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Cost Management as A Strategy

Effect of Security on the Performance

Private Higher Education Institutions

Management through Digital Technologies

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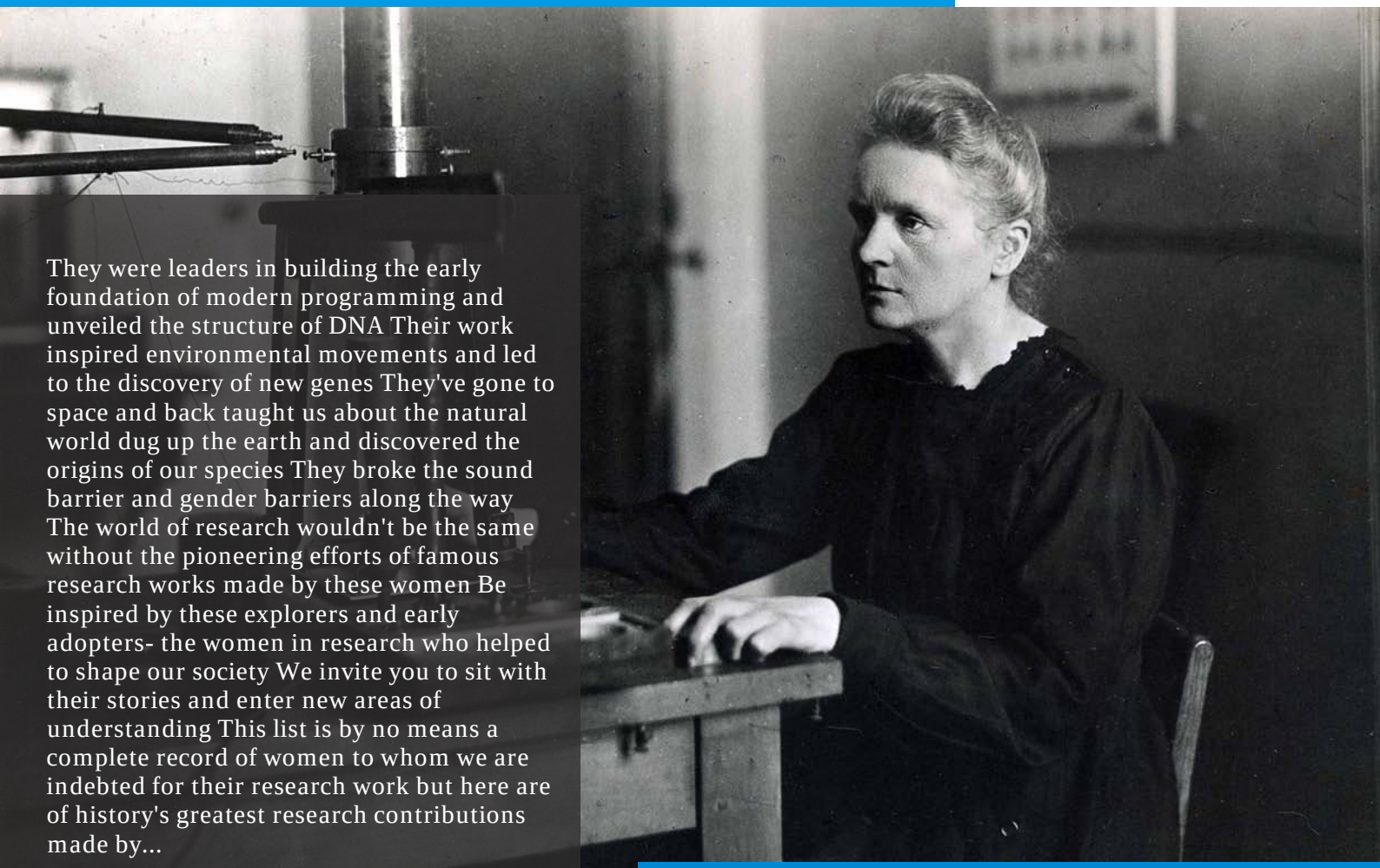

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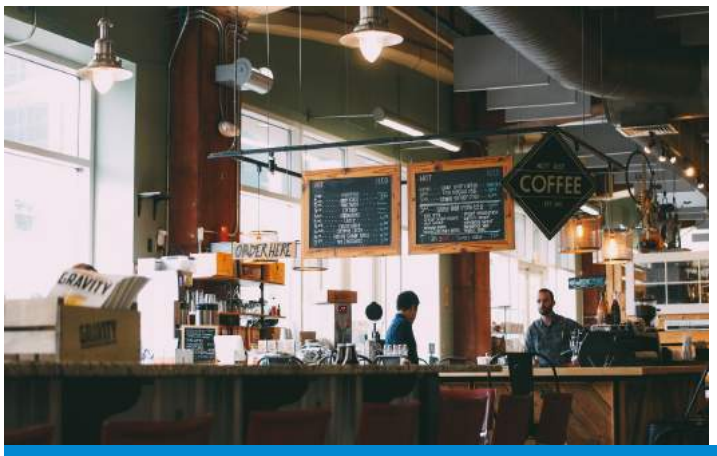

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Cost Management as a Strategy for Competitiveness in Private Higher Education Institutions in Cabinda

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Novembro University

ABSTRACT

This dissertation investigates Cost Management as a Strategy for the Competitiveness of Private Higher Education Institutions (PHEIs) in Cabinda, highlighting its importance as a strategic instrument for institutional efficiency, sustainability, and performance. The study employed a qualitative case study method at the Polytechnic Higher Institute of Cabinda (ISPCAB), using semi-structured interviews and document analysis of managerial data and internal records. The implementation of Activity-Based Costing (ABC) enabled precise allocation of costs by activity and academic program, ensuring greater traceability and supporting decision-making processes. The findings reveal a positive impact on operational efficiency and financial sustainability, with costs representing 17.5% of annual revenue and the highest profit margin observed in the International Relations program (85.61%). ABC also facilitated internal benchmarking, identifying best practices and performance disparities among programs. The results confirm that strategic cost management enhances competitiveness by optimizing resources and improving profitability, constituting a valuable, rare, inimitable, and well-organized resource for institutional advantage (VRIO framework).

Keywords: cost management in higher education; activity-based costing (abc); competitiveness; benchmarking; financial sustainability; oper- ational efficiency; cabinda.

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Cost Management as a Strategy for Competitiveness in Private Higher Education Institutions in Cabinda

Cosme Felisberto Tula Gomes[α] & Paulo Deco, PhD[σ]

ABSTRACT

This dissertation investigates Cost Management as a Strategy for the Competitiveness of Private Higher Education Institutions (PHEIs) in Cabinda, highlighting its importance as a strategic instrument for institutional efficiency, sustainability, and performance. The study employed a qualitative case study method at the Polytechnic Higher Institute of Cabinda (ISPCAB), using semi-structured interviews and document analysis of managerial data and internal records. The implementation of Activity-Based Costing (ABC) enabled precise allocation of costs by activity and academic program, ensuring greater traceability and supporting decision-making processes. The findings reveal a positive impact on operational efficiency and financial sustainability, with costs representing 17.5% of annual revenue and the highest profit margin observed in the International Relations program (85.61%). ABC also facilitated internal benchmarking, identifying best practices and performance disparities among programs. The results confirm that strategic cost management enhances competitiveness by optimizing resources and improving profitability, constituting a valuable, rare, inimitable, and well-organized resource for institutional advantage (VRIO framework). Furthermore, this study addresses a gap in the literature on the application of ABC in African PHEIs, offering a scalable reference model for other institutions with limited resources in Angola and similar contexts. The study concludes that cost management—particularly through ABC, is essential for proactive decision-making, operational efficiency, financial sustainability, and competitive advantage, paving the way for future research and more robust institutional strategies.

Keywords: cost management in higher education; activity-based costing (abc); competitiveness; benchmarking; financial sustainability; operational efficiency; cabinda.

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I. INTRODUCTION

The competitive landscape of private higher education in Angola has compelled institutions to adopt new management approaches to ensure their competitiveness. In Cabinda, where only two Private Higher Education Institutions (PHEIs) operate, this challenge is even more pressing due to their strong dependence on student tuition fees and the scarcity of alternative funding sources. In this context, it becomes imperative to rethink financial management models aimed at sustainability and the strengthening of these institutions' competitive positions.

Cost management, as an administrative, financial, and strategic activity, plays a central role in contemporary higher education institutions. With increasing competition in the sector, this area has gained heightened relevance. Private higher education institutions face growing financial pressures, requiring more sophisticated costing systems to secure their sustainability (Johnstone & Marcucci, 2010). In recent decades, the need for efficient financial management has risen among the priorities of PHEIs, particularly in contexts of limited resources.

The outcomes of effective cost management derive from the optimization of financial, human, and

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material resources, ensuring that institutions operate with a balance between academic quality and economic viability. This process requires not only rigorous expenditure control but also strategic planning that enables intelligent and sustainable allocation of resources. According to Martins (2020), this approach rests on key pillars: "resource optimization, waste reduction, development of efficient systems, sustainable growth, and preservation of service quality", all of which are essential for organizational success.

Although the literature addresses cost management in higher education institutions (Johnstone & Marcucci, 2010; Martins, 2020), there is a notable lack of empirical studies exploring the application of advanced models, such as Activity-Based Costing (ABC), in the specific context of PHEIs in Angola or other Portuguese-speaking African countries, where financial and regulatory dynamics are distinct. Cost management can also be integrated into broader strategic management frameworks, such as the Balanced Scorecard (Kaplan & Norton, 1996) or the principles of Total Quality Management, providing a more holistic perspective on sustainability and performance.

The phenomenon of cost management in PHEIs highlights two essential aspects: the need to maintain the quality of education and the obligation to ensure financial sustainability. Striking this balance enables institutions to achieve objectives such as waste reduction, enhanced operational efficiency, improved educational offerings, and long-term market presence. Moreover, well-implemented cost management can foster institutional growth by enabling investments in infrastructure, technology, and faculty development.

According to Hashim (2019, pp. 20-60), the implementation of Activity-Based Costing (ABC) systems in higher education institutions allows for more accurate cost allocation per activity than traditional methods, enabling the identification of inefficiencies and promoting institutional optimization. This method is particularly relevant for PHEIs, which must maximize every investment given their budgetary constraints and the intensifying competition within the education sector.

Cost management can also stimulate new financing models and contribute to reducing inequalities in access to higher education, since financially sound institutions are better positioned to provide scholarships and support programs for low-income students. Cost rationalization further allows PHEIs to invest in strategic areas such as research and innovation, thereby reinforcing their role in regional development.

The existence of robust and well-managed PHEIs requires administrators to adopt modern financial management practices. Failures in expense control, realistic budgeting, or accounting transparency are not acceptable. It is essential for these institutions to have efficient information systems capable of supporting strategic decision-making and fostering institutional sustainability.

It is within this framework that the present dissertation is situated, given the relevance of cost management as a strategy for the competitiveness of PHEIs in Cabinda. The study seeks not only to analyze current challenges but also to propose solutions that ensure the financial balance of these entities, safeguard their educational mission, and contribute to the socioeconomic development of the region.

Accordingly, this dissertation's main objective is to analyze the importance and impact of cost management, focusing on the Activity-Based Costing (ABC) methodology, as a strategy for competitiveness and financial sustainability of PHEIs in Cabinda, specifically the ISPCAB.

PHEIs operate in a dynamic environment where economic fluctuations, inflation rates, and demographic changes in Angola exert continuous pressure on their financial viability, making cost management even more critical.

1.1 Cost Management

Cost management is an essential process for optimizing resources and improving organizational operational efficiency. Its origins

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trace back to the Industrial Revolution, when the need arose to systematize the control of expenses related to raw materials, labor, and equipment. Since then, it has evolved from a merely accounting and descriptive function into a strategic management tool, capable of supporting critical decision-making and influencing organizational sustainability.

To properly understand the strategic role of cost management today, it is fundamental to explore its main definitions and theoretical approaches, as well as to recognize the specific challenges that emerge in different sectors, such as private higher education, where financial and regulatory constraints shape the application of more sophisticated models.

1.2. Definitions

Cost management should not be understood as an isolated activity, but rather as an integral part of an interconnected system that encompasses various organizational areas. Horngren et al. (2015) reinforce this perspective by arguing that it should be conceived "as a holistic system," capable of articulating processes, departments, activities, human and technological resources, with a central focus on creating value for stakeholders.

Effective cost management must rest on principles that transcend mere expense reduction, emphasizing the creation of sustainable value. Martins (2020) highlights as the pillars of this practice "resource optimization, waste reduction, development of efficient systems, sustainable growth, and preservation of service quality" factors that are essential for organizational success.

In the case of Private Higher Education Institutions (PHEIs), this approach gains particular relevance, as it enables balancing financial sustainability with academic excellence. However, its implementation faces additional challenges, such as the scarcity of alternative funding sources, the high dependence on tuition fees, and the need to adapt international models to local contexts. These limitations reinforce the importance of rethinking cost management as a strategic, rather than merely technical, instrument.

1.3. Costing Systems and the Focus on Activity-based Costing (ABC)

Costing systems are essential instruments for financial management, as they enable the calculation, control, and allocation of costs in ways that support strategic decisions such as pricing and profitability analysis. The choice of the most appropriate system acquires particular importance in institutions with limited financial resources, as is the case for many PHEIs.

In addition to fulfilling a financial control function, costing systems also assume a strategic role, as they allow institutional expenditures to be aligned with performance goals and competitive differentiation strategies. In this regard, Hansen and Mowen (2019) emphasize that costing models should not be regarded merely as technical measurement tools, but rather as strategic support mechanisms that foster the integration between cost management and organizational objectives. Similarly, Drury and Tayles (2022) highlight that the adequacy and effectiveness of each system depend directly on the context in which they are applied, since different competitive and institutional environments demand specific cost determination methods.

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Table 1: Main Costing Systems and Their Characteristics

Costing System	Description	Advantages	Disadvantages
Absorption Costing (Full Costing)	Traditional method that allocates all production costs (fixed and variable) to products or services. Accepted for tax purposes.	Provides a comprehensive view of operational costs.	May lead to distortions due to the lack of clear distinction between fixed and variable costs.
Variable (or Direct) Costing	Considers only variable production costs, treating fixed costs as period expenses.	Useful for contribution margin analysis and tactical decision-making support.	Not accepted for tax purposes.
Standard Costing	Establishes predetermined (expected or ideal) costs, enabling comparison with actual costs and analysis of production efficiency.	Facilitates budgetary control and efficiency evaluation.	Can become outdated quickly if standards are not reviewed regularly.
Activity-Based Costing (ABC)	Developed by Cooper and Kaplan (1991), it assigns costs based on the activities that consume resources, suitable for more complex organizational environments.	Provides greater accuracy in cost allocation and better understanding of cost drivers.	Requires large amounts of data and greater effort in implementation and maintenance.

Source: Field research (2025).

It is based on two essential assumptions: activities generate costs, and cost objects create the need for those activities.

Advantages and characteristics of ABC (Activity-Based Costing):

- Greater accuracy in cost allocation: Especially useful in organizations with high indirect costs and a wide variety of services.
- Cost transparency: Allows for a more detailed identification of the source and destination of used resources.
- Encourages continuous improvement: Enables identification of activities with excessive costs and promotes their rationalization.
- Strategic management support: Provides relevant data for decisions such as pricing, course portfolio definition, technology acquisition, and budget planning.

1.3.1. ABC implementation follows four stages

- Identification of activities (unit-level, batch-level, product-sustaining, or facility-sustaining activities);
- Creation of activity centers;
- Definition of cost drivers;
- Allocation of costs to cost objects based on resource consumption.

Despite its advantages, ABC can face obstacles such as resistance to change, lack of management support, or unclear strategic objectives. The Activity-Based Management (ABM) model emerges as an extension of ABC, using the generated information to improve processes and increase profitability and the value delivered to the customer.

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II. THEORIES OF COMPETITIVENESS AND APPLICATION TO THE EDUCATION SECTOR

Competitiveness can be defined as the ability of an organization to establish itself in the market by delivering greater value to its target audiences compared to its competitors. In the business context, Michael Porter (1985) proposed three generic strategies for achieving sustainable competitive advantage:

- *Cost Leadership:* Achieving the lowest absolute cost position through process rationalization and economies of scale.
- *Differentiation:* Creating value by offering products or services perceived as superior in terms of quality, brand, or personalized service.
- *Focus:* Specializing in specific market segments, delivering competitive advantage either through cost leadership or differentiation within that niche.

Complementarily, the Resource-Based View (RBV), developed by Wernerfelt (1984) and Barney (1991), argues that competitive advantage arises from the possession of strategic resources that are valuable, rare, inimitable, and exploitable (VRIN/VRIO model). This perspective is further reinforced by Teece's (2018) theory of dynamic capabilities, which emphasizes the ability of organizations to reconfigure resources and competencies in uncertain and competitive environments.

2.1 Application of Theories to the PHEI Sector

In Private Higher Education Institutions (PHEIs), these theories gain practical significance as they guide strategies that ensure competitiveness and financial sustainability.

- *Cost Leadership* may be achieved through the optimization of existing infrastructure, digitalization of administrative processes, and improvements in operational efficiency, as observed in ISPCAB.
- *Differentiation* can be pursued by offering innovative academic programs, specializing in niche disciplines, or strengthening the quality of faculty and other strategic internal resources (RBV), which are valuable and difficult to replicate.
- *Focus* allows some PHEIs to position themselves within specific market segments, such as specialized technical programs or postgraduate studies tailored to local needs, thereby reinforcing their competitiveness within that niche.

Recent studies confirm that digital transformation in higher education enhances both efficiency and innovation, consolidating the competitive advantage of PHEIs (Du; Grigorescu; Aivaz, 2023; Tapsoba et al., 2022; Almeida, 2021). Furthermore, digitalization contributes to regional development by increasing the social relevance of private institutions (Hong, 2025).

