

DEVELOPMENT OF STUDENT PERFORMANCE AND INSTITUTIONAL EFFECTIVENESS IN UAE HIGHER EDUCATION THROUGH DATA ANALYTICS METHODS

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ABSTRACT

This study aims to investigate how data analytics approaches affect the academic performance of students and the Effectiveness of the United Arab Emirates higher education institutions. It will examine how data-driven decision-making could help institutional outcomes, student learning results, and retention rates to be raised. The study also discusses the function of institutional Effectiveness as a mediator in the link between student academic performance and data analytics methodologies. A structured survey was used from a sample of 384 academics, managers, and decision-makers from UAE institutions to collect information for a quantitative investigation utilizing a correlational design. Using a Likert scale question of the survey, the data analytics approach, the data-driven decision-making capacity, institutional Effectiveness, and student academic performance were all assessed. SEM and AMOS were used to examine direct, indirect, and mediating effects and measure the correlations between the variables. The findings imply that data analytics approaches and data-driven decision-making assist pupils in raising their academic achievement via the institution's Effectiveness. The study clarifies the potential applications of data analytics to enhance student outcomes and institutional performance, therefore arming higher education institutions eager to maximize their data-driven operations with educated information.

Keywords: Data Analytics, Institutional Effectiveness, Student Academic Performance, Data-Driven Decision-Making, UAE Higher Education, Retention Rates, Structural Equation Modeling (SEM).

Introduction

Big data technology has lately attracted considerable interest in higher education due to its potential to completely transform teaching, learning, and institutional management. As a result of the exponential rise in data created in educational settings, teachers and administrators are increasingly using big data analytics to glean insightful information and improve several facets of education [1];[2].

The development of educational software, e-learning materials, classroom Internet use, and government student information databases has produced large educational data databases. Traditional educational institutions have long used information systems that include many intriguing data. The proliferation of Web-based learning platforms in recent years has resulted in the need to store enormous volumes of potential data in various formats and granularity levels from several sources[3]. A significant quantity of data on students is also gathered via emerging forms of educational settings, including Game learning, mobile/ubiquitous learning, virtual/enhanced environments, blended learning, etc.

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Although all of these technologies generate vast amounts of very instructive data, human analysis is not feasible. This kind of data offers a wealth of educational information that can be assessed and used to better understand how children learn; thus, it is also essential to have techniques for automatically evaluating it. The exponential rise of educational data and its conversion into fresh insights that might help administrators, instructors, and students is one of the largest problems facing educational institutions today[4].

Due to their shared interest in using educational data to advance learning science and education, various distinct groups have developed in the same subject[5]:

- Educational Data Mining (EDM) aims to provide techniques for investigating the distinctive kinds of data that originate in educational settings. Another way to describe it would be applying Data Mining (DM) methods to these specific educational datasets to address important educational issues[6].
- To better understand and improve learning and the contexts in which it takes place, learning analytics (LA) is the process of measuring, gathering, analyzing, and reporting data about students and their circumstances [7]. Three key elements are included. This term includes action, analysis, and data.
- Academic Analytics (AA) and Institutional Analytics (IA) focus on gathering, assessing, and visualizing academic program activities, such as courses, degree programs, research, student fee income, course assessment, resource allocation, and management, to provide institutional insight [8][9]. As a result, the political and economic problem is their main emphasis.
- It involves planning, creating, and using instructional analytics (TA) and evaluation activities and analyzing performance data and instructional activities[10]. From the educators' perspective, it focuses on the educational challenge.
- The terms "Data-Driven Decision Making in Education" (DDDM) and "Data-Driven Education" (DDE) describe the systematic gathering and evaluation of various instructional information to inform a variety of choices aimed at enhancing student and school performance[11].
- "Big Data in Education" (BDE) refers to using big data methods to data from educational environments. Volume, variety, value, and velocity may be used to summarize the basic meaning of BDE[12].
- Educational data science, or EDS, is the use of information gathered from educational contexts and settings to educational problems, according to [3]. Statistics, data analysis, machine learning, and similar methods may all be grouped under the general heading of data science.

The motivation for using big data analytics in higher education is to improve student outcomes, increase institutional Effectiveness, and adjust to the changing needs of the digital era. [13]. By using extensive data derived from student interactions, Institutions may better understand learning styles, identify at-risk pupils, and customize interventions to enhance student accomplishment by analyzing academic performance and administrative processes [14]. Additionally, there are opportunities for big data technology to improve the distribution of resources, streamline administrative procedures, and increase overall operational Effectiveness inside educational institutions [15].

