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ARTICLE

COMPETITIVE INTELLIGENCE ARCHITECTURE IN HIGHER EDUCATION AND THE ROLE OF DIGITAL TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE IN STRATEGIC DECISION-MAKING

ARQUITETURA DE INTELIGÊNCIA COMPETITIVA NO ENSINO SUPERIOR E O PAPEL DAS TECNOLOGIAS DIGITAIS E DA INTELIGÊNCIA ARTIFICIAL NA TOMADA DE DECISÕES ESTRATÉGICAS

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ABSTRACT

Purpose: This study examines Competitive Intelligence as a strategic decision-making capability of higher education institutions in the context of digital transformation, artificial intelligence, and increasing competition among universities.

Methodology/approach: The study applies a qualitative exploratory design based on conceptual modelling, structured literature review, and documentary analysis. The methodological framework integrates Competitive Intelligence Theory, the Knowledge-Based View, and Dynamic Capabilities Theory.

Originality/Relevance: The originality of the article lies in repositioning digital technologies and artificial intelligence as enabling tools within a broader Competitive Intelligence architecture, rather than as independent objects of educational modernization.

Key findings: The study shows that Competitive Intelligence can transform fragmented educational, technological, labour market, and institutional data into actionable knowledge for strategic decision-making. It supports curriculum modernization, quality assurance, labour market alignment, graduate employability, and university competitiveness.

Theoretical/methodological contributions: The article adapts the intelligence cycle to higher education governance and proposes an analytical model for assessing CI maturity through environmental scanning, data collection, strategic analysis, decision-making, feedback, and institutional adaptation.

Keywords: Competitive Intelligence. Intelligence cycle. Higher education governance. Strategic decision-making. Artificial intelligence. Digital transformation. University competitiveness. Professional competencies. Ukraine.

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RESUMO

Objetivo: Este estudo examina a Inteligência Competitiva como uma capacidade de tomada de decisão estratégica das instituições de ensino superior no contexto da transformação digital, da inteligência artificial e da crescente competição entre universidades.

Metodologia/abordagem: O estudo aplica uma abordagem exploratória qualitativa baseada em modelagem conceitual, revisão estruturada da literatura e análise documental. O arcabouço metodológico integra a Teoria da Inteligência Competitiva, a Visão Baseada no Conhecimento e a Teoria das Capacidades Dinâmicas.

Originalidade/Relevância: A originalidade do artigo reside em reposicionar as tecnologias digitais e a inteligência artificial como ferramentas facilitadoras dentro de uma arquitetura mais ampla de Inteligência Competitiva, em vez de objetos independentes de modernização educacional.

Principais conclusões: O estudo demonstra que a Inteligência Competitiva pode transformar dados fragmentados nas áreas da educação, tecnologia, mercado de trabalho e instituições em conhecimento acionável para a tomada de decisões estratégicas. Ela apoia a modernização curricular, a garantia da qualidade, o alinhamento com o mercado de trabalho, a empregabilidade dos graduados e a competitividade universitária.

Contribuições teóricas/metodológicas: O artigo adapta o ciclo de inteligência à governança do ensino superior e propõe um modelo analítico para avaliar a maturidade da inteligência competitiva por meio de monitoramento ambiental, coleta de dados, análise estratégica, tomada de decisão, feedback e adaptação institucional.

Palavras-chave: Inteligência competitiva. Ciclo de inteligência. Governança do ensino superior. Tomada de decisão estratégica. Inteligência artificial. Transformação digital. Competitividade universitária. Competências profissionais. Ucrânia.

1 INTRODUCTION

Higher education institutions operate today in an increasingly competitive, data-intensive, and strategically uncertain environment. Universities compete not only for students, academic staff, research funding, international partnerships, rankings, and institutional reputation, but also for the ability to anticipate changes in labour market demands, technological development, regulatory requirements, and societal expectations. In this context, the capacity of universities to collect, interpret, transform, and use information for strategic decision-making has become a critical factor of institutional competitiveness.

This article argues that the modernization of higher education should not be examined only through the lens of digital technologies, artificial intelligence, or professional competency formation. These elements are important, but they acquire strategic significance only when they are integrated into a broader system of Competitive Intelligence. Competitive Intelligence refers to a systematic and ethically grounded process of identifying information needs, collecting relevant data from the internal and external environment, analysing this information, disseminating intelligence products, and using them to support strategic decisions. For higher education institutions, CI may serve as a decision-making capability that connects educational quality, labour market responsiveness, institutional positioning, digital transformation, and long-term competitiveness.

The relevance of Competitive Intelligence in higher education is strengthened by the transformation of universities into complex knowledge-based organizations. Their strategic success increasingly depends on the ability to monitor external signals, evaluate competitors, identify emerging educational trends, assess employer expectations, anticipate technological disruptions, and adapt academic programmes accordingly. In this regard, CI is not limited to market observation. It includes the development of an institutional intelligence cycle that supports strategic planning, curriculum design, quality assurance, internationalization, research policy, digital transformation, and graduate employability.

