A Model for Applying Competitive Advantage in Egyptian Universities

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Abstract:

This research develops a comprehensive model for applying competitive advantage in Egyptian universities to enhance their academic and administrative performance. The study identifies key dimensions of competitive advantage, including cost leadership, differentiation, innovation, and operational efficiency, which collectively address the challenges faced by higher education institutions in Egypt. These dimensions aim to improve educational quality, optimize resources, and create a distinctive position for universities in the competitive academic landscape.

A descriptive analytical methodology was employed to assess the current practices of competitive advantage in Egyptian universities and their potential for further development. Advanced statistical methods were used to analyze data, and AMOS software was applied to measure the relationships between the dimensions and their impact on overall university performance. The findings demonstrate significant correlations, revealing that adopting strategies aligned with these dimensions can drive operational excellence, foster innovation, and strengthen competitive positioning.

The study concludes with a proposed model that serves as a practical guide for Egyptian universities to implement competitive advantage strategies effectively. This model emphasizes the integration of modern management practices and innovative solutions to ensure sustainable development and adaptability to dynamic educational needs. Recommendations include the adoption of strategic cost-saving measures, investment in innovative academic programs, and fostering a culture of differentiation and continuous improvement across all levels of university operations.

Keywords: Competitive Advantage, Egyptian Universities, Cost Leadership, Differentiation, Innovation, Operational Efficiency.

الملخص:

يقدم هذا البحث نموذجًا شاملًا لتطبيق الميزة التنافسية في الجامعات المصرية بهدف تحسين الأداء الأكاديمي والإداري. يركز البحث على أبعاد رئيسية للميزة التنافسية، وهي قيادة التكلفة، التميز، الابتكار، والكفاءة التشغيلية، والتي تهدف إلى مواجهة التحديات التي تواجه مؤسسات التعليم العالي في مصر. تسعى هذه الأبعاد إلى تحسين جودة التعليم، تحسين استغلال الموارد، وخلق موقع متميز للجامعات في الساحة الأكاديمية التنافسية.

اعتمد البحث على المنهج الوصفي التحليلي لتقييم الممارسات الحالية للميزة التنافسية في الجامعات المصرية وإمكانية تطويرها. تم استخدام أساليب إحصائية متقدمة لتحليل البيانات، وتم تطبيق برنامج AMOS لقياس العلاقات بين الأبعاد وتأثيرها على الأداء العام للجامعات. أظهرت النتائج وجود علاقات ذات دلالة إحصائية، مما يدل على أن تبني استراتيجيات تتوافق مع هذه الأبعاد يعزز من التميز التشغيلي، يدعم الابتكار، ويقوي الموقف التنافسي للجامعات.

خلص البحث إلى اقتراح نموذج يوفر إطارًا عمليًا للجامعات المصرية لتطبيق استراتيجيات الميزة التنافسية بشكل فعال. يؤكد هذا النموذج على دمج ممارسات الإدارة الحديثة والحلول المبتكرة لضمان التنمية المستدامة والقدرة على التكيف مع الاحتياجات التعليمية المتغيرة. تشمل التوصيات اعتماد تدابير استراتيجية لتوفير التكاليف، الاستثمار في البرامج الأكاديمية المبتكرة، وتعزيز ثقافة التميز والتحسين المستمر على جميع المستويات التشغيلية للجامعات.

الكلمات المفتاحية:

الميزة التنافسية، الجامعات المصرية، قيادة التكلفة، التميز، الابتكار، الكفاءة التشغيلية.

Introduction:

Amid rapid changes in the higher education sector, Egyptian universities are increasingly facing pressing challenges that require adopting new strategies to meet the demands of advanced education and technology. Fourth-generation universities represent a novel model that integrates science, technology, and industry, aimed at preparing graduates who can compete in global labor markets and contribute effectively to the knowledge economy. This makes achieving a competitive advantage within these universities essential (Thomas, et al., 2020).

Dimensions of academic excellence include providing advanced educational programs that leverage modern technology, such as artificial intelligence and machine learning, to improve students' learning experiences and interactions, thereby creating a supportive educational environment that meets labor market demands (Chen et al., 2020; Zawacki-Richter et al., 2019). These programs not only enhance educational standards but also ensure cost leadership by delivering high-quality education at competitive costs through efficient academic and administrative processes (Porter, 1998).

Furthermore, differentiation is highlighted by offering unique academic programs and certifications that add value to the university, including collaborations with international universities and industrial institutions. This provides students with practical training and employment opportunities, supporting both academic and professional sustainability (Barney, 1991).

The proposed framework also aims to achieve administrative flexibility, enabling university leaders to respond to rapid changes in the educational environment and manage resources in ways that enhance academic productivity and quality. This flexibility requires adopting adaptive, innovative policies that allow universities to respond to the evolving needs of society and the labor market (Marginson, 2007).

Moreover, research excellence is one of the fundamental pillars for strengthening the academic reputation and competitiveness of universities. High-quality research enhances the university's global ranking, which is a key metric in international rankings like QS and Times Higher Education (Hazelkorn, 2015).

1/1- Problem Statement

In the competitive higher education landscape, Egyptian universities face significant challenges in achieving differentiation, operational efficiency, cost leadership, and innovation. This study evaluates how private universities address these dimensions to sustain their competitive edge.

Table 1: Results of the Opinions on Competitive Advantage Dimensions

Opinion Poll Phrases	Agree (%)	Neutral (%)	Disagree (%)
Private universities adopt strategies to enhance operational efficiency.	58	30	12

Opinion Poll Phrases	Agree (%)	Neutral (%)	Disagree (%)
Efforts are evident in reducing costs while maintaining educational quality.	50	25	25
Differentiation through unique academic offerings is prioritized.	55	20	25
Innovative programs align with market demands and global trends.	52	28	20
Investments in technology support competitive advantage goals.	60	20	20

Source: Prepared by the researcher based on the universities under study and application

- A stronjority (58%) agree that operational efficiency strategies are implemented. However, 30% remain neutral, indicating a need for more impactful evidence or communication of these efforts.
- Half (50%) of the respondents acknowledge cost-reduction strategies, but the 25% disagreement highlights inconsistent application or perceived ineffectiveness.
- Differentiation strategies resonate with 55% of the sample, but a significant 25% disagree, suggesting an uneven emphasis on specialization across universities.
- The focus on innovation garners agreement from 52% of respondents, with 20% expressing disagreement. This reflects potential gaps in aligning innovation with practical educational outcomes.
- A notable 60% agreement suggests technology is viewed as a cornerstone of competitive advantage, but 20% still question its adequacy or relevance.

In the highly competitive and evolving higher education landscape, Egyptian universities face mounting challenges in sustaining their competitive edge and meeting global benchmarks. Achieving a distinctive position requires universities to strategically implement practices that foster differentiation, operational efficiency, cost leadership, and innovation—key dimensions of competitive advantage that underpin success in contemporary education systems.

Globally, universities that excel in achieving competitive advantage often leverage advanced strategies, foster innovation, and align their services with labor market demands. However, many Egyptian universities face significant barriers in adopting and institutionalizing such strategies effectively.

Key challenges include:

1. Limited integration of cost-effective practices that enhance resource utilization without compromising quality.
2. Inefficiencies in operational processes, which negatively impact academic and administrative outcomes.
3. Insufficient differentiation strategies that fail to position universities as leaders in specialized academic and research fields.
4. Minimal focus on fostering innovation in educational and research activities, hindering competitiveness on a global scale.

This research aims to address these challenges by proposing a comprehensive framework for applying the dimensions of competitive advantage in Egyptian universities. The framework seeks to enable institutions to optimize their operations, improve service quality, foster innovation, and achieve sustainable differentiation, ultimately strengthening their positioning in the global higher education ecosystem.

The problem of the study is represented in answering the following main question:

"How does competitive advantage contribute to the advancement of private universities in Egypt amidst current challenges?"

To address this main question, the following sub-questions were formulated:

1. What is the relationship between the dimensions of competitive advantage and the performance of private universities in Egypt?
2. What is the impact of applying the dimensions of competitive advantage (operational efficiency, differentiation, cost leadership, and innovation) on achieving excellence in private universities?

1/2-Importance of the Research

Practical Importance:

- The study highlights the significance of applying competitive advantage in Egyptian universities to enhance academic and administrative performance in line with global trends.
- It focuses on transitioning Egyptian universities to the Fourth-Generation University (4GU) model, emphasizing innovation and digital transformation.
- The research proposes practical solutions to strengthen competitive advantage through dimensions such as (Cost Leadership, Operational Efficiency, Differentiation, Innovation)
- These strategies aim to improve educational quality, optimize resource utilization, and contribute to sustainability.
- The study offers insights to enhance the international reputation of Egyptian universities, increasing their appeal to local and international students.

Scientific Importance:

- This research enriches the literature on applying competitive advantage in higher education institutions, specifically focusing on Egyptian universities.
- It provides an in-depth understanding of leveraging competitive advantage dimensions to enhance academic, research, and administrative performance.
- The study aligns with the standards of smart universities, addressing the need for sustainable competitiveness in higher education.
- It examines the effective implementation of competitive advantage dimensions in the context of technological advancements and digital transformation within Fourth-Generation Universities.

1/3-Research Objectives

In the face of growing challenges for Egyptian universities to sustain their competitive edge in the evolving higher education landscape, this research aims to propose a comprehensive framework to strengthen their global positioning. The study focuses on leveraging the dimensions of competitive advantage to enhance academic

and administrative performance, develop innovative strategies, meet labor market demands, and ensure sustainable success. Accordingly, the research seeks to achieve the following objectives:

1. Evaluate the application of competitive advantage dimensions (cost leadership, operational efficiency, differentiation, and innovation) in Egyptian universities, identifying gaps and opportunities for performance improvement.
2. Design a comprehensive framework to enhance operational efficiency and foster innovation while supporting strategies for differentiation and cost leadership in Egyptian universities.
3. Propose innovative and practical solutions to improve the academic and administrative performance of Egyptian universities, aligning with global university ranking standards.
4. Provide strategic recommendations to ensure the sustainability of competitive advantage in Egyptian universities and strengthen their ability to compete in local and international job markets.

1/4-Research Hypotheses

The following hypothesis were formulated to study how competitive advantage is applied in Egyptian universities. These hypotheses focus on the relationship between the application of competitive advantage and its impact on various operational aspects within these universities.