2.2 Limitations and Contextual Considerations

It is essential to recognize that business models cannot be directly applied to the education sector due to the necessary balance between financial sustainability, social responsibility, and academic quality. Purely commercial strategies may conflict with the pedagogical mission of PHEIs, requiring careful adaptation.

2.3 Strategic Variations and Competitiveness Metrics

Competitive strategies may vary significantly across institutions:

- *Public institutions,* which rely on state funding, may have less flexibility in cost optimization.
- *Private institutions,* such as ISPCAB, rely primarily on tuition fees, requiring efficient cost management and clear differentiation to attract students.
- Differences also exist between *urban and rural institutions* in terms of access to resources, partnerships, and strategic markets.

The competitiveness of PHEIs can be assessed through indicators such as:

- Enrollment growth and student retention;
- Graduate employability;

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- Student satisfaction;
- Research output and scientific production;
- Efficiency and financial sustainability, measured through profitability and cost per student, as demonstrated by ISPCAB.

III. COST MANAGEMENT IN HIGHER EDUCATION: CATEGORIES, CHALLENGES, AND OPPORTUNITIES

Cost management in private higher education is vital to ensuring economic sustainability without compromising academic quality. According to Brigham and Ehrhardt (2018), PHEIs must adopt sustainable financial models that promote operational efficiency and revenue diversification.

3.1 Particularities of PHEIs in Cabinda

Private higher education institutions in Cabinda are characterized by a heavy dependence on tuition fees (90-95%) and a predominance of fixed cost structures (70-80%), as evidenced in the ISPCAB case through documentary analysis. This reality is further aggravated by the lack of specialized financial management departments (around 90%), which limits the sophistication of economic control practices.

3.2 Main Categories of Costs in HEIs

- *Teaching Costs:* Faculty salaries, pedagogical materials, curriculum development.
- *Administrative Costs:* IT, administrative services, management salaries.
- *Research and Extension Costs:* Scientific projects, community engagement initiatives, pursuit of external funding.
- *Maintenance and Infrastructure Costs:* Upkeep of buildings, equipment, and facilities.

3.3 Threats and Opportunities

- *Threats:*

Beyond growing competition and increasing quality demands, PHEIs in Cabinda face macroeconomic and regulatory factors that directly affect their sustainability: exchange rate fluctuations and inflation in the Angolan economy, demographic changes reducing demand for higher education, and regulatory instability influencing accreditation and funding rules.

- *Opportunities:*
  - Digitalization of education and the adoption of hybrid models reduce costs related to physical infrastructure while expanding program reach.
  - Diversification of revenue sources, through postgraduate courses, consultancy services, and strategic partnerships, represents a direct pathway to mitigating the near-exclusive reliance on tuition fees.
  - Strategic cost management, particularly through Activity-Based Costing (ABC), enables more precise allocation of indirect costs to activities and programs, revealing the true costs of each course. This facilitates pricing decisions, investment prioritization, and strategic planning, as demonstrated in ISPCAB's profitability analysis.

3.3 Strategic Interdependencies

Opportunities are closely tied to the mitigation of threats. For instance, revenue diversification reduces vulnerability to excessive dependence on tuition fees; digitalization helps address the pressure for lower operational costs; and the adoption of ABC provides greater transparency and efficiency in management, strengthening institutional resilience in unstable economic environments.

IV. METHODOLOGICAL PROCEDURES

This research is characterized by a qualitative approach and a case study design, centered on the Instituto Superior Politécnico de Cabinda (ISPCAB) during the 2022–2023 biennium. According to Silva and Menezes (2001), qualitative research seeks to interpret phenomena based on the meanings attributed by participants, while Yin (2005) emphasizes that case study methodology enables an in-depth analysis of phenomena within their real-life context.

In terms of purpose, the study is exploratory, descriptive, and explanatory:

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i. the exploratory phase mapped cost management practices in Private Higher Education Institutions (PHEIs) in Cabinda;
ii. the descriptive phase presented the characteristics of such practices at ISPCAB;
iii. the explanatory phase aimed to understand how these practices influence institutional competitiveness.

The adopted method was *hypothetico-deductive,* involving the formulation of theoretical hypotheses subsequently confronted with empirical data.

4.1. Sampling Strategy

Semi-structured interviews were conducted with 8 to 13 key staff members from ISPCAB's Administration and Finance departments, as detailed in Table 2. Participants were selected through convenience and snowball sampling, considering their direct experience and in-depth knowledge of the institution's financial and administrative operations.

4.2. Data Collection Procedures

Multiple sources of evidence were employed

- *Bibliographic research:* conducted in open-access international databases (Google Scholar, CAPES Journals, ScienceDirect), using the keywords *"Strategic cost management"*, *"Strategic management accounting"*, *"Strategic management accounting practices"*, and *"Strategic cost management practices"*.
- *Semi-structured interviews:* carried out with ISPCAB staff from the Administration and Finance departments to identify applied cost management practices.
- *Documentary analysis:* of budget plans, financial statements, and organizational records disaggregated by courses and activities.

The combination of these techniques ensured a comprehensive and up-to-date understanding of cost management practices at ISPCAB (2022–2023).

Table 2: Studies, Methodological Procedures and Objectives

Studies	Methodological Procedures and Objectives
Yin (2005); Gil (2008); Vergara (2007) – Case Study at ISPCAB (2022–2023)	Application of semi-structured interviews with 8 to 13 employees from the Administration and Finance departments. Documentary analysis of financial and academic reports. Objective: To understand how cost management contributes to ISPCAB's institutional competitiveness.
Gil (2008); Lakatos and Marconi (2010) – Preliminary Exploratory Review	Literature review in international scientific databases and informal interviews with local experts. Objective: To define the research problem and clarify operational concepts related to strategic cost management.
Kaplan and Cooper (1998); Martins (2010) – Document Analysis at ISPCAB	Organization of financial data by course and activity based on the Activity-Based Costing (ABC) model. Objective: To assess efficiency in resource allocation and identify critical and profitable areas.
Popper (1972); Gil (2008) - Hypothesis Formulation and Validation	Application of the hypothetical-deductive method to investigate the relationship between cost management practices and institutional competitiveness. Objective: To empirically validate the proposed hypotheses based on data triangulation.

Source: Research data (2025).

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4.3. Data Analysis Procedures

Qualitative analysis followed Bardin's (2010) content analysis technique, structured in three stages:

(i) pre-analysis,
(ii) systematic coding,
(iii) data interpretation.

To support the process, tools such as *Microsoft Excel and Apple Numbers* were used to organize coding grids, construct comparative tables, and calculate descriptive indicators (cost per course, profit margins, efficiency in resource allocation).

4.4. Validity and Reliability Measures

To ensure robustness of the findings, the following strategies were adopted:

- *Methodological triangulation:* integration of data from interviews, documentary analysis, and indirect observation;
- *Member checking:* preliminary findings were shared with some participants to validate interpretive consistency;
- *Peer debriefing:* critical review of the analysis by academic peers, minimizing researcher bias.

These measures enhanced the credibility, internal validity, and reliability of the study, aligning it with best practices in qualitative research.

V. RESULTS AND DISCUSSION

The following section presents the characterization of the Instituto Superior Politécnico de Cabinda (ISPCAB), the case study of this research, whose empirical analysis supports the evaluation of cost management practices applied within the context of Private Higher Education Institutions (PHEIs) in Cabinda.

5.1. Case Study: Characterization of ISPCAB

ISPCAB is one of the leading PHEIs in the province of Cabinda, Angola. Founded in 2003 as a branch of ISPRA, it gained institutional autonomy in 2012 through Decree-Law No. 168/12. Currently, it operates independently in the Cabassango district, offering undergraduate programs in Nursing, Architecture and Urbanism, Management and Accounting, Computer Engineering, and International Relations.

The institution's mission is grounded in the integration of teaching, research, university outreach, and community services, promoting the democratization of knowledge and social development, based on the values of science, knowledge, and academic excellence. Its organizational structure comprises a General Directorate, Deputy Directorates, and a Secretary-General, with academic activities distributed across five departments corresponding to the offered areas of study.

Cost management is regarded as a strategic pillar for the institution's efficiency and competitiveness, especially in light of market competition and reliance on tuition fees. A SWOT analysis, constructed from semi-structured interviews with managers and internal documents, highlighted the following:

- Strengths: consolidated academic reputation, strategic location, and qualified faculty.
- Weaknesses: limited infrastructure, insufficient technological resources, and high dependence on fixed revenues.
- Opportunities: expansion through digitalization, growing demand for specialized programs, postgraduate studies, and favorable educational reforms.
- Threats: increasing competition, regulatory instability, and macroeconomic uncertainty.

Financial documents from ISPCAB for 2022/2023, combined with interviews with managers, revealed that "our greatest challenge is the dependence on tuition fees, which represent approximately 90-95% of annual revenues." This dependence, together with a predominantly fixed cost structure (70-80%), restricts financial flexibility and limits investment capacity without rigorous management.

5.2. Identification of Cost Objects and Total Revenue per Course

Courses were considered as cost objects, with the number of students used as the criterion to

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estimate the pressure exerted on institutional resources.

Table 3: Identification of Cost Objects

Cost Objects	No. of Students	Percentage Representation
Computer Engineering	348	22,9
Nursing	445	29,2
International Relations	446	29,3
Management and Accounting	283	18,6
Total	1 522	100,0

Source: Field research (2025).

Table 1 shows that the Nursing (29.2%) and International Relations (29.3%) programs together account for approximately 58.5% of the total student population. This enrollment density implies a proportionally higher mobilization of both direct and indirect costs. The Computer Engineering (22.9%) and Management and Accounting (18.6%) programs complete the distribution.

ISPCAB's annual revenue, derived primarily from student tuition fees, totaled Kz 648,205,000.00 in the 2022/2023 academic year.

Table 4: Total Revenue by Program

Cost Objects	Monthly Tuition (Kz)	No. of Students	Monthly Revenue (Kz)	Annual Revenue (Kz)
Computer Engineering	40 250	348	14 007 000,00	140 070 000,00
Nursing	48 250	445	21 471 250,00	214 712 500,00
International Relations	40 250	446	17 951 500,00	179 515 000,00
Management and Accounting	40 250	283	11 390 750,00	113 907 500,00
Total	-	-	-	648 205 000,00

Source: Field Research/2025

The Nursing program leads in revenue generation, with Kz 214,712,500.00 (33.1% of the annual income), followed by International Relations (27.7%) and Computer Engineering (21.6%). This concentration of revenue in the Nursing program reveals a significant structural dependency, highlighting the need to diversify revenue sources and enhance the attractiveness of other programs to ensure greater institutional financial balance.

5.4. Costs by Activity

The application of the ABC method allowed for an accurate identification of the costs associated with each key activity carried out by the institution.

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Table 5: Costs by Activity

Activities	Cost Indicator	Unit/Year	Unit Cost (Kz)	Annual Cost (Kz)
Teaching theoretical classes	Class hours	16 600	4 849,17	80 496 155,60
Teaching practical classes	Class hours	1 600	4 849,17	7 758 665,60
Course supervision and coordination	No. of coordinators	48	120 000,00	5 760 000,00
Cleaning and sanitizing facilities	Workstations	96	110 000,00	10 560 000,00
Processing enrollment and tuition collection	No. of staff	36	245 000,00	8 820 000,00
Total	-	-	-	113 394 821,20

Source: Field Research/2025

The delivery of theoretical classes represents the main expense (Kz 80,496,155.60/year), reflecting the number of sessions taught, faculty salaries, materials, and energy consumption. Practical classes account for a cost of Kz 7,758,665.60/year, requiring laboratory infrastructure and specific materials. The supervision and coordination of programs (Kz 5,760,000.00/year) is a strategic activity, although with lower financial impact. Support activities, such as cleaning and sanitation (Kz 10,560,000.00/year), as well as student registration and tuition fee processing (Kz 8,820,000.00/year), are essential for operational continuity and the institution's financial sustainability. The total annual cost of all activities amounts to Kz 113,394,821.20.

5.5. Indirect and Direct Costs

The application of the ABC method to indirect costs allowed for a detailed mapping of the main supporting operational expenses.

Table 6: Indirect Costs

Indirect Costs	Drivers	Unit/Month	Annual Value (Kz)
Electricity	Energy consumption (kWh)	27 000,00	324 000,00
Water	Water consumption (m^3)	74 000,00	888 000,00
Rent	Physical space occupied	6 500 000,00	78 000 000,00
Institutional security	Number of classrooms	500 000,00	6 000 000,00
Depreciation of equipment	Number of classrooms	750 000,00	9 000 000,00
Teaching materials	Number of classroom equipment	34 875,00	418 500,00
Administrative consumables	Number of staff	600 000,00	6 000 000,00
Administrative personnel	Number of staff	4 500 000,00	54 000 000,00
Total	-	-	154 630 500,00

Source: Field Research/2025

The cost of property rental is the most significant (Kz 78,000,000.00/year), followed by administrative personnel expenses (Kz 54,000,000.00/year). These figures highlight critical areas that may warrant renegotiation or restructuring.

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Other relevant elements include equipment depreciation, security, consumable materials, and basic services, which together make up a total indirect cost of Kz 154,630,500.00/year. This detailed analysis, enabled by the ABC method, reveals how support structures impact outcomes, contributing to more efficient strategic decision-making.

Table 7: Direct Costs

Direct Costs	Driver	Unit/Month	Annual Value (Kz)
Teaching Staff	Total workload (hours)	18 200	88 254 821,20
Didactic Material	Total annual value	-	4 500 000,00
Total	-	-	92 754 821,20

Source: Field Research/2025

Direct costs are predominantly related to the core teaching activity. Teaching staff represent the highest direct cost (Kz 88,254,821.20/year for 18,200 teaching hours), reflecting the investment in qualified human capital. Didactic materials (Kz 4,500,000.00/year) are also essential to the pedagogical process. The total direct cost amounts to Kz 92,754,821.20 per year. Efficient management of these costs, without compromising quality, poses a challenge that requires optimized planning of teaching hours and continuous training policies.

5.6. Detailed Allocation of Costs by Activity and Cost Object (ABC)

The ABC methodology enabled the precise allocation of costs to activities and, subsequently, to cost objects (courses), through the use of specific cost drivers.

Table 8: Allocation of the activity cost "Delivering theoretical lectures" to cost objects

Driver	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Class Time	3 920	5160	4000	3520	16 600
Unit Cost	4 849,17	4 849,17	4 849,17	4 849,17	-
Total	19 008 730,72	25 021 696,56	19 396 664,00	17 069 064,32	80 496 155,60

Source: Field Research/2025

The Nursing course absorbs the largest share of theoretical class hours (31%), resulting in a cost of Kz 25,021,696.56 for this activity, justified by its curricular requirements. The cost per hour (Kz 4,849.17) remains consistent, indicating a standardized salary policy across courses.

Table 9: Allocation of the activity cost “Delivering practical classes” to cost objects

Driver	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Class Time	0	1 600	0	0	1 600
Unit Cost	0,00	4 849,17	0,00	0,00	-
Total	0,00	7 758 665,60	0,00	0,00	7 758 665,60

Source: Field Research/2025

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The 1,600 hours of practical classes and the associated costs (Kz 7,758,665.60) fall exclusively on the Nursing course, confirming its technical-practical nature and the need for specialized equipment and materials.

Table 10: Allocation of the activity cost "Course supervision and coordination" to cost objects

Driver	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Number of Coordinators	1	1	1	1	4
Unit Cost	1 440 000,00	1 440 000,00	1 440 000,00	1 440 000,00	-
Total	1 440 000,00	1 440 000,00	1 440 000,00	1 440 000,00	5 760 000,00

Source: Field Research/2025

The cost of the supervision and coordination activity (Kz 5,760,000.00) was evenly distributed among the four programs (Kz 1,440,000.00 each), reflecting a balanced academic management structure. However, this uniform distribution may conceal specific operational imbalances.

Table 11: Allocation of the activity cost "Cleaning and sanitation" to academic units

Driver	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Number of Rooms	9	8	8	10	35
Unit Cost	301 714,29	301 714,29	301 714,29	301 714,29	
Total	2 715 428,61	2 413 714,32	2 413 714,32	3 017 142,90	10 560 000,15

Source: Field Research/2025

The costs were allocated based on the number of classrooms assigned to each program. Management and Accounting (10 classrooms) bears the highest cost (Kz 3,017,142.90), followed by Computer Engineering (9 classrooms), and Nursing and International Relations (8 classrooms each). This proportional allocation reflects the level of physical use of the facilities.

Table 12: Allocation of the activity "Enrollment processing and tuition fee collection" to cost objects

Driver	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Number of Students	348	445	446	283	1 522
Unit Cost	5 795,01	5 795,01	5 795,01	5 795,01	
Total	2 016 663,48	2 578 779,45	2 584 574,46	1 639 987,83	8 820 005,22

Source: Field Research/2025

The allocation was based on the number of students. Nursing and International Relations account for approximately 29% each, while Computer Engineering and Management and Accounting represent 23% and 19%, respectively. This criterion aligns administrative costs with the actual workload generated.

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Table 13: Allocation of Indirect Costs to Activities

Indirect Costs	Drivers	Teaching heoretical classes	Teaching practical classes	Course supervision and coordination	Cleaning and sanitizing facilities	Enrollment processing and tuition collection	Total
Electricity	Energy consumption (kWh)	129 600,00	97 200,00	32400	32 400,00	32 400,00	324 000,00
Water	Water consumption (m^3)	355 200,00	266 400,00	44400	177 600,00	44 400,00	888 000,00
Rent	Physical space occupied	27 300 000,00	19 500 000,00	11 700 000,00	11 700 000,00	7 800 000,00	78 000 000,00
Institutional security	Number of classrooms	1 800 000,00	1 800 000,00	600000	1 200 000,00	600 000,00	6 000 000,00
Depreciation of equipment	Number of classrooms	2 700 000,00	2 700 000,00	900000	1 800 000,00	900 000,00	9 000 000,00
Materials	Number of classroom equipment	209 250,hk400	125 550,00	41850	20 925,00	20 925,00	418 500,00
Administrative consumption	Number of staff	0,00	0,00	600000	0,00	5 400 000,00	6 000 000,00
Administrative personnel	Number of staff	0,00	0,00	5400000	0,00	48 600 000,00	54 000 000,00
Total	-	32 494 050,00	24 489 150,00	19 318 650,00	14 930 925,00	63 397 725,00	154 630 500,00

Source: Field Research/2025

Rent (50.45%) and administrative staff (34.93%) represent the largest indirect expenses, primarily allocated to theoretical/practical teaching and administrative activities. This analysis makes it possible to identify opportunities for contract 000.,'k k renegotiation and resource optimization.