Ukraine's higher education system provides a particularly relevant context for examining this problem. Ukrainian universities are functioning under conditions of European integration, demographic decline, growing international competition, digital transformation, and the need to align educational outcomes with labour market expectations. National legislation, including the Law of Ukraine "On Education" and the Law of Ukraine "On Higher Education", emphasizes competency-based learning, institutional autonomy, quality assurance, and integration into the European Higher Education Area. However, these normative requirements alone do not ensure strategic competitiveness. Universities need analytical systems capable of transforming legal, educational, technological, labour market, and institutional data into actionable intelligence for managerial and academic decision-making.

Existing research on higher education modernization often focuses on digital learning environments, artificial intelligence, professional competencies, student-centred education, and educational quality assurance. Although these areas are significant, they do not sufficiently explain how higher education institutions can use information strategically to strengthen their competitive position. As a result, the discussion remains fragmented: digital technologies are usually treated as instructional tools, artificial intelligence as an educational innovation, and competencies as learning outcomes. Much less attention is paid to how these elements can be integrated into a Competitive Intelligence architecture that enables

universities to analyse their environment, identify strategic opportunities and threats, and make evidence-based institutional decisions.

This gap is especially important because the term "intelligence" in educational research is frequently associated only with artificial intelligence, while the managerial and strategic meaning of intelligence remains underdeveloped. Artificial intelligence may support data processing, predictive analytics, learning analytics, and decision-support systems, but it should not replace the broader concept of Competitive Intelligence. In the context of higher education, AI can be considered one of the technological instruments within the CI system, whereas Competitive Intelligence represents the strategic capability that defines how information is collected, interpreted, validated, communicated, and used by university decision-makers.

Therefore, the central research problem addressed in this article is the insufficient conceptualization and operationalization of Competitive Intelligence as a strategic decision-making capability of higher education institutions. The article seeks to shift the focus from a descriptive discussion of digital technologies in education to an analytical examination of how universities can build Competitive Intelligence systems that support competitiveness, responsiveness to labour market needs, and the development of graduates' professional competencies.

The aim of the article is to develop and substantiate an analytical model of Competitive Intelligence for higher education institutions, with particular attention to the role of digital technologies and artificial intelligence in supporting the intelligence cycle and strategic decision-making. To achieve this aim, the article addresses the following research questions:

1. How can Competitive Intelligence be conceptualized as a strategic capability of higher education institutions?
2. What elements should constitute a Competitive Intelligence architecture in the context of university governance and educational programme development?
3. How can digital technologies and artificial intelligence support the stages of the intelligence cycle in higher education?
4. How can Competitive Intelligence contribute to the alignment of professional competencies with labour market demands and institutional competitiveness?

By addressing these questions, the article contributes to the literature on Competitive Intelligence, higher education governance, and digital transformation. Its theoretical contribution lies in integrating Competitive Intelligence Theory, the Knowledge-Based View, and Dynamic Capabilities Theory into the analysis of higher education institutions. Its practical contribution consists in proposing a model through which universities can organize information flows, monitor competitive environments, evaluate strategic risks and opportunities, and support evidence-based decision-making in educational management.

2 THEORETICAL REFERENCE

The theoretical foundation of this study is based on the assumption that higher education institutions should be analysed not only as educational providers but also as knowledge-based and strategically oriented organizations operating in a competitive environment. In this context, digital technologies and artificial intelligence are not treated as

independent objects of analysis, but as instruments that may support the development of Competitive Intelligence systems and strategic decision-making capabilities within universities.

Competitive Intelligence is understood as a systematic, ethical, and continuous process through which organizations identify information needs, collect relevant internal and external data, analyse this information, transform it into actionable knowledge, and disseminate it to decision-makers (Kahaner, 1996; Prescott & Miller, 2001). In classical Competitive Intelligence literature, this process is usually described through the intelligence cycle, which includes planning and direction, data collection, information processing, analysis, dissemination, and feedback (Fleisher & Bensoussan, 2007; Calof & Wright, 2008). For higher education institutions, this cycle may be applied to the monitoring of labour market trends, student demand, competitors' educational programmes, international rankings, research performance, funding opportunities, regulatory changes, and technological innovations.

From this perspective, Competitive Intelligence is not synonymous with artificial intelligence. Artificial intelligence refers to technological systems capable of performing tasks such as data processing, prediction, classification, automation, and pattern recognition. Competitive Intelligence, by contrast, is a managerial and strategic capability that determines how information is selected, interpreted, validated, and used for institutional decisions (Gilad, 2011; Calof & Wright, 2008). Therefore, AI may function as a technological component of a broader CI architecture, but it cannot replace the strategic logic of Competitive Intelligence.

The application of Competitive Intelligence in higher education is particularly relevant because universities increasingly compete for students, academic staff, research funding, international partnerships, institutional reputation, and labour market relevance. Strategic decisions concerning curriculum development, digital transformation, internationalization, quality assurance, and graduate employability require reliable intelligence about both the internal performance of the institution and the external competitive environment. This logic corresponds to Porter's understanding of competition as a process shaped by external forces, strategic positioning, and the ability of organizations to respond to changes in their environment (Porter, 1980, 1985). Without such intelligence, universities risk making fragmented, reactive, or purely administrative decisions that do not strengthen their long-term competitiveness.

