edu.eg/index.php/ijci/article/view/154

Adewusi, A., Okoli, U., & others. (2024). Business intelligence in the era of big data: A review of analytical tools and competitive advantage. *Studies in Higher Education, 49*(11), 2153–2177. https://doi.org/10.1080/03075079.2023.2293926

Andrés Puerta-Guardo, F., Cantillo-Orozco, A. S., Castillo-Loaiza, J. L., Narváez-Grisales, J. A., & Molina-Guerrero, J. (2026). Quality in higher education institutions as a transversal tool in institutional accreditation: A bibliometric review. *European Journal of Educational Research, 15*(1), 19. https://doi.org/10.12973/eu-jer.15.1.19

Bordeleau, F., Mosconi, E., & Santa-Eulalia, L. (2018). Business intelligence in Industry 4.0: State of the art and research opportunities. *Proceedings of the Hawaii International Conference on System Sciences*. https://scholarspace.manoa.hawaii.edu/bitstreams/bd2afd28-a130-4efd-aa79-2878bff08dde/download

Carvajal-Pérez, J. A. (2025). Impacto de gestión educativa fundamentada en la inteligencia competitiva. *CIENCIAMATRIA, 11*(1), 97–109. https://doi.org/10.35381/cm.v11i1.1533

Cruz, D. F., Sakaya, A. Y., Ferreira, M. G. G., Forcellini, F. A., Anjos, S. J. G., Abreu, A. F. de, & Cauchick Miguel, P. A. (2015). Inteligência competitiva em organizações de serviços: Uma revisão sistemática da literatura. *Revista Produção Online, 15*(1), 50–77. https://doi.org/10.14488/1676-1901.v15i1.1663

Dalfovo, O., Schirmann, F. R., & Correia, R. B. (2010). A utilização do observatório da educação como inteligência competitiva em uma instituição de ensino superior. *Revista Eletrônica de Estratégia & Negócios, 3*(2), 140–158. https://doi.org/10.19177/reen.v3e22010140-158

Ernest Mwandumbya, N. K., & Mushi, G. (2026). Artificial intelligence in hospitality and tourism training: Opportunities and challenges in Arusha's vocational training colleges. *Journal of Research Innovation and Implications in Education*. https://doi.org/10.59765/qpf42

Wang, G. (2025). Performance evaluation and optimization of photovoltaic systems in urban environments. *International Journal of New Developments in Engineering and Society, 9*(1). https://doi.org/10.25236/ijndes.2025.090106

Garcia-Alsina, M., Cobarsí-Morales, J., & Ortoll, E. (2016). Competitive intelligence theoretical framework and practices: The case of Spanish universities. *Aslib Journal of Information Management, 68*(1), 57–75. https://doi.org/10.1108/AJIM-04-2015-0061

Gonçalves, C. M., Colauto, R. D., & Beuren, I. M. (2007). Proposta de indicadores para sistema de inteligência competitiva em instituição de ensino superior. *Revista Produção Online, 7*(1). https://doi.org/10.14488/1676-1901.v7i1.95

Hussein, R., Zink, A., Ramadan, B., Howard, F. M., Hightower, M., Shah, S., & Beaulieu-Jones, B. K. (2026). Advancing healthcare AI governance through a comprehensive maturity model based on systematic review. *npj Digital Medicine, 9*(1), Article 236. https://doi.org/10.1038/s41746-026-02418-7

Hair, J. F., Babin, B. J., Anderson, R. E., & Black, W. C. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning. https://www.cengage.uk/c/multivariate-data-analysis-8e-hair-babin-anderson-black/9781473756540

Jones, J., MacDonnell, J., & Aamir, A. (2025). Mature undergraduates' experiences of a UK university induction programme: Accruing social capital, evolving habitus and developing a sense of belonging. *Innovations in Education and Teaching International*. https://doi.org/10.1080/14703297.2025.2555959

Júnior, C. A. C. de M., Pinto, P. A. L. de A., & Melo, F. J. C. de. (2026). Business intelligence and sustainability features in education: A systematic literature review. *Sustainability, 18*(4), 1954. https://doi.org/10.3390/su18041954

Li, Y.-M. (2026). Challenges and opportunities of adopting digital technology for curriculum reform. In *Digital technology in management education* (pp. 5–15). https://doi.org/10.4324/9781003662792-2

Mazumder, Q. H. (2014). Applying Six Sigma in higher education quality improvement. In *ASEE Annual Conference and Exposition Proceedings*. https://doi.org/10.18260/1-2--20082