Many studies have been conducted on student academic performance in higher education (HE) to address persistent issues such as academic underachievement, rising university dropout rates, and graduation delays[16]. Student performance is the degree to which short-term and long-term learning objectives are met[17]. Academicians, however, assess student achievement from various angles, including final grades, GPA, and possible career prospects [18]. The literature contains several computational attempts to enhance student performance in educational settings, particularly those motivated by data mining and learning analytics methodologies [19]. Nonetheless, there is still disagreement over how successful the current intelligent models and methodologies are.

However, there are drawbacks to using big data technology in higher education. There are a variety of challenges and issues, even with the potential advantages[20]; [16]. These include concerns about technology infrastructure, faculty preparedness and training, data governance and management, and data security and privacy [21]; [22]. Additionally, Responsible data and ethical considerations must be guaranteed in educational decision-making processes[23].

It is crucial to conduct a thorough study that explores the variables impacting the acceptance, deployment, and effect of these technologies in order to solve these problems and optimize higher

education data analytics methods[24];[25]. Recognizing the elements, challenges, and main goal of this research, which looks at data analytics methods in UAE higher education settings, is to identify opportunities associated with this phenomenon.

This research will look at student performance and institutional Effectiveness development by examining student learning outcomes and retention rates in UAE Higher Education Through data analytics methods, drawing on insights from the body of current literature and empirical research. This research aims to increase our knowledge of how data analytics approaches are incorporated into teaching, learning, and institutional administration in UAE higher education by looking at these elements from a multidisciplinary perspective.

In conclusion, big data technology has the potential to revolutionize higher education by improving student learning experiences, facilitating data-driven decision-making, and boosting institutional efficacy. However, to fully appreciate these benefits, Adopting and using data analytics techniques in educational settings presents several difficulties and complexities that must be resolved. [26]. This study uses evidence-based ideas and empirical research to enhance the calibre and applicability of education in the digital era by informing best practices and strategies for successfully integrating Higher education data analytics techniques.

Objectives

- Analyzing how data analytics affects students' academic achievement at UAE higher education.
- To assess the function of Making decisions based on data in enhancing institutional Effectiveness in UAE universities.
- To examine how data-driven decision-making affects student learning outcomes and retention rates at higher education institutions in the United Arab Emirates.
- To examine how institutional Effectiveness mediates the association between data analytics techniques and academic achievement among UAE Institutions of higher learning students.

Literature Review and Hypothesis Development

Because big data analytics may enhance instruction, learning, and administrative procedures, its integration in higher education has drawn considerable attention. The study's hypotheses are constructed based on this evaluation of the literature, which examines many studies that examine how data analytics techniques are adopted, used, and performed in higher education.

Impact of Data Analytics on Student Academic Performance

Measuring students' academic achievement in higher education has unquestionably many advantages, such as setting program standards for teachers and students, evaluating the usefulness of courses and programs, and offering crucial program success metrics, among other things[27]. Several quality assurance frameworks and evaluation tools, such as [28]and [29], were implemented to implement outcome-based education and get certification for programs.

Furthermore, the capacity to predict student results offers even more priceless benefits, such as the ability to implement remedial interventions into the educational process. Few studies, nonetheless, have examined the intelligent prediction of student outcomes. Furthermore, it is still unclear which characteristics and circumstances influence educational results. According to studies, these elements include non-academic traits like involvement in the family [30], the motivation of students [31], and academic traits like teaching quality [32]and online engagement[33].

Indicators such as post-course results, student knowledge, and dropout rate are often used to gauge student performance, according to [34]. Grades from assessments alone shouldn't be used to assess student performance in school. The learning process is now guided by the student outcomes, which examine the cohort's performance. It should be used in particular to study it from a wider perspective. To infer student performance, a new study by [35] suggested investigating the possibility of forecasting the achievement of student results. Statistical methods, data mining, supervised learning, and unsupervised learning are often categorized by learning analytics. These are the four main categories into which the clever techniques used to forecast pupils' achievements fall [18].

An empirical study on how big data may be used to promote Sustainability in higher education was carried out by [36], who emphasized the significance of this approach for tackling current issues in the educational field. [37]highlighted the need for strong data analytics techniques and frameworks while examining the benefits and difficulties of using big data mining in the classroom. In their research,[38]offered a model-based approach to evaluating big data in education, emphasizing its

capacity to examine student behaviour and improve teaching tactics.[39]spoke about how educational data mining and learning analytics may be used to manage massive data, focusing on how they can enhance learning outcomes and decision-making. The following theory was created after accounting for each of these inspections:

- **Hypothesis 1:** In United Arab Emirates' universities and colleges, data analytics significantly improves student academic performance.

