The Usefulness of Big Data and IoT/AI at Dubai University

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The Usefulness of Big Data and IoT/AI at Dubai University

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Abstract

Digital transformation is disrupting most sectors and most so the education sector. Universities across the world are using technology to reach out to students and to deliver classes remotely enabling students and staff to adopt modern emerging technologies. Dubai University, based in the heart of a technological hub, has the unique opportunity to leverage cutting-edge technologies like Big Data, the Internet of Things (IoT), and Artificial Intelligence (AI) to revolutionize its academic and operational landscape. This research study explores the usefulness of emerging technologies in enhancing Educational Experiences by analyzing Big Data of student learning patterns, engagement levels, and performance to unlock personalized learning pathways, adaptive courseware, and targeted interventions. AI-powered tutoring systems and virtual labs offer immersive and customized learning experiences shortly. IoT sensors can monitor and manage energy consumption, building security, and resource allocation, leading to sustainable and efficient campus operations. AI-powered systems can automate administrative tasks, streamline processes, and provide predictive maintenance for facilities. The main contribution of the study is using PLS-SEM modeling to analyze Big Data enabling researchers to extract insights from vast datasets and make data-driven discoveries. AI-powered tools can aid in research design, data analysis, and scientific simulation, fostering a culture of innovation. This study will employ a mixed-method approach, utilizing quantitative data analysis of existing university data sets and qualitative interviews with stakeholders. The findings will contribute to developing a strategic roadmap for the optimal integration of Big Data, IoT, and AI within Dubai University's ecosystem. This research aims to position Dubai University as a pioneer in education and innovation, setting a benchmark for higher education institutions in the region and beyond. The study aims to provide insights to empower decision-makers at Dubai University to make well-informed choices regarding the adoption and integration of emerging technologies. The study facilitates strategic planning by comprehensively grasping the challenges and opportunities presented by digital transformation. Moreover, it guides resource allocation and offers recommendations for leveraging data analytics to support students who may be at risk.

Keywords: *Big Data, IoT, AI, Education, Dubai University, Personalized Learning, Campus Operations, Research, Innovation.*

Introduction and Background

Introduction

The education landscape is on the cusp of a seismic shift. Universities everywhere are grappling with the need to adapt to the rapidly evolving digital landscape, with cutting-edge technologies

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like Big Data, the Internet of Things (IoT), and Artificial Intelligence (AI) holding immense potential for disruption and transformation. Among these institutions, Dubai University, nestled in the heart of a global technology hub, faces a unique opportunity. Positioned at the forefront of innovation, it can seize this transformative potential to redefine the very essence of education and operational excellence. This research study, therefore, embarks on a critical investigation into the usefulness of Big Data and IoT/AI at Dubai University, aiming to unlock tangible pathways for growth and advancement (Polin et al., 2023); (Persaud, 2021).

The world of education is witnessing a paradigm shift. Traditional pedagogy, once rigid and static, is now giving way to personalized, data-driven approaches. The burgeoning field of educational technology is fueling this change, and universities across the globe are actively seeking new pathways to leverage the power of data and digital tools. In this context, Big Data, IoT, and AI emerge as potent catalysts for change, promising to personalize learning experiences, optimize campus operations, and accelerate research and innovation.

The landscape in Dubai is particularly fertile for such a technological revolution. As a thriving center for digital innovation, the city offers a unique infrastructure and a culture of embracing groundbreaking trends. Dubai University, situated within this dynamic ecosystem, can capitalize on this environment to become a global leader in utilizing Big Data and IoT/AI for educational and operational advancement (Luo et al., 2023).

Many Universities are focused on giving students a student-centric curriculum to make them employable in the ever-changing industrial environment. Hence there is a need to develop short-term courses that will enable students to enhance their skills, upgrade, their competencies and integrate emerging technologies into the workplace. The AI, Bigdata can visualize the student's learning experiences, their employability skills, and their actual fit into the industry once they graduate (Aljohani et al., 2022).

Research Statement

This research study posits that the strategic and deliberate integration of Big Data and IoT/AI technologies holds immense potential to transform Dubai University into a world-class institution of learning and innovation. By effectively leveraging these tools, the university can enhance educational experiences, optimize campus operations, and foster a thriving research culture.