H1:" The model expressing that using competitive advantage in Egyptian universities is significant."

2- Competitive Advantage concepts

Competitive advantage refers to the superior position in the market that enables the economic unit to outperform its competitors. To achieve competitive advantage, the economic unit must create value equal to or exceed the value of competitors by producing greater value for the customer than what competitors can produce or the same value at a lower cost. Therefore, the concept of competitive advantage is directly related to customer values. The closer the values provided by the economic unit are to the customer's values, the more superior and advantage it has over its competitors in one or more competitive dimensions (Thompson, et al., 2020).

Competitive advantage can be defined as an organization's ability to outperform its competitors by offering unique value, lower costs, or superior product or service quality. This concept refers to the factors that contribute to achieving better performance and increasing market share.

According to Michael Porter, competitive advantage lies in the ability to deliver the same benefits as competitors but at a lower cost (cost advantage) or to deliver benefits that exceed those of competing products (differentiation advantage) (Porter, 1985).

It is also known as: A firm is said to have a competitive advantage when it is implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors" (Barney, 1991).

"A competitive advantage exists when a company has a resource or capability that allows it to create a superior value proposition in the market relative to its

competitors". (Aaker, 1989).

Competitive advantage refers to the fact that "Competitive advantage is a company's ability to perform in one or more ways that competitors cannot or will not match" (Kotler, 2000).

It is known as "Competitive advantage refers to an organization's ability to deliver products or services that are valued by customers more highly than those of its competitors, resulting from unique capabilities, resources, and processes". (Chen, et al., 2022).

It is also known as "Competitive advantage is the superior performance that a firm achieves through leveraging information technology, data analytics, and unique organizational capabilities that are difficult for competitors to replicate". (Mithas,et al., 2023).

3- Competitive Advantage in Universities: Stages and Strategies
3/1- Types of Competitive Advantage

Cost Leadership: This strategy involves offering educational services at a lower cost compared to competitors, which can attract price-sensitive students without compromising on quality(Barney, 1991).

Differentiation: Universities can differentiate themselves by providing unique programs, superior teaching quality, cutting-edge research, and state-of-the-art facilities (Grant, 1991).

Focus: Targeting niche markets or specific student demographics allows universities to tailor their offerings and marketing efforts to meet the unique needs of these groups (Porter, 1985).

3/2- Competitive Advantage in Universities in Egypt

Private universities in Egypt aim to distinguish themselves from public institutions and other private competitors by leveraging their unique strengths. This section explores how these universities can enhance their competitive advantage through various strategies.

3/2/1. Academic Reputation

A strong academic reputation is a key competitive advantage for private universities. Reputation is built on the quality of education, faculty expertise, research output, and alumni success. To enhance their academic reputation, private universities should:

Invest in Faculty Development: Hiring and retaining highly qualified faculty members who are leaders in their fields can significantly enhance a university's reputation (Teece, et al., 1997).

Promote Research Excellence: Encouraging and supporting research initiatives that address local and global challenges can position a university as a leader in innovation and knowledge creation(Grant, 1991).

3/2/2. Technological Innovation

The integration of technology in education can provide a significant competitive edge. Private universities can enhance their competitive advantage through:

Implementing Advanced Learning Technologies: Utilizing artificial intelligence (AI), virtual reality (VR), and online learning platforms to provide a modern and

flexible learning environment (Porter, 1985).

Developing Smart Campuses: Integrating Internet of Things (IoT) technologies to enhance campus facilities, improve security, and streamline administrative processes (Teece et al., 1997).

3/2/3. Student Satisfaction and Engagement

Student satisfaction is crucial for attracting and retaining students. Strategies to enhance student satisfaction include:

Personalized Learning Experiences: Using AI and data analytics to tailor educational experiences to individual student needs and preferences (Barney, 1991).

Enhanced Support Services: Providing comprehensive student support services, including career counseling, mental health resources, and academic advising (Grant, 1991).

3/2/4. Internationalization

Establishing international partnerships and attracting international students can enhance a university's global standing and competitive advantage. Strategies include: Collaborative Programs: Developing joint degree programs and research collaborations with prestigious international universities (Porter, 1985).

Global Student Recruitment: Implementing targeted recruitment strategies to attract a diverse student body from around the world (Teece et al., 1997).

3/3- Enhancing Competitive Advantage: Evidence from Egyptian Private Universities

Several private universities in Egypt have successfully implemented strategies to enhance their competitive advantage. The following examples illustrate how these institutions have leveraged various strategies to distinguish themselves:

3/3/1. The American University in Cairo (AUC)

Academic Excellence: AUC has built a strong academic reputation through its rigorous academic programs and distinguished faculty. The university invests heavily in research and offers numerous opportunities for student-faculty collaboration (American University in Cairo).

Technological Integration: AUC has embraced technological innovation by incorporating AI and data analytics into its administrative and academic processes, enhancing operational efficiency and student experience.

3/3/2. The German University in Cairo (GUC)

Innovative Programs: GUC offers unique programs that combine theoretical knowledge with practical experience, catering to the demands of the job market.

Research Initiatives: The university promotes interdisciplinary research initiatives that address local and international challenges, positioning itself as a leader in innovation (German University in Cairo).

3/3/3. Nile University

Focus on Technology: Nile University has positioned itself as a leader in technological education and research, offering cutting-edge programs in fields such as AI and information technology.

Student-Centric Approach: The university prioritizes student satisfaction by providing personalized learning experiences and comprehensive support services (Nile University).

Why did you choose this phenomenon to study?

I chose to study competitive advantage in private universities because it represents a real challenge in light of the rapid changes in market needs and technology. Universities that can adapt and respond effectively to these changes will be able to achieve competitive advantage and sustainability.

3/4- Enhancing AI in Education, Student Affairs, Academic Services, and Educational Institution Management and Decision Making

The integration of artificial intelligence (AI) into higher education is transforming various aspects of the educational landscape, enhancing the quality of education, supporting student affairs, and improving institutional management and decision-making processes.

In the field of education, AI provides endless possibilities for improving the learning experience through adaptive learning systems that analyze student data to offer personalized learning experiences (Popenici & Kerr, 2017). These systems allow students to progress through their educational paths according to their individual needs and levels, increasing the effectiveness of the learning process (Zawacki-Richter et al., 2019).

In student affairs, AI plays a crucial role in enhancing the student experience by employing predictive analytics to offer personalized guidance based on student data (Cerezo et al., 2020). This form of data-driven support helps students make better decisions regarding their academic and career paths, contributing to improved retention rates and reduced dropout rates (Sanchez et al., 2021).

In academic services, AI solutions have proven effective in managing academic content and providing faster and easier access to educational resources (Luckin et al., 2016). These systems automate numerous administrative tasks, such as student registration and performance evaluations, allowing faculty to focus on their core tasks of teaching and research.

Regarding educational institution management and decision-making, AI offers powerful analytics that enable administrators to make informed strategic decisions based on large datasets gathered from various academic and administrative activities (Mhlanga, 2020). These insights support future planning and ensure the sustainability of educational institutions in a constantly evolving competitive environment (Hussin, 2018).

4- The Importance of Competitive Advantage

The concept of competitive advantage is pivotal for universities striving to excel in an increasingly complex and competitive higher education landscape. As institutions are confronted with growing expectations from students, employers, and society, the ability to establish a unique position in the market becomes essential.

First and foremost, a strong competitive advantage allows universities to attract and retain high-quality students. With the proliferation of educational options available to prospective students, institutions that differentiate themselves through unique

programs, cutting-edge research, and enhanced learning experiences can effectively appeal to a broader audience. This is particularly crucial in the context of fourth-generation universities, which are expected to provide innovative educational solutions that prepare graduates for dynamic labor markets (Salmi, 2009).

Furthermore, competitive advantage contributes to the reputation of universities on both national and international stages. An institution recognized for its academic excellence, research output, and successful alumni can leverage this reputation to secure funding, partnerships, and collaborations that enhance its offerings and further solidify its standing. Studies indicate that a university's reputation directly impacts its ability to attract research grants and establish productive partnerships with industry and other academic entities (Hazelkorn, 2015).

Additionally, competitive advantage fosters financial sustainability by enabling universities to optimize resource allocation, reduce operational costs, and enhance administrative efficiency. Institutions that innovate and implement effective strategies are better positioned to manage their budgets, thus allowing for reinvestment in academic programs and facilities (Porter, 1998).

Moreover, in an era where global rankings significantly influence institutional prestige, universities must continuously assess and improve their competitive strategies to maintain or elevate their positions. Rankings such as QS and Times Higher Education are increasingly reliant on indicators of research impact, teaching quality, and internationalization efforts, all of which are manifestations of a university's competitive advantage (QS Quacquarelli Symonds. 2023).

In conclusion, competitive advantage is not merely a strategic asset for universities; it is a critical factor that influences their survival and growth in an ever-evolving educational environment. By understanding and effectively leveraging their strengths, universities can ensure their long-term success and relevance in the higher education landscape.

5- literature

(Chatterjee and Kar, 2018) aimed to explore the impact of AI on business and society by analyzing the roles AI plays in improving business processes and enhancing innovation. The study also aims to discuss the social dimensions of AI uses, including ethical implications and challenges related to privacy and security. The study used an analytical methodology based on a literature review and previous studies on AI and its applications in business and society. The study also analyzed practical examples of AI applications in various industries to demonstrate how this technology can add value. The study found that AI has a significant and positive impact on the efficiency of business processes, as it can improve performance, reduce costs, and increase competitiveness. In addition, the study noted that AI contributes to radical transformations in traditional business models, leading to the innovation of new products and services.

(Zhang et al., 2019) aimed to explore the impact of AI on operational efficiency and academic performance in higher education institutions. The study focused on how AI can be used to improve educational resource management and enhance the effectiveness of the educational process. The study relied on an analytical

methodology that involved the use of quantitative data from educational institutions that apply AI. The study used questionnaires to collect data from administrators, faculty, and students, in addition to analyzing academic and administrative performance data. The study found that AI enhances operational efficiency by improving resource management, reducing routine administrative work, and providing accurate analyses of student performance. The study also confirmed that the use of AI contributes to improving the learning experience and providing personalized academic support, which leads to improving overall academic performance.

(Smith et al., 2019) focused on the use of computer vision to improve operational efficiency in universities. The study aimed to explore how computer vision technologies can be used to improve the management of academic processes such as attendance recording and automated assessment. The study relied on a quantitative data analysis methodology through field experiments in several universities. The results showed that computer vision applications can contribute significantly to improving operational efficiency and reducing human error.