This study integrates three theoretical perspectives. The first is Competitive Intelligence Theory, which explains how organizations transform dispersed information into strategic knowledge for decision-making (Kahaner, 1996; Prescott & Miller, 2001; Fleisher & Bensoussan, 2007). Within this framework, universities are viewed as institutions that need structured mechanisms for environmental scanning, competitor analysis, stakeholder analysis, and strategic interpretation of educational and labour market data.

The second theoretical perspective is the Knowledge-Based View of the organization. According to this approach, knowledge constitutes one of the most important strategic resources of an organization (Nonaka & Takeuchi, 1995; Grant, 1996). Higher education institutions generate, store, transfer, and apply knowledge through teaching, research, management, and external cooperation. However, knowledge becomes strategically valuable only when it is organized and used in decision-making processes. Competitive Intelligence can therefore be understood as a mechanism through which universities transform fragmented data and institutional knowledge into strategic assets.

The third perspective is Dynamic Capabilities Theory. This theory emphasizes an organization's ability to sense changes in the external environment, seize opportunities, and reconfigure internal resources in response to new challenges (Teece, Pisano, & Shuen, 1997; Teece, 2007). In higher education, dynamic capabilities are reflected in the ability of universities to identify changes in labour market needs, redesign educational programmes, adopt digital tools, respond to international competition, and adjust institutional strategies. Competitive Intelligence supports these dynamic capabilities by providing the analytical basis for timely and evidence-based strategic action.

Based on these theoretical perspectives, this article proposes that Competitive Intelligence in higher education should be understood as an integrated institutional architecture consisting of four interrelated components. The first component is environmental scanning, which includes the systematic monitoring of labour market requirements, educational trends, technological innovations, legal changes, demographic dynamics, competitors, and international standards. The second component is data collection and processing, which involves gathering information from internal university systems, student performance data, employer feedback, alumni trajectories, academic rankings, research indicators, and digital learning platforms. The third component is strategic analysis, through which collected information is interpreted in relation to institutional goals, competitive positioning, educational quality, and competency development. The fourth component is decision-making and feedback, which ensures that intelligence products are used in curriculum design, quality assurance, digital transformation, institutional governance, and strategic planning. Such a structure corresponds to the classical logic of the intelligence cycle and strategic analysis in CI research (Fleisher & Bensoussan, 2007; Calof & Wright, 2008).

Within this model, digital technologies and artificial intelligence play an enabling role. Learning management systems, digital assessment tools, learning analytics, databases, dashboards, predictive analytics, and AI-based decision-support tools may strengthen the collection, processing, and interpretation of information. However, their strategic value depends on whether they are embedded in a coherent Competitive Intelligence system. In other words, digital tools produce value not simply by being implemented, but by contributing to the intelligence cycle and supporting institutional decisions.

The proposed theoretical model establishes a logical relationship between Competitive Intelligence, digital technologies, strategic decision-making, and the formation of professional competencies. Competitive Intelligence helps universities identify which competencies are demanded by employers and society, compare these needs with existing educational programmes, detect gaps in graduate preparation, and support evidence-based curriculum modernization. Therefore, the formation of professional competencies is interpreted not only as a pedagogical task but also as a strategic outcome of intelligence-based university governance.

The theoretical model of the study may be expressed through the following analytical logic: external and internal data are transformed through the intelligence cycle into strategic knowledge; this knowledge supports university decision-making; decision-making influences curriculum design, digital transformation, and quality assurance; and these institutional actions contribute to graduate competency formation and university competitiveness.

On this basis, the following hypotheses are formulated:

The research is guided by four analytical assumptions derived from the theoretical framework of Competitive Intelligence. First, the development of

Competitive Intelligence practices may strengthen the capacity of higher education institutions for evidence-based strategic decision-making.

Second, the integration of digital technologies and artificial intelligence into the Competitive Intelligence cycle may improve the quality of information processing, monitoring, forecasting, and strategic analysis in university governance.

Third, Competitive Intelligence may contribute to better alignment between educational programmes and labour market demands by identifying competency gaps and emerging professional requirements.

Fourth, higher education institutions that use Competitive Intelligence as a strategic capability may be better positioned to strengthen institutional competitiveness, graduate employability, and responsiveness to external changes.

Thus, the theoretical framework of this study shifts the analysis from a descriptive discussion of digital technologies in education to an integrated model of Competitive Intelligence in higher education. This approach makes it possible to examine digital transformation, artificial intelligence, competency development, and university competitiveness as interconnected elements of a strategic intelligence system.

3 METHOD

This study adopts a qualitative exploratory research design aimed at developing and testing an analytical model of Competitive Intelligence in higher education institutions. The methodological logic of the study is based on the assumption that universities can strengthen their strategic decision-making capacity when internal and external data are systematically collected, analysed, transformed into intelligence products, and used for institutional decisions. Therefore, the object of analysis is not digital technology as such, but the way in which digital technologies and artificial intelligence may support the Competitive Intelligence cycle in higher education governance.

The study is designed as a conceptual and empirical documentary analysis. This design is appropriate because Competitive Intelligence in higher education remains an insufficiently institutionalized field, particularly in the Ukrainian context, and therefore requires both theoretical model-building and the analysis of publicly available institutional evidence. The methodological approach combines elements of structured literature review, qualitative content analysis, and comparative institutional analysis (Tranfield, Denyer, & Smart, 2003; Krippendorff, 2018; Yin, 2018).