Table 14: Total Costs of Activities and Cost Objects

Activities	Computer Engineering	Nursing	International Relations	Management and Accounting	Total
Teaching theoretical classes	19 008 730,72	25 021 696,56	19 396 664,00	17 069 064,32	80 496 155,60
Teaching practical classes	-	7 758 665,60	-	-	7 758 665,60
Course supervision and coordination	1 440 000,00	1 440 000,00	1 440 000,00	1 440 000,00	5 760 000,00
Cleaning and hygiene of facilities	2 715 428,57	2 413 714,29	2 413 714,29	3 017 142,86	10 560 000,01
Processing of enrollments and tuition collection	2 016 662,29	2 578 777,92	2 584 572,93	1 639 986,86	8 820 000,00
Total	25 180 821,58	39 212 854,37	25 834 951,22	23 166 194,04	113 394 821,21

Source: Field Research/2025

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The Nursing course shows the highest total indirect cost (Kz 39,212,854.37), due to its practical nature and larger number of students. The Management and Accounting course presents the lowest overall cost (Kz 23,166,194.04), which may indicate greater efficiency or a less demanding curricular structure.

5.6. Discussion and Interpretation of Results

The results show that cost management at ISPCAB directly influences operational efficiency and financial sustainability. The implementation of the ABC system proved to be crucial for the correct allocation of indirect costs, enabling the identification of areas with higher resource consumption and promoting a more strategic and evidence-based management approach.

5.7. Profitability by Course and by Student

The profitability analysis revealed that all courses are financially sustainable, contributing positively to the institution's results.

Table 15: Profitability by Course Based on Revenue and Annual Cost

Cost Objects	Annual Revenue (Kz)	Annual Cost (Kz)	Annual Cost (Kz)
Computer Engineering	140 070 000,00	25 180 821,58	114 889 178,42
Nursing	214 712 500,00	39 212 854,37	175 499 645,63
International Relations	179 515 000,00	25 834 951,22	153 680 048,78
Management and Accounting	113 907 500,00	23 166 194,04	90 741 305,96

Source: Field Research/2025

The Nursing course shows the highest profitability (Kz 175,499,645.63), despite having the highest operational cost, justified by the high revenue generated. Management and Accounting shows the lowest profit (Kz 90,741,305.96), which may justify a review of costs or the tuition fee policy. Computer Engineering and International Relations maintain balanced margins, reinforcing the importance of ABC analysis for strategic management decisions.

Table 16: Result per Student

Cost Objects	Unit Revenue (Kz)	ABC Unit Cost (Kz)	Unit Profit (Kz)
Computer Engineering	402 500,00	65 575,06	336 924,94
Nursing	482 500,00	88 118,77	394 381,23
International Relations	402 500,00	57 925,90	344 574,10
Management and Accounting	402 500,00	81 859,34	320 640,66

Source: Field Research/2025

The per-student analysis confirms the economic viability of all courses. Nursing stands out with the highest unit revenue (Kz 482,500.00) and the highest net result per student (Kz 394,381.23), even with the highest unit cost (Kz 88,118.77). International Relations shows the lowest cost per student (Kz 57,925.90) and a solid margin (Kz 344,574.10), demonstrating a good cost-benefit ratio.

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Table 17: Profitability Analysis per Student: Unit Cost and Unit Result

Cost Objects	Number of Students	Annual Revenue (Kz)	Annual Cost (Kz)	Unit Revenue (Kz)	Unit Cost (Kz)	Unit Profit (Kz)
Computer Engineering	348	140 070 000,00	25 180 821,58	402 500,00	72 358,68	330 141,32
Nursing	445	214 712 500,00	39 212 854,37	482 500,00	88 118,77	394 381,23
International Relations	446	179 515 000,00	25 834 951,22	402 500,00	57 925,90	344 574,10
Management and Accounting	283	113 907 500,00	23 166 194,04	402 500,00	81 859,34	320 640,66
TOTAL	1 522	648 205 000,00	113 394 821,21	425 890,28	74 503,82	351 386,46

Source: Field Research/2025

On average, the institution achieved a net result of Kz 351,386.46 per student, which attests to the financial efficiency of the current management model and the economic viability of the academic operation.

5.8. Profit Margin per Course

The analysis of profit margins per course confirms the effectiveness of cost management practices.

Table 18: Revenue per Student (Profit Margin)

Cost Objects	Annual Revenue (Kz)	Annual Cost (Kz)	Profit (Kz)	Profit Margin (%)
Computer Engineering	140 070 000,00	25 180 821,58	114 889 178,42	82,02
Nursing	214 712 500,00	39 212 854,37	175 499 645,63	81,74
International Relations	179 515 000,00	25 834 951,22	153 680 048,78	85,61
Management and Accounting	113 907 500,00	23 166 194,04	90 741 305,96	79,66

Source: Field Research/2025

The International Relations course presents the highest margin (85.61%), suggesting an efficient cost structure in relation to its revenue. Computer Engineering (82.02%) and Nursing (81.74%) also show high margins, reflecting effective cost rationalization despite more demanding operational requirements. Management and Accounting, with 79.66%, also maintains a positive performance. These data highlight that cost management is a key factor for the institution's economic sustainability, aligning with literature that identifies ABC as an effective tool for strategic management.

5.9. Cost-Benefit Index (CBI)

The Cost-Benefit Index (CBI) was calculated to assess the economic efficiency of operational activities.

Based on total revenue of Kz 648,205,000.00 and total cost of Kz 113,394,821.20, the resulting CBI was 5.72. This means that for every kwanza invested, the institution obtains a return of Kz 5.72, demonstrating a high level of resource management efficiency. This alignment between strategic cost management and activity-based

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analysis contributes significantly to the institution's financial sustainability and competitiveness.

5.10. Hypothesis Validation

The study proposed two hypotheses, with H1 (cost management contributes to the competitiveness of ISPCAB) being validated based on the data collected. The application of the ABC method enabled efficient cost allocation, supporting strategic decision-making and sustainable resource use. All courses showed positive results. Ho, which denied such impact, was refuted, as there was no contrary evidence; on the contrary, balanced margins and operational efficiency (with 34.4% cost over revenue) confirm the effectiveness of cost management.

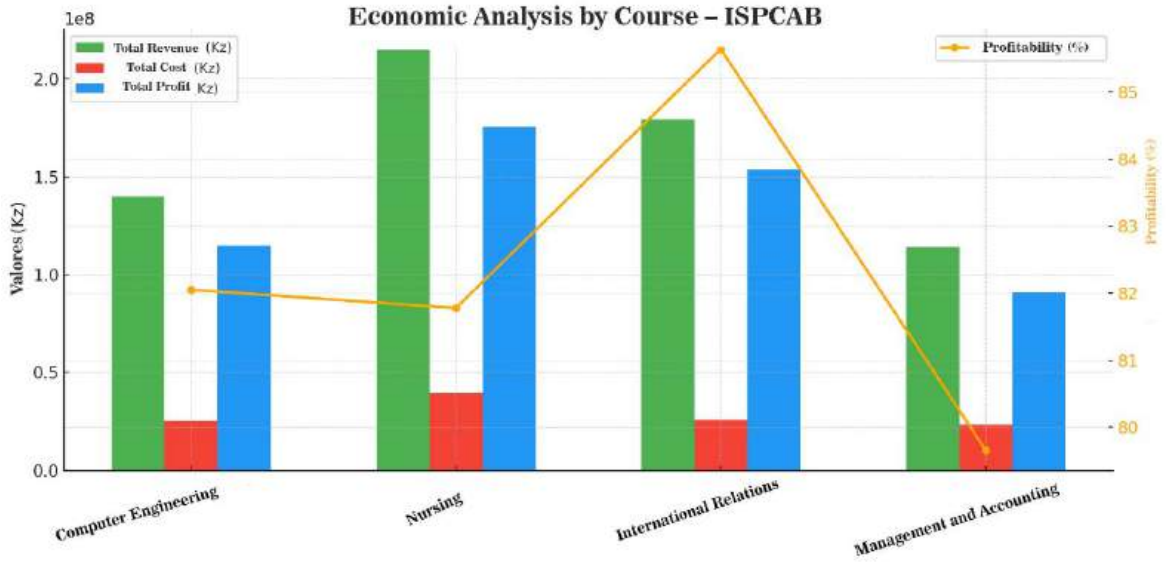
5.11. Internal Benchmarking Results

The research included an internal benchmarking exercise at ISPCAB, aiming to identify best practices and promote improvements in cost management to enhance competitiveness. Internal benchmarking was chosen due to limited access to external data and the relevance of comparing the institution's own courses. The process was based on ABC principles, allowing for reliable efficiency and sustainability indicators per course.

Table 19: Standardized Sheet – Comparative Indicators

Courses	Number of Students	Unit Revenue (Kz)	Annual Revenue (Kz)	ABC Unit Cost (Kz)	Annual Cost (Kz)	Unit Profit (Kz)	Total Profit (Kz)	Profitability (%)
Computer Engineering	348	402 500,00	140 070 000,00	72 358,68	25 180 821,58	330 141,32	114 889 178,42	82,02
Nursing	445	482 500,00	214 712 500,00	88 118,77	39 212 854,37	394 381,23	175 499 645,63	81,74
International Relations	446	402 500,00	179 515 000,00	57 925,90	25 834 951,22	344 574,10	153 680 048,78	85,61
Management and Accounting	283	402 500,00	113 907 500,00	81 859,34	23 166 194,04	320 640,66	90 741 305,96	79,66

Source: Field Research/2025



Source: Field Research/2025

Chart 2: Internal Benchmarking Results: Course Profitability at ISPCAB (Evening Classes), Based on ABC Costing

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The internal benchmarking revealed significant variations among ISPCAB's courses. Nursing proved to be the most profitable, despite its high operational costs, due to the high revenue per student. International Relations showed the highest profit margin (85.61%) as a result of lower unit costs. Management and Accounting had a positive performance but with a lower margin, indicating room for improvement. The analysis identified good administrative practices that could be replicated, such as the use of technologies and optimization of teaching loads. The results reinforce that efficient cost management is associated with better competitive performance, confirming hypothesis H1.

VI. CONCLUSIONS

This dissertation reinforces that cost management, when applied strategically, constitutes an essential pillar for the sustainability and competitiveness of Private Higher Education Institutions (PHEIs) in Cabinda. Based on the ISPCAB case study, the following conclusions can be drawn:

. *Cost management proved to be crucial* for the operational efficiency and financial sustainability of ISPCAB. Traditional costing methods show limitations in the precise allocation of indirect expenses, which may obscure real operational imbalances and hinder strategic decision-making. The institution's high dependence on tuition fees (90-95% of revenues) and a predominantly fixed cost structure further highlight the need for advanced systems to ensure financial flexibility and a clear view of course profitability.

. *The implementation of Activity-Based Costing (ABC)* provided detailed cost tracking, refined resource allocation, and support for strategic decision-making. It enabled the identification of courses with higher resource consumption (e.g., Nursing) and more profitable ones (e.g., International Relations), thereby optimizing internal processes and reducing waste. With total costs representing only 17.5% of annual revenue (CBI of 5.72), the institution demonstrates high operational efficiency, capable of sustaining strong margins without compromising teaching quality.

. *The ability to implement and manage ABC* may be considered a valuable, rare, inimitable, and organizationally exploitable resource, according to the VRIO framework. It is valuable for enabling informed decision-making and resource optimization; rare, given the limited adoption of advanced costing methods in other PHEIs; difficult to imitate, requiring managerial commitment and staff training; and organizationally embedded, reflecting ISPCAB's adaptable information systems. This capacity confers a sustainable competitive advantage to the institution.

Despite some weaknesses in the full adoption of advanced systems, ISPCAB shows remarkable potential for transitioning towards proactive cost management, supported by technology and continuous staff development. Failure to seize this opportunity may result in operational stagnation, loss of competitiveness, and underutilization of resources.

— *The accuracy of ABC allowed performance comparisons across programs* and the identification of best practices. This internal benchmarking reinforces the central hypothesis of the study: efficient cost management is fundamental for superior competitive performance.

— Although this study focuses on a single case at ISPCAB, the findings on cost management and ABC are highly indicative for other PHEIs in Cabinda and may serve as a reference for institutions in similar socio-economic contexts. Future research may confirm the applicability of these findings in different institutional settings.

To consolidate leadership, it is recommended that ISPCAB:

- Continue enhancing the ABC system;
- Develop training programs for managers and administrative staff;

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- Explore strategic partnerships for the adoption of new technologies;
- Transition to a proactive cost management model that not only optimizes existing resources but also creates new opportunities for growth and sustainability within the dynamic educational landscape.

This study paves the way by emphasizing that strategic cost management is not merely a requirement, but rather the cornerstone of efficiency, sustainability, and competitive advantage for PHEIs in Cabinda. ISPCAB, as a paradigmatic case, unequivocally demonstrates the urgency and benefit of moving beyond reactive models towards proactive cost management, anchored in advanced costing systems and data-driven decision-making. It is important to note, however, that while ISPCAB's results are strongly indicative for other PHEIs facing similar characteristics and challenges in Cabinda, their full generalization requires further studies to confirm applicability in different institutional contexts, given the single-case study design and the non-probabilistic sampling adopted. This path will ensure not only academic excellence but also the institution's indisputable leadership within the dynamic educational landscape.

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A Framework for Dynamic ANN Index Lifecycle Management in Ad Retrieval

Praveen Kumar Alam

Deemed to be University

ABSTRACT

The digital advertising landscape requires exceptional scale and efficiency in candidate retrieval systems, where Approximate Nearest Neighbor indexes function as the core technology facilitating real-time ad matching across extensive inventories. Dynamic advertising catalogs face distinct challenges due to ongoing changes from campaign launches, budget modifications, and creative updates, requiring ANN indexes that can manage frequent insertions, deletions, and changes while ensuring optimal query performance. Current dynamic ANN implementations experience a gradual performance decline as update operations build up, resulting in heightened query latency and diminished retrieval accuracy that directly affects system efficiency. The suggested framework tackles these issues using a thorough method that merges smart index selection techniques with advanced lifecycle management strategies. The selection element assesses candidate ANN algorithms based on workload-specific traits, including degradation resistance as a key factor in addition to conventional static performance measurements. The management part employs a dual-layer architecture that differentiates real-time updates from batch optimizations, allowing for instant responsiveness while maintaining long-term performance traits. At the core of this framework is a re-indexing policy that is aware of degradation, which observes performance indicators and initiates reconstruction actions using predictive models and adjustable thresholds.

Keywords: approximate nearest neighbor, dynamic indexing, advertisement retrieval, performance degradation, graph-based algorithms.

Classification: JEL Code: QA76.9.D343, QA76.889

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Keywords: approximate nearest neighbor, dynamic indexing, advertisement retrieval, performance degradation, graph-based algorithms.

Author: Independent Researcher, USA

I. INTRODUCTION

The digital advertising landscape has experienced exceptional growth, with industry analyses recording a significant increase in digital ad spending to $189 billion in 2021, highlighting a considerable year-over-year rise that emphasizes the industry's swift transformation [1]. This unparalleled scale transformation has drastically changed the technical demands for advertising platforms, requiring systems that can handle millions of queries each second while ensuring sub-millisecond response times to provide an optimal user experience and enhance advertiser return on investment. The immense scale of contemporary advertising activities necessitates platforms to assess extensive ad inventories for every user engagement, rendering effective retrieval systems not just beneficial but critically vital for operational success.

Approximate Nearest Neighbor indexes have become the core technology facilitating this scalable similarity search within high-dimensional embedding spaces that define contemporary advertising systems. Modern platforms generally use embedding dimensions between 128 and 1024, with each dimension capturing intricate user behavior patterns, contextual environmental

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cues, and advanced advertisement features through dense vector representations. These mathematical concepts encapsulate subtle semantic connections that conventional keyword-focused matching systems are inherently unable to depict, thus facilitating more advanced and efficient advertisement targeting techniques that propel the industry's ongoing growth path.

The technical difficulties posed by contemporary advertising platforms function at levels once thought to be theoretically insurmountable. Extensive platforms commonly handle billions of ad requests every day, with each distinct request requiring assessment against inventories featuring tens of millions of active ads spread across various geographic areas and demographic categories. Conventional exact nearest neighbor search algorithms, due to their linear complexity traits, become computationally daunting at these operational scales. Sophisticated ANN algorithms tackle this core limitation by lowering computational complexity to logarithmic or sub-logarithmic levels, facilitating real-time management of large datasets while upholding accuracy standards that meet strict business demands.

The key feature that sets advertising applications apart from other ANN use cases is the inherently dynamic aspect of managing advertising inventory. Advertising catalogues are constantly changing because of new campaign launches, budget exhaustion that results in ad deactivation, changes to creative assets that reflect market dynamics, and adjustments to bidding strategies in response to competitive influences. This is in contrast to recommendation systems or image search tools, which operate on comparatively stable datasets with infrequent updates. This operational reality results in millions of insert, update, and delete actions happening continuously throughout the distributed systems infrastructure.