(Jin et al., 2020) aimed to explore the importance of research on big data and artificial intelligence applications in improving organizational performance. The study focused on how artificial intelligence techniques can be used to analyze big data in order to enhance operational efficiency and make informed decisions in various sectors. The study used an analytical methodology that included a review of the current literature on big data and artificial intelligence, in addition to studying application cases from various industries. The study relied on analyzing data derived from previous studies and practical experiences of organizations using artificial intelligence in data analysis. The study found that artificial intelligence can significantly enhance the effectiveness of big data analysis by providing accurate and rapid insights that help improve the decision-making process. The study confirmed that organizations that apply artificial intelligence in their data analysis benefit from improvements in operational efficiency, innovation, and increased ability to respond quickly to changes in the market.

The study by (Dwivedi et al., 2021) aimed to provide multidisciplinary insights into the challenges and opportunities associated with AI, as well as formulate a future research agenda that addresses these challenges and opportunities. The study aimed to understand how AI impacts various fields, including business, policy, and academic practices. The study relied on a comprehensive review of the literature related to AI from multidisciplinary perspectives. The study also included a qualitative analysis of academic articles and industry reports that discuss AI applications and challenges. The study found that AI offers tremendous opportunities to enhance efficiency and innovation across sectors. However, organizations face significant challenges related to privacy, ethics, and policies that must be addressed to ensure that AI is used responsibly. The study emphasized the need for multidisciplinary collaboration to make the most of AI.

(Yang, 2021) aimed to analyze the role of AI in enhancing cost leadership strategy within organizations. The main objective was to understand how AI

applications can contribute to reducing operating costs and improving operational efficiency, giving organizations a competitive advantage by offering products and services at lower prices. The study used a quantitative approach based on field data from companies that rely on AI to achieve cost leadership. The data was collected through questionnaires and interviews with managers in those companies, and the data was analyzed using statistical methods to determine the impact of AI on cost reduction. The study concluded that AI plays a vital role in reducing operational costs by improving efficiency, reducing waste, and improving resource utilization. It concluded that organizations that adopt AI as part of their cost leadership strategies have a greater ability to offer products at competitive prices, which enhances their position in the market.

(Hussain et al., 2021) explored the impact of Artificial Intelligence (AI) in improving competitive advantage in the healthcare sector. The study focused on how AI technologies such as machine learning and natural language processing contribute to improving operational efficiency, patient care, and decision-making processes. Through qualitative data collected from healthcare professionals, the study revealed that AI not only improved patient diagnosis accuracy but also significantly reduced costs and optimized resource allocation, thus providing healthcare organizations with a competitive edge. The research concluded that AI adoption leads to sustainable operational improvements, which, in turn, enable healthcare institutions to outperform competitors in delivering high-quality services at lower costs.

(Kaur and Singh, 2021) conducted a study to examine the role of Artificial Intelligence in enhancing the competitive advantage of manufacturing industries. The research focused on the use of AI in automating production processes, predictive maintenance, and supply chain optimization. By analyzing field data and interviews with industry managers, the study found that AI-driven innovations in manufacturing processes reduce downtime, enhance production capacity, and improve the customization of products based on consumer preferences. These advancements allowed manufacturing companies to significantly outperform their competitors in both cost efficiency and product differentiation.

(Kim et al., 2022) aimed to analyze differentiation and differentiation strategies in organizations using AI technologies. The goal was to understand how AI can be used to enhance competitive differentiation of companies by providing differentiated products and services that better respond to customer needs. The researchers used a case study methodology and quantitative analysis to collect data on the use of AI technologies in companies adopting differentiation strategies. The data was also analyzed using statistical tools and AI models to assess the impact of these technologies on competitive performance. The study concluded that the use of AI in differentiation strategies contributes significantly to enhancing companies' competitiveness. Through in-depth analysis of customer data and market behavior, companies were able to develop customized products and services that better meet customer expectations. The study also showed that companies that invest in AI to achieve differentiation enjoy a sustainable competitive advantage in the long term.

(Ali et al., 2022) aimed to investigate the effect of AI-based customer

relationship management (CRM) systems on the competitive advantage of service organizations. The study highlighted how AI tools like chatbots, sentiment analysis, and recommendation algorithms improve customer service, reduce operational costs, and foster stronger customer loyalty. The researchers used quantitative data from service providers who had implemented AI in their CRM strategies. The study concluded that AI-driven CRM systems help service organizations better understand customer needs, improve service delivery, and create a more personalized customer experience, leading to enhanced competitive advantage.

(Pereira et al., 2023) conducted a study on the application of AI in enhancing innovation and differentiation strategies in retail businesses. The research explored how AI enables retail companies to personalize marketing efforts, optimize inventory management, and predict consumer trends. By analyzing data from several retail firms, the study found that AI played a critical role in creating new product lines and services, leading to increased customer satisfaction and a distinct market position. The study emphasized that companies leveraging AI for innovation can build a sustainable competitive advantage by offering unique value propositions to their customers.

(Liao, & Suprapto, 2023) focused on investigating the relationship between entrepreneurial orientation (EO), dynamic capabilities (DC), and competitive advantages (CA). It identified the direct and indirect impact of EO and DC on CA and university rankings. In addition, it verified the impact of CA on university rankings and studied the interactive effect between EO and DC on CA and university rankings. The research methodology relied on studying 240 higher education institutions (HEIs) from 13 countries in the East and Southeast Asia region, using data from the QS World University Rankings and the SciVal database. The data were collected in 2021, and the study focused on measuring entrepreneurial behaviors (EB) and dynamic capabilities (DC) and their impact on competitive advantages (CA) and university performance. Regression analysis methods were used to test the hypotheses. The study concluded that entrepreneurial behaviors have a significant impact on dynamic capabilities, competitive advantages, and university rankings, and that dynamic capabilities act as a partial mediator in the relationship between entrepreneurial behaviors and competitive advantages. It also concluded that university leaders should promote entrepreneurial behaviors and dynamic capabilities to ensure improved performance and ranking.

(Nguyen et al., 2024) focused on the role of Artificial Intelligence in higher education, specifically how AI can be integrated into university management and teaching to enhance competitive advantage. The study explored the use of AI in streamlining administrative functions, personalizing student learning, and improving academic research outputs. The researchers found that universities adopting AI-based tools for student management, course recommendations, and research assistance not only enhanced operational efficiency but also attracted more students and faculty by offering an innovative educational experience. The study concluded that AI serves as a strategic asset for universities aiming to improve their rankings and sustain their competitive advantage in the global education market.

(Sahrul et al., 2024) aimed to investigate the impact of differentiation strategies, market-based approaches, and AI marketing on sustainable competitive advantage, with school image as a moderating mediator variable through school culture in private vocational schools in Balikpapan. This research was designed as research using a quantitative descriptive approach. The study concluded that differentiation strategies significantly support sustainable competitive advantage for private vocational schools. Schools that successfully implement distinctive offerings or features are better able to differentiate themselves in the market, which enhances their overall competitiveness.

(Liu and Zhang, 2024) investigated the relationship between AI, digital transformation, and competitive advantage in the banking sector. The study analyzed how AI applications in risk management, fraud detection, and customer service have helped banks maintain a competitive edge. Through a mixed-methods approach, including surveys and case studies from leading financial institutions, the research demonstrated that AI-driven innovations contributed to faster decision-making, cost reduction, and improved customer satisfaction. The study emphasized that banks that leverage AI technologies in their operations enjoy significant advantages in terms of speed, reliability, and customer loyalty, positioning them ahead of their competitors.

Critical Analysis of Previous Studies

The studies addressing artificial intelligence (AI), performance enhancement, and competitive advantage represent a pivotal shift in understanding the practical applications of this technology across various sectors. (**Chatterjee and Kar, 2018**) highlighted the positive impact of AI in enhancing business operations and fostering innovation, while also pointing out social challenges such as privacy and ethics. Their study underscored practical examples demonstrating AI's ability to reduce costs and increase operational efficiency, aligning with the findings of (**Jin et al., 2020**) on improving big data analytics.

In the academic context, (**Zhang et al., 2019**) emphasized the positive effects of AI on educational efficiency by optimizing resource management and providing personalized academic support, which ultimately improves overall academic performance. Similarly, (**Smith et al., 2019**) demonstrated how computer vision applications could enhance operational efficiency by minimizing human errors in universities, supporting the notion that technology is a critical tool for improving administrative and educational processes.

Regarding competitive strategies, (**Yang, 2021**) highlighted AI's vital role in supporting cost leadership strategies by improving operational efficiency and reducing waste. At the same time, (**Kim et al., 2022**) focused on differentiation strategies by leveraging AI to develop customized products and services that better meet customer needs. These results are consistent with (**Kaur and Singh's, 2021**) findings, which confirmed that AI utilization in industrial processes enhances efficiency, reduces costs, and boosts productivity.

In service industries, (**Hussain et al., 2021**) demonstrated how technologies such as natural language processing and machine learning improve healthcare quality by enhancing diagnostic accuracy and reducing costs. Meanwhile, (**Ali et al., 2022**)

explored the impact of AI-powered customer relationship management systems on increasing customer loyalty and improving service experiences, underscoring the importance of these technologies in enhancing competitive advantage across sectors.

Despite the diversity of these studies and their applications, many share a common emphasis on the ethical and societal challenges of implementing AI. (**Dwivedi et al., 2021**) underscored the need for interdisciplinary collaboration to address these challenges and maximize the benefits of AI.

In higher education, (**Nguyen et al., 2024**) highlighted AI's role in improving university management and enhancing the educational experience, leading to greater attraction for students and faculty. Similarly, (**Sahrul et al., 2024**) emphasized AI-supported differentiation strategies in private schools, strengthening sustainable competitive advantages.

Moreover, (**Liu and Zhang, 2024**) reviewed AI applications in the banking sector, illustrating how these technologies enhanced decision-making efficiency and reduced costs, thereby providing banks with a strong competitive edge.

These studies collectively illustrate that AI serves as a crucial tool for enhancing performance and achieving competitive advantage. However, they also stress the need for carefully planned strategies to address associated challenges and ensure sustainability and innovation.