Role of Data-Driven Decision-Making in Institutional Effectiveness

Modern information systems integrate data analytics technologies to provide meaningful insights into a number of institutional performance factors, including trends in student involvement, the efficacy of budget allocation, and operational efficiency indicators. These systems' integrated data analytics and visualization features enable administrators to make defensible judgments based on up-to-date information, greatly enhancing the decision-making standard and guaranteeing the best possible use of educational resources [40].

In today's competitive and accountability-focused educational context, the installation of information technologies in educational institutions also supports the trend toward data-driven decision-making [41]. Administrators and teachers may use information systems to monitor and evaluate student performance, attendance, and engagement trends, giving them the knowledge they need to modify their teaching strategies or allocate resources more effectively. This data-driven strategy aids institutions in proactively addressing problems, including student retention and academic achievement, which are important measures of institutional Effectiveness and reputation [42].

Consequently, [43]suggested that big data may enhance teaching and learning processes in two ways: institutional Effectiveness and data-driven decision-making. [44]outlined and discussed big data in business analytics, giving a thorough rundown of the main ideas, procedures, and uses. However, [23]examined how analytics and big data are being used increasingly in higher education and how they affect administrative decision-making, student assistance, and institutional research. Speaking on the benefits and drawbacks of big data and analytics in higher education, [16]underlined the need for evidence-based procedures and data-driven decision-making.

Data-driven decision-making is one method used in higher education to assess institutional Effectiveness. It employs measurements, facts, and insights to help guide organizational decisions and strategic thinking[45].According to [46], there are still unanswered concerns about why many organizations and people do not routinely utilize data despite the documented link between data usage and increased Effectiveness.

Lastly,[47] emphasized how crucial it is to match information technology with a culture of morally sound decision-making based on data to enable more efficient, responsible, and responsive educational administration. Therefore, to increase institutional Effectiveness in the UAE's educational sectors, this study aimed to examine the consequences of data-driven decision-making. Consequently, the following second hypothesis was created:

- **Hypothesis 2:** Data-driven decision-making significantly enhances institutional Effectiveness in UAE universities.

Influence of Data-Driven Decision-Making on Student Learning Outcomes and Retention

Higher education institutions' (HEIs') performance is largely gauged by student retention. Employers and society rely on students' acquisition of knowledge and skills throughout their time in higher education, and many institutions rely on student income to finance expansion and facility upgrades. Numerous research [48], [49], [50]have examined the factors that lead to dropout, including difficulties in the classroom and issues with support and student life, as well as how dropouts affect both students and institutions. A different body of research has concentrated on each student's unique traits and situations [51].

Effective decision-making at educational institutions includes weighing various operational, academic, and financial issues. To make well-informed decisions on curriculum design, student support initiatives, and resource distribution, there is a growing need for quick, precise, and complete data as educational settings become more complex [52]. The foundation of this framework is provided by information systems, which provide administrators with organized, real-time access to data from several departments. This allows administrators to make decisions supporting student learning outcomes and retention while aligning with institutional objectives. Academic and non-academic processes may be optimized by institutions with the capacity to access and evaluate pertinent data, which enhances

institutional performance overall. For instance, information systems enable teachers and administrators to evaluate the efficacy of academic programs and make modifications that directly improve student learning experiences via gathering information on performance, attendance, and feedback[53].

Research on educational data analytics has highlighted the importance of this tool for evidence-based making choices and continuing to improve. The significance of data analytics in identifying at-risk pupils, creating tailored treatments, and streamlining learning paths was emphasized by [54]. Data-driven insights allow teachers to customize their teaching methods, increasing student retention and success. Consequently, the following hypothesis was developed:

- **Hypothesis 3:** Students benefit when choices are made based on evidence-based learning outcomes and retention rates

Mediating Role of Institutional Effectiveness Between Data Analytics Methods Academic Success

Although the academic and institutional sectors have generally regarded data analytics methods as a revolutionary technical advancement[55], ongoing discussions persist regarding whether Considering the circumstances under which these technologies may result in improvements in academic success [56][57]. While many studies explore the challenges institutions face in achieving measurable improvements in academic outcomes from data analytics[58], [59]caution against ungrounded optimism surrounding these projects. [60]contend that further study is required to support assertions that these expenditures may directly improve academic performance, even when evidence points to data analytics techniques as adding value.

Based on their literature review addressing the relationship between data analytics methods and measurable performance, [58]identified six primary categories. The writers underline the necessity of further empirical research to help to understand the processes by which advances in academic results are obtained, and the advantages of data analytics approaches are realized. [61]emphasized that many institutions fall short of projected results despite major data analytics efforts, which is consistent with the academic environment.