Dynamic ANN applications encounter considerable technical hurdles in advertising scenarios, especially related to performance decline during prolonged operating durations. The Hierarchical Navigable Small World graph, although showcasing outstanding performance in static situations, suffers from structural degradation as the buildup of updates disrupts the meticulously designed connectivity patterns necessary for efficient navigation [2]. This decline is evident in heightened query latency since search algorithms have to navigate inefficient routes within deteriorated graph structures, ultimately impacting the real-time performance features crucial for competitive advertising platforms.

II. BACKGROUND AND THEORETICAL FOUNDATION

The development of Approximate Nearest Neighbor algorithms signifies a significant shift from conventional tree structures to advanced graph-based techniques that have fundamentally transformed high-dimensional similarity search potentials. Historical methods such as KD-trees and Locality Sensitive Hashing showed acceptable performance for low-dimensional datasets but experienced exponential declines as dimensionality surpassed practical limits. The shift to graph-based algorithms arose from understanding that high-dimensional spaces have distinct geometric traits that support connectivity-driven navigation rather than partition-focused traversal methods, resulting in the creation of algorithms capable of sustaining effective performance across various dimensional spans and dataset sizes.

The Hierarchical Navigable Small World algorithm exemplifies the zenith of graph-based ANN evolution, creating advanced multi-layered network structures where each node aligns with a data point in high-dimensional space, and edges form probabilistic connections founded on distance relations and navigability enhancement standards [3]. The hierarchical arrangement comprises several tiers with diminishing node counts as layer indices rise, forming a pyramid-shaped connectivity pattern where higher layers aid in long-distance navigation while lower layers enable detailed local search functions. The process of construction entails the repetitive addition of data points to the graph framework while preserving connectivity traits via

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precisely tuned neighbor selection methods that harmonize local enhancements with overarching navigability goals.

Contemporary graph-based systems achieve remarkable performance characteristics through sophisticated architectural design techniques that improve query execution speed and build efficiency. The HNSW algorithm shows remarkable efficiency in sustaining sublinear query complexity, even with datasets of millions of vectors in hundreds of dimensions, marking a notable improvement over earlier methods that faced polynomial deterioration under comparable circumstances. The algorithm succeeds due to its capability to construct easily navigable graph structures, where query processing utilizes greedy search methods that effectively explore starting points through increasingly refined areas until optimal matches are found within acceptable computational limits.

Dynamic update operations in graph-based systems pose intricate algorithmic challenges that go well beyond mere node addition or deletion methods. The insertion process demands advanced analysis of the current graph topology to pinpoint optimal connection points that maintain both local clustering traits and global connectivity features crucial for efficient traversal. Contemporary benchmarking efforts have shown that insertion operations may need computational resources that scale logarithmically with the size of the dataset, yet the quality of the generated graph structures is highly dependent on the order and distribution of insertion operations throughout time [4]. These results emphasize the need to account for update patterns during the design of systems intended for dynamic settings where data changes happen consistently instead of in separate batches.

Deletion operations add complexity by requiring the preservation of graph connectivity while eliminating nodes and their related edges from the network framework. The removal procedure must reallocate connections among the existing neighbors to maintain reachability characteristics and avert graph fragmentation that might significantly affect query efficiency. Studies show that basic deletion methods can lead to the formation of isolated clusters or raise average path lengths between connected data points, requiring advanced reconnection algorithms that evaluate local graph structures and create new edges based on distance relationships and criteria for optimizing connectivity.

The theoretical framework that supports performance decline in dynamic ANN systems includes interrelated processes that accumulate over long operational durations, systematically diminishing system efficiency. Structural entropy builds up as continuous update actions lead graph architectures to stray from the ideal setups that would emerge from fully reconstructing with current data distributions. This divergence appears in the form of inefficient routing patterns, greater query complexity, and lower recall accuracy as navigation algorithms face less effective paths due to deteriorated graph structures that fail to represent optimal connectivity relationships.

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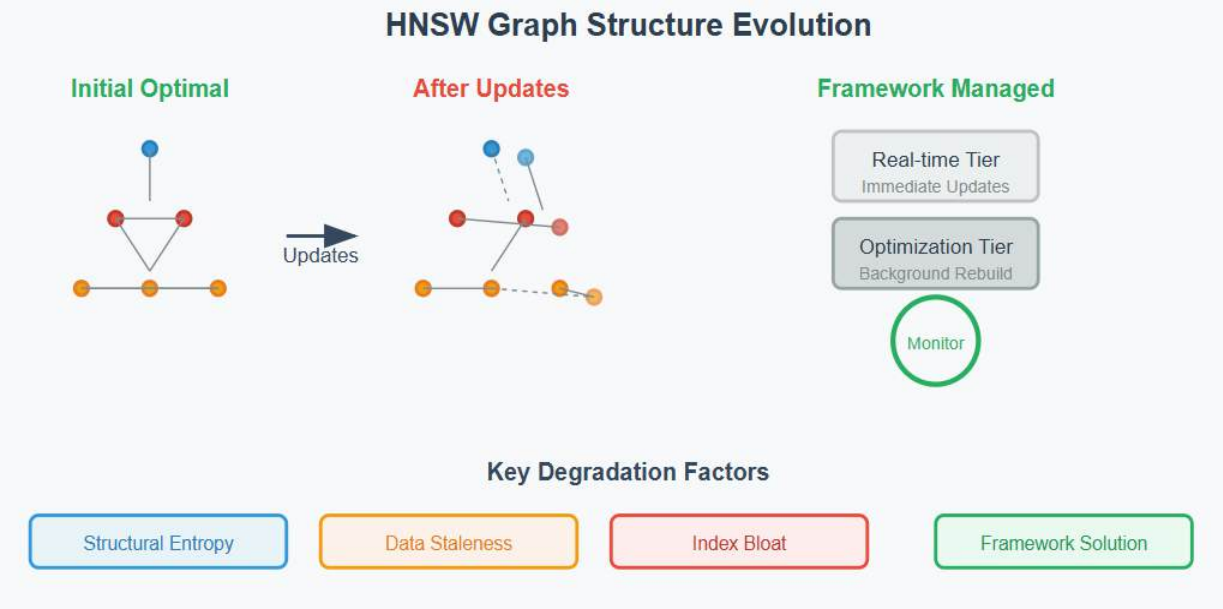

Fig. 1: HNSW Graph Structure Evolution [3, 4].

III. PERFORMANCE DEGRADATION ANALYSIS

Performance decline in dynamic ANN indexes is a complex issue that emerges through consistent worsening of both query response features and retrieval quality measures as systems gather update operations over lengthy operational durations. The deterioration process functions through various interrelated mechanisms that accumulate over time, resulting in cascading impacts across the index structure that eventually undermine system efficiency. Grasping these degradation trends is especially vital for applications demanding consistent high performance, as even slight decreases in efficiency can lead to considerable operational effects and a decline in user experience.

Query latency deterioration occurs as graph-based structures gradually stray from their initially optimized connection patterns, compelling search algorithms to navigate through increasingly inefficient routes within degraded network topologies. The analysis of the Elastic implementation shows that contemporary ANN systems face a tangible decrease in performance as update operations create structural inconsistencies that interfere with the precisely tuned neighbor relationships vital for effective graph traversal [5]. This deterioration appears in the form of longer search paths, heightened computational costs during neighbor assessment, and diminished efficacy of heuristic optimization methods that depend on the regularity of graph structure for performance improvements.

The mathematical description of latency adheres to consistent patterns, in which query processing time rises in proportion to the buildup of structural irregularities caused by dynamic update actions. Studies show that the typical time for query execution rises logarithmically as the count of handled updates grows, with sharper decline patterns noted in cases with regular deletion tasks that disrupt graph connectivity. The rate of degradation differs markedly depending on the dimensional properties of the embedding space, with datasets in higher dimensions generally showing a greater susceptibility to structural disturbances because of the heightened intricacy of preserving optimal neighbor connections in larger vector spaces.

Recall degradation signifies a vital performance issue that affects the core functionality of ANN systems by diminishing their capability to discern genuinely relevant nearest neighbors within reasonable computational limits. The degradation process functions via various routes, such as the decline of routing data that steers search algorithms to ideal areas of the embedding space,

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the breakup of connectivity routes that cut off access to once reachable data points, and the buildup of outdated neighbor associations that lead queries to less ideal options. Hash-based indexing methods, although providing various trade-offs in contrast to graph-based techniques, show comparable vulnerability to performance decline due to the accumulation of hash collisions and issues with bucket imbalance that worsen over time [6].

Testing across various operational situations uncovers unique degradation patterns linked to particular update characteristics frequently observed in production settings. Workloads dominated by insertions generally show performance deterioration mainly due to greater structural density, which impairs graph navigability, while patterns focused on deletions reveal more significant accuracy decline because of connectivity fragmentation. The most difficult situations feature mixed update distributions that integrate insertion, deletion, and modification tasks in ways that mirror real-world application usage, leading to combined degradation effects that necessitate advanced analytical methods for proper characterization and accurate prediction.

The time-based progression of performance decline adheres to mathematically manageable patterns that facilitate the creation of predictive models for proactive maintenance and scheduling of optimization. These degradation curves exhibit logarithmic decay traits in which performance metrics decrease at rates that are proportional to the logarithm of total update operations, with decay coefficients affected by algorithmic parameters, dataset features, and update distribution patterns. Grasping these time-related connections offers the mathematical basis for executing degradation-aware management strategies that can foresee performance threshold breaches and activate proactive optimization actions before system efficiency drops beneath acceptable operational limits.

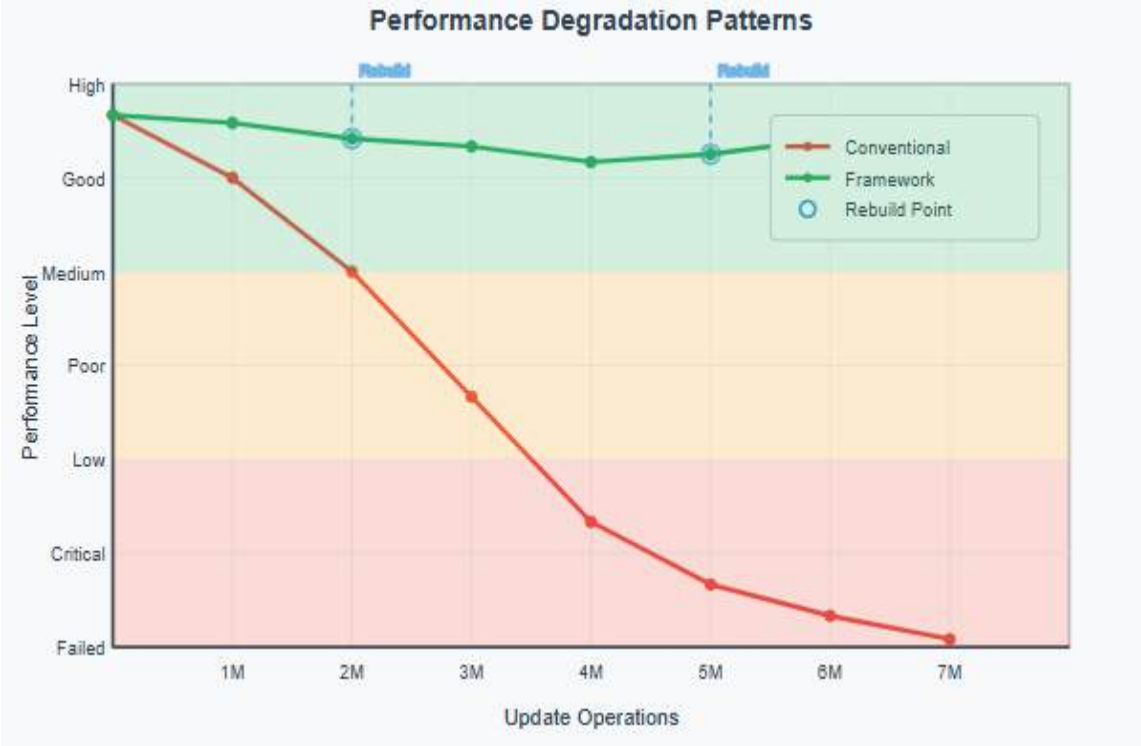

Fig. 2: Performance Degradation Patterns [5, 6].

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IV. FRAMEWORK ARCHITECTURE AND MANAGEMENT STRATEGY

The suggested framework design tackles the essential issues of managing dynamic ANN indexes by employing an extensive dual-part system that combines smart algorithm choices with advanced operational management techniques. The index selection approach functions as a multi-faceted evaluation system that methodically evaluates potential ANN algorithms based on performance criteria tailored to specific workloads, taking into account both short-term operational demands and long-term sustainability factors. This assessment framework goes beyond conventional static benchmarking methods by employing thorough temporal analysis that investigates algorithm performance under realistic update patterns and operational stress scenarios during prolonged deployment phases.

The selection approach utilizes an advanced scoring framework that blends quantitative performance indicators with qualitative operational traits to formulate detailed algorithm profiles tailored for particular deployment situations. The assessment procedure evaluates query processing effectiveness across diverse traffic patterns, examines memory usage traits during both peak and off-peak times, measures recall accuracy at various similarity thresholds and dataset configurations, and importantly, assesses the algorithm's robustness against performance decline during ongoing update tasks. Product quantization methods are essential in this assessment framework as they facilitate efficient similarity calculations while minimizing memory needs, which is particularly vital for large-scale advertising applications where storage efficiency directly influences operational expenses and system scalability [7].

The managed update framework adopts a novel two-tiered architectural strategy that effectively separates short-term operational responsiveness from long-term system improvement via meticulously structured operational layers. The main tier acts as a high-efficiency update buffer that can handle modification tasks with low latency effects on simultaneous query processing, using enhanced data structures and memory management strategies to ensure system responsiveness under heavy traffic situations. This level utilizes lock-free concurrent algorithms and optimistic concurrency control methods to reduce conflicts between update and query operations, guaranteeing that system performance stays consistent even during times of heavy index modification activity.

The secondary tier functions as an advanced optimization engine that carries out complex index reorganization and reconstruction tasks to mitigate the structural decline that builds up from ongoing update actions. This level utilizes sophisticated algorithms for analyzing and optimizing graph structures, detecting inefficient connectivity patterns, and applying specific reconstruction methods that enhance efficient navigation routes within the index framework. Recent progress in billion-scale approximate nearest neighbor search, like those shown in SPANN implementations, offers architectural guidance for handling very large datasets while preserving sub-linear query complexity and efficient update processing abilities [8].

At the heart of the framework's operational efficiency lies the degradation-aware re-indexing policy, which constantly observes system performance metrics and executes predictive maintenance tactics grounded in advanced trend analysis and performance forecasting models. This policy framework employs machine learning methods that analyze past operational data to detect patterns of performance decline and forecast when system efficiency may fall below acceptable operational limits. The ability to predict allows for the scheduling of maintenance in a proactive manner that reduces service interruptions while maintaining consistent performance across different operational conditions and workloads.

The re-indexing policy framework establishes an all-encompassing cost-benefit optimization system that weighs the computational resources needed for index rebuilding against the enhancements in performance gained from new index creation. This optimization takes into

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account various factors such as existing system usage trends, available processing power, anticipated traffic levels, and past reconstruction efficiency metrics to identify the best maintenance timing and resource distribution methods. The framework accommodates various operational modes, including threshold-triggered systems that commence reconstruction when performance metrics drop below set levels, and advanced predictive scheduling algorithms that foresee ideal maintenance periods based on traffic predictions and resource availability assessments.

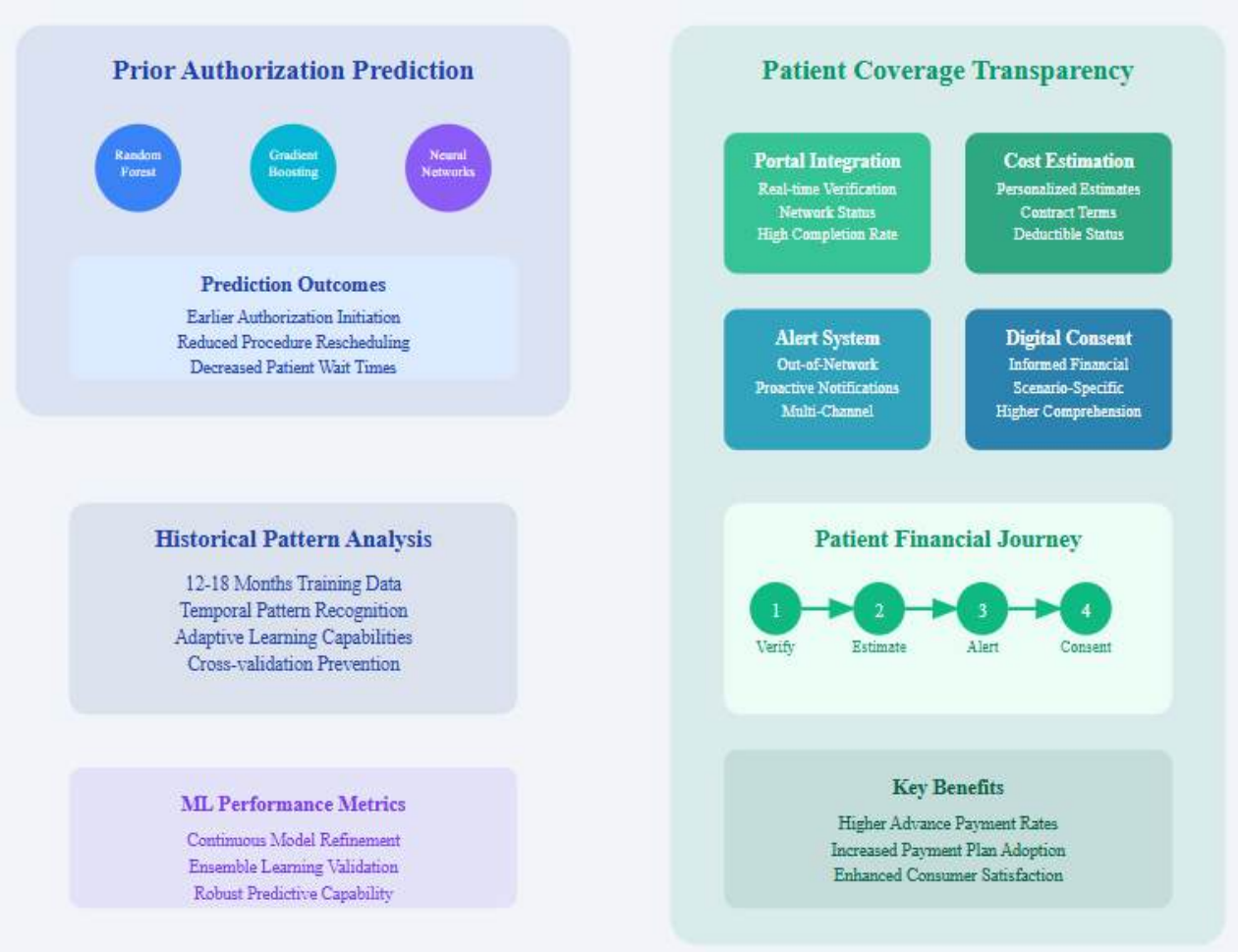

Fig. 3: Two-Tiered Framework Architecture [7, 8].