6- The Gap

Despite significant developments in higher education management and global trends toward enhancing the **competitive advantage** of educational institutions, the application of this concept in Egyptian universities remains limited and lacks the structured approach needed to align with the rapid changes in the global job market. Recent studies show that universities in many countries are improving their competitiveness by focusing on key areas such as academic quality, scientific research, continuous development, global reputation, and adhering to prestigious rankings like QS and Times Higher Education, which have become crucial indicators for attracting students and international partners.

However, in the Egyptian context, there are still no clear, comprehensive frameworks aimed at strengthening the competitive advantage of Egyptian universities in a way that ensures an overall improvement in the quality of higher education outcomes, broadens the scope of scientific research, and achieves financial sustainability by optimizing resource management. Most studies have focused on **analyzing the current state of higher education** without sufficient emphasis on implementing integrated strategies to achieve sustainable competitive advantages that align with global standards.

Therefore, a clear research gap exists in developing a proposed framework to enhance the competitive advantage of Egyptian universities by adopting integrated strategies that focus on innovation, academic excellence, improving education quality, and increasing student satisfaction. Addressing this gap can provide a knowledge base for further applied research that contributes to enhancing the performance of Egyptian universities and positioning them as leading institutions regionally and globally.

7-Research Methodology

7/1- Research Approach

The researcher presented the methodology of the field study through the variables of the study and its dimensions, identifying the type and sources of data, identifying the study community and sample, data collection methods, and the statistical methods used that were relied upon in analyzing the field study data. The nature of the study requires relying on the appropriate method that achieves its objectives, so the researcher resorted to using the descriptive analytical method that is concerned with studying the phenomenon and analyzing it to reach accurate conclusions about the phenomenon and its interpretation, and depends on studying the problem as in practical reality, and is concerned with describing it accurately and analyzing it quantitatively and qualitatively, and linking information about the problem and interpreting and analyzing it in a way that leads to accurate conclusions about the problem and ways to treat it, and the researcher reviews the methodology of the study by clarifying the variables of the study and its dimensions, identifying the type and sources of data and the study sample, data collection methods, and statistical analysis methods that were relied upon in analyzing the field study data.

The researcher can display the study dimensions for the variable (Competitive Advantage), which includes four dimensions as follows: (cost leadership, operational efficiency, differentiation, innovation).

7/2- Data collection tools

To achieve the study objectives, two main sources of data were relied upon, namely:

Secondary data: The secondary data that was used in this study to achieve its objectives were identified in light of the study problem and the variables associated with it. The researcher relied on the following sources to collect secondary data: Arab and foreign references, published and unpublished research related to the subject of the study. Various Arab and foreign periodicals, bulletins, reports and statistics. Annual reports issued by the Egyptian universities under study and application.

Primary data: The researcher developed a field application to address the analytical aspects and survey opinions on the subject of the study through an opinion poll directed to a sample of faculty members at Egyptian universities. The data resulting from the survey were collected, classified and tabulated to facilitate their analysis and interpretation to extract results and recommendations. The obtained data were analyzed using appropriate statistical methods to test the validity of the study hypotheses, in addition to conducting some personal interviews.

7/3-. Study community and sample:

The researcher relied on the survey method as a tool for collecting data. The data collection tool is represented by the survey list directed to faculty members at Egyptian universities. The survey includes the following:

- The first section: relates to the variable "Competitive Advantage" and its dimensions are: (cost leadership, operational efficiency, Differentiation, innovation), and the total number of phrases of the variable as a whole is (20) phrases.
- The second section: relates to the variable "practices for applying competitive

advantage in Egyptian Universities", and the total number of phrases of the variable as a whole is (5) phrases.

The researcher also conducted some personal interviews when collecting the survey from faculty members at Egyptian universities, in order to know the extent of the application of competitive advantage in Egyptian universities.

(a) Study community:

The study community consists of all faculty members in private universities in Egypt, numbering (14414), who work in (31) private universities (October for Modern Sciences and Arts, Misr International, Misr for Science and Technology, October 6, American, Al-Ahram Canadian, British, French, Pharos, Egyptian Russian, Modern for Technology and Information, Sinai, German, Future, Nahda, Delta for Science and Technology, Heliopolis, Badr, Derayah, New Giza, Horus, Egyptian Chinese, Egyptian Japanese, Zewail, Sphinx, Merit, Al-Salam, New Salhia, Al-Hayat, Badr Assiut, May), and (6) private universities in Egypt were selected for study and application, namely: "October 6 University, Sinai University, Badr University, Future University, New Giza University, Heliopolis University". These six universities were selected for their distinguished scientific and academic reasons. October 6 University is one of the oldest and largest private universities in Egypt, with a strong reputation and advanced infrastructure. Sinai University is distinguished by its strategic location in the Sinai Peninsula and its specialized programs in medical and engineering sciences, which contribute to the development of the region. Badr University is considered one of the emerging universities that focuses on innovation and scientific research and provides modern facilities for students. Future University is known for its distinguished academic programs and has a presence in international rankings thanks to the quality of education and international cooperation. New Giza University offers study programs in partnership with international universities and supports scientific research and innovation in a unique location. As for Heliopolis University, it focuses on sustainable development and provides specialized educational programs in this field, making it a pioneer in supporting environmental sustainability in Egypt. The selection of these universities reflects the diversity and balance between academic quality, scientific research, and innovation in higher education in Egypt.

The researcher conducted a field study on them, and the following table shows the components of the study community as follows:

Table No. (1)
Study community vocabulary

	Universities \ Study community vocabulary	Faculty members
1	6th October University	968
2	Sinai University	561
3	Badr University	555
4	Future university	446
5	New Giza University	238
6	Heliopolis University	203
	Total	2971

Source: Prepared by the researcher based on the universities under study and application

It is clear from the previous table that the study community in the private universities in Egypt, the subject of the study and application, amounted to (2971) individuals.

(b) Study sample:

In light of the study community vocabulary table, the researcher relied on a random sample of faculty members at the private universities under study and application, numbering (2971) individuals. By examining the tables to determine the sample size for the study community (2000), it became clear that the sample size was (322) individuals. As for examining the study community (3000), it became clear that the sample size was (346) individuals. For considerations of the study sample representing the study community, the researcher relied on the sample size (346) individuals. The following table shows the distribution of the study sample size among the private universities in Egypt under study and application as follows:

Table No. (2)
Distribution of the sample size of faculty members in private Universities in Egypt under study and application

	Universities / Study community and sample	Study community	The study sample	
1	6th October University	968	364× 968 /2971= 112	32.4%
2	Sinai University	561	346×561/2971= 65	18.8%
3	Badr University	555	346×555/2971= 65	18.8%
4	Future university	446	346×446/2971= 52	15%
5	New Giza University	238	346×238/2971= 28	8.1%
6	Heliopolis University	203	346×203/2971= 24	6.9%
	Total	2971	346	100%

Source: Prepared by the researcher based on the universities under study.

It is clear from the previous table that the study sample consisted of (346) faculty members in the private universities in Egypt, the subject of the study and application, in order to identify their opinions and suggestions regarding the

dimensions of the variables under study. The total number of correct responses from faculty members reached (346) items, at a rate of (100%).

(c) Description of the study sample: The researcher described the study sample through the demographic variables represented by: "academic degree, gender, number of years of experience, age" in light of the category, number and percentage. The following table shows a description of the demographic variables of the study sample as follows:

Table No. (3)
Description of demographic variables of the study sample

Demographic variables	Category	Number	percentage
Degree	Teaching Assistant	16	4.6%
	Assistant Lecturer	70	20.2%
	Lecturer	135	39.1%
	Assistant Professor	95	27.4%
	Professor	30	8.7%
	Total	346	100%
Type	Males	154	44.5%
	Females	192	55.5%
	Total	346	100%
Years of Experience	Less than 5 years of experience	19	5.5%
	6:10 years of experience	64	18.5%
	11:15 years of experience	129	37.3%
	16:20 years of experience	98	28.3%
	20+ years of experience	36	10.4%
	Total	346	100%
Age	Less than 30 years	94	27.2%
	31:40 years	133	38.4%
	41:50 years	81	23.4%
	Over 50 years	38	11%
	Total	346	100%

Source: Prepared by the researcher based on the results of the statistical analysis

The previous table shows that the total study sample amounted to (346) individuals, and with regard to the academic degree variable, there were (16) individuals in the teaching assistant's category, (4.6%), (70) individuals in the assistant lecturer category, (20.2%), (135) individuals in the instructor category, (39.1%), (95) individuals in the assistant professor category, (27.4%), and (30)

individuals in the professor category, (8.7%). With regard to the gender variable, the number of males was (154) individuals, (44.5%), and the number of females was (192) individuals, (55.5%). With regard to the number of years of experience, the number of members with less than 5 years of experience was (19) individuals, (5.5%), and the category of members with 6:10 years of experience was (64) individuals, (18.5%), and the category of members with 11:15 years of experience was (129) individuals, (13.5%). (37.3%), and the category of members from 16 to 20 years of experience is (98) individuals at a rate of (28.3%), and the category of members more than 20 years of experience is (36) individuals at a rate of (10.4%), and with regard to the age variable, there are (94) individuals in the age group less than 30 years at a rate of (27.2%), and the age group from 31 to 40 years is (133) individuals at a rate of (38.4%), and the age group from 41 to 50 years is (81) individuals at a rate of (23.4%), and the age group more than 50 years is (38) individuals at a rate of (11%).

7/4-Validity & Reliability

Validity:

The correlation coefficient of the score of each item with the total sum of the items of each dimension was calculated. The following table shows the values of the correlation coefficients between the score of each item and the total score of the dimension to which it belongs as follows:

Table No. (4)

Correlation coefficients between the score of each item and the total score of the dimension to which it belongs

Cost Leadership		Operational Efficiency		Differentiation		Innovation	
	Correlation coefficient		Correlation coefficient		Correlation coefficient		Correlation coefficient
1	0.887**	6	0.803**	11	**0.798	16	** 0.443
2	0.818**	7	0.739**	12	**0.773	17	**0.792
3	0.854**	8	0.472**	13	**0.712	18	**0.799
4	0.840**	9	0.750**	14	**0.696	19	**0.764
5	0.497**	10	0.792**	15	**0.841	20	**0.714

Source: Prepared by the researcher based on the results of the statistical analysis
**Statistically significant at the (0.01) level.