Research Scope

This study will focus on the specific applications of Big Data and IoT/AI within the context of Dubai University. It will encompass three key areas Enhancing Educational Experiences to explore how Big Data and AI can be utilized to personalize learning pathways, develop adaptive courseware, and provide targeted interventions to support student success. The potential of IoT sensors and AI-powered systems to streamline administrative tasks, manage resources efficiently, and ensure a sustainable and secure campus environment. The Research will investigate how Big Data and AI can empower researchers to analyze vast datasets, conduct data-driven experiments, and accelerate discoveries across diverse disciplines.

Research Questions

This research aims to answer the following critical questions:

1. How can Big Data and AI be harnessed to personalize learning experiences and improve student outcomes at Dubai University?

2. What are the potential applications of IoT and AI in optimizing campus operations and driving sustainability at Dubai University?
3. How can Big Data and AI be leveraged to enhance research productivity and foster a culture of innovation at Dubai University?

Research Objectives

The primary objectives of this research are:

1. To analyze the current state of Big Data, IoT, and AI implementation at Dubai University.
2. To identify concrete opportunities and challenges associated with the integration of these technologies within the university.
3. To develop a strategic roadmap for the optimal deployment of Big Data and IoT/AI across all facets of Dubai University's operations for the advancement of best practices and knowledge creation in the field of educational technology.

Literature Review

Technology Acceptance involves individuals' willingness and ability to adopt and use emerging technologies. In a university setting like Dubai University, embracing technology enhances the efficiency and effectiveness of learning processes. Faculty, staff, and students utilizing technological tools enable innovative teaching methods, online resources, and collaborative platforms, creating a dynamic learning environment. This acceptance directly impacts the university's resilience, allowing swift adaptation to challenges, such as pandemics (Johnson et al., 2021). Technology acceptance also facilitates resource sharing, supports wellness through accessible learning, influences investment decisions, and shapes top management strategies. Mindset, focusing on beliefs and attitudes, particularly a growth mindset, contributes to Dubai University's resilience, resource sharing, wellness emphasis, investments, and top management decisions. A growth mindset instills a belief in continuous learning, fostering adaptability and positive responses to challenges. Individuals with this mindset share resources willingly, contribute to a collaborative environment, prioritize wellness, drive investments in innovation, and influence top management strategies (Luan et al., 2020). Adaptability, the ability to adjust to evolving circumstances, is crucial for Dubai University's resilience, resource sharing, wellness emphasis, investments, and top management decisions. Adaptability enables effective responses to challenges, fosters collaboration, supports wellness initiatives, drives technological investments, and influences leadership decisions. A resilient university embraces adaptability, contributing to a responsive, collaborative, and forward-thinking learning environment. Attitude, representing positive or negative feelings, significantly influences Dubai University's learning factors. A positive attitude fosters resilience, promotes resource sharing, emphasizes wellness, encourages technological investments, and shapes top management decisions (Hassan et al., 2023). A supportive attitude creates an environment conducive to organizational learning, contributing to the university's overall success and growth. Culture, encompassing shared values and behaviors, plays a crucial role in shaping Dubai University's organizational learning factors. A resilient culture views challenges as opportunities for growth, encourages resource sharing, prioritizes wellness, supports technological investments, and influences top management decisions. A positive and forward-thinking culture contributes to a dynamic learning environment, fostering adaptability, collaboration, well-being, strategic investments, and effective leadership within the university (Yu et al., 2023). When aligned positively, these factors collectively create an environment at Dubai University that embraces technological

advancements, encourages a growth mindset, adapts to changes, fosters positive attitudes, and supports a culture of effective teaching and learning.