V. EXPERIMENTAL VALIDATION

Thorough experimental verification was performed using extensive datasets that accurately portray the intricate and large-scale characteristics of production advertising settings, including evaluation scenarios that cover various operational conditions typical of real-world deployment issues. The testing framework featured datasets that varied from mid-sized collections with millions of advertisement embeddings to extensive repositories nearing the size of leading advertising platforms, spread across high-dimensional embedding spaces that reflect the semantic depth necessary for efficient advertisement matching. These experimental conditions were meticulously crafted to confirm both the algorithmic efficiency of the suggested framework and its practical feasibility under the stringent performance demands typical of modern advertising systems.

The experimental approach utilized advanced workload generation methods that mimic authentic traffic patterns and update distributions seen in actual advertising platforms, integrating time-related changes that represent the cyclical characteristics of advertising campaigns and

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seasonal market fluctuations. Testing scenarios involved a thorough evaluation of query processing performance under different load conditions, a systematic analysis of how update operations are managed across various modification patterns, and an in-depth assessment of system behavior during stress conditions typically experienced during high-traffic advertising events. The validation procedure included prolonged operational simulations covering several months of comparable production time to identify long-term performance patterns and system stability features under ongoing operational pressure.

The assessment of performance versus established baseline methods revealed considerable advantages of the managed framework in various key operational areas, especially highlighting metrics that have a direct effect on user experience and system dependability in advertising applications. The comparative study showed that traditional dynamic indexing methods suffer significant performance decline over time, which is evident in longer query response times, decreased retrieval accuracy, and potential system instability that demands manual fixes or total reconstruction. Contemporary streaming processing frameworks, including those utilizing time-based indexing methods for dynamic spatio-temporal data governance, offer architectural perspectives pertinent to managing ongoing update streams while preserving query performance features [9].

The experimental validation included a comprehensive analysis of the framework's response to burst traffic scenarios that frequently arise during significant advertising events, promotional initiatives, or seasonal traffic surges that can elevate system load by several orders of magnitude in brief intervals. These burst situations illustrate significant operational issues for advertising platforms, as abrupt rises in both query volume and update frequency can stress traditional indexing systems and result in service decline or breakdown. The managed framework showcased remarkable resilience under these tough conditions, ensuring responsive query processing while effectively handling the heightened update load through its advanced buffering and optimization strategies.

Thorough evaluation of high-dimensional performance traits tackled essential inquiries about the framework's efficiency in the challenging dimensional ranges common in contemporary machine learning applications, where embedding spaces frequently surpass several hundred dimensions and conventional nearest neighbor methods may experience performance decline because of dimensional scaling impacts. Investigations into how nearest neighbor classifiers function in high-dimensional environments offer crucial theoretical insights into the computational difficulties and algorithmic constraints that need to be tackled in real-world applications [10]. The experimental findings showed that the suggested framework retains strong performance traits throughout the complete spectrum of dimensional scales pertinent to advertising applications, attaining stable query accuracy and response time features irrespective of embedding dimensionality.

The validation process comprised a thorough long-term stability evaluation that tracked system performance over prolonged operational times comparable to several years of production use, offering essential insights into the framework's capacity to uphold steady performance traits without necessitating frequent maintenance actions or system overhauls that could hinder service availability and raise operational expenses.

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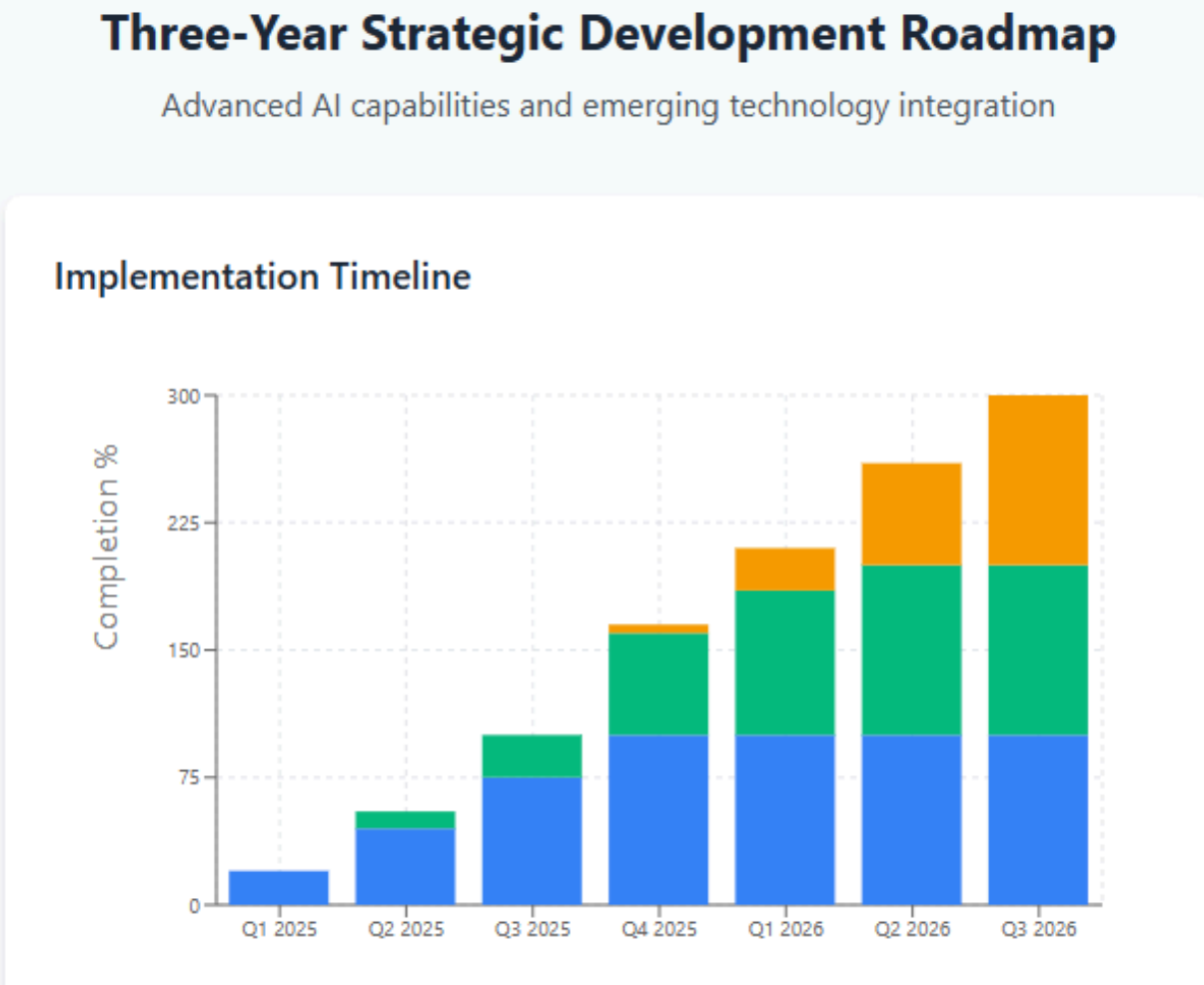

Fig. 4: Experimental Validation Results [9, 10].

VI. CONCLUSION

The proposed framework offers a complete solution for handling dynamic ANN indexes in advertising retrieval systems, tackling the significant issues of performance decline that affect traditional implementations. By employing strategic algorithm selection and advanced lifecycle management, the framework ensures stable performance traits even with ongoing data changes and frequent update activities. The two-level architecture effectively separates short-term operational needs from long-term improvement goals, allowing systems to manage burst traffic scenarios while maintaining structural stability over prolonged deployment times. The degradation-focused re-indexing approach marks a major improvement in proactive system upkeep, employing predictive models to foresee performance deterioration and execute optimization methods prior to a drop in service quality. Experimental validation shows the framework's advantages in various operational aspects, proving consistent performance in conditions that lead standard systems to fail or need human intervention. The framework's capability to uphold high retrieval precision and minimal query delay in various operational contexts renders it especially beneficial for advertising platforms where performance reliability directly affects revenue production. The smart selection technique guarantees the best algorithm selection for particular deployment situations, whereas the controlled update system offers functional adaptability without sacrificing lasting system reliability. Future advancements will aim to broaden the framework to include distributed indexing systems and integrate machine learning methods for improved degradation forecasting and optimization scheduling. The concepts outlined in this

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framework extend beyond advertising systems, offering crucial insights for any area that demands efficient similarity search over changing datasets where ensuring consistent service quality is essential for operational success.

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Effect of Security on the Performance of Momo Data Promoter Agents at MTN Ivory Coast

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Psychologie Université

ABSTRACT

This study aims to highlight the role of security in the performance of MTN Ivory Coast promoter agents. It focuses on a sample of three MTN network promoters residing in the municipalities of Koumassi, Adjamé and Yopougon. These promoters were subjected to the interview technique. The data from this operation were analyzed and followed by a synthesis. This reveals to us that security at the level of promoters and technical services play a key role in the performance of Momo Data promoters at MTN. This study recommands that managers of all compagnies take into account individual and IT security in oder to achieve satisfactory results.

Keywords: effect, security, performance, Momo Data promoter agent and MTN Ivory Coast.

Classification: JEL Code: L96, M15, M54

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Effect of Security on the Performance of Momo Data Promoter Agents at MTN Ivory Coast

Effet de la Sécurité Sur la Performance des Agents Promoteurs Momo Data Chez Mtn Côte D'ivoire

Tra Bi Dizan Felix[α] & Yao N'goran Hubert[σ]

RÉSUMÉ

La présente étude vise à mettre en relief le rôle de la sécurité dans la performance des agents promoteurs de MTN Côte d'Ivoire. Elle porte sur un échantillon de trois promoteurs du réseau MTN résidant dans la commune de Koumassi, Adjamé et Yopougon. Ces promoteurs ont été soumis à un entretien. Les données issues de cette opération ont été analysées et suivies d'une synthèse. Cela nous révèle que la sécurité au niveau des promoteurs et des services techniques joue un rôle primordial dans la performance des promoteurs Momo Data chez MTN. Cette étude recommande aux dirigeants de toutes entreprises de tenir compte de la sécurité individuelle et informatique afin d'aboutir aux résultats satisfaisants.

Mots clés : effet, sécurité, performance, agent promoteur Momo Data et MTN Côte d'Ivoire.

ABSTRACT

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I. INTRODUCTION

La performance des travailleurs parait comme le moteur du fonctionnement d'une organisation et sa définition revoie à un niveau de réalisation des tâches des employés en fonction de l'objectif fixé par l'organisation. Pour d'autres, c'est le résultat des travaux des individus au sein d'une entreprise. De nos jours, la performance est un élément incontournable à prendre en compte pour l'évolution des organisations. En ce sens, Adair et Berguiga (2010), déclarent que la finalité d'une bonne performance est d'accroître la rentabilité de l'entreprise tout en la rendant durable. Pour Issor (2017), la survie, la pérennité et les avantages concurrentiels des organisations dépendent de la performance des employés. Encore, l'amélioration perpétuelle de la performance permet donc aux entreprises de s'adapter aux obligations du marché, ce qui contribue à leur avancement (OCM, 2023).

Cependant, les entreprises sont, aujourd'hui, confrontées aux problèmes de performance. La baisse de la performance des employés est devenue un phénomène très critique au sein des organisations. Elle prend en compte les entreprises privées et publiques. Ainsi, la motivation personnelle de la présente étude est

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basée sur la baisse de la performance des agents promoteurs du réseau MTN Côte d'Ivoire. En effet, le rendement des promoteurs Momo Data atteignait 35 000 nouveaux clients par jour en 2020. Mais, en 2024, il est difficile aux agents d'atteindre 20 000 nouveaux consommateurs en une journée. Cette remarque révèle donc une baisse de la performance des agents promoteurs du réseau MTN Côte d'Ivoire. Ce phénomène ne se limite pas seulement à l'entreprise MTN, il touche plusieurs entreprises dans le monde.

En Europe, notamment en France, les entreprises sont confrontées aux problèmes de performance. Selon Bernard (2019), les entreprises sont confrontées à de nombreuses difficultés et sont de plus en plus à la recherche de performance. En outre, après le covid-19 et les confinements, les travailleurs Français souffrent des difficultés psychologiques qui impactent négativement leur performance (Lasacq, 2022). Les problèmes liés à la performance inquiètent donc les dirigeants des organisations Européennes.

En Amérique, la contre performance cause de véritables pertes dans les entreprises. Dans cette logique, le groupe de défense américaine a perdu 225 millions de Dollars dans sa division aéronautique en raison de problème de performance dans un programme classé secret défense (Lockheed Martin,2021). Ce phénomène est donc une réalité qui occasionne d'énorme perte financière dans les entreprises Américaines.

En outre, les organisations du continent Africain sont plus fragilisées par la baisse de la performance. Au Mali, les entreprises sont en baisse du chiffre d'affaires. Telle est le cas de la performance financière des PME du district de Bamako (Koné et *al.*, 2022). De même, au Cameroun, la contre performance fragilise certaines entreprises jusqu'à la faillite malgré les stratégies mises en œuvre. C'est le cas d'Enron en 2001 et celle de Lehman Brother en 2008 (Pigé et Sangué-fotso, 2014).

En Côte d'Ivoire, les problèmes de performance sont très alarmants. En effet, les organisations publiques Ivoiriennes sont en baisse globale de 3% de leur chiffre d'affaires depuis 2015 (Doumbia, 2018). Selon le Ministère de la promotion des PME (2021), les PME créés en 2020 ont connu une baisse de 13785 PME, c'est-à-dire 15468 contre 16785 en 2019. En ce sens, le degré de réalisation en 2020 est de 64,98% contre 81,25% en 2019. Pour Diarrassouba (2022), les PME Ivoiriennes ont un faible niveau de performance malgré l'évolution favorable de l'environnement. De même, la contreperformance des entreprises est aussi révélée à travers l'étude nationale du marché du travail en Côte d'Ivoire (Organisation Internationale pour les Migrations, 2023). En fait, les sociétés ivoiriennes souffrent des problèmes de performance, ce qui pousse la jeunesse à rechercher de meilleures opportunités d'emploi dans les pays étrangers. Ces derniers empruntent souvent des voies irrégulières et sont soumis à toute sorte de traitement, d'esclavage et d'abus professionnel. En plus, le nombre de place très limité lors des insertions professionnelles et les insuffisances salariales révélées souvent par des grèves montrent que les entreprises Ivoiriennes sont moins performantes. En rappel, l'entreprise MTN Côte d'Ivoire est aussi touchée par ce phénomène. Evoquer préalablement, le cas des promoteurs Momo data de 2020 à 2024, en est un exemple. Les difficultés de performance sont devenues l'un des phénomènes qui touche, sans doute aujourd'hui, un nombre important d'entreprise dans le monde.

Ainsi, quelles sont les conséquences d'une telle situation problématique ?

Les conséquences de la baisse de performance sont multiples. D'abord, le problème de performance participe à l'augmentation du taux de chômage et de la pauvreté. En fait, les entreprises moins performantes sont très limitées en matière du recrutement des personnels, ce qui pousse certaines personnes à demeurer dans le chômage. En plus, la contre performance engendre la faillite des organisations, ce qui a été le cas de KOZ, Green en Côte d'Ivoire. Au Cameroun, la faillite de certaines entreprises émane de ce phénomène (Pigé et Sangué-fotso, 2014). Selon les statistiques officielles, le taux de mortalité des entreprises Marocaines est alarmant à cause des difficultés de performance (Achour, 2014, Bichra et *al.*, 2019). En outre, les problèmes

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de rendement sont à l'origine de la baisse des salaires, des conflits interrelationnels et des difficultés de la survie organisationnelle. Cela peut aussi entrainer des conséquences psychologiques telles que le déséquilibre de la vie familiale et professionnelle, le stress et la dépression. Les conséquences de la contre performance sont donc désastreuses. Au niveau de MTN, elles provoquent la perte des clients, les problèmes de paiement des employés et donnent plus d'avantages aux concurrents.

Cependant, quels facteurs pourraient donc expliquer la baisse de la performance des agents promoteurs de MTN Côte d'Ivoire ?

Les travaux antérieurs révèlent que les études menées sur les facteurs de la performance sont abordées sous l'angle économique. C'est dans ce contexte que Kaplan et Norton (1996) déclarent que la performance des entreprises est au cœur des préoccupations de plusieurs chercheurs en gestion, mais leurs études abordent la performance sous un angle financier. Or, plusieurs domaines ont leur part de vérité sur l'origine de la baisse de performance des employés. Le volet humain semble être négligé par les dirigeants d'entreprise. Cette réalité se révèle à travers l'étude de Kouamé (2011) qui met en évidence la baisse de motivation au travail chez les travailleurs qui sont injustement traités sans bénéficier d'une rémunération non financière. Cela sous-entend que la contre-performance émane de la baisse de motivation des employés.