The following table shows that all correlation coefficient values are positive and statistically significant at a significance level of (0.01), where the values of the correlation coefficients of the degree of each item with the total degree of the cost leadership dimension ranged between (0.497, 0.887), and the values of the correlation coefficients of the degree of each item with the total degree of the operational efficiency dimension ranged between (0.472, 0.803), and the values of the correlation coefficients of the degree of each item with the total degree of the differentiation dimension ranged between (0.696, 0.841), and the values of the correlation coefficients of the degree of each item with the total degree of the innovation

dimension ranged between (0.443, 0.799), and the values of the correlation coefficients of the degree of each item with the total degree of Egyptian universities ranged between (0.568, 0.781), and all of these values are statistically acceptable, and therefore no item was deleted from these items, and this indicates the existence of a good relationship between the degree of each item and the total degree of the dimension to which the item belongs.

Reliability:

To estimate the reliability of the survey, the Cronbach's alpha and split-half methods were used. The following table shows the values of the Cronbach's alpha and split-half reliability coefficients for each dimension of the survey as follows:

Table No. (5)

Values of Cronbach's alpha reliability coefficients and the split-half for each dimension of the survey

	Competitive Advantage		Half-split stability coefficients	
	Dimensions	Cronbach's alpha reliability coefficients	Getman equation	Spearman Brown
1	Cost Leadership	0.835	0.740	0.742
2	Operational Efficiency	0.730	0.750	0.753
3	Differentiation	0.819	0.872	0.874
4	Innovation	0.722	0.721	0.724

Source: Prepared by the researcher based on the results of the statistical analysis

The previous table shows that the values of the Cronbach's alpha stability coefficients for the dimensions of the study variables came in the range (0.722, 0.894), and the values of the split-half stability coefficients before correction according to the Getman equation came in the range (0.721, 0.878), and after correction according to the Spearman-Brown equation came in the range (0.724, 0.881), and all of these are statistically high coefficient values, which confirms the stability and validity of the use of the survey and its suitability for the purposes of the study.

7/5- Competitive Advantage measurement Model Test

Grounded in the theoretical framework, the Competitive Advantage measurement model (Shown in Figure [1]) was conceptualized as a hierarchical structure with 'Competitive Advantage' serving as a second-order factor. This second-order factor encompasses four distinct first-order latent dimensions: Cost Leadership, Operational Efficiency, Differentiation, and Innovation.

| Variable	Dimension	Statements	Reference
Competitive Advantage	**Cost Leadership**	- The cost of services provided to university visitors is competitive compared to other universities.	(Klemenčič, & Brennan, 2020). "Competitive Advantage in Higher Education."

Variable	Dimension	Statements	Reference
		- There is no conflict between the quality of products and their cost.	(Douglas, et al., 2021). "Operational Efficiency in Higher Education."
		- The university provides the best products at the lowest possible cost.	(Smith, & Zhou, 2022). "Strategic Alliances in Higher Education."
	Operational Efficiency	- The university administration applies appropriate operational efficiency in services provided to university visitors.	(Douglas, et al., 2021). "Operational Efficiency in Higher Education."
		- The university achieves appropriate operational efficiency in academic, research, and administrative outputs.	(Smith, & Zhou, 2022). "Strategic Alliances in Higher Education."
		- Improving operational efficiency is a priority for the university.	(Klemenčič, & Brennan, 2020). "Competitive Advantage in Higher Education."
	Differentiation	- The university has a strong reputation for its unique offering of specialized academic programs.	Douglas, et al., 2021). "Operational Efficiency in Higher Education."
		- The university provides modern educational technology that distinguishes it from other educational institutions.	(Smith, & Zhou, 2022). "Strategic Alliances in Higher Education."
		- The university has the ability to attract distinguished faculty who add unique value to the educational programs.	(Pfeffer, & Salancik, 2023). The External Control of Organizations: A Resource Dependence Perspective. Stanford Business Books.

Variable	Dimension	Statements	Reference
	Innovation	- The university applies continuous improvements in scientific research.	(Nonaka, & Takeuchi, 2023). The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press.
		- The university provides a research environment that encourages innovation and the use of modern technologies such as artificial intelligence.	(Chesbrough, 2023). Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press.
		- The university promotes collaboration between researchers, industry, and society to foster innovation in scientific research.	(Etzkowitz, & Leydesdorff, 2023). The Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix of University-Industry Relations.

Source: Prepared by the researcher

Figure [1]: Initial Competitive Advantage measurement model
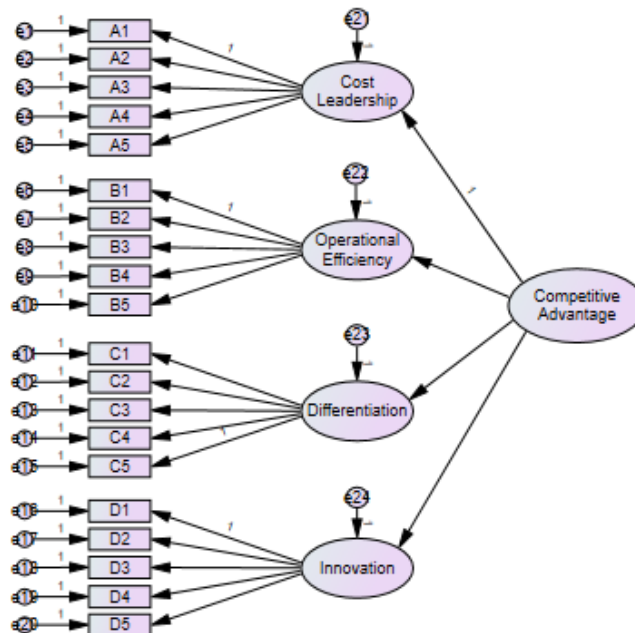
Source: Prepared by the researcher

Rigorous evaluation of the model was undertaken through Confirmatory Factor Analysis (CFA) utilizing AMOS v26. Initial CFA results indicated suboptimal model

fit, with indices (CMIN/DF = 7.000, GFI = 0.761, NFI = 0.747, RFI = 0.710, IFI = 0.775, TLI = 0.741, CFI = 0.773, and RMSEA = .132) falling below the established thresholds for acceptable fit as outlined by Hu and Bentler (1999) and Browne and Cudeck (1992).

To address this, iterative model refinement procedures were implemented to achieve satisfactory fit. Two distinct refinement approaches were employed: one involving multiple refinement cycles, and another utilizing a single iterative refinement process. The model demonstrating superior fit indices was ultimately selected.

7/5/1- multiple refinement cycles approach

Multiple refinement cycles for the Competitive Advantage measurement model involved a three-step process:

- ❖ Examination of items loadings: Assessing the strength of the relationship between observed variables and their respective latent factors.
- ❖ Analysis of modification indices: Identifying potential modifications to the model structure suggested by the software to improve model fit.
- ❖ Inspection of standardized residual covariances: Investigating unexpected relationships between variables that were not accounted for in the initial model specification.

7/5/1/1- Examination of items loadings

A rigorous examination of the item loadings (Table [6]) revealed that several items exhibited loadings below the recommended threshold of 0.5. Specifically, item A5 within the Cost Leadership dimension (loading = 0.265), item B3 within the Operational Efficiency dimension (loading = -0.254), and item D1 within the Innovation dimension (loading = 0.105) demonstrated inadequate factor loadings. Consequently, these items were excluded from the model.

Table [6]: Items loadings

Factor	Item	Loading	Item	Loading
Cost Leadership	A1	.887	A4	.785
	A2	.781	A5	.265
	A3	.885		
Operational Efficiency	B1	.657	B4	.842
	B2	.697	B5	.757
	B3	-.254		
Differentiation	C1	.733	C4	.630
	C2	.716	C5	.799
	C3	.622		
Innovation	D1	.105	D4	.735
	D2	.706	D5	.769
	D3	.741		

Source: Prepared by the researcher based on the results of the statistical analysis

This exclusion resulted in changes to the initial fit indices (CMIN/DF = 7.000, GFI = 0.761, NFI = 0.747, RFI = 0.710, IFI = 0.775, TLI = 0.741, CFI = 0.773, and

RMSEA = 0.132). However, it is noteworthy that the exclusion of these items did not result in a significant improvement in the model fit, as evidenced by the subsequent fit indices: CMIN/DF = 8.658, GFI = 0.764, NFI = 0.772, RFI = 0.731, IFI = 0.793, TLI = 0.754, CFI = 0.792, and RMSEA = 0.149.

7/5/1/2- Analysis of modification indices

Following the removal of weakly loaded items in the preceding step, modification indices were consulted to address potential model misspecifications within the single-factor framework. Model modifications were implemented iteratively, aiming for a chi-square reduction of at least 20 units per modification.

Figure [2]: Competitive Advantage Model after addressing misspecifications within the single-factor framework
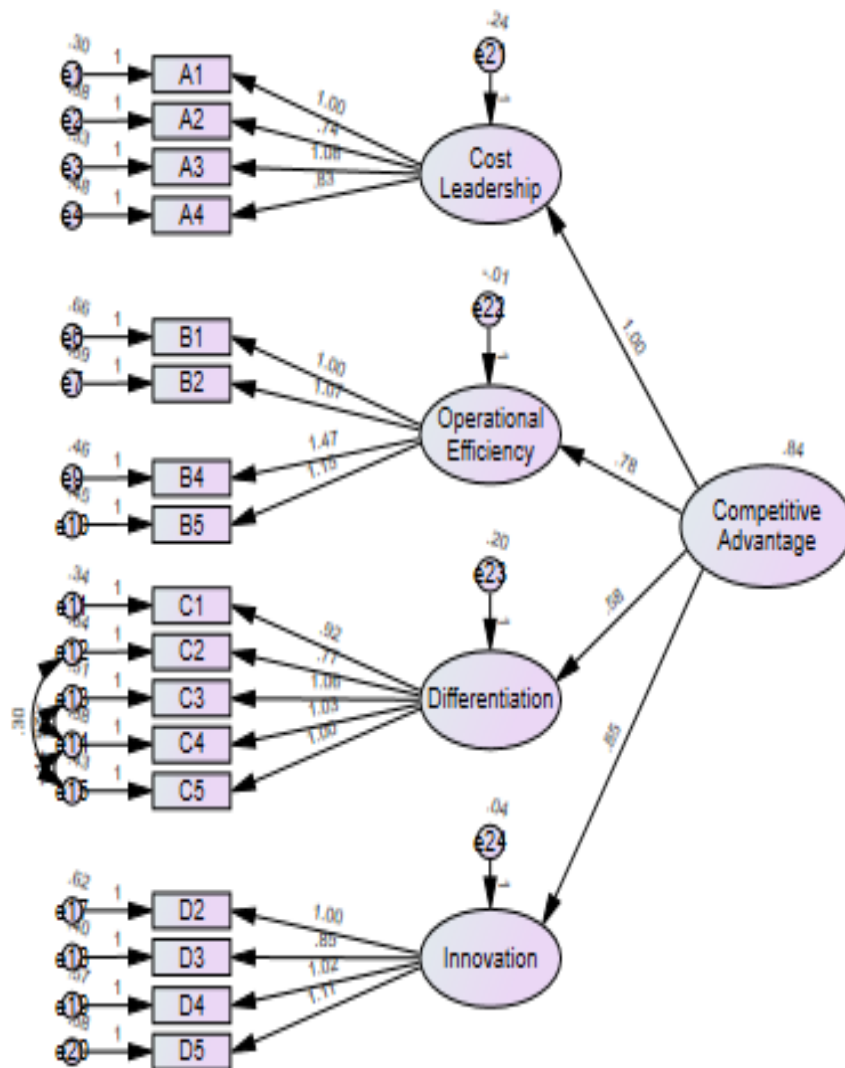
Source: Prepared by the researcher using AMOS