System Thinking entails analyzing and understanding the interconnections among various components within a system. In the context of Dubai University, factors like student enrolment, faculty development, curriculum-to-industry adaptation, technology integration, community engagement, and sustainable resource management contribute to organizational learning. For student enrolment, system thinking involves analyzing demographic characteristics and adapting teaching methods based on student needs. It also includes monitoring enrolment trends to stay responsive to educational requirements, impacting resource allocation, well-being, and strategic investments (Mohamed Sufian et al., 2023). In faculty development, system thinking emphasizes continuous training for resilient educators. Collaboration, resource sharing, and integrating well-being principles into teaching practices contribute to a culture of continuous learning. Faculty development aligns with strategic goals, fostering innovation and leadership within the organization. In curriculum-to-industry adaptation, system thinking focuses on preparing students for evolving industry needs (Mahardhani et al., 2023). Faculty development ensures educators stay abreast of industry trends, collaborate on curriculum development, and build networks. This approach balances industry demands with student well-being, promoting a dynamic and relevant curriculum. Technology integration, viewed through system thinking, enhances organizational resilience by fostering a tech-savvy learning environment. It enables remote learning, resource sharing through digital platforms, and the creation of online resources. Technology also supports wellness initiatives and aligns with strategic investments, promoting data-driven decision-making. Community engagement, in a system thinking context, involves collaboration with stakeholders for resilience and diverse perspectives (Sibson et al., 2022). It promotes resource sharing, and well-being through community support, and joint funding initiatives. Community engagement aligns with organizational investments, fostering a positive relationship with the broader community. Sustainable resource management, through system thinking, emphasizes efficient resource allocation and diversification of income sources. It encourages resource sharing, green campus initiatives for well-being, and strategic investments in sustainability. Leadership in sustainable practices from top management ensures a balanced approach to decision-making (Fuller et al., 2022). In summary, system thinking, applied to these factors, contributes to Dubai University's organizational learning by fostering adaptability, innovation, and an interconnected approach to education. This integrated perspective enhances the institution's ability to navigate challenges, promote continuous improvement, and align with broader organizational objectives.

Connectivism, a learning theory emphasizing digital networks and social interactions, can significantly impact organizational learning at Dubai University. Digital networks provide a wealth of information, fostering a culture of continuous learning and enhancing resilience through remote learning capabilities. These networks also support resource sharing, collaborative platforms, and wellness programs, contributing to the institution's adaptability.

Social learning, integral to connectivism, shapes organizational factors at Dubai University (Haque et al., 2023). Online spaces promoting interaction and collaboration improve the learning experience. Incorporating social media encourages informal learning, community-building, and mentorship programs, fostering resilience through diverse perspectives. Social learning facilitates collaborative problem-solving, resource sharing, and interdisciplinary collaboration, enhancing the university's overall learning environment. Teamwork, a crucial

element influencing organizational learning, fosters resilience through collaborative problem-solving and support networks. The team dynamic encourages collaborative decision-making, innovation, and leadership development (Mousa et al., 2020). Top management's role in endorsing teamwork shapes the institution's collaborative and interconnected organizational culture, contributing to a dynamic learning environment at Dubai University. Global collaboration at Dubai University involves establishing partnerships with universities worldwide and fostering international collaboration through joint projects, exchange programs, and shared resources. This enriches the learning environment, exposes students to diverse perspectives, and prepares them for a globally connected world. Virtual exchange programs promote collaboration, global citizenship, and intercultural competence (O'Dowd, 2021). Exposure to cultural diversity prepares students and faculty to navigate different perspectives, enhancing adaptability. Collaborating on global projects addresses international challenges, fostering resilience and preparing the institution for broader educational demands. Lifelong learning is crucial at Dubai University, promoting continuous education for faculty and staff. It fosters adaptability, problem-solving skills, and a culture of continuous improvement. Lifelong learners engage in knowledge exchange, bridge generational gaps, and contribute to resource sharing (Ashour, 2024). The holistic approach of lifelong learning supports wellness, flexible learning options, and strategic investments in professional development and technology infrastructure. Top management plays a vital role in cultivating a lifelong learning culture, investing in leadership development, and aligning strategic planning with educational trends. Continuous Assessment & Feedback involves real-time feedback facilitated by digital tools, enabling instructors to provide timely guidance to students. This approach fosters a continuous improvement mindset and enhances the learning experience. Adaptive learning platforms that tailor content based on individual performance promote personalized assessment, aligning with connectivism principles (Zhang, 2023). Integrating peer feedback into assessments encourages collaborative learning. At Dubai University, Continuous Assessment & Feedback significantly influences organizational learning by providing real-time insights into program effectiveness, teaching methodologies, and learning outcomes. This data allows prompt adjustments to curriculum and strategies, fostering resilience in response to changing educational needs. Continuous assessment identifies challenges and areas for improvement, enabling the institution to build resilience, enhance program quality, and maintain high educational standards. Feedback from assessments helps create adaptive learning environments, ensuring resilience in the face of disruptions and technological advancements (Peimani et al., 2021). Efficient resource allocation is facilitated by identifying areas of strength and weakness and optimizing faculty expertise, support services, and technological infrastructure. Continuous assessment fosters collaboration by sharing effective teaching materials and methods among faculty, contributing to a culture of resource-sharing. Timely intervention for students facing challenges contributes to overall student wellness and a supportive learning environment. Continuous assessment tools can include metrics related to student well-being, emphasizing a holistic approach to education. Data from continuous assessments aids strategic investment decisions, aligning educational initiatives with the highest impact on learning outcomes and student satisfaction. Assessments reveal areas requiring additional training for faculty and staff, guiding strategic investments in professional development programs (Kilag et al., 2023). Continuous assessment provides valuable data for top management's informed decision-making, contributing to overall effectiveness and success. Assessment results contribute to strategic planning, identifying areas for improvement, and aligning the institution's strategic direction with the evolving needs of the educational landscape. The interconnected nature of global collaboration and lifelong learning enhances