Although data analytics approaches are often sought after in educational environments, new research indicates that success rates differ greatly [62]. These results show that most schools cannot get academic benefits from their data analytics initiatives due to technology and other factors. Rather, one of the most important institutional-related challenges is properly matching institutional performance to mediate and convert data analytics approaches into quantifiable academic achievement[63].Taking this into account, the following hypothesis was developed:

- **Hypothesis 4:** Institutional Effectiveness mediates the connection between student academic achievement and data analytics techniques.

Literature Gap

Even while data analytics techniques are increasingly being used in higher education worldwide, little is understood about how these techniques affect students' academic achievement and the efficacy of UAE institutions. Most studies lack comprehensive empirical evidence showing how data analytics directly influences student outcomes and how it enhances institutional Effectiveness to result in better student learning and retention. Furthermore, research analytics methods of institutional effectiveness also have underdeveloped ways of data analytics in relation to student performance. The objective of this paper is to close the knowledge gaps regarding how data analytics methods and Decisions based on data may either directly or indirectly affect how well students doin investigating the institutional effectiveness mediation process while offering worthwhile insights to higher education institutions of the United Arab Emirates as to optimizing data analytics strategies.

Materials and Methods

Research Design

Using a quantitative research design and correlational approach, this study investigated the relationship between data analytics methods, data-driven decision-making, and institutional Effectiveness concerning student academic performance in UAE higher education institutions. It also investigates how data analytics techniques affect student academic performance and how data-driven decision-making could help increase institutional Effectiveness, influencing student learning results and perhaps retention rates. In addition, the present study examined the mediating function of institutional Effectiveness in the context of data analytics methods and student performance. Data were collected via structured questionnaires that were formulated to capture insights and perspectives from various faculty members,

administrators and decision-makers at UAE higher education institutions based on how data analytics and data-driven decision-making affect academic and institutional results.

The selected variables that acted as the foundation for the research are shown in Table 1. In addition, these factors originated from previous studies. Altered from [64], the student academic performance variable consists of five factors that measure grades, academic performance, and other kinds of student success. A similar five-component institutional effectiveness variable from [65] will be used to evaluate institutional governance, resource management, and strategic outcomes. The variable of five-item student learning outcomes and retention rates was adopted from [66][67] to ensure the measurement of academic performance as it checks growth, knowledge retention, and institutional support. The data analytics methodologies variable of five items was adapted from [68] to determine the tools, methods, and techniques used for academic data analysis.

A five-item

Scale from [69] was used to measure the data-driven decision-making variable. It assessed how data-driven tactics may improve decision-making, resource allocation, and institutional planning. The efficiency of the institution variable was probed as a mediating factor, assessing its role in relating data analytics techniques to student academic performance and institutional results.

Table 1: Adopted Variables

Variable	Number of Items	Source of Adoption
Student Academic Performance	5	Singal et al., 2024
Institutional Effectiveness	5	Volkwein, 2010
Student Learning Outcomes and Retention Rates	5	Naik et al., 2020, Al Hassani & Wilkins, 2022
Data Analytics Methods	5	Agasisti & Bowers, 2017
Data-Driven Decision-Making	5	Datnow & Hubbard, 2016

Description of the Study Area

The research depended on academics, managers, and decision-makers who have been involved in implementing and employing data analytics approaches. Both data-driven decision-making and higher education institutions in the United Arab Emirates were used. Through a survey, a cross-section of all the respondents was derived, considering their variations in academic fields, years of institution experience, and the kind of institution in terms of size.

This study aimed to investigate the manner in which these factors affect student academic performance, institutional efficacy, and the adoption of data analytics. It emphasizes the manner in which different factors impact resource distribution, planning in an institution, and student's overall academic success within higher institutions within the UAE.

Sampling

A sample of 384 academic members, administrators, and decision-makers from a range of UAE higher education institutions were selected for the study using a stratified random selection technique. Stratification ensured that the sample would represent a balanced spread of academic departments, responsibilities, years of experience, and public and private universities. To give ample insights into the influence of analytics techniques and the impact that impact of data-driven decision-making processes on pupils' academic performance achievement and the Effectiveness of institutions within higher education systems in UAE, the sample size was sufficiently big to allow for statistical significance and wider applicability of the findings.