After three iterations guided by these indices (as depicted in Figure [2]), no further modifications were identified that could yield a chi-square reduction exceeding this threshold. Despite these efforts, the model fit indices remained unsatisfactory (CMIN/DF = 7.445, GFI = 0.791, NFI = 0.809, RFI = 0.768, IFI = 0.831, TLI = 0.793, CFI = 0.830, and RMSEA = 0.137). A summary of the three iterative improvement steps, including the associated changes in fit indices, is presented in Table [7].

Table [7]: Fit indices during addressing misspecifications within the single-factor framework

Refinement	Reduction	CMIN/DF	GFI	NFI	RFI	IFI	TLI	CFI	RMSE
		< 3	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	< 0.08
End of step 1		8.658	0.764	.772	.731	.793	.754	.792	0.149
+ e14--> <e15	23.151	8.357	.771	.782	.740	.803	.764	.802	.146
+ e12--> <e15	24.532	7.795	.784	.798	.757	.820	.782	.819	.140
+ e13--> <e14	29.102	7.445	.791	.809	.768	.831	.793	.830	.137

Notes: CMIN/DF = discrepancy divided by degree of freedom; GFI = Goodness of Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis coefficient; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation
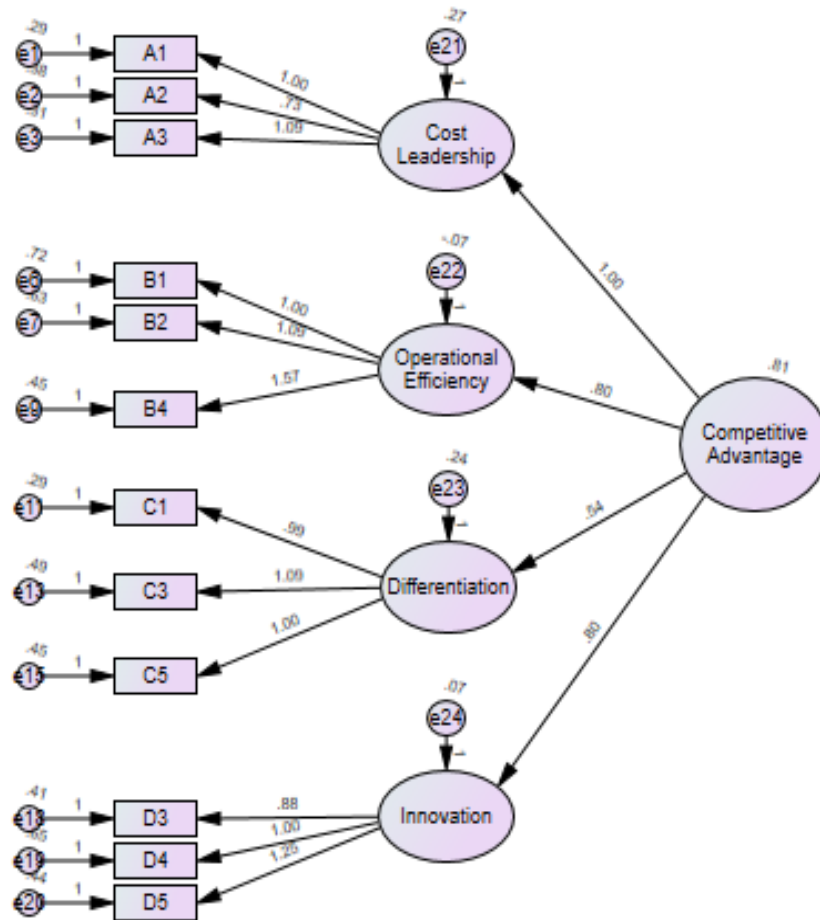
Source: Prepared by the researcher based on the results of the statistical analysis

7/5/1/3- Inspection of standardized residual covariances

Building upon the results of the previous step, which exhibited unsatisfactory fit indices (CMIN/DF = 7.445, GFI = 0.791, NFI = 0.809, RFI = 0.768, IFI = 0.831, TLI = 0.793, CFI = 0.830, and RMSEA = 0.137), the model refinement process continued.

Prior to commencing item deletion, a minimum of three items per factor was established as a criterion. Subsequently, items exhibiting standardized residual variances exceeding ±2 in relation to other items were iteratively removed. Standardized residual variances, derived by dividing each residual variance by its standard error estimate, are theoretically expected to conform to a standard normal distribution within sufficiently large samples under a suitably specified model. Consequently, a majority of standardized residual variances are anticipated to fall within an absolute value of 2.

The deletion process for the dimensions of Operational Efficiency, Differentiation, and Innovation ceased following the removal of items D2, C4, C2, and B5, resulting in three remaining items per dimension. In contrast, the Cost Leadership dimension permitted the deletion of only four items from the preceding stage. As no standardized residual variances exceeding ±2 was observed among these four remaining items, the item with the highest standardized residual variance in relation to other items (A4) was selected for removal.

Figure [3]: Competitive Advantage Model at the end of inspection of standardized residual covariances

Source: Prepared by the researcher using AMOS

This deletion step yielded acceptable levels for the GFI, IFI, and CFI fit indices. However, the CMIN/DF, NFI, RFI, TLI, and RMSEA indices remained unsatisfactory. A summary of the improvements achieved during this step, including changes in fit indices, is presented in Table [8]

Table [8]: Fit indices during inspection of standardized residual covariances

Stage	Elimination	with	S.R.C	CMIN/DF < 3	GFI ≥ 0.9	NFI ≥ 0.9	RFI ≥ 0.9	IFI ≥ 0.9	TLI ≥ 0.9	CFI ≥ 0.9	RMSE < 0.08
0	End of step 2			7.445	.791	.809	.768	.831	.793	.830	.137
1	Eliminate D2	C4	6.487	6.240	.831	.846	.810	.868	.835	.867	.123
		C1	2.365								
	+ C4	B5	2.092	5.542	.850	.869	.838	.890	.864	.890	.115
		A3	2.299								
	+ C2	A3	2.423	5.855	.854	.871	.839	.890	.862	.890	.119
		A2	2.502								
		A1	2.299								
	+ B5	D4	2.601	5.169	.890	.893	.863	.912	.887	.912	.110
2	+ A4	D3	1.483	5.301	.901	.899	.866	.916	.889	.916	.112
		B2	1.835								
		B1	1.253								

Notes: CMIN/DF = discrepancy divided by degree of freedom; GFI = Goodness of Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis coefficient; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation

Source: Prepared by the researcher based on the results of the statistical analysis

This step represents the culmination of multiple refinement cycles for the competitive advantage measurement model, resulting in a final set of fit indices: CMIN/DF = 5.301, GFI = 0.901, NFI = 0.899, RFI = 0.866, IFI = 0.916, TLI = 0.906, CFI = 0.916, and RMSEA = 0.112.

7/5/2- Single iterative refinement process approach

In contrast to the multiple-step approach, which employed a combination of strategies such as evaluating items loadings, standardized residual covariances, for item deletion, alongside the use of modification indices to address within-factor item covariances, the single iterative refinement process approach exclusively employed sequential item deletion guided solely by modification indices. Specifically, at each iteration, the item exhibiting the largest number of covariances and discrepancy with other items, as indicated by the modification indices, was systematically deleted. This iterative process continued until acceptable model fit indices were achieved. A summary of the sequential item deletion refinement for the competitive advantage measurement model, guided by modification indices and including the associated changes in fit indices, is presented in Table [9].

Table [9]: Fit indices during sequential item deletion refinement guided by modification indices

| Refinement	CMIN/DF	GFI	NFI	RFI	IFI	TLI	CFI	RMSE
	< 3	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	≥ 0.9	< 0.08
NO Elimination	7.000	.761	.747	.710	.775	.741	.773	.132
Eliminating C4	5.798	.797	.793	.761	.823	.794	.822	.118
+ D2	5.353	.814	.815	.784	.844	.817	.843	.112
+ D4	5.043	.835	.833	.802	.862	.835	.861	.108
+ B3	5.347	.840	.843	.812	.868	.841	.868	.112
+ A3	5.366	.849	.841	.806	.867	.837	.866	.112
+ C2	4.623	.881	.871	.839	.896	.869	.895	.102
+ B4	3.693	.917	.896	.867	.922	.899	.921	.088
+ A1	2.438	.946	.929	.907	.957	.943	.957	.065

Notes: CMIN/DF = discrepancy divided by degree of freedom; GFI = Goodness of Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index; IFI = Incremental Fit Index; TLI = Tucker-Lewis coefficient; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation

Source: Prepared by the researcher based on the results of the statistical analysis

This approach adheres to the same constraint as the preceding multi-step approach: a minimum of three measurement elements must be retained for each dimension. The item deletion process is terminated upon reaching three measurement

elements per dimension, irrespective of whether acceptable model fit indices have been attained.