The research population consists of Ukrainian higher education institutions operating under the national legal framework on higher education and quality assurance. The empirical sample includes 12 Ukrainian universities, selected according to the following criteria: public availability of strategic development documents; presence of digital transformation or quality assurance policies; publication of educational programme descriptions; availability of information on labour market cooperation, graduate employability, internationalization, rankings, or institutional analytics. The period of analysis covers 2020–2025, which reflects the intensified digital transformation of Ukrainian higher education and the growing strategic importance of data-driven decision-making.

Table 1. Sample of Ukrainian Higher Education Institutions Included in the Documentary Analysis

No.	Higher education institution	Type of institution	Documents and public data analysed	Period of analysis
1	Taras Shevchenko National University of Kyiv	Classical national university	Development strategy, quality assurance documents, educational programme descriptions, public institutional reports	2020–2025
2	V. N. Karazin Kharkiv National University	Classical national university	Strategic documents, educational programme information, internationalisation data, quality assurance materials	2020–2025
3	Ivan Franko National University of Lviv	Classical national university	University strategy, programme descriptions, stakeholder cooperation information, quality assurance documents	2020–2025
4	National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”	Technical national university	Digital transformation information, educational programmes, research indicators, employer cooperation materials	2020–2025
5	Lviv Polytechnic National University	Technical national university	Strategic development documents, programme descriptions, international cooperation data, institutional reports	2020–2025
6	National University of Kyiv-Mohyla Academy	Research-oriented university	Strategic documents, educational programme descriptions, quality assurance materials, public performance indicators	2020–2025
7	Sumy State Pedagogical University named after A. S. Makarenko	Pedagogical university	Educational programme descriptions, quality assurance documents, stakeholder cooperation information	2020–2025
8	Uzhhorod National University	Classical national university	Institutional strategy, programme descriptions, internationalisation data, quality assurance documents	2020–2025
9	State Higher Educational Institution “Donbas State Pedagogical University”	Pedagogical university	Educational programme descriptions, development documents, quality assurance materials, public institutional information	2020–2025
10	Kyiv National	Specialised	Educational programme	2020–

No.	Higher education institution	Type of institution	Documents and public data analysed	Period of analysis
	University of Culture and Arts	university	descriptions, institutional reports, stakeholder cooperation materials, public data on academic activity	2025
11	Rivne State University for the Humanities	Humanities-oriented university	Programme descriptions, quality assurance documents, development information, public institutional reports	2020–2025
12	Odesa I. I. Mechnikov National University	Classical national university	Strategic documents, educational programme descriptions, international cooperation data, quality assurance materials	2020–2025

The selected institutions represent different types of Ukrainian higher education institutions, including classical, technical, pedagogical, humanities-oriented, and specialised universities. This diversity made it possible to analyse visible elements of Competitive Intelligence practices across different institutional profiles. The documentary analysis focused on publicly available evidence related to strategic planning, quality assurance, educational programme development, labour market cooperation, digital transformation, internationalisation, and institutional competitiveness.

The empirical material of the study consists of four categories of sources. The first category includes institutional strategic documents of selected universities, such as development strategies, digital transformation plans, quality assurance policies, annual reports, and internationalization strategies. The second category includes educational programme descriptions, competency matrices, accreditation-related materials, and documents concerning learning outcomes and graduate profiles. The third category includes publicly available information on university competitiveness, including rankings, employer cooperation, research indicators, international partnerships, student recruitment, and graduate employability. The fourth category includes national and international policy documents regulating higher education, digital transformation, quality assurance, and competency-based education.

The study uses a document analysis protocol developed specifically for the purpose of identifying Competitive Intelligence elements in university governance. The protocol includes the following analytical categories: environmental scanning; labour market monitoring; competitor analysis; stakeholder analysis; data collection mechanisms; digital and AI-based analytical tools; strategic decision-making procedures; feedback mechanisms; competency gap identification; curriculum modernization; and indicators of institutional competitiveness. These categories correspond to the classical intelligence cycle and to the theoretical assumptions of Competitive Intelligence Theory, the Knowledge-Based View, and Dynamic Capabilities Theory (Kahaner, 1996; Grant, 1996; Teece, Pisano, & Shuen, 1997; Fleisher & Bensoussan, 2007; Calof & Wright, 2008).

The main research instrument is a coding matrix for Competitive Intelligence analysis in higher education institutions. The matrix contains five dimensions. The first dimension is

information needs identification, which examines whether the university defines strategic information needs related to labour market changes, student demand, competitors, internationalization, technological trends, and regulatory requirements. The second dimension is data collection and monitoring, which assesses whether the institution systematically collects internal and external data relevant to strategic governance. The third dimension is analysis and interpretation, which evaluates whether the collected data are transformed into analytical conclusions, risk assessments, forecasts, or strategic recommendations. The fourth dimension is dissemination and decision-making, which identifies whether analytical results are used by university management, quality assurance units, academic departments, or curriculum committees. The fifth dimension is feedback and institutional adaptation, which examines whether decisions based on intelligence lead to changes in educational programmes, competency models, digital transformation strategies, or competitive positioning.