De même, la question de la sécurité des employés n'est plus la préoccupation majeure des managers. En effet, la dimension sécuritaire, longtemps limitée aux seuls volets militaires, a évolué tout en multipliant son champ d'intervention. Elle concerne désormais le volet humain, environnemental, informatique et la protection des biens et services. Elle inclut donc les réalités du monde professionnel. En ce sens, Veil (2014) nous interpelle que la sécurité au niveau du monde du travail prend en compte la protection des travailleurs contre les accidents du travail et les maladies professionnelles. Les entreprises étant donc exposées à un ensemble de risques, la gestion de la sécurité du travail devient un défi complexe souvent ignoré par les managers (Nomadia, 2023). C'est en ce sens que l'insécurité professionnelle prend de l'ampleur de plus en plus au sein des organisations. En Tanzanie, 80% des employés déclarent être en situation d'insécurité (OIT, 2019). De nos jours, le monde professionnel est entravé par les enjeux sécuritaires des personnels. Selon certains auteurs, la sécurité semble être l'un des facteurs majeurs de la performance des travailleurs. Au niveau des promoteurs, l'entreprise MTN (Mobile Technologique Network) met toujours en place des moyens très efficaces pour remédier aux effets négatifs de la concurrence et d'autres facteurs de ce genre. Mais il semble que la sécurité des agents promoteurs de MTN est ignorée par les managers. Dans cette optique, la dimension sécuritaire n'impacte-t-elle pas la performance des promoteurs du réseau MTN Côte d'Ivoire ?

Répondre à cette question mérite d'être une préoccupation majeure des chercheurs car la finalité des recherches scientifiques est de connaitre, expliquer, décrire et comprendre l'existence de tout phénomène en vue de prédire l'avenir. Pour Mialaret (2004), les études scientifiques permettent d'approfondir nos connaissances sur un phénomène ou un sujet donné, de clarifier nos idées et de les communiquer de façon logique et rigoureuse.

Ainsi, l'objectif de la présente étude est de montrer l'impact de la sécurité des Promoteurs Momo Data chez MTN Côte d'Ivoire sur leur performance, d'une part et d'autre part, met en relief l'effet de la sécurité des services techniques du réseau MTN sur la performance des promoteurs Momo Data. C'est-à-dire, analyser à la fois le rôle de la sécurité des employés et celui des services techniques dans la performance des agents de terrain au niveau du réseau MTN Côte d'Ivoire. Pour atteindre cet objectif, il est important de faire référence à une méthodologie appropriée en vue d'avoir des résultats fiables qui seront interprétés et discutés avec ceux des autres chercheurs.

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II. METHODOLOGIE

La population concernée pour cette recherche est l'ensemble des agents promoteurs Momo Data de MTN Côte d'Ivoire. Ces promoteurs exercent dans les agences de distribution de MTN qui ont leurs zones de travail spécifiques. Ainsi, cette étude s'est déroulée dans la commune de Koumassi, Adjamé et Yopougon qui sont respectivement les zones de travail des entreprises de distribution suivantes : AGIMAS, OMASCOM et GND.

Dans la présente étude, nous avons adopté une démarche qualitative. Cette étude étant de nature qualitative, l'instrument de recueil des données est l'entretien semi-directif. Cet instrument a été appliqué sur un échantillon de quatre (4) promoteurs MTN dont trois (3) ont été retenus pour cette recherche. Les données du quatrième promoteur ont été rejetée à cause de la répétition des informations déjà recueillies lors des entretiens des trois premiers sujets retenus. Ces promoteurs ont été sélectionnés selon les critères suivants:

- Avoir un an d'ancienneté au minimum dans le service de promotion et
- Exercer l'activité de promotion Momo Data en plein temps.

La durée des entretiens est de dix (10) à quinze (15) minutes par sujet. Ces entretiens se sont effectués dans de très bonnes conditions même si d'autres agents ont refusé d'y participer. Le choix de l'entretien comme outil de recueil des données se justifie à travers le fait qu'il permet d'être en contact direct avec les cibles, d'évaluer profondément ces cibles tout en orientant l'interview en vue d'avoir des informations crédibles. Toute notre attention a donc été employée au cours de ces entretiens afin d'aboutir à des résultats palpables.

Ainsi, les résultats issus de cette technique feront l'objet d'une analyse dans la partie suivante.

III. RESULTATS

L'analyse des résultats de nos entretiens se résument autour des discours des trois promoteurs retenus (Eva, Malan et Jonathan).

D'abord, Le discours de la promotrice Eva révèle qu'*« être performant, c'est être meilleur que d'autres pour que l'entreprise s'agrandit, se donner à fond dans son domaine »*. Cela sous-entend qu'une personne est considérée comme performante lorsqu'elle déploie tout son énergie pour avoir un bon résultat. C'est celui qui est meilleur que les autres. C'est aussi l'accomplissement d'une vision individuelle et collective en fonction de l'objectif fixé par l'entreprise. La sécurité, quant à elle, *« c'est faire attention à nous, être prudent, ne pas prendre des risques, des mauvaises décisions, réfléchir sur l'impact d'une chose avant de faire. »* En ce sens, la sécurité renvoie à la vigilance, à la prudence et à éviter les erreurs ou les dangers liés à une chose. Elle ajoute à cela que les promoteurs n'ont pas forcément besoin des outils de protection lors de leur activité, mais le volet sécuritaire est un élément essentiel qui impacte obligatoirement leur performance.

Ensuite, à travers les propos du promoteur Malan, la performance *« c'est l'atteint de l'objectif fixé par l'employeur, aller au bout »*. Pour lui, cette notion se définit comme la capacité d'une personne à atteindre l'objectif fixé. Autrement dit, l'ensemble des réalisations d'une personne par rapport à l'objectif fixé par l'employeur. En outre, la sécurité, quant à lui, fait référence à la liberté financière. Pour Malan, ce sont les moyens financiers qui font la sécurité individuelle et organisationnelle. Mais les promoteurs Momo Data ne sont pas contraints de faire usage aux équipements de protection car MTN est une structure sécurisée dans l'optique de promouvoir une bonne performance. En fait, la sécurité au niveau du réseau MTN met plus l'accent sur le volet informatique. Par conséquent, il existe un lien entre la sécurité et la performance.

Enfin, l'analyse des propos recueillis auprès du promoteur Jonathan, montre qu'être performant est le fait d'être meilleur dans son domaine d'activité. C'est aussi être reconnu par son attitude d'efficacité et atteindre toujours l'objectif fixé. Selon Jonathan, les promoteurs Momo Data exercent dans un milieu d'insécurité et chacun d'entre eux doit faire sa propre sécurité. Le discours de Jonathan révèle que les promoteurs

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n'ont pas forcément besoin des moyens de sécurité, mais en cas d'agressivité, il est nécessaire de faire recours à ses propres moyens de protection. Il met plus l'accent sur la sécurité d'ordre individuel et non organisationnel. En d'autres termes, la sécurité des promoteurs MTN est individuelle, ce qui impacte, par ricochet, la performance.

Après avoir analysé ces différents discours, il importe d'en tirer des solutions concrètes. D'où le recours à une synthèse.

3.1 Synthese

L'analyse de chacun des cas, révèle des informations importantes sur la sécurité et la performance au niveau des agents promoteurs de MTN Côte d'Ivoire. D'abord, la performance est le niveau de réalisation d'un promoteur selon l'objectif fixé (cas n°2). A cet effet, une personne performante est celle qui est considérée comme meilleur dans son secteur d'activité (cas n°1 et 3). En outre, la sécurité obéit aux principes de prudence, de vigilance et de contrôle ou de surveillance (cas n°1). Elle renvoie à la liberté (cas n°2). La sécurité provient de l'individu et de l'organisation (cas n°2 et 3). Nous retenons que la sécurité impacte la performance des promoteurs Momo Data chez MTN Côte d'Ivoire. En d'autres termes, le volet sécuritaire au niveau individuel et informatique joue un rôle important dans l'activité des employés de MTN Côte d'Ivoire. Cependant, il est important de comparer ces résultats avec ceux des travaux antérieurs.

IV. DISCUSSION DES RESULTATS

L'objectif est de montrer l'effet de la sécurité individuelle et des services techniques du réseau MTN sur la performance des promoteurs Momo Data. Les résultats indiquent que la performance des promoteurs est tributaire de la sécurité de l'individu et des services techniques. Ces résultats sont comparables aux résultats de certaines études. Parmi ces études, nous avons l'étude de : Chako et *al* (2023), Dubruc et Khawaja (2023) et Rocha (2014), Benistant (2016) et CountAct (2024).

Les travaux de Chako et *al* (2023) portent sur les outils de contrôle de gestion et performance des PME au Cameroun. Pour bien mener leurs études, ils se fixent un objectif général qui est d'examiner l'influence du système de contrôle de gestion sur la performance des PME au Cameroun. Les résultats de leurs travaux montrent que le système de contrôle de gestion influence significativement la performance des PME au Cameroun. Nous retenons de ces chercheurs que le maintien de la sécurité a un effet positif sur la performance des PME. Il existe donc une relation entre la sécurité et la performance des Petites et Moyennes Entreprises. Par conséquent, ces résultats sont similaires à nos résultats car la sécurité joue un rôle important dans le rendement des PME Camerounaises.

En outre, l'étude de Dubruc et Khawaja (2023) met en relief la résilience d'une entreprise Libanaise (SOPRINT) en période des crises. Il s'agit d'une étude de cas longitudinale montrant la manière dont cette entreprise Libanaise est restée proactive dans la gestion pendant les multi-crises du Liban. A ce propos, face à l'insécurité du pays, la gestion de l'entreprise consiste à veiller sur les projets à long terme avec l'adoption des actions concrètes de résilience. En ce sens, la responsable de SOPRINT déclare que la vision de manager, la fidélité des employés et la performance organisationnelle permettent à son entreprise de traverser la crise sans trop de dommage. En conclusion, ces deux auteurs préconisent trois facteurs clés de la résilience organisationnelle face à de multiples crises : la vision à court et long terme du dirigeant, la nécessité d'une Gestion des Ressources Humaines (GRH) durable du bien commun et la gouvernance multi-parties prenantes. Ainsi, ces facteurs engendrent une meilleure résilience organisationnelle dans la période de crise qui permet le maintien et l'amélioration de la performance de l'entreprise. Quelques soit donc la durée de la crise, les entreprises résilientes resteront toujours performantes. Cela nous rappelle de la fameuse question de Gayer (2019) : *« qui gardera les gardiens ? »* Par conséquent, les résultats de l'étude de Dubruc et Khawaja (2023) sont similaires à nos résultats. Cela se justifie par la

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prise en compte des facteurs de résilience qui évitent les dommages de l'insécurité car cela impacte négativement la performance des entreprises.

Les résultats de la recherche de Rocha (2014) vont dans le même sens que nos résultats. En effet, l'étude de cet auteur porte sur la sécurité des organisations. Il postule que la restauration d'une atmosphère de sécurité émane de la participation des salariés de tous les niveaux hiérarchiques de l'entreprise. Ce postulat a été vérifié dans deux entreprises de distribution d'énergie en France. En analysant la question de sécurité, il parvient à développer le débat sur le travail, ce qui a permis de traiter des questions de santé des employés, de qualité du travail et de performance du système. Il existe donc une relation entre la sécurité, la santé et la performance des employés. En conséquence, la sécurité joue un rôle primordial dans la performance des salariés, ce qui est similaire à nos résultats.

L'étude de Benistant (2016) révèle que la sécurité et la santé ont un effet sur la performance des employés. Pour lui, améliorer la sécurité est un véritable levier d'amélioration de la performance économique. Ainsi, la sécurité et la performance des salariés sont donc liées. En outre, le Blog CountAct (2024) souligne que les salariés s'investissent plus dans leur activité lorsqu'ils se sentent en sécurité. C'est en ce sens que réagir rapidement aux risques liés à l'environnement de travail renforce la sécurité et garantit la performance des travailleurs. Il existe donc une conformité entre nos résultats et ces résultats car ils montrent l'impact de la sécurité sur le rendement des employés.

V. CONCLUSION

Cette étude montre l'effet de la sécurité des Promoteurs Momo Data chez MTN Côte d'Ivoire et celle des services techniques sur la performance. Il en ressort que la sécurité au niveau individuel et technique joue un rôle crucial dans la performance des agents promoteurs du réseau MTN Côte d'Ivoire. A cet effet, nous recommandons aux managers du réseau MTN de bien planifier les tâches tout en les suivant progressivement jusqu'à la réalisation et de tenir compte de la sécurité des agents et des services techniques afin d'avoir de meilleure performance. La sécurité, même si elle permet d'exercer librement, n'est pas la seule variable qui impacte la performance des employés. Celle dernière peut être modifier par d'autres facteurs comme le présentéisme, l'absentéisme, le harcèlement, l'abandon du poste, l'estime de soi et le stéréotype. En ce sens, engager d'autres recherches avec d'autres facteurs serait avantageux pour toutes les organisations qui visent à améliorer leur performance.

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Appian Applications in Supply Chain

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ABSTRACT

Business Process Management platforms are vital enablers supporting the efficient optimization of global supply chains because they provide fast application development, solid process automation, and end-to-end real-time visibility. It is thus crucial to explore the development of Appian solutions specifically customized to supply chain teams, assess the natural positive side of choosing to develop solutions within a BPM-based system, and the strategic justification of investing in low-code BPM solutions across the enterprise-level Appian. The analysis based on three trusted sources only allows for the synthesis of the results. It reveals how the visual modeling interface, inbuilt robotic process automation functions, and analytics dashboards provided by Appian facilitate and simplify the core supply chain functions, such as procurement, inventory management, and logistics coordination, ensuring visible gains in cycle times, data accuracy, and decision-making agility. The facts point to the fact that the organizations embracing Appian realize its substantial manual work reduction, decreased time to markets, and speedy investment returns.

Keywords: appian, business process management, supply chain optimization, low-code development, robotic process automation, real-time analytics, procurement automation, inventory management, logistics tracking.

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I. INTRODUCTION

Today's supply chains have a dynamic environment that is becoming more volatile and highly fragmented by regulation, and customer demands are increasing. Legacy software development cycles tend to hamper the organization's agility, leading to stretching of release schedules, isolated data storage systems, and ineffective manual tasks. Business Process Management (BPM) tools overcome such limitations through their ability to allow stakeholders to model, automate, and monitor workflow processes through a common platform. Appian is unique in using a low-code, visual development paradigm that allows technical developers and business analysts to build high-quality enterprise applications quickly. It also features built-in robotic process automation (RPA), intelligent document processing, and real-time analytics, enabling supply chain teams to react to changes in demand, respond to risks and other issues, and optimize the use of resources in real time. The use of a low-code development platform, robot process automation, and real-time analytics provided by the Appian platform enables the supply chain managers to efficiently optimize procurement, management, and logistics processes, leading to significant cycle time reduction, improvement of data quality, and gaining a competitive advantage that is sustainable in the current fast-changing markets.

II. LITERATURE REVIEW

The systematic literature review of Singh, Mehta, and Saraswat gives a detailed evaluation of Appian's key strengths and weaknesses [1]. Their discussion indicates that the Appian rapid application development platform can save around seventy percent of coding-related development effort compared to the traditional development methodologies. They point out the easy user-guided process modeler present on the platform that enables business users to specify highly intricate workflow patterns using drag-and-drop and still satisfies the demands of governance and compliance. The review, however, presents problems in highly customized legacy systems integration whereby special connectors or

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custom codes might be necessary to interconnect some interfaces in the ERP. Nevertheless, the authors conclude that it has more advantages, especially faster delivery and enhanced transparency, compared to the complexities of integration.

Continuing the work of BPM, the study of Kunduru turns to the cloud-based RPA of Appian and its influence on supply chain automation [2]. An empirical example of case studies presented by Kunduru shows that through the Appian RPA feature, there have been forty percent reductions in manual processing of high volumes of routine tasks, including verification of invoices and monitoring shipment statuses in terms of reduction of processing efforts. The study highlights the smooth interaction between Appian process models and RPA bots, allowing automated tasks to be handed off between human working processes and bots. Such amalgamed or hybrid automation invalidates not only a twenty-five percent increase in throughput but also increases data accuracy as the hand-touching activities are significantly reduced.

The Gartner report by Vincent, Iijima, Driver, Wong, and Natis has placed Appian in the Magic Quadrant of the enterprise low-code application platforms, praising the vendor for having proper vision and execution capabilities [3]. According to the authors, the figure is expected to reach seventy percent by 2025 as a factor of pressure on time to value and organizational agility. Notably, the report notes that a platform such as Appian allows rapid prototyping, iterative development, and constant improvement and optimization, thus allowing supply chain teams to run new processes on a small scale and expand successful efforts enterprise-wide.

III. METHODOLOGY

The study combines the elements of the three chosen sources to draw up an effective road map to establish the Appian applications in supply chain settings. The methodology includes five consecutive stages. To start with, the supply chain processes, including procurement requisition, supplier onboarding, replenishment of inventories, and order fulfillment, are identified in a cooperative effort with the stakeholders of the process. This mapping exercise lays decider points, data sources, and data integration needs. Second, data integration design identifies RESTful API and interface connections to ERP and supplier portals and ingestion pipelines to IoT sensor feeds. Third, Appian goods application prototyping helps to use low-code interfaces to build user interfaces, process models, and business rules. Fourth, RPA configuration deploys bots to apply automation of rule-based workflows that have a high volume, as depicted in the documented use cases by Kunduru [2]. Lastly, performance measurement identifies key performance indicators, including cycle time, reduction of the error rate, and user adoption, and sets monitoring dashboard systems to monitor the results in real time.