Dubai University's organizational learning, and continuous feedback, fostering resilience, adaptability, and alignment with broader objectives (Aithal et al., 2023).

Dubai University's Organizational Learning enabled the Resilience of the institution to adapt to unforeseen challenges and changes in the educational landscape. A resilient organization can quickly adjust its strategies, curriculum, and resources to maintain the quality of education. This adaptability ensures continuous learning even in the face of disruptions, such as global crises or unexpected events. Resource sharing plays a significant role in organizational learning at Dubai University by optimizing the use of educational materials, faculty expertise, and technological infrastructure. Efficient resource sharing reduces redundancy, fosters collaboration among departments, and creates a culture of openness and cooperation (Broekhuizen et al., 2023). Shared resources contribute to a diverse and enriched learning environment, enhancing the overall educational experience. Emphasizing wellness at Dubai University positively impacts organizational learning by promoting a healthy and supportive environment. Wellness programs, mental health initiatives, and a focus on work-life balance contribute to the overall well-being of students and faculty. A mentally and emotionally healthy community is better equipped for effective learning, collaboration, and sustained engagement in educational activities. Strategic investments in educational technologies, programs, and infrastructure contribute significantly to organizational learning at Dubai University (Rahmah et al., 2020). Investments aligning with emerging trends enhance the learning experience, attract a diverse student population, and support the institution's competitiveness. Additionally, investments in professional development and technology ensure that the educational environment remains current and aligned with evolving needs. Top management plays a pivotal role in shaping the learning culture and direction of Dubai University. Leadership commitment to innovation, collaboration, and a digital learning culture sets the tone for the entire organization. Effective top management fosters a dynamic and interconnected organizational culture, ensuring that the institution adapts to emerging trends, invests strategically, and remains aligned with its long-term vision. Leadership also influences the development of resilient strategies and the promotion of a continuous learning mindset within the organization (Brewer et al., 2022).

Figure 1 illustrates the Conceptual model and is followed by the hypotheses formulated.
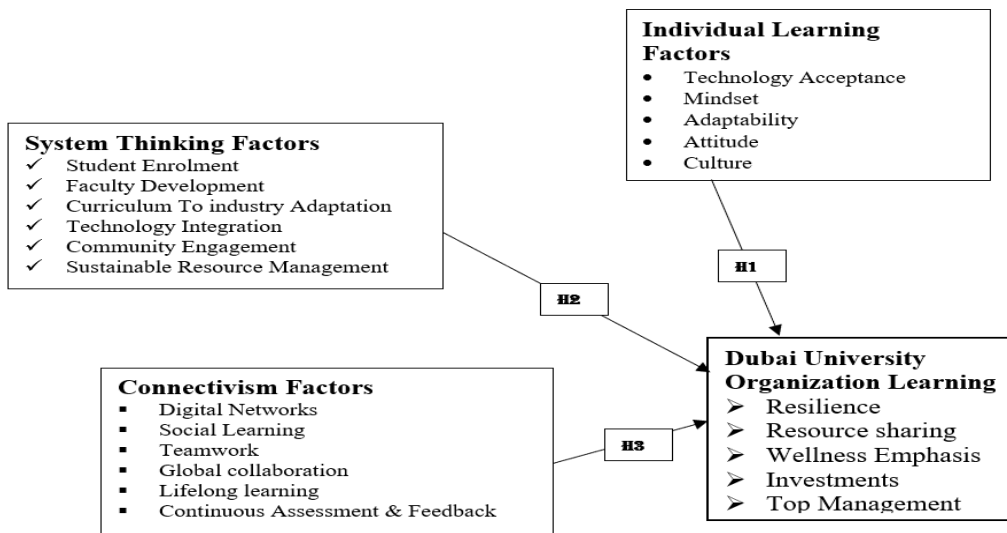
Figure 1: Using System Thinking and Connectivism Theory applied to Organization Learning at Dubai University.