Data analysis was conducted in several stages. At the first stage, relevant literature on Competitive Intelligence, strategic management, knowledge-based organizations, dynamic capabilities, higher education governance, and digital transformation was identified and analysed. The aim of this stage was to define the theoretical constructs and to develop the analytical framework of the study. At the second stage, institutional documents and publicly available university data were collected according to the selection criteria. At the third stage, the documents were coded using the Competitive Intelligence coding matrix. At the fourth stage, the identified CI elements were compared across selected institutions in order to determine the level of integration of Competitive Intelligence practices into university governance. At the fifth stage, the results were interpreted in relation to the proposed hypotheses and the broader problem of institutional competitiveness.

The study evaluates the presence and maturity of Competitive Intelligence practices through a set of analytical indicators. These include: availability of strategic monitoring procedures; use of labour market and employer feedback in curriculum design; analysis of competitors and educational market trends; use of digital dashboards, databases, learning analytics, or AI-supported tools; integration of analytical findings into management decisions; evidence of curriculum revision based on external data; connection between competency development and institutional strategy; and mechanisms for feedback and continuous improvement. These indicators make it possible to move beyond a descriptive discussion of digital technologies and to assess whether universities use information as a strategic resource.

The research is guided by a set of analytical assumptions derived from the theoretical framework of Competitive Intelligence, the Knowledge-Based View, and Dynamic Capabilities Theory. First, the study assumes that the development of Competitive Intelligence practices may strengthen the capacity of higher education institutions for evidence-based strategic decision-making. Second, it proceeds from the assumption that digital technologies and artificial intelligence can improve the efficiency of the intelligence cycle by supporting data collection, monitoring, analysis, forecasting, and dissemination of intelligence products. Third, the study assumes that Competitive Intelligence may contribute to better alignment between educational programmes and labour market demands by identifying competency gaps and emerging professional requirements. Finally, the research is based on the assumption that higher education institutions using Competitive Intelligence as a strategic capability are better positioned to strengthen institutional competitiveness, graduate employability, and responsiveness to external changes.

To ensure methodological reliability, the study applies triangulation of sources by comparing institutional documents, policy documents, educational programme descriptions, and publicly available competitiveness indicators. The coding categories were derived from established theoretical approaches and then adapted to the higher education context. This procedure increases the internal consistency of the analysis and allows the study to connect theoretical assumptions with observable institutional practices.

The limitations of the study are related to the use of publicly available documentary data. Some universities may apply Competitive Intelligence practices internally without explicitly naming them or publishing relevant documents. Therefore, the study does not claim to provide a complete measurement of all CI activities in Ukrainian higher education institutions. Instead, it identifies the degree to which Competitive Intelligence elements are visible, institutionalized, and connected to strategic decision-making in available institutional evidence. This limitation also indicates a direction for further research, which may include expert interviews, surveys of university managers, and quantitative assessment of the relationship between CI maturity and institutional performance indicators.

Thus, the methodology of this study provides a structured research protocol for analysing Competitive Intelligence as a strategic capability of higher education institutions. It defines the research population, sample selection criteria, empirical sources, analytical instrument, coding procedure, indicators, hypotheses, and limitations. This allows the article to move from a general conceptual discussion toward a more rigorous examination of how universities can use Competitive Intelligence architecture to support strategic decision-making, competency development, and institutional competitiveness.

4 RESULTS AND DISCUSSION

The results of the study demonstrate that Competitive Intelligence in higher education institutions should be understood as an integrated strategic capability rather than as a set of isolated digital tools or administrative procedures. The documentary analysis of selected Ukrainian higher education institutions indicates that universities increasingly use digital platforms, institutional websites, quality assurance documents, educational programme descriptions, employer feedback, and public performance indicators. However, these information resources are rarely organized as a coherent Competitive Intelligence system. As a result, information exists within universities, but it is not always transformed into actionable intelligence for strategic decision-making.

The analysis was conducted according to five dimensions of the Competitive Intelligence cycle: identification of strategic information needs, data collection and monitoring, analysis and interpretation, dissemination and decision-making, and feedback and institutional adaptation. This structure reflects the classical logic of Competitive Intelligence, according to which information becomes strategically valuable only when it is systematically collected, analysed, interpreted, and used by decision-makers (Kahaner, 1996; Prescott & Miller, 2001; Fleisher & Bensoussan, 2007; Calof & Wright, 2008).

Competitive Intelligence maturity in higher education institutions

The first analytical finding concerns the fragmented nature of Competitive Intelligence practices in higher education governance. Most universities demonstrate certain elements of strategic information use, especially in relation to quality assurance, educational programme development, internationalization, and cooperation with employers. However, these elements

are usually dispersed across different units and are not explicitly connected to a unified intelligence cycle.

The analysis shows that the strongest dimension is usually data collection and monitoring. Universities collect information on student enrolment, educational programmes, accreditation requirements, graduate competencies, employer expectations, international cooperation, and research activity. Nevertheless, the weakest dimensions are strategic analysis, dissemination of intelligence products, and feedback-based institutional adaptation. This means that data are available, but universities do not always convert them into structured analytical products that support strategic decisions.

Table 2. The results can be summarized through the following analytical matrix.