Mgweba, C., Rawjee, V. P., & Naidoo, P. (2024). The use of competitive intelligence as a strategic tool for student recruitment in public universities. *International Journal of Business Ecosystem & Strategy, 6*(3), 196–203. https://doi.org/10.36096/ijbes.v6i3.523

Mohammad, A. B., Al-Okaily, M., & others. (2022). Business intelligence and analytics (BIA) usage in the banking industry sector: An application of the TOE framework. *Information, 8*(4), 189. https://www.mdpi.com/2199-8531/8/4/189

Naranjo, J. E., Valle, A., & Bousia, A. (2026). The use of business intelligence and analytics in electric vehicle technology: A comprehensive survey. *Electronics, 15*(2), 366. https://doi.org/10.3390/electronics15020366

Ojinaga, E. P., Medina, M. A. R., & Rivas, X. G. A. (2026). Competitive intelligence practices in Mexico: An updated systematic review and meta-analysis (2000–2024). *International Journal of Professional Business Review, 11*(1), 1. https://doi.org/10.26668/businessreview/2026.v11i1.5679

Önden, A. (2026). Integrating artificial intelligence and enterprise resource planning systems: A structured review of decision support capabilities, constraints, and governance. *Management Science Advances, 3*(1), 172–186. https://doi.org/10.31181/msa31202643

Pailingan, V. R., & Batmetan, J. R. (2019). How competitive intelligence can be used to improve a management vocational high school: A case from Indonesia. *Journal of Intelligence Studies in Business, 9*(3), 56–61. https://doi.org/10.37380/jisib.v9i3.515

Pradeepa, S. V., Singh, P., Shanmugam, R., & Suresh, N. V. (2026). Transforming business intelligence with emerging technologies in the IT industry. In *Empowering inclusive innovation* (pp. 733–738). Routledge. https://doi.org/10.1201/9781003753445-87

Prihatin, E., & Hartini, N. (2018). Competitive intelligence-based decision making model as a global market competitive strategy in educational institutions.

Rahmi, N., Ishak, P., & others. (2020). Understanding the relationship between competitive intelligence and strategic management of universities: A critical review. *Jurnal Manajemen Bisnis*. https://doi.org/10.33096/jmb.v7i2.560

Rane, N. L., Chika, O. E., & Rane, J. (2026). Business intelligence systems integrating artificial intelligence, big data analytics, machine learning, internet of things, and blockchain. *International Journal of Applied Resilience and Sustainability, 2*(2), 367–395. https://doi.org/10.70593/deepsci.0202014

Romero, C. T., Ortiz, J., & Khalaf, O. (2021). Business intelligence: Business evolution after Industry 4.0. *Sustainability, 13*(18), 10026. https://www.mdpi.com/2071-1050/13/18/10026

Roy, P. (2025). Transforming higher education libraries with data analytics, business intelligence, and business analytics: A review. *Journal of Librarianship and Information Science*. https://doi.org/10.1177/09610006241307028

Sahu, A., & Shrivastava, R. (2013). Critical success factors for sustainable improvement in technical education excellence: A literature review. *The TQM Journal, 25*(1), 62–74.

Saleem, I. (2026). Agentic artificial intelligence in business higher education: A bibliometric analysis. *Higher Education, Skills and Work-Based Learning, 16*(1), 219–236. https://doi.org/10.1108/HESWBL-08-2025-0330

Sanni, J. O., & Atima, M. E. (2021). Business intelligence dashboard frameworks resolving executive visibility gaps in strategic marketing governance. *International Journal of Multidisciplinary Research and Growth Evaluation, 2*(6), 633–646. https://doi.org/10.54660/.ijmrge.2021.2.6.633-646

Shawyun, T. (2020). Integrated electronic HEI performance management. In *Encyclopedia of organizational knowledge, administration, and technology* (pp. 1108–1131). https://doi.org/10.4018/978-1-7998-3473-1.ch077

Silveira Junior, R. R. da. (2015). Utilização de inteligência competitiva, da gestão de riscos e da computação aplicada para ganhos de competitividade. https://doi.org/10.26512/2015.12.D.20623

Tafuro, A., Colamartino, C., Dammacco, G., & Toma, P. (2026). Business intelligence for SMEs: A hybrid review of models, barriers, and future directions. *Enterprise Information Systems, 20*(1). https://doi.org/10.1080/17517575.2025.2588755

Variyar, A. R., & Karangara, R. (2026). Enhancing complex decision making in BPM through artificial intelligence: A systematic examination. *ShodhAI: Journal of Artificial Intelligence, 3*(1), 29–36. https://doi.org/10.29121/shodhai.v3.i1.2026.72