IV. BUILDING APPIAN APPLICATIONS FOR SUPPLY CHAIN TEAMS

To illustrate how Appian could be used in the operations of the supply chain, three modules come into play: procurement, inventory management, and logistics tracking. A list of features of the procurement module includes an electronic requisition form that invokes a workflow process of sequential approval. When submitted, the availability of the budget is automatically validated against ERP records through a secure API call. When the amount required is above the predefined quantities, this leaves the process of the requisition to be further authorized by the senior management within the company. The application will create a purchase order once it has been approved and send it to the supplier of choice via an integrated supplier portal. Appian imposes the same rules of compliance audit logs and role-based access controls throughout this workflow, and therefore, all transactions are transparent and verifiable [1]. This module is used in inventory management where the Appian app is coupled with warehouse Internet of Things sensors to offer real-time inventory level updates. A special dashboard is designed to show important notifications on low or excess stocks. Supply chain managers can directly trigger an automatic replenishment

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process in the dashboard through a process model that determines the quantity to order depending on past consumption trends and future demand. When a transaction is made, the app records the transaction, records it on the central ERP system, and alerts the interested stakeholders through email or phone push messages. Such end-to-end visibility can give teams confidence in their decision-making and avoid stockouts that would cost valuable time in the production cycle.

Logistics tracking within Appian incorporates the manual and the automated data capture method, providing a complete picture of shipment status. The application requests real-time tracking updates through third-party logistic providers and carrier systems via standard connectors. RPA bots complement this connection by accessing the carrier legacy portals, where APIs do not exist, and pick up the delivery points. These milestones result in feedback to Appian process models, which may result in the shipment late x-ray alert and exception-handling workflows. Because of this, supply chain coordinators get just a single pane of glass to track the shipment, saving more than sixty percent of the time that used to be spent on manually determining the shipment status [2].

V. BENEFITS OF BUILDING IN A BPM TOOL

Creating supply chain applications in a BPM environment can be even more beneficial than traditional software development. The low-code strategy of Appian has the benefit of increasing the pace of development as a business analyst can join the application design team and close the gap between the requirements collection and its implementation [1]. The cooperation minimizes the gap between misconceptions and duplication and decreases the total delivery periods of various months to a few weeks. Moreover, the Appian unified platform optimizes process modeling, data management, RPA, and analytics with no stitching required; this makes it easy to bring tools together and operate.

Another important advantage is real-time visibility and control. The dashboards on Appian give us interactive analytics that reveal process hangups and performance patterns. The insights can enable the supply chain decision-makers to anticipate challenges that might arise, like a spontaneous sway in the suppliers or a surprise in product stock, and solve them before they become a significant disturbance to the chain. According to a report by Gartner, response time to operational exceptions is reduced by up to fifty percent lifetime using a low code BPM platform [3]. The resilience of organizations is also enhanced through the flexibility of BPM models. Process engineers do not have to restart with recoding to modify process models and redeploy once the market conditions or regulations change, as process models can be modified directly in the Appian interface or even other applications with shared data. Such flexibility means that supply chain processes are kept in line with existing business demands and regulatory requirements. In addition, increasing the traditional infrastructure to keep up with the higher demand would be an inefficient solution as elastic scaling is just one of the core features of Appian cloud-native architecture, enabling the enterprises to support peaks (peak ordering periods) without affecting performance or increasing infrastructure investment requirements.

VI. WHY COMPANIES SHOULD INVEST IN BPM TOOLS LIKE APPIAN

investment in BPM platforms like Appian is profitable. According to Singh and fellow researchers, organizations have been known to recover their investment in twelve to eighteen months due to reduced manual effort, cycle time, and speedier product launches [1]. Such efficiency improvements will be reflected in cost reduction, satisfaction, and customer competitive standing. In addition to the short-term ROI, BPM tools enhance strategic differentiation. With supply chain agility a source of competitive advantage in such an agile landscape, rapid prototyping and deployment of novel processes, including dynamic order promising or supplier scorecards running on automatized processes, allows organizations to react faster to the changes in the market. According to Gartner's forecast, compared to other enterprises that use only traditional

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development methods, companies that employ low-code BPM systems are at twice as high risk of executing customer-centric digital experiences by 2025 [3].

Risk management and compliance integrity are other catalysts to BPM. The auditable logs, version control, and policy enforcement system provided by Appian allow all the process instances to be documented and follow regulatory standards like ISO 9001 and Sarbanes-Oxley. This governance rate minimizes administrative sanctions risk and fortifies internal control systems, where the managers have developed confidence in the integrity of process management. Lastly, automation and analytics are integrated into the operations, making companies ready to adopt advanced technologies without much interference. Appian roadmap incorporates the development of artificial intelligence and machine learning to support predictive maintenance, demand forecasting, and smart decision support. Investing in flexible BPM foundations today gives organizations a free hand to add such innovations without migrating the platforms or even reengineering them at high costs as they become available [2].

VII. IMPLEMENTATION CONSIDERATIONS

A roadmap between technology deployment and organizational goals should be ensured for successful Appian implementation. The executive-level sponsorship forms an agenda of cross-functional cooperation and resource distribution, where the supply chain, IT, and finance representatives are on the same page regarding the vision. High-impact Proof-Of-Concept Projects: Proof-of-concept projects can establish value and gather steam in areas where the business processes crave. Rollouts can be phased with initial modules, like procurement and inventory, and gradually expanded to enterprise-wide programs to allow the teams to work out best practices and governance designs fully. Vigorous change management entails stakeholder communication, user training, and continued guidance, as well as promoting adoption and generating long-term benefits.

VIII. CONCLUSION

Appian's low-code and RPA-based architecture enables organizations to revolutionize their supply chain processes into resiliency, data-driven business engines. End-to-end procurement stream of work, real-time inventory, automated logistics tracking, and monitoring provide decision-making visibility that speeds up the decision process and reduces the chances of bottlenecks. Business analysts and developers work in an integrated environment to test and design processes faster, shortening implementation cycles and decreasing the overall cost of ownership. The operational control is made by continuous process optimization, based on the interactive dashboard and audit trail, which facilitates regulatory compliance within the global network, and the complexity of which increases. In the cloud, elastic scalability will provide performance at peak demand. Appian platform roadmap will enable the integration of AI and high-order analytics without migrating to a new platform. With the market becoming increasingly volatile and customers expecting more from it, a dynamic BPM base is the key to remaining resilient and holding a competitive edge. By putting low-code automation into the essence of supply chain strategy, businesses obtain quicker time to value, enhanced precision, and workflow maturation that is future-proof and can be expanded as their business requires.

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Interaction of Rationality of Economic Behavior and Ethnic Preferences in the Organizational Culture of Latvia

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ANNOTATION

Sociological research aimed to understand the extent to which the values and norms of the practiced organizational culture adopted at the enterprises/organizations of Latvia are shared by economic actors as rational ways of organizing the economic space, forming solidary relations within the teams of the enterprises, regardless of the ethnic origin and ethnocultural identity of these actors. It was necessary to understand whether there are limitations in the universality of these rational rules, which are somehow connected with the ethno-cultural identity of economic actors. This is important also because the author of the article in his previous sociological study established the fact of the presence of ethnic favoritism in the economic life of Latvia. The sociological research was organized within the framework of the State research program "Vectors of social cohesion: from cohesion around the state-nation (2012-2018) to a cohesive civil community for the security of the state, society and individuals (2024-2025)" (No. VPP-KM-SPASA-2023/ 1-0002) in 2025, January 6-15. Conducting an online survey on employee cohesion in economic activity in the target group of Latvian employed persons – employees and employers. The total sample in the survey n=1008. The sample was formed according to gender, age and place of residence quotas. Most of the organizational culture parameters of Latvians and ethnic minorities that concern them coincide, which indicates a high degree of integration of these population groups into common values and norms determined by the economic space in Latvia.

Keywords: organizational culture, rationality, cohesion, team building, socio-economic factors, economic actors, ethnic identity.

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Interaction of Rationality of Economic Behavior and Ethnic Preferences in the Organizational Culture of Latvia

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Sociological research aimed to understand the extent to which the values and norms of the practiced organizational culture adopted at the enterprises/organizations of Latvia are shared by economic actors as rational ways of organizing the economic space, forming solidary relations within the teams of the enterprises, regardless of the ethnic origin and ethnocultural identity of these actors. It was necessary to understand whether there are limitations in the universality of these rational rules, which are somehow connected with the ethno-cultural identity of economic actors. This is important also because the author of the article in his previous sociological study established the fact of the presence of ethnic favoritism in the economic life of Latvia. The sociological research was organized within the framework of the State research program "Vectors of social cohesion: from cohesion around the state-nation (2012-2018) to a cohesive civil community for the security of the state, society and individuals (2024-2025)" (No. VPP-KM-SPASA-2023/1-0002) in 2025, January 6-15. Conducting an online survey on employee cohesion in economic activity in the target group of Latvian employed persons – employees and employers. The total sample in the survey n=1008. The sample was formed according to gender, age and place of residence quotas. Most of the organizational culture parameters of Latvians and ethnic minorities that concern them coincide, which indicates a high degree of integration of these population groups into common values and norms determined by the economic space in Latvia. However, the content of these organizational cultural features of the Latvian population is related to their attitude towards values that are oriented towards achieving goals, which are determined by the very nature of the economic and production tasks of the enterprise and the organization. In situations that actualize their national and ethnic identity values in the business and interpersonal communication of employees, ethnic differences arise in the understanding of the existing organizational cultural practices. At the same time, the study revealed that the greatest differences in terms of organizational cultural values and norms, existing management practices in organizations and enterprises are related to the level of education of the respondents, gender differences and areas of professional employment.

Keywords: organizational culture, rationality, cohesion, team building, socio-economic factors, economic actors, ethnic identity.

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I. THE RELEVANCE OF RESEARCH ON THE ORGANIZATIONAL CULTURE OF ENTERPRISES AND ORGANIZATIONS.

Organizational culture is a social phenomenon that characterizes the system of formation, operation and development of all enterprises and organizations. Each enterprise is characterized by individual features of organizational culture. At the same time, organizational culture has typical values, characteristic of the characteristics of the economic life of nations and historical and cultural regions of the world (Mouls 2003, p. 83 – 94). The organizational culture of enterprises is created to strengthen common values and norms in the behavior of economic actors (employees,

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managers, entrepreneurs) performing various professional functions and occupying various social positions in the enterprise and organization. Thus, the economic sphere of society performs the most important role of social integration (Weber 1976, p. 133 – 155).

The need to study the processes of social integration and solidarity taking place in economic life is determined by the peculiarities of ethnic diversity in Latvia. In 2025, ethnic Latvians will make up 1,182,008 (63.7% of the country's total population), Russians - 434,243 (23.4%), Belarusians 53,207 (2.9%), Ukrainians 52,266 (2.8%), Poles 35,140 (1.9%), Lithuanians - 19,809 (1.1%), other ethnic groups - 4.2% (Atsevišķu tautību... 2025). Within this ethnic diversity, there are two ethnic poles - ethnic Latvians and Russians - whose share is 87.1% of the total population of Latvia. The features of this ethnic diversity raise the issue of the real possibilities of the formation of social solidarity of representatives of different ethnic groups in economic life, which should be reflected in their organizational culture. In Latvian sociology and political science, the role of the ethnic factor in the life of Latvian society is examined mainly in order to gain a deeper understanding of political processes in the country, the peculiarities of national and political identification, geopolitical sympathies, the nature of public communication and historical memory. However, interethnic interaction, mainly between ethnic Latvians and Russians, at the individual level in the public space is most intensively and almost daily implemented in the economic space. The contradictory nature of the interaction of economic and ethnic factors has already been revealed in the studies of Latvian sociologists. On the one hand, the significant role of the economy in the integration of Latvian society has been noted. On the other hand, studies indicate a significant division of the business environment along ethnic lines (Mouls 2003; Zepa et al. 2004, p. 8–11, 13–14, 18–28; Zepa et al. 2005, p. 11–15). Sociologists demonstrate the positive role of the Latvian economic system in promoting people's social and professional mobility, focusing on the values of individual self-realization regardless of their ethnic affiliation, which certainly promotes the economic solidarity of society (Koroļeva et al. 2014; Žabko 2023). The economic interaction of people with different ethnic identities is the sphere in which the process of competition between individuals and groups and the everyday cohesion of people in the implementation of joint economic and social activities takes place (Volkov 2023, p. 100 – 103). Not only sociologists, but also economists draw attention to the need to study the role of the ethnic factor in the economic life of Latvia, the ethnic peculiarities of the social division of labor, the income level of Latvians and ethnic minorities (Hazans 2010, p. 125–128, 143). Some studies on the quality of the workforce in Latvia record the need to take into account not only economic factors in the formation of organizational culture, but also consider it important to pay special attention to the ethnocultural identity of employees (Cilvēkkapitāla ... 2025, p. 18 – 19; Latvijas aktīvās ... 2019, p.140 – 194; Latvija 2030 2009, p. 7– 11, 24 – 26).

Taking into account the interest of scientists from various social science disciplines in the role of organizational culture and the entire economic sphere in the integration of Latvia's society, the author of the article set himself the goal of showing how the organizational culture that has developed in enterprises and organizations in Latvia contributes to the spread of typical norms and values of economic behavior among ethnic Latvians and ethnic minorities. As the data of this study show (Volkov 2023; Volkov et al. 2024), as well as the data of previous studies by the author of this article, the role of the ethnic factor in the formation and implementation of organizational culture in Latvia as a country with pronounced ethnic diversity is not a constant, independent value for all situations and contexts of interethnic interaction of people with different ethnic identities in a multiethnic economic space. Summarizing the research data, two contexts of interethnic interaction were identified, which to varying degrees influenced the actualization of the ethnic factor in organizational culture:

Firstly, it is a complex of interethnic interactions, the task of which is to achieve goals determined

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by the nature of the economic and production tasks of the enterprise and organization;

Secondly, it is a complex of situations that arise to one degree or another in economic activity, when the values of an individual's identity, understanding of life goals and strategies that go beyond narrowly understood production and economic tasks are actualized.

The proposed analytical division of interethnic interaction complexes to one degree or another corresponds to the ideas already conceptualized in management theory and sociology. These are the theories of George Elton Mayo and Mary Parker Follett, who, during the Hawthorne effect, conducted in the United States in the 1920s and 1930s, revealed the importance of employees recognizing their individual value in solving the production tasks of enterprises (Mayo 2007) . The analytical division of social activity into success-oriented and agreement-oriented forms the basis of Jürgen Habermas's communication theory (Habermas 1992).

II. FEATURES OF ORGANIZATIONAL CULTURE

Edgar Schein's model is one of the most widely used in organizational culture research. The author of the article adheres to the understanding of organizational culture as "a pattern of shared basic assumptions adopted by a group in solving its problems through external adaptation and internal integration" (Schein 2010, p. 10). The culture of organizations in Latvia turns out to be the intersection of two important factors, which, as practice shows, are often contradictory in nature. On the one hand, the high degree of integration of the Latvian economy into the European and world division of labor, the liberal nature of the market economy and Latvian labor legislation requires workers, regardless of their ethnic origin, to follow uniform norms of organizational and professional culture for the successful implementation of the goals of companies and organizations. On the other hand, the different access opportunities for ethnic Latvians and ethnic minorities to prestigious areas of employment contribute to ethnic favoritism in economic life, which ultimately largely erodes the equal value of organizational culture in the minds of ethnic Latvians and ethnic minorities.

The interaction of employees in organizations and companies turns out to be primarily a form of intercultural communication, as shown in the studies of Geert Hofstede (Hofstede et al., 2010). An important feature of organizational culture that has become established in the economic life of a particular nation-state is the degree of its internal differentiation, which mainly depends on the ethnic diversity of society. The ethnic differentiation of Latvian society is the most important factor influencing the differentiation of organizational culture in commercial companies, state organizations depending on the proportion of certain ethnic groups employed in these enterprises. In addition, perceptions of ethnic groups as carriers of various types of organizational culture, business ethos, etc. are taking root in society.

The organizational culture of enterprises ensures the effectiveness of economic or management activities that implement certain rational behavioral strategies of economic actors, for example, activities for the production, provision, purchase or sale of goods or services (Krugman, Wells 2012, p. 2). Therefore, the most important feature of organizational culture is the rationality of its values and norms, which economic actors accept, approve and implement in their behavior in the company and organization (Ritzer 1975, p. 627). Thus, the level of internal social solidarity of these economic actors, who perform various functional duties in the enterprise and, consequently, occupy various social statuses, is determined by the rationality of their accepted values and organizational cultural norms.

An integral part of the research methodology of this article was the theory of rationality as a way of implementing effective social activity and a way of constructing social integration of communities that achieve economic and socio-cultural success by competing with other social participants. As the main theories for understanding such rationality, the authors of the article turned to

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Max Weber's views on the nature and types of social activity (Weber 2004, p. 254 –284), Talcott Parsons' views on social activity as one of the structuring elements of an integrated social system (Parsons 1949, p. 43 – 76.), Jürgen Habermas's theory of communicative action and moral discourse as ways of mutual equal recognition and coordination of the interests of social actors in the process of their rationalization (Habermas 1992, p. 116 – 194). The choice of this theory is explained by the understanding of organizational culture, in which the rationality of its basic values, rules and norms directly follows both from the rational nature of the economic and organizational activities of individual and collective actors, and from the advantages of rationally emphasizing the specific social and cultural interests of these actors in the situation of their interaction and arising from their collective identity. This idea of organizational culture is oriented towards a comprehensive understanding of rationality, characteristic of modern sociology (Bezes et. al. 2021, p. 11 – 38; Coutant 2021, p. 71 – 101).