Figure [4]: Competitive Advantage Model after sequential item deletion refinement guided by modification indices
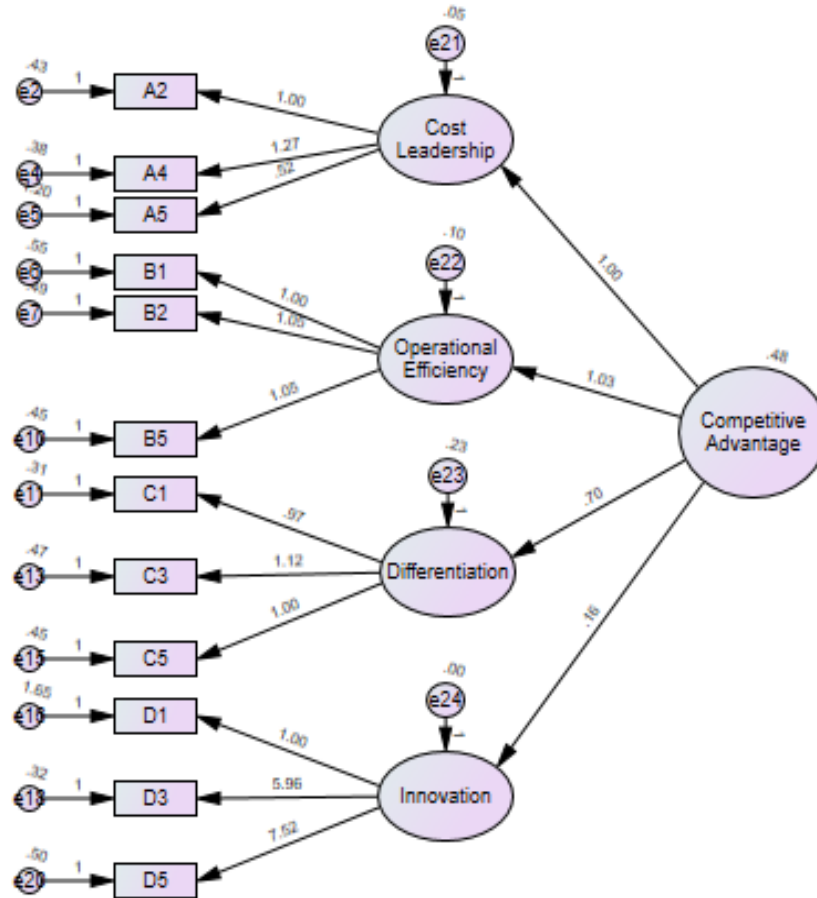
Source: Prepared by the researcher using AMOS

Based on the iterative process of item deletion guided by modification indices, the model achieved acceptable levels of fit indices (CMIN/DF = 2.438, GFI = 0.946, NFI = 0.929, RFI = 0.907, IFI = 0.957, TLI = 0.943, CFI = 0.957, and RMSEA = 0.065). while simultaneously ensuring each dimension of the model comprised three items. This process concluded as depicted in Figure [4].

7/5/3- Representation of the Competitive Advantage measurement model

The Competitive Advantage measurement model resulting from the multi-step optimization cycle exhibited suboptimal model fit, as evidenced by unacceptable values for critical indices such as CMIN/DF = 5.301, RFI = 0.866, NFI = 0.899, and RMSEA = 0.112. In contrast, the model refined through an iterative elimination process guided by modification indices (Shown in Figure [4]), demonstrated acceptable fit (CMIN/DF = 2.438, GFI = 0.946, NFI = 0.929, RFI = 0.907, IFI = 0.957, TLI = 0.943, CFI = 0.957, and RMSEA = 0.065). Consequently, the latter model was selected as the final representation of the Competitive Advantage measurement model.

Final AI Measurement Items of
Dimensions of Artificial Intelligence

Dimension	Practice	(1) Not practiced	(2) Practiced to a minimal degree	(3) Practiced to an acceptable degree	(4) Practiced to a good degree	(5) Practiced to the highest degree
1.Cost Leadership	The cost of services provided to university visitors is competitive compared to other universities.					
	There is no conflict between the quality of products and their cost.					
	The university provides the best products at the lowest possible cost.					
2. Operational Efficiency	The university administration applies appropriate operational efficiency in services provided to university visitors.					
	The university achieves appropriate operational efficiency in academic, research, and administrative outputs.					
	Improving operational efficiency is a priority for the university.					
3.Differentiation	The university has a strong reputation for its unique offering of specialized academic programs.					
	The university provides modern educational technology that distinguishes it from other educational institutions.					
	The university has the ability to attract distinguished faculty who add unique value to the educational programs.					
4. Innovation	The university applies continuous improvements in scientific research.					
	The university provides a research environment that encourages innovation and the use of modern technologies such as artificial intelligence.					
	The university promotes collaboration between researchers, industry, and society to foster innovation in scientific research.					

Source: Prepared by the researcher

8- Testing Hypotheses

H1: "*The Model expressing that using competitive advantage in Egyptian universities is significant.*"

The selected model demonstrated acceptable fit (CMIN/DF = 2.438, GFI = 0.946, NFI = 0.929, RFI = 0.907, IFI = 0.957, TLI = 0.943, CFI = 0.957, and RMSEA = 0.065).

To verify the validity of this hypothesis, Pearson's correlation coefficient was calculated between the dimensions of competitive advantage in Egyptian universities. The following table shows the matrix of correlation coefficients between the dimensions of competitive advantage in Egyptian universities as follows:

Table No. (10)

Matrix of correlation coefficients between the dimensions of Competitive Advantage in Egyptian universities.

Dimensions	Cost Leadership	Operational efficiency	Differentiation	Innovation
Cost Leadership	1.00	0.669**	0.599**	0.688**
Operational Efficiency	0.669**	1.00	0.545**	0.665**
Differentiation	0.599**	0.545**	1.00	0.618**
Innovation	0.688**	0.665**	0.618**	1.00

Source: Prepared by the researcher based on the results of the statistical analysis
**Statistically significant at the (0.01) level.

The previous table shows the following:

The correlation coefficients presented in the matrix indicate statistically significant relationships (at the 0.01 level) between the dimensions of Competitive Advantage in Egyptian universities. Specifically:

- Cost Leadership shows a strong positive correlation with Innovation (0.688) and a moderate correlation with Differentiation (0.599) and Operational Efficiency (0.669).
- Operational Efficiency has a strong correlation with Innovation (0.665) and a moderate correlation with Differentiation (0.545).
- Differentiation exhibits a significant correlation with Innovation (0.618).

9- Discussion

9/1-Overview of Results

This section discusses the results reached through analyzing the impact of applying the dimensions of competitive advantage in Egyptian universities.

- The results showed the validity of the hypothesis, which is: "*The Model expressing that using competitive advantage in Egyptian universities is significant.*"

Results of the statistical study

The field study reached the following results through answering the statistical

hypotheses:

- Cost Leadership shows a strong positive correlation with Innovation (0.688) and a moderate correlation with Differentiation (0.599) and Operational Efficiency (0.669).
- Operational Efficiency has a strong correlation with Innovation (0.665) and a moderate correlation with Differentiation (0.545).
- Differentiation exhibits a significant correlation with Innovation (0.618).
- The Competitive Advantage measurement model resulting from the multi-step optimization cycle exhibited suboptimal model fit, as evidenced by unacceptable values for critical indices such as CMIN/DF = 5.301, RFI = 0.866, NFI = 0.899, and RMSEA = 0.112. In contrast, the model refined through an iterative elimination process guided by modification indices (Shown in Figure [4]), demonstrated acceptable fit (CMIN/DF = 2.438, GFI = 0.946, NFI = 0.929, RFI = 0.907, IFI = 0.957, TLI = 0.943, CFI = 0.957, and RMSEA = 0.065). Consequently, the latter model was selected as the final representation of the Competitive Advantage measurement model.

General results of the study

- The results confirmed that universities that apply the dimensions of competitive advantage, including cost leadership, operational efficiency, innovation, achieve outstanding academic performance, which is reflected in improving the quality of academic programs and increasing student and faculty satisfaction.
- The study proved that universities' reliance on advanced technologies in education and student affairs management contributes to enhancing their ability to compete locally and internationally.

9/2-Comparison of Results

The study is similar to Yang (2021) in focusing on the dimensions of competitive advantage in educational institutions. Your study addressed the competitive advantage of Egyptian universities through enhancing institutional performance, while Yang (2021) focused on how to use AI to enhance cost leadership strategy and increase operational efficiency. In both studies, AI is exploited to improve institutional performance and enhance competitive advantage, but with differences in AI applications between universities and companies.

The study is similar in its focus on the relationship between competitive advantage and institutional performance, as in the studies of Zhang et al. (2019) and Yang (2021), where the focus was on the impact of artificial intelligence in improving operational efficiency and innovation in educational institutions. Your study is similar in that it focuses on the application of artificial intelligence dimensions to improve competitive advantage in Egyptian universities, as the statistical results show a significant impact of AI dimensions such as cost leadership, differentiation, and innovation on enhancing competitive advantage.

The study differs from previous studies in its focus on competitive advantage in the education sector: while studies such as Zhang et al. (2019) and Liao & Suprapto (2023) have explored the impact of AI on operational efficiency and management in universities, your study focuses specifically on the application of AI in Egyptian

universities to enhance competitive advantage at the local level.

The study differs from previous studies in the specific variables studied: While studies such as Smith et al. (2019) have focused on AI applications for operational efficiency, particularly in the area of computer vision, your study broadens the scope by examining AI in education, student affairs, academic services, and university administration, adding broader dimensions related to institutional development and student engagement.

10-Summary

This proposal aims to develop a framework for the application of competitive advantage dimensions in Egyptian universities. The research investigates how various dimensions of competitive advantage, such as cost leadership, differentiation, operational efficiency, and innovation, can be integrated with artificial intelligence to improve the academic environment. By examining both theoretical and practical aspects, the study seeks to explore the potential of AI in transforming educational processes and driving institutional performance.

As these institutions evolve to integrate advanced technologies and modernize their educational approaches, the study explores how the application of artificial intelligence (AI) and its dimensions, such as machine learning, natural language processing, and robotics, can improve academic and administrative processes.

The primary objectives include identifying the relationship between competitive advantage dimensions, analyzing the role of AI in achieving these objectives, and proposing strategies for Egyptian universities to adopt and leverage these tools for continuous improvement. Through this framework, the study addresses gaps in the current academic environment and provides a comprehensive guide for universities to remain competitive in an increasingly digital and globalized world.

The research findings offer a comprehensive understanding of how AI, combined with key competitive advantage strategies, can contribute to the success and development of fourth-generation universities in Egypt."