Dimension of Competitive Intelligence	**Evidence identified in university practice**	**Main problem identified**
Identification of strategic information needs	Strategic plans, quality assurance policies, educational programme goals	Information needs are often formulated generally rather than as specific intelligence questions
Data collection and monitoring	Institutional reports, employer feedback, accreditation documents, rankings, digital platforms	Data are collected, but often remain fragmented across departments
Analysis and interpretation	Some references to labour market needs, competency gaps, internationalization, digitalization	Limited evidence of systematic competitor analysis, risk assessment, or forecasting
Dissemination and decision-making	Decisions on curriculum revision, quality assurance, digital tools, cooperation agreements	Weak connection between analytical findings and documented strategic decisions
Feedback and institutional adaptation	Programme updates, stakeholder surveys, internal monitoring procedures	Feedback mechanisms exist, but their strategic impact is insufficiently visible

This finding confirms the need to distinguish between data availability and Competitive Intelligence maturity. The mere existence of digital systems, educational platforms, rankings, or employer surveys does not mean that a university has a functioning CI architecture. Competitive Intelligence emerges only when these information flows are connected to strategic interpretation and decision-making.

Competitive Intelligence and university competitiveness

The second major result concerns the relationship between Competitive Intelligence and institutional competitiveness. In contemporary higher education, universities compete for students, academic staff, research funding, international partnerships, reputation, and labour market relevance. This competitive environment requires universities to monitor not only their internal performance but also external signals, including demographic changes, student

preferences, competitors' programmes, employers' expectations, technological trends, and regulatory developments.

From the perspective of Porter's theory of competitive strategy, institutional competitiveness depends on the capacity to understand the external environment and to position the organization accordingly (Porter, 1980, 1985). In the higher education context, this means that universities need intelligence about competing institutions, educational market trends, alternative learning providers, international mobility, funding opportunities, and graduate employability indicators. Without such intelligence, strategic planning risks becoming formal and declarative.

The study therefore confirms H1, according to which the stronger the development of Competitive Intelligence practices in a higher education institution, the higher its capacity for evidence-based strategic decision-making. Universities that systematically analyse labour market expectations, stakeholder feedback, educational trends, and competitor activity are better positioned to revise curricula, develop relevant competencies, strengthen internationalization, and improve institutional visibility.

Digital technologies and artificial intelligence as CI enablers

The third result concerns the role of digital technologies and artificial intelligence. The analysis shows that digital tools should not be treated as the main research object. Their value depends on whether they support the Competitive Intelligence cycle. Learning management systems, digital dashboards, institutional databases, online surveys, ranking analytics, learning analytics, and AI-based tools may significantly improve the collection and processing of information. However, without a strategic intelligence framework, these tools remain technical instruments rather than mechanisms of institutional competitiveness.

Artificial intelligence may support Competitive Intelligence by automating data processing, identifying patterns, predicting student demand, analysing labour market trends, detecting competency gaps, and supporting decision-making dashboards. Nevertheless, AI is only one component of CI architecture. Competitive Intelligence remains a broader managerial capability that includes ethical data collection, human interpretation, contextual judgement, strategic communication, and decision implementation.

This confirms H2, according to which the integration of digital technologies and artificial intelligence into the Competitive Intelligence cycle positively influences the quality of information processing and strategic analysis in university governance. However, this influence is not automatic. It depends on institutional readiness, data quality, analytical capacity, governance culture, and the existence of clear decision-making procedures.

Competitive Intelligence and professional competency development

The fourth result concerns the connection between Competitive Intelligence and the formation of students' professional competencies. In the previous version of the manuscript, competency development was mainly discussed as a pedagogical and digital learning issue. The present analysis shows that competency formation should also be understood as a strategic outcome of intelligence-based university governance.

Competitive Intelligence allows universities to identify which professional, transversal, and digital competencies are demanded by employers, public institutions, international partners, and emerging sectors of the economy. Through labour market monitoring, employer surveys, graduate tracking, analysis of vacancies, accreditation feedback, and international

benchmarking, universities can detect gaps between existing educational programmes and actual professional requirements.

Table 3. The relationship between CI and competency development may be presented as follows.

CI component	Strategic function in higher education	Impact on competency development
Labour market monitoring	Identification of emerging professional requirements	Updating learning outcomes and competency profiles
Employer feedback	Assessment of graduate readiness	Revision of practical training and professional skills
Competitor analysis	Comparison with other universities and programmes	Improvement of programme positioning and content
Graduate tracking	Analysis of employability and career trajectories	Evidence-based curriculum modernization
Digital and AI analytics	Processing of large volumes of educational and labour market data	Identification of competency gaps and future skills
Strategic decision-making	Transformation of intelligence into institutional action	Alignment between education, labour market, and competitiveness

The findings provide analytical support for the assumption that Competitive Intelligence contributes to better alignment between educational programmes and labour market demands by identifying competency gaps and emerging professional requirements. In this sense, professional competencies are not only educational outcomes but also indicators of how effectively a university uses intelligence for strategic adaptation.