III. SOCIOLOGICAL RESEARCH METHODOLOGY AND DATA.

Sociological research aimed to understand the extent to which the values and norms of the practiced organizational culture adopted at the enterprises/organizations of Latvia are shared by economic actors as rational ways of organizing the economic space, forming solidary relations within the teams of the enterprises, regardless of the ethnic origin and ethnocultural identity of these actors. It was necessary to understand whether there are limitations in the universality of these rational rules, which are somehow connected with the ethno-cultural identity of economic actors. This is important also because the author of the article in his previous sociological study established the fact of the presence of ethnic favoritism in the economic life of Latvia (Volkov 2023).

The author of the article developed the sociological research methodology and questionnaire questions. The sociological research was organized within the framework of the State Research Program project "Vectors of social cohesion: from cohesion around the state-nation (2012-2018) to a cohesive civil community for the security of the state, society and individuals (2024-2025)" (No. VPP-KM-SPASA-2023/ 1-0002) in 2025, January 6-15. Conducting an online survey on employee cohesion in economic activity in the target group of employed persons in Latvia - employees and employers. The total sample in the survey n=1008. The sample was formed according to gender, age and place of residence quotas, in accordance with the total population according to the data of the Central Statistical Office. The survey was conducted by a group of sociologists from the Institute of Philosophy and Sociology, Faculty of Humanities, University of Latvia. The distribution of respondents by social factors is shown in Table 1.

Table 1: Distribution of respondents by social characteristics

Gender	
Women	525
Men	483
Education level	
Primary or incomplete primary education	2,98%
Incomplete secondary; vocational education without secondary education	4,46%
General secondary education	16,37%
Secondary vocational/specialized education	28,87%
Bachelor's degree	25,69%
Master's degree	20,73%
PhD	0,89%
Ethnicity	
Ethnic Latvian	68,55%

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Russian	25,20%
Ukrainian	0,89%
Belarusian	1,39%
Polish	0,79%
Jewish	0,69%
Other	2,48%
Occupational group membership	
Managers	14,78%
Senior professionals	14,98%
Specialists	37,50%
Servants	2,68%
Service and sales workers	11,31%
Skilled agricultural, forestry and fishing workers	1,59%
Skilled workers and craftsmen	5,95%
Plant and machine operators and product assemblers	2,58%
Simple occupations	5,36%
Other	3,27%
Status	
Employee/employee	95,44%
Entrepreneur/employer	4,56%
Residence	
Riga	35,12%
City of national significance: Daugavpils, Liepāja, Jelgava, Ventspils, Jurmala, Rēzekne, Valmiera, Jēkabpils, Ogre	21,33%
Other city	26,29%
Small village, hamlet, countryside	17,26%

In order to assess the impact of organizational culture and team cohesion not only qualitatively, but also quantitatively, the author of the article has identified several economic, managerial and financial indicators. The complex of these factors reflects the rational nature of the behavior of economic actors, which is embodied in the nature of the organizational culture. These indicators allow us to conclude how effectively the culture supports employee cooperation, innovation and organizational sustainability. One of the main measures of the impact of culture is employee productivity, or the company's revenue or profit per employee. A culture that promotes learning, adaptation and cooperation directly affects the organization's ability to operate effectively and competitively (Schein 2010). Similarly, the amount of resources invested in employee development is used as an indirect indicator of the organization's long-term vision and value system (Ouchi 1981). Turklāt organizācijās, kur darbinieki tiek iesaistīti lēmumu pieņemšanā, kultūra tiek uztverta kā iekļaujošāka, kas veicina sadarbību un lojalitāti Furthermore, in organizations where employees are involved in decision-making, the culture is perceived as more inclusive, which fosters collaboration and loyalty (Hofstede et. al. 2020). From a financial perspective, organizational culture influences aspects such as profit profitability, customer retention levels, and cost efficiency (Schwartz, Davis 1981, p. 30 – 48). Additional indicators are ESG (environmental, social, governance) results, which are increasingly linked to the maturity of an organization's internal culture, social responsibility and employee well-being (Eccles, Ioannou, Serafeim 2014, p. 2835–2857).

The sociological research data showed that the greatest differences between respondents who positioned themselves as ethnic Latvians and Russians were manifested where the organizational culture to one degree or another affected the problem of ethnic identity. At the

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same time, factors related to the specifics of the implementation of production tasks did not create a large, statistically significant difference in the opinions of ethnic Latvians and Russians. Table 2 presents data on the respondents' views regarding the main organizational cultural norms and existing practices.

Table 2: Assessment of characteristics to call a team (a group of employees of a company, organization) socially cohesive, %.

1. The moral and material rewards of team members should depend on their contribution to the team's activities.					
	Very important	Important	Not very important	Not at all important	Total
Ethnic Latvians	40,8	52,6	5,8	0,7	100,0
Russians	45,9	49,6	4,1	0,4	100,0
Others	38,7	54,8	4,8	1,6	100,0
Total	41,9	52,0	5,3	0,7	100,0
Asymp. Sig. (2-sided) 0,696					
2. The moral and material rewards of team members should depend on compliance with work discipline requirements.					
Ethnic Latvians	26,6	62,7	9,6	1,0	100,0
Russians	30,5	59,0	9,2	1,2	100,0
Others	24,2	53,2	19,4	3,2	100,0
Total	27,5	61,2	10,1	1,2	100,0
Asymp. Sig. (2-sided) 0,118					
3. Team members must be loyal to the decisions made by the company's and organization's management.					
Ethnic Latvians	33,8	55,9	8,4	1,9	100,0
Russians	26,4	60,7	12,0	0,8	100,0
Others	22,2	57,1	12,7	7,9	100,0
Total	31,3	57,2	9,5	2,0	100,0
Asymp. Sig. (2-sided) 0,002					
4. Defending one's position in professional matters within a company or organization is more important than adhering to the principles of hierarchy within that company.					
Ethnic Latvians	19,7	59,5	18,2	2,6	100,0
Russians	22,6	55,3	19,6	2,6	100,0
Others	18,3	66,7	11,7	3,3	100,0
Total	20,3	58,9	18,1	2,6	100,0
Asymp. Sig. (2-sided) 0,711					
5. For team members, defending their moral position in conflicts between employees is more important than adhering to the principles of this company's hierarchy.					
Ethnic Latvians	19,6	54,7	19,9	5,8	100,0
Russians	21,1	53,3	17,6	7,9	100,0
Others	15,3	50,8	27,1	7,9	100,0
Total	19,7	54,1	19,8	6,4	100,0
Asymp. Sig. (2-sided) 0,632					

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6. Active participation of team members in informal joint activities (e.g., joint celebration of employees' birthdays, national holidays, participation in tourist trips, etc.) should affect their moral and material rewards.					
Ethnic Latvians	17,0	36,3	27,1	19,6	100,0
Russians	16,7	34,2	27,1	20,0	100,0
Others	16,7	34,2	28,3	25,0	100,0
Total	16,9	35,4	27,7	20,0	100,0
Asymp. Sig. (2-sided) 0,934					
7. The participation of team members in Latvian public and political life should affect their material remuneration.					
Ethnic Latvians	10,1	27,1	31,2	31,5	100,0
Russians	4,8	21,8	33,2	40,2	100,0
Others	6,9	17,2	24,1	51,7	100,0
Total	8,6	25,2	31,3	35,0	100,0
Asymp. Sig. (2-sided) 0,004					
8. Showing respect to teammates who have achieved professional success					
Ethnic Latvians	25,3	55,5	15,2	3,9	100,0
Russians	29,0	58,5	8,9	3,6	100,0
Others	21,7	55,0	18,3	5,0	100,0
Total	26,1	56,2	13,8	3,9	100,0
Asymp. Sig. (2-sided) 0,224					
9. Showing respect to team members who have high social status in society					
Ethnic Latvians	8,9	25,6	38,0	27,5	100,0
Russians	5,8	30,3	38,6	25,3	100,0
Others	5,8	23,7	45,8	25,4	100,0
Total	7,9	26,6	38,6	25,4	100,0
Asymp. Sig. (2-sided) 0,457					
10. Providing assistance to team members who are unable to effectively perform their professional duties due to age					
Ethnic Latvians	22,2	56,9	16,2	4,6	100,0
Russians	22,1	60,6	10,8	6,5	100,0
Others	24,6	52,5	21,3	6,5	100,0
Total	22,3	52,5	15,2	4,9	100,0
Asymp. Sig. (2-sided) 0,217					
11. Providing assistance to team members who are unable to effectively perform their professional duties due to certain physical limitations.					
Ethnic Latvians	27,6	59,8	9,8	2,8	100,0
Russians	27,6	55,4	11,2	4,1	100,0
Others	33,9	45,8	16,9	3,4	100,0
Total	33,9	57,8	10,6	3,1	100,0
Asymp. Sig. (2-sided) 0,341					
12. Providing assistance to team members who are unable to effectively perform their professional duties due to insufficient knowledge of the state language.					
Ethnic Latvians	14,7	37,9	24,2	23,1	100,0
Russians	17,5	42,9	19,6	20,0	100,0

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Others	12,9	46,8	22,6	17,7	100,0
Total	15,3	39,8	22,9	22,0	100,0
Asymp. Sig. (2-sided) 0,421					

Table 3 presents data on the impact of the respondent's team's internal solidarity on achieving the company's economic results. The data provided show that representatives of different ethnic groups have a typical understanding of the role of team (work collective) solidarity in ensuring the most important economic efficiency indicators of companies and organizations. Some significant differences were found only in the competency level assessment position/competence assessment organization.

Table 3: Cohesion of the team where the respondents work in achieving the economic results of the company (organization) (%).

1. Ensuring the careful use of material resources (materials, equipment, technical devices, information systems) in their work.					
	Very important	Important	Not very important	Not at all important	Total
Ethnic Latvians	45,8	47,1	5,9	1,2	100,0
Russians	49,2	45,6	3,6	1,6	100,0
Others	42,6	44,3	11,5	1,6	100,0
Total	46,4	46,5	5,7	1,3	100,0
Asymp. Sig. (2-sided) 0,356					
2. Ensuring the careful use of financial resources in your work.					
Ethnic Latvians	38,9	54,1	4,8	2,3	100,0
Russians	40,5	50,6	4,8	1,6	100,0
Others	40,3	50,0	6,5	3,2	100,0
Total	39,4	52,9	5,5	2,2	100,0
Asymp. Sig. (2-sided) 0,752					
3. Increasing the competitiveness of a company/organization, product/service.					
Ethnic Latvians	43,9	51,2	4,3	0,6	100,0
Russians	47,6	46,4	4,8	1,2	100,0
Others	41,3	44,4	11,1	3,2	100,0
Total	44,6	49,5	4,9	0,9	100,0
Asymp. Sig. (2-sided) 0,066					
4. Building a positive reputation for a company/organization.					
Ethnic Latvians	48,2	45,1	6,0	0,7	100,0
Russians	48,6	45,4	4,8	1,2	100,0
Others	56,5	35,5	4,8	3,2	100,0
Total	48,8	44,6	5,6	1,0	100,0
Asymp. Sig. (2-sided) 0,417					
5. Rationally organizing your workspace to perform your professional duties.					
Ethnic Latvians	43,0	51,1	5,0	0,9	100,0
Russians	46,4	48,4	4,4	0,8	100,0
Others	43,5	45,2	9,7	1,6	100,0
Total	43,9	50,1	5,1	0,9	100,0
Asymp. Sig. (2-sided) 0,641					

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6. Promoting fair treatment of employees by management.					
Ethnic Latvians	59,2	36,1	3,8	0,9	100,0
Russians	59,5	37,2	2,4	0,8	100,0
Others	51,7	45,0	0,0	3,3	100,0
Total	58,8	36,9	3,2	1,0	100,0
Asymp. Sig. (2-sided) 0,215					
7. Creating principles of mutual respect among employees.					
Ethnic Latvians	51,8	44,2	3,4	0,6	100,0
Russians	51,8	42,6	3,6	0,8	100,0
Others	60,3	31,7	4,8	3,2	100,0
Total	52,7	43,0	3,5	0,8	100,0
Asymp. Sig. (2-sided) 0,240					
8. Promoting the motivation of initiative and creativity among management staff.					
Ethnic Latvians	44,2	49,1	5,2	1,5	100,0
Russians	37,2	55,2	6,0	1,6	100,0
Others	42,9	47,6	7,9	1,6	100,0
Total	42,4	50,6	5,6	1,5	100,0
Asymp. Sig. (2-sided) 0,612					
9. Promoting company/organization participation in financing environmental protection and ecology projects.					
Ethnic Latvians	25,3	50,2	19,8	4,8	100,0
Russians	25,0	43,5	25,0	6,5	100,0
Others	25,0	43,3	23,3	8,3	100,0
Total	25,2	48,1	21,3	5,4	100,0
Asymp. Sig. (2-sided) 0,409					
10. Building diverse competencies of company/organization employees.					
Ethnic Latvians	28,7	57,9	11,6	1,8	100,0
Russians	28,3	52,7	15,6	3,4	100,0
Others	31,1	41,0	24,6	3,3	100,0
Total	28,7	55,6	13,4	2,3	100,0
Asymp. Sig. (2-sided) 0,033					
11. Ensuring the participation of people of different ethnic backgrounds in the management of the company/organization.					
Ethnic Latvians	15,5	42,0	31,4	11,1	100,0
Russians	20,2	42,5	23,6	13,7	100,0
Others	23,0	45,9	19,7	11,5	100,0
Total	17,1	42,4	28,7	11,8	100,0
Asymp. Sig. (2-sided) 0,117					

As can be seen from the data provided, ethnic differences in Latvia have practically no impact on the attitude of respondents towards the prevailing norms and values of the organizational culture that has developed in the country. This indicates that these values serve as the most important basis for strengthening ethnic Latvians and ethnic minorities in economic life. However, the data of the sociological study revealed the fact that the level of education of respondents has a greater impact on the attitude towards these organizational culture norms than was typical for

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the influence of the ethnic factor. Table 4 compares the impact of the respondents' ethnic identity and their level of education on ten questions. Significant differences between ethnic groups were found only in two positions regarding their ethnopolitical and civic preferences in relation to the values practiced in the organizational culture (No. 3 and 6). However, differences in educational level are significant in all ten characteristics of organizational culture, which relate to both respondents' ethnopolitical preferences and the role of moral values (No. 1, 2), perceptions of loyalty to the social hierarchy (No. 4), the importance of the ethnic factor in company management, choice of profession (No. 5, 9, 10), and the role of respondents' individual competencies and interests as a subjective basis of organizational culture (No. 7, 8).

Table 4: Comparison of the role of ethnic and educational factors in respondents' perceptions of the importance of some organizational cultural values (according to Pearson Chi-Square Asymp. Sig.).

Ethnic factor	Educational factor
1. Defending one's position in professional matters within a company or organization is more important than adhering to the principles of hierarchy within that company.	
0,711	0,019
2. For team members, defending their moral position in conflicts between employees is more important than adhering to the principles of hierarchy in this company	
0,632	0,035
3. The participation of team members in the public and political life of Latvia should affect their material remuneration	
0,004	0,000
4. Showing respect to team members who have high social status in society	
0,457	0,000
5. Ensuring the participation of people of different ethnic backgrounds in the management of the company/organization	
0,117	0,009
6. Regularly participate in celebrating national holidays with colleagues at a company, organization, or educational institution	
0,021	0,049
7. Competence in the chosen profession or field of activity	
0,927	0,000
8. The respondent was mainly guided by the desire to develop his/her abilities and interests in choosing a profession	
0,534	0,001
9. The respondent was guided mainly by the example of people of similar ethnic origin in choosing a profession	
0,925	0,004
10. In choosing his/her profession, the respondent is oriented towards working in companies and organizations where people of similar ethnic origin work.	
0,983	0,007

IV. CONCLUSIONS

The materials of the sociological study confirmed both the hypotheses put forward and the conclusions of the author of similar previous studies. Most of the organizational culture parameters of ethnic Latvians and ethnic minorities that concern them coincide, which indicates a high degree of integration of these population groups into common values and norms determined by the economic space in Latvia. The basis of such an attitude towards the existing organizational cultural values is the typification of rational economic behavioral

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practices, which is characteristic of Latvians and ethnic minorities in economic behavior. This applies to assessments of calling a team socially cohesive; to the role of team (collective) cohesion in achieving the economic results of an enterprise (organization); to the assessment of the influence of social and economic factors on social cohesion in an enterprise/organization; to perceptions of the conditions for achieving the desired or intended social position/status and the role of various factors in the respondents' choice of profession. In this sense, the logic of economic necessity turns out to be stronger than the need to emphasize the special ethnocultural preferences of representatives of ethnic groups in the economic space of Latvia.

However, the content of these organizational cultural features of Latvian residents is related to their attitude towards values that are oriented towards achieving goals, which are determined by the very nature of the economic and production tasks of the enterprise and the organization. Here, ethnic differences are insignificant. At the same time, in situations that actualize the values of their national and ethnic identity in the business and interpersonal communication of employees, ethnic differences arise in the understanding of the existing organizational cultural practices. This applies, for example, to perceptions of employee loyalty in relation to management decisions, views on the relationship of material remuneration with the level of active participation in the political life of Latvia, including employee participation in the celebration of national holidays in the enterprise and organization. Therefore, the logic of economic rationality in the behavior of representatives of ethnic groups, and thus in the established system of organizational culture in Latvia, is not absolute. There, in the economic space, where conditions exist for the actualization of the values of ethnocultural identity, these values are actualized. These are not situations that go beyond the scope of economic life and are associated with the socio-political context of interaction between ethnic Latvians and ethnic minorities, with ethnic stereotypes and preferences that dominate public consciousness, and with established practices of interpersonal relations between representatives of these ethnic groups. Therefore, the penetration of ethnic favoritism into the organizational culture of Latvian enterprises is a difficult to conceal phenomenon. But if by itself the ethnic factor does not distort the typification of the norms and values of the organizational culture practiced among ethnic Latvians and ethnic minorities, then its imposition on the different level of education of the respondents leads to the ethnocultural fragmentation of this culture (Volkov, 2023, p. 104 – 108).

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