Conceptual Model

The study's five main concepts were Student Learning Outcomes and Retention Rates, Data Analytics Methods, Student Academic Performance, and Data-driven and institutionally efficient decision-making. The conceptual model to investigate the relationship between Data Analytics Methods and Student Academic Performance is guided by Data-Driven Decision-Making, which mediates between Data Analytics Methods and Institutional Effectiveness. The approach also considered how directly Data-Driven Decision-Making influences Retention Rates and Student Learning Outcomes. Analyzing was the mediating influence of data analytics techniques to help one understand their role in enhancing institutional Effectiveness and student academic performance. Figure 1 shows the suggested relationships and hypothesized effects among these factors.

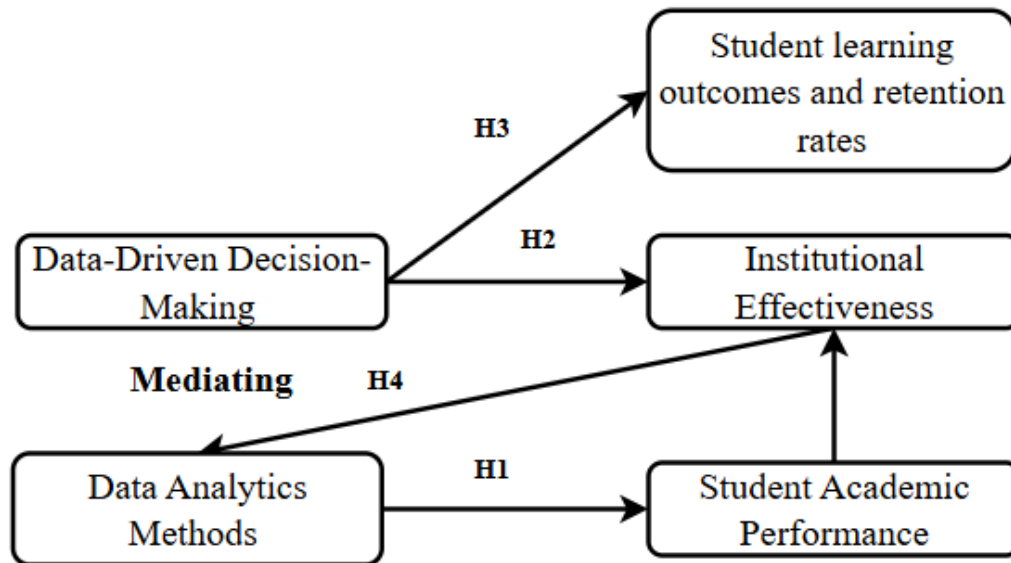


Figure 1: Conceptual Model

Data Collection Tools and Techniques

A structured survey was the primary tool utilized in this research to gather information on institutional efficacy, data analytics techniques, and student academic performance at UAE higher education institutions. Measures of student academic performance (grades, success of academics, and retention percentages); institutional efficacy (in governance, resource management and strategic outcomes); data-informed decision-making (uses of data for planning or resource allocation purposes); methods of data analytics (resources/tools, techniques, and the strategies used for data elaboration). Participants who were faculty members, administrators, or UAE higher education institution decision-makers were surveyed. Those who didn't participate in data analysis processes or make institutional decisions. The analytical program, AMOS, evaluated the relationship between the component elements using Structural Equation Modeling (SEM) to better understand how data analytics techniques and data-driven decision-making impact student academic performance via Institutional Effectiveness. SEM made examining direct, indirect, and mediating impacts possible.

Measures

- **Student Academic Performance:** Academic performance in higher education encompasses course achievements, test scores, attitudes, aspirations, cognitive and non-cognitive attributes, knowledge, skills, competencies, career progression, and persistence. Understanding the student's strengths, weaknesses, and potential for success is vital. The Student Academic Performance Scale is one tool used to measure academic achievements through five questions using a 5-point Likert scale.
- **Institutional Effectiveness:** Institutional Effectiveness is a systematic approach used by higher education establishments to evaluate and enhance their performance in accomplishing their mission and objectives through continuous development and strategic goals. Five questions using a 5-point Likert scale for assessment.
- **Student Learning Outcomes and Retention Rates:** Student learning outcomes are measurable statements of students' knowledge, skills, abilities, or attitudes post-course completion that reflect content mastery levels. The number of students who successfully finish academic programs is referred to as student retention, indicating a school's commitment to student success. The Student Learning Outcomes and Retention Rates Scale had five questions focusing on students' understanding of course material, critical thinking skills, and retention rates, scored on a 5-point Likert scale.