Proposed Competitive Intelligence architecture for higher education institutions

Based on the results of the analysis, the article proposes a Competitive Intelligence architecture for higher education institutions. This architecture includes six interconnected blocks:

1. Strategic information needs: identification of questions relevant to institutional competitiveness, labour market alignment, student recruitment, internationalization, quality assurance, and digital transformation.
2. Internal data sources: student performance data, graduate outcomes, accreditation materials, curriculum documents, quality assurance reports, research indicators, and institutional digital platforms.
3. External data sources: labour market trends, employer expectations, competitors' programmes, rankings, international standards, demographic data, technological developments, and regulatory changes.

4. Analytical processing: data comparison, benchmarking, SWOT analysis, trend analysis, competency gap analysis, risk assessment, and forecasting.

5. Intelligence products: analytical reports, dashboards, strategic briefs, curriculum recommendations, labour market reviews, competitiveness profiles, and decision-support documents.

6. Strategic decisions and feedback: curriculum revision, new programme development, digital transformation, quality assurance improvement, internationalization strategy, employer cooperation, and institutional repositioning.

This architecture reflects the Knowledge-Based View, according to which knowledge becomes a strategic resource only when it is organized, interpreted, and applied in decision-making (Grant, 1996; Nonaka & Takeuchi, 1995). It also corresponds to Dynamic Capabilities Theory, because CI enables universities to sense environmental changes, seize opportunities, and reconfigure educational and organizational resources (Teece, Pisano, & Shuen, 1997; Teece, 2007).

Discussion of hypotheses

The findings support all four hypotheses formulated in the theoretical framework and methodology.

The analysis suggests that the presence of CI practices may strengthen evidence-based strategic decision-making in higher education institutions. Universities that identify strategic information needs and analyse internal and external data appear better equipped to make decisions regarding curriculum development, quality assurance, international cooperation, and competitive positioning.

The findings also indicate that digital technologies and artificial intelligence may improve the efficiency of the intelligence cycle by supporting data collection, monitoring, analysis, visualisation, forecasting, and dissemination. However, technological tools generate strategic value only when they are embedded in a broader CI architecture.

The findings further suggest that Competitive Intelligence provides mechanisms for identifying competency gaps and aligning educational programmes with labour market needs. Employer feedback, graduate tracking, labour market analysis, and benchmarking may help universities revise learning outcomes and professional competency models.

Finally, the analysis indicates that institutions using Competitive Intelligence as a strategic capability are better positioned to respond to external changes, strengthen employability, develop relevant educational programmes, and improve competitiveness. CI therefore functions as a bridge between institutional governance, educational quality, digital transformation, and strategic positioning.

The connection between Competitive Intelligence and professional competency development was analysed through the relationship between CI components, their strategic function in higher education governance, and their impact on curriculum modernization and graduate employability. This approach makes it possible to interpret professional competency development not only as a pedagogical outcome, but also as a strategic result of intelligence-based university governance.

Table 4. Relationship Between Competitive Intelligence Components and Professional Competency Development

CI dimension	Number of universities where evidence was identified	Percentage	Maturity level
Strategic information needs	10/12	83.3%	Medium
Data collection and monitoring	12/12	100%	High
Strategic analysis	5/12	41.7%	Low
Dissemination and decision-making	6/12	50%	Medium
Feedback and adaptation	4/12	33.3%	Low

The table demonstrates that Competitive Intelligence supports professional competency development by linking labour market monitoring, employer feedback, competitor analysis, graduate tracking, digital analytics, and strategic decision-making. Through these mechanisms, universities can identify competency gaps, update learning outcomes, modernize educational programmes, and strengthen alignment between higher education and labour market needs. Thus, CI functions as a bridge between institutional strategy, educational quality, and graduate competitiveness.

Implications for higher education governance

The results have several implications for university governance. First, higher education institutions should move from fragmented data collection to integrated Competitive Intelligence systems. Second, CI should be institutionalized through dedicated procedures, responsible units, analytical roles, and regular intelligence products. Third, digital technologies and AI should be used not only for teaching and learning but also for strategic analysis, forecasting, benchmarking, and decision support. Fourth, professional competency development should be linked to continuous monitoring of labour market and stakeholder needs. Fifth, quality assurance systems should include CI indicators that measure how effectively universities transform information into strategic decisions.

The study also shows that Competitive Intelligence can strengthen university autonomy. Institutional autonomy becomes meaningful when universities possess the analytical capacity to make informed strategic choices. Without CI, autonomy may remain formal, while decisions continue to be reactive, fragmented, or based on incomplete information.

Analytical synthesis

The main contribution of this section is the shift from a descriptive discussion of digital educational technologies to an analytical model of Competitive Intelligence in higher education. Digital technologies and artificial intelligence are no longer treated as the central subject of the study. Instead, they are interpreted as tools that support the intelligence cycle. The central construct is Competitive Intelligence as a strategic decision-making capability.

The results demonstrate that the competitiveness of higher education institutions depends not only on the availability of digital infrastructure but also on the ability to transform information into intelligence. This transformation requires an institutional architecture that

connects information needs, data collection, strategic analysis, dissemination, decision-making, and feedback. In this model, professional competency development becomes one of the outcomes of intelligence-based governance, because universities use CI to align educational programmes with labour market demands and external challenges.

Thus, Competitive Intelligence should be considered a necessary component of modern higher education governance. It enables universities to anticipate changes, identify opportunities and risks, support evidence-based decisions, improve educational programmes, and strengthen institutional competitiveness in a rapidly changing educational environment.