The research methodology combines qualitative and quantitative approaches, including literature reviews, data collection from university administrators, faculty, and students, and statistical analysis to validate the proposed hypotheses. Ultimately, this study is intended to offer actionable insights that could lead to sustainable improvements in the quality of higher education in Egypt.

11- A Framework for Applying Competitive Advantage in Egyptian Universities

Dimension	Description	Indicators	Rules and Policies	Academic Impact	Outcomes
Cost Leadership	AI solutions to reduce administrative costs in processes such as student registration, fee payment, and resource management.	- Reduction in administrative processing time. - Lower operational costs in student services.	- Financial regulations governing fee processing and online payments. - Compliance with rules related to automation.	- Improved administrative efficiency while reducing operational costs. - Better allocation of resources to improve the student experience.	- More affordable services for students. - Increased financial efficiency.
Operational Efficiency	Improving administrative and academic process efficiency using AI technologies.	- Reduction in time spent processing student requests. - Increase in student productivity. - Reduction in resource waste.	- Policies ensuring fairness in resource allocation. - Rules ensuring accessibility for all students, including those with disabilities.	- Enhanced efficiency in academic and administrative processes contributing to improved student performance.	- Faster administrative processes. - Improved resource utilization.
Differentiation	Providing personalized learning experiences for students using AI, offering tailored educational paths based on performance and interests.	- Percentage of students using personalized learning paths. - Improvement in student performance.	- Rules ensuring equal access to personalized learning tools. - Intellectual property rights for AI-generated content.	- Enhanced personalized learning experience, improving student performance.	- Improved learning outcomes. - Unique educational experiences that attract more students.

Dimension	Description	Indicators	Rules and Policies	Academic Impact	Outcomes
Innovation	AI-supported platforms that encourage student innovation, such as AI labs and research projects tackling real-world challenges.	- Number of student-driven AI projects. - AI-focused grants and awards.	- Research ethics rules governing AI projects. - Policies protecting student intellectual property and collaboration with industry.	- Supporting student creativity through innovative AI tools. - Encouraging student-led research.	- Increased research output. - Enhanced university reputation in AI research.

Source: Prepared by the researcher.

This framework, developed by the researcher, aims to enhance the competitive advantage of Egyptian universities by integrating artificial intelligence (AI) technologies. It focuses on four key dimensions: cost leadership, operational efficiency, differentiation, and innovation. The framework addresses practical solutions to improve academic and administrative performance, strengthening universities' ability to compete effectively in the current educational landscape.

The framework emphasizes leveraging AI to reduce administrative costs, such as student registration, fee payment, and resource management, leading to financial efficiency and reduced operational burdens. It also prioritizes operational efficiency through the implementation of AI tools to streamline processes, reduce resource waste, and enhance productivity in both administrative and academic activities.

Moreover, the framework highlights the role of AI in fostering differentiation by providing personalized learning experiences tailored to students' needs and performance, thereby improving educational outcomes and attracting more students. Innovation is another vital aspect, where AI-supported platforms are utilized to encourage student-led research and innovation, facilitating real-world problem-solving and strengthening the university's reputation in AI-related research.

Each dimension is supported by measurable indicators, such as reductions in operational costs, improvements in student performance, and increases in research output. The framework also ensures compliance with ethical and regulatory policies, including fair access to technology, protection of intellectual property, and adherence to research ethics. This balance between cost efficiency and quality enhancement positions the framework as a comprehensive tool for the advancement of Egyptian universities.

12- Recommendations

Based on the results of this study, which aims to explore the role of competitive advantage in enhancing academic excellence in Egyptian universities, this research presents a set of practical recommendations aimed at improving academic and administrative performance within universities. The results showed that artificial intelligence is one of the modern tools that can effectively contribute to improving

the quality of education, managing academic and administrative resources, and enhancing the experience of students and faculty members.

Although the application of artificial intelligence faces some challenges related to the technical infrastructure and the acceptance of these technologies among faculty members and administrators, the results showed that there are great opportunities that can be invested in to improve academic performance and increase competitiveness among Egyptian universities at the local and international levels. In this context, it is important for Egyptian universities to adopt integrated strategies for applying artificial intelligence in a manner consistent with international quality standards in higher education.

The following recommendations are based on the results analyzed in this study, and aim to develop a practical plan to enhance the use of artificial intelligence in achieving academic excellence and enhancing competitive advantage in Egyptian universities. These recommendations aim to provide practical and scientific guidelines that can help accelerate and expand the scope of the use of artificial intelligence in various educational and administrative fields, and provide an educational environment that contributes to providing high-quality education.

An AMOS model was employed to analyze the dimensions of competitive advantage, which include [list the dimensions: such as cost leadership, operational Efficiency, Differentiation, and Innovation]. The model was applied to the collected data to evaluate the impact of these dimensions on academic practices in private universities.

The analysis resulted in the structural figure illustrated in Figure 4, which represents the relationship between Competitive Advantage dimensions and the extent of universities' practices in the academic process.

Figure [4]: Competitive Advantage Model after sequential item deletion refinement guided by modification indices
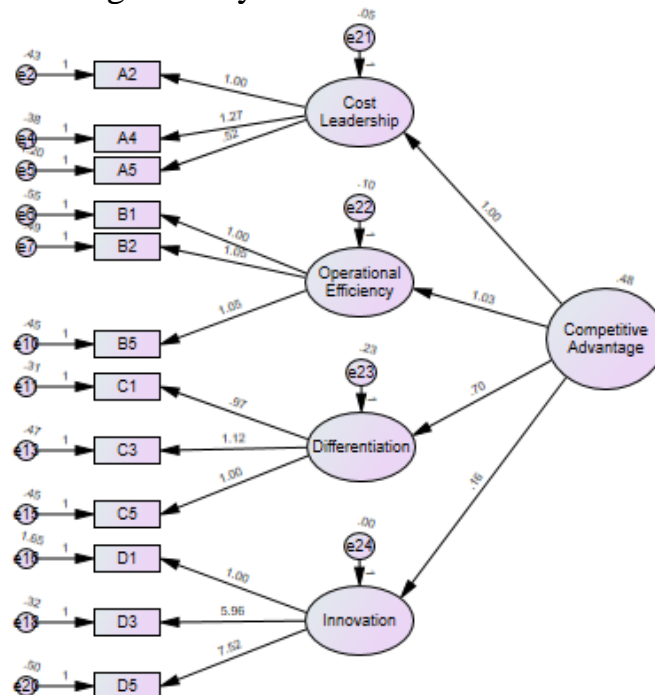
Source: Prepared by the researcher using AMOS

It is recommended that universities adopt this model as a self-assessment tool to evaluate their use of competitive advantage in academic operations. This model can assist universities in identifying strengths and weaknesses in their application of competitive advantage technologies, thereby improving education quality and enhancing operational efficiency.

The final Competitive Advantage measurement model, as refined through an iterative elimination process guided by modification indices (Figure [4]), provides a robust framework for evaluating the implementation of competitive advantage in academic practices. This model demonstrated acceptable fit indices, including (CMIN/DF = 2.438, GFI = 0.946, NFI = 0.929, RFI = 0.907, IFI = 0.957, TLI = 0.943, CFI = 0.957, and RMSEA = 0.065) making it a reliable tool for assessment.

It is recommended that universities adopt this proposed model as a foundational framework for enhancing competitive advantage. Specifically, the model can be applied to:

- Identify key dimensions of competitive advantage, such as cost leadership, differentiation, innovation, and operational efficiency, that require strategic focus and improvement.
- Assess institutional performance periodically by benchmarking against global standards and comparing progress over time to ensure alignment with competitive benchmarks.
- Develop actionable strategies based on the model's insights to address identified gaps, enabling universities to strengthen their position in the market while catering to diverse student and faculty needs.
- Promote sustainable practices by integrating innovation and operational efficiency into long-term institutional goals, ensuring the university's adaptability and resilience in a competitive educational landscape.

By leveraging this model, universities can ensure a systematic and data-driven approach to achieving and maintaining a competitive advantage in the dynamic environment of higher education.

Recommendations for applying self-assessment for applying Competitive Advantage in Egyptian universities

Practice	Incubator (1 point)	Initiative (3 points)	Integrated (9 points)	Score
Cost Leadership	Limited use of AI tools to reduce administrative costs in some university processes like registration, fee payment, and resource management.	Partial integration of AI to reduce administrative costs and improve academic and administrative processes.	Fully integrated AI across all university processes to achieve high efficiency and significantly reduce operational costs.	

Practice	Incubator (1 point)	Initiative (3 points)	Integrated (9 points)	Score
Operational Efficiency	Partial improvement in operational efficiency using AI tools in some administrative processes.	Significant improvement in operational efficiency through the use of AI in academic and administrative management.	High operational efficiency with complete AI integration in all university functions (education, administration, services).	
Differentiation	Partial use of AI to offer personalized solutions in some academic areas such as academic advising.	Larger scale use of personalized learning paths through AI, with measurable improvement in student performance.	Fully integrated AI offering personalized educational experiences, improving academic outcomes and differentiating the university.	
innovation in Research	Initial AI support for research projects, but limited in scope.	Use of AI to support research projects, encouraging innovation and creativity.	Comprehensive support for innovation in research using AI, IoT, and collaboration with industry, fostering student-driven research.	
Total score				

Source: **Prepared by the researcher.**

13-Future Research

Future research can expand on the current study by applying the proposed framework for competitive advantage to a wider variety of private universities, including institutions with different organizational structures or regional contexts within Egypt. This would allow for a deeper understanding of how the framework performs across diverse operational settings and cultural nuances.

Additionally, researchers could explore specific dimensions of competitive advantage, such as sustainability or digital transformation, to assess their unique contributions to enhancing competitiveness. Longitudinal studies can be conducted to measure the long-term effects of competitive advantage strategies on student satisfaction, financial stability, and institutional reputation.

Another promising avenue involves examining the integration of modern

technologies, including artificial intelligence, in fostering differentiation and innovation within private universities. This includes evaluating how advanced tools can streamline operations, improve resource allocation, and offer unique learning experiences.

Finally, future studies might focus on the interaction between government policies and institutional strategies in private universities, investigating how regulatory frameworks and incentives shape the competitive dynamics in higher education. These directions will provide further insights into optimizing competitive advantage frameworks tailored to the evolving needs of the academic sector.

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