- **Data Analytics Methods:** Data analytics techniques in higher education include obtaining, organizing, and analyzing data to enhance an institution's performance and quality. The Data Analytics Methods Scale had five questions measuring the use of data analysis techniques. Using a 5-point Likert scale, gauge respondents' perceptions on the frequency and efficacy of analytics usage.
- **Data-Driven Decision-Making:** Higher education's use of data-driven decision-making (DDDM) improves teaching and learning by analyzing trends, knowing students' strengths, personalizing education, resource allocation, and making future projections. The Data-Driven Decision-Making Scale contained five questions designed to determine the reliance on data insights for planning and operational decisions. The scale was measured using a 5-point Likert scale.

Result

The study looks at how data analytics impacts institutional Effectiveness and student academic performance in UAE institutes of higher learning. The study looks at how data-driven choices are made. It can improve institutional effectiveness and student academic results. It focuses on how data analytics techniques might enhance student academic performance, retention rates, and student learning outcomes at UAE higher education institutions. The research also examines how institutional Effectiveness influences the link between student academic performance and data analytics methods. The research focuses on 384 university students, faculty, and administrators from various higher education establishments across the United Arab Emirates. Data is gathered via frequent surveys and discussions to investigate the use and benefits of data analytics in academic contexts. The results are intended to contribute to the general growth of the UAE's higher education system by offering insightful information on how universities may improve educational quality, student retention, and institutional Effectiveness using data analytics methods. The report also emphasizes how data-driven decision-making will impact future developments in higher education institutions and their capacity to satisfy the general public's and students' needs.

Table 1: Internal Consistency and Convergent Validity

Variables	Cronbach's Alpha	CR	AVE
Student Academic Performance	0.844	0.764	0.557
Institutional Effectiveness	0.858	0.793	0.606
Student Learning Outcomes and Retention Rates	0.847	0.848	0.732
Data Analytics Methods	0.892	0.833	0.691
Data-Driven Decision-Making	0.879	0.861	0.771

The table shows the convergent validity and internal consistency of conceptions about student academic performance, student learning outcomes and retention rates, the efficacy of higher education institutions, data analytics techniques, and making decisions in higher education based on facts. Cronbach's alpha values for each variable range from 0.844 to 0.892. which shows that they are quite trustworthy and have excellent internal consistency across the constructs. The constructions' dependability is further supported by their CR values, which fall between 0.764 and 0.861. Furthermore, all the constructs have good convergent validity since their AVE values, which vary from 0.557 to 0.732, are greater than the allowed limit of 0.5. Significantly, "Student Learning Outcomes and Retention Rates" attains the highest AVE value of 0.732, thus indicating a high convergence degree. Similarly, "Data-Driven Decision-Making" has high internal consistency, with Cronbach's alpha at 0.879, CR at 0.861, and AVE at 0.771, further ascertaining its reliability and validity. In general, findings confirm that all constructs within the study have high reliability and convergent validity that provide a strong foundation for further investigation of the interrelations among these variables directed toward improving Student Academic Performance and institutional effectiveness in UAE higher education establishments.

Table 2: Descriptive Statistics of Variables

Variables	Mean	Std. Deviation
Student Academic Performance	3.7031	0.71404
Institutional Effectiveness	3.7406	0.68693
Student Learning Outcomes and Retention Rates	3.5370	0.86117
Data Analytics Methods	3.6073	0.78334
Data-Driven Decision-Making	3.7427	0.79163

Table 2 provides descriptive data for the key variables' mean and standard deviation. to Student Academic Performance and institutional effectiveness in UAE higher education. Overall, good attitudes are indicated by the mean of all the factors, which falls between 3.54 and 3.74. among respondents regarding the factors being measured. In fact, Institutional Effectiveness, mean = 3.74, and Data-Driven Decision-Making, mean = 3.74, are the factors that get the highest mean values; respondents have a very positive perception of the institutional practices and the decision-making processes. On the opposite end, Student Learning Outcomes and Retention Rates stand out with the lowest mean value, mean = 3.54, and slightly less favourable perceptions of Student Learning Outcomes and Retention Rates than the other factors.

The standard deviations range from 0.69 to 0.86, which means the response variability is moderate. Student Learning Outcomes and Retention Rates have the highest standard deviation of 0.86, meaning variations in how respondents perceive the factors are more significant. This implies that the participants' opinions about the Student Learning Outcomes and Retention Rates vary. However, institutional Effectiveness shows the least variation, with a standard deviation of 0.69, which means that the views on the Effectiveness of higher education institutions are more consistent among respondents. These descriptive data show that most people agree that Data Analytics Methods and Data-Driven Decision-Making positively affect higher education. However, there are differences in how people see Student Learning Outcomes and Retention Rates that could be improved.