5 FINAL CONSIDERATIONS

This study examined Competitive Intelligence as a strategic decision-making capability of higher education institutions in the context of digital transformation, artificial intelligence, and increasing competition in the educational sector. The main conclusion is that universities should not limit their modernization strategies to the implementation of digital learning technologies or isolated artificial intelligence tools. These instruments become strategically meaningful only when they are integrated into a broader Competitive Intelligence architecture that enables higher education institutions to collect, analyse, interpret, disseminate, and use information for evidence-based decisions.

The findings demonstrate that Competitive Intelligence provides a relevant theoretical and practical framework for understanding how universities may strengthen their institutional competitiveness. In contrast to approaches that focus only on digital infrastructure, this study emphasizes the strategic value of information. Universities operate in an environment shaped by competition for students, academic staff, research funding, international partnerships, rankings, labour market relevance, and institutional reputation. Therefore, their ability to monitor external changes and transform dispersed data into actionable intelligence becomes a decisive factor of strategic adaptation.

The article contributes to Competitive Intelligence research by applying the logic of the intelligence cycle to higher education governance. The proposed model includes the identification of strategic information needs, collection of internal and external data, analytical processing, dissemination of intelligence products, decision-making, and feedback-based institutional adaptation. This model shows that Competitive Intelligence is not synonymous with artificial intelligence. AI may support data processing, forecasting, learning analytics, and decision-support tools, but Competitive Intelligence remains a broader managerial capability based on interpretation, contextual judgement, ethical information use, and strategic action (Kahaner, 1996; Prescott & Miller, 2001; Calof & Wright, 2008).

The theoretical contribution of the study lies in the integration of Competitive Intelligence Theory, the Knowledge-Based View, and Dynamic Capabilities Theory. From the perspective of the Knowledge-Based View, universities are knowledge-intensive organizations whose competitiveness depends on their ability to organize and apply knowledge strategically (Grant, 1996; Nonaka & Takeuchi, 1995). From the perspective of Dynamic Capabilities Theory, Competitive Intelligence helps universities sense changes in the external environment, seize opportunities, and reconfigure internal resources in response to labour market, technological, demographic, and regulatory challenges (Teece, Pisano, & Shuen, 1997; Teece, 2007). This theoretical combination allows higher education institutions

to be analysed not only as providers of educational services but also as strategic actors in a competitive knowledge economy.

The practical contribution of the study consists in proposing a Competitive Intelligence architecture for higher education institutions. This architecture may support strategic planning, curriculum modernization, quality assurance, internationalization, employer cooperation, graduate employability, and digital transformation. In particular, CI can help universities identify emerging competency requirements, compare educational programmes with labour market expectations, analyse competitors' strategies, evaluate institutional risks, and improve strategic positioning. Thus, professional competency development should be understood not only as a pedagogical result but also as an outcome of intelligence-based university governance.

The study also shows that digital technologies and artificial intelligence should be considered enabling components of Competitive Intelligence rather than independent strategic solutions. Learning management systems, institutional databases, digital dashboards, employer surveys, graduate tracking systems, learning analytics, and AI-based analytical tools may significantly improve the intelligence cycle. However, their effectiveness depends on whether the university has clear procedures for transforming data into strategic knowledge and using this knowledge in decision-making. Without such procedures, digitalization risks remaining fragmented, technical, and disconnected from institutional competitiveness.

The proposed approach has important implications for university management. Higher education institutions should institutionalize Competitive Intelligence through dedicated analytical procedures, responsible units or teams, regular monitoring of external and internal data, and the preparation of intelligence products for decision-makers. Universities should also integrate CI indicators into quality assurance systems, including indicators related to labour market monitoring, employer feedback, graduate employability, competitor analysis, curriculum revision, digital transformation, and strategic responsiveness. Such measures would allow universities to move from reactive administration to proactive strategic governance.

For policymakers, the results suggest that higher education modernization should not be reduced to digital infrastructure development or formal compliance with educational standards. Public policy should encourage universities to build analytical capacity, use data ethically, monitor educational and labour market trends, and develop evidence-based strategic planning. In this sense, Competitive Intelligence can support both institutional autonomy and accountability, because autonomous universities need reliable intelligence to make informed decisions and demonstrate the effectiveness of those decisions.

At the same time, the study has several limitations. The analysis is based primarily on conceptual modelling and documentary evidence, which means that it identifies visible and institutionally expressed elements of Competitive Intelligence rather than all possible internal practices used by universities. Some institutions may apply CI-related practices without formally naming them as Competitive Intelligence. Future research should therefore include expert interviews with university managers, surveys of academic and administrative staff, quantitative assessment of CI maturity, and comparative studies between Ukrainian and European higher education institutions.

Overall, this study confirms that Competitive Intelligence should be placed at the centre of contemporary higher education governance. It connects digital transformation, artificial intelligence, competency development, quality assurance, and institutional competitiveness

within a single strategic framework. Universities that are able to transform information into intelligence are better prepared to anticipate change, respond to labour market needs, modernize educational programmes, strengthen graduate employability, and improve their competitive position in the national and international educational space.

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