Table 3: Discriminant Validity

	Student Academic Performance	Institutional Effectiveness	Student Learning Outcomes and Retention Rates	Data Analytics Methods	Data-Driven Decision-Making
Student Academic Performance	0.746				
Institutional Effectiveness	0.750	0.778			
Student Learning Outcomes and Retention Rates	0.646	0.669	0.855		
Data Analytics Methods	0.662	0.680	0.974	0.831	
Data-Driven Decision-Making	0.682	0.680	0.655	0.672	0.878

The table above gives the correlations between student academic performance, institutional Effectiveness, student learning outcomes and retention rates, data analytics methods, and decision-making based on data, using the respective correlation coefficients and discriminant validity. All relations are significant at the 0.01 level.

Student Academic Performance correlates significantly positively with Institutional Effectiveness, $r = 0.750$ and Student Learning Outcomes and Retention Rates, $r = 0.646$. Therefore, better performance in an institution strongly influences Student Learning Outcomes and Retention Rates. Also, the relationship is moderately significant with Data Analytics Methods, $r = 0.662$ and Data-Driven Decision-Making, $r = 0.682$; these factors greatly impact improved student academic performance.

Institutional Effectiveness is significantly correlated with Student Learning Outcomes and Retention Rates ($r = 0.669$), which means that effective institutional practices contribute immensely to improving student outcomes and retention. It also reflects a positive correlation between data analytics methods ($r = 0.680$) and data-driven decision-making ($r = 0.680$), which means that these data-driven approaches are important in enhancing institutional Effectiveness.

Student Learning Outcomes and Retention Rates are closely related to Data Analytics Methods ($r = 0.974$), meaning that the implementation of data analytics methods improves student learning outcomes and retention rates. Also, they have a moderate relationship with Data-Driven Decision-Making ($r = 0.655$), which means that using data in decision-making is one of the factors affecting better retention and learning outcomes.

Moderately correlated at $r = 0.672$, Data-driven decision-making and data analytics techniques indicate the interaction between these two variables in relation to student learning and institutional effectiveness enhancement.

The diagonal numbers display the Average Variance Extracted (AVE) square root, which could be used to verify the structures' dependability. The high values of Data Analytics Methods (0.831) and Data-Driven Decision-Making (0) could suggest good internal consistency for these variables.

Table 4: Hypothesis Implementation

Hypothesis	Relationship	Estimate	CR.	Sig. p	Results
H1	Data Analytics Methods --->Student Academic Performance	0.686	12.893	***	Accepted
H2	Data-Driven Decision-Making --->Institutional Effectiveness	0.674	11.757	***	Accepted
H3	Data-Driven Decision-Making --->student learning outcomes and retention rates	0.674	11.848	***	Accepted
H4	Mediating				Accepted
	Institutional Effectiveness <--- Data Analytics Methods	0.680	18.136	***	
	Student Academic Performance <--- Data Analytics Methods	0.283	6.476	***	
	Student Academic Performance <--- Institutional Effectiveness	0.557	12.725	***	
**. Correlation is significant at the 0.01 level (2-tailed).					

Regarding student academic achievement and institutional Effectiveness, the table comprehensively analyses the relationships between data analytics methodologies and data-driven decision-making in UAE higher education institutions. To determine if these associations are significant, each hypothesis is put to the test. H1 shows a significant beneficial relationship between student academic achievement and data analytics techniques. It is estimated to have a value of 0.686, with a critical ratio (CR) of 12.893. This result, marked as highly significant ($p < 0.001$), supports the idea that data analytics methods significantly enhance student academic performance in UAE universities. H2 highlights the link between data-driven decision-making and institutional Effectiveness, with an estimate of 0.674 and a CR of 11.757. This relationship is also significant ($p < 0.001$), showing that enhancing the efficacy List United Arab Emirates' higher education establishments requires data-driven decision-making. H3 examines how student learning results and retention rates are affected by making decisions based on facts. This hypothesis is supported by an approximation of 0.674 and a CR of 11.848, demonstrating how data-driven decision-making improves retention rates and student learning outcomes ($p < 0.001$).

H4 examines the function of institutional efficacy as a mediator in the connection between student academic achievement and data analytics techniques. The mediating effect is confirmed with an estimate of 0.680 and a CR of 18.136, indicating that institutional Effectiveness plays an important part in the connection between student academic achievement and data analytics techniques since it amplifies the impact of data analytics techniques. Additionally, the direct relationships between data analytics methods and student academic performance (estimate = 0.283, CR = 6.476) and between institutional Effectiveness and student academic performance (estimate = 0.557, CR = 12.725) are significant ($p < 0.001$), further validating the interdependence of these factors. Overall, the findings highlight how important data analytics techniques and Decision-making based on data may improve students' academic achievement and institutional efficacy at UAE universities. The findings also emphasize the importance of institutional Effectiveness as a mediator in improving Student Academic Performance. Statistically, all results marked with *** are highly significant ($p < 0.001$), reinforcing the robustness of the observed relationships.

Discussion

Data analytics's revolutionary potential in higher education lies in helping students succeed, faculty improve, and institutions make smart decisions. Since higher education is more competitive than ever, decisions are often made without data analysis. Integrating LA, AA, and EDM allows for a comprehensive approach where one process informs another. This fosters the integrated educational ecosystem [70]. The literature emphasizes the necessity for a unified framework to organize educational data analytics methods and expertise. Such frameworks may enhance teaching, learning, and decision-

making to help institutions meet changing social and global requirements. Data-driven innovation in higher education depends on these collaborations.

Institutional Effectiveness improves higher education administration and quality assurance. As an example, the American College of Dubai (ACD) reaccreditation of the Bachelor of Business Administration (BBA) program will demonstrate how QF Emirates, the UAE's quality assurance framework, has been incorporated into institutional operations[71]. Quality management, long-term institutional strategy, learner experience, and instructional Effectiveness are aligned. The BBA program's reaccreditation has increased student enrollment and income by reiterating ACD's commitment to excellent education and improving its academic reputation. This case study shows that institutional Effectiveness establishes academic program excellence and organizational objectives through organized quality assurance procedures, preparing higher education institutions for long-term success in a competitive market.

Incorporating data analytics into higher education has shown encouraging outcomes in improving student retention, institutional Effectiveness, and successful academic performance. Improved educational results are promoted by using advanced analytical methods to extract useful information for Data-driven decision-making. Optimizing operational efficiency, supporting curriculum design, and aligning with institutional objectives all depend on making decisions based on facts. Additionally, it helps identify retention rates and improve student learning outcomes while facilitating prompt action. Institutional Effectiveness is a critical mediator of analytics methods and academic performance, thus pointing out the value of structured data systems and collaborations in using data to its most educational potential. The findings indicate that data analytics is transformative in solving challenges in a competitive and dynamic education environment. The ability to enable stakeholders to respond proactively to the changing demands and enhance the institution's overall performance underscores this capability.

Successful academic performance, institutional efficacy, and student retention might all be greatly enhanced by integrating data analytics into higher education. It enhances teaching quality, encourages self-regulated learning, and guides strategic decision-making, much like the general frameworks discussed. A key element that mediates analytics and academic achievement and connects quality assurance procedures with institutional objectives is institutional Effectiveness. A comprehensive strategy for addressing educational issues is promoted by combining academic and learning analytics approaches. Institutions may actively meet changing needs using innovative data-driven technologies and teamwork, guaranteeing sustained development and better results in a competitive environment.

Conclusion

This study demonstrates the potential for data analytics to improve institutional effectiveness and student academic achievement in UAE higher education institutions. The results point to ways in which data-based practices may increase Student Learning Outcomes and Retention Rates and institutional success overall. By using advanced data analytics technologies, universities might discover patterns, perform trend analyses, and make informed decisions that further serve strategic goals. Institutions can increase student learning outcomes and retention rates in higher education institutions by employing interventions targeting at-risk students; hence, data-driven methods must be combined to determine decisions.

The connection between pupils' academic achievement and data analytics methods was shown to be significantly mediated by institutional Effectiveness. To ensure a smooth alignment between data insights and strategic planning, it is essential to have a solid structure. That incorporates data analytics into higher education institutional operations. Additionally, the study supports the important role that data-driven decision-making plays in maximizing curriculum development, operational efficiency, and quality control. All of these things add up to a higher education system that is more sensitive and flexible, able to meet changing social and economic needs.

Governmental organizations, legislators, academic institutions, students, and business partners are among the many stakeholders expected to benefit from the study's findings. The study offers government organizations practical insights on performance patterns and gaps at the institutes of higher learning, supporting the development of evidence-based policies that address skill shortages and improve the employability of graduates. Policymakers may use these results to evaluate student academic performance and match national development objectives with educational outcomes.

The research provides university administration with a comparative analysis of regional institutional performance, allowing them to create programs and courses that align with market demands and provide graduates with skills applicable to the workplace. Improved curriculum and focused

interventions that increase students' readiness for the labour market will benefit them indirectly. The study emphasizes the significance of using data analytics to promote an innovative and improving culture in higher education. Data-driven approaches can transform education by addressing major issues and allocating resources as efficiently as possible, supporting institutions' and stakeholders' long-term success.

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