H1: There is a significant relationship between the Individual Learning Factors and Dubai University Organization Learning

H2: The System Thinking Factors Influence the Dubai University Organization Learning.

H3: There is a significant relationship between the Connectivism Factors and Dubai University Organization Learning

Methodology

In conducting this research, a blend of primary and secondary data collection methods has been employed to bolster the reliability and precision of gathered information, aligning with the research objectives. Primary data is obtained through a targeted questionnaire or survey administered to a specific sample group. The survey, comprising pertinent questions crucial to the research, is meticulously crafted using Google Forms and distributed via email and WhatsApp within the higher education sector of the UAE. Concurrently, secondary data is sourced from various online platforms, including websites, journal articles, research papers, and books. This comprehensive literature review not only enhances the study's credibility but also aids in analyzing specific concepts. By referencing existing literature, secondary data collection ensures a thorough coverage of all elements within the conceptual model, as outlined by Harrison et al. (2020). The researchers propose a Mixed Methodology, incorporating both quantitative and qualitative research techniques. The quantitative aspect involves employing a questionnaire or survey to collect data, with the outcomes visually presented through bar graphs and pie charts containing precise percentages and statistical data. This technique provides a broad understanding of the sample size, thereby augmenting the credibility of the findings. While quantitative research facilitates swift data collection with immediate responses, it is essential to acknowledge its limitation in providing in-depth insights and explanations from participants due to the straightforward nature of survey questions, as highlighted by Iyer (2020). Expert interviews will complement this by employing thematic analysis as a qualitative methodology. In this study, the sample size denotes the number of individual responses from the target population. The chosen sample size, influenced by time constraints and challenges posed by COVID-19 restrictions, comprises 416 responses. Utilizing the Rao soft sample size calculator with parameters such as a 10% margin of error, a 90% confidence level, and a population size of 20,000, resulted in a recommended sample size of 377. The researchers successfully collected 416 responses. The questionnaire utilized is provided in Annexure 1, and additional details for both qualitative and quantitative research can be found in Annexures 1 and 2. Purposive sampling is employed to gather insights from experts in Information Technology, IoT, AI, Big Data, and digital transformation challenges. The Fuzzy Delphi Method ensures accuracy and reliability. Fifteen key informants in mid to senior management positions undergo in-depth interviews, providing diverse perspectives. Interviews span two months, with sessions lasting 40-50 minutes. All discussions are transcribed for future reference, ensuring participant anonymity and privacy (Vivek et al., 2021; Vebrianto et al., 2020). Thematic analysis is employed for qualitative insights gathered from expert interviews. This involves recording, transcribing, and reviewing responses, organizing them under major themes following Dawadi et al., 2021 procedure. Table 1 provides a summary of the interviews using thematic analysis. Data is collected through a survey distributed to a specific sample group.

Table 1. Summary of the Interview and Transcript.

Interviewee no, (Experience in years), Designation, Location	Main Comments on the Usefulness of Big Data and IoT/AI at Dubai University (Other Interviewees agreeing to these comments)
1. (12), Head of Department, Research Private Business School, Sharjah	Faculty, staff, and students utilizing technological tools enable innovative teaching methods, online resources, and collaborative platforms, creating a dynamic learning environment. A growth mindset instills a belief in continuous learning, fostering adaptability and positive responses to challenges. Attitude influences the university's approach toward investments, particularly in the adoption of new technologies and educational innovations. The collective impact of cultural elements shapes the learning culture within Dubai University and significantly influences its overall success and growth. In the context of a university organization like Dubai University, several factors contribute to its effective functioning and organizational learning. iewee 2, 4, 7, 12) (Almaskari et al., 2021)
2. (10), Government Company Education Administration, Abu Dhabi	Embracing technology allows the implementation of strategies such as online mental health resources, virtual counseling services, and wellness apps to support the well-being of both students and faculty. Technology acceptance also facilitates resource sharing, supports wellness through accessible learning, influences investment decisions, and shapes top management strategies. An adaptable institution is more likely to allocate resources for research and development, cutting-edge educational technologies, and initiatives aimed at enhancing the learning experience. In a culture that promotes innovation, faculty, staff, and leadership are more likely to advocate for and support investments in virtual learning environments, adaptive learning systems, and emerging technologies, ensuring the institution remains at the forefront of educational advancements. (Interviewee 1, 5, 11, 13) (Abulibdeh et al., 2024)
3. (13), Public Transport Manager, Dubai	Shared online platforms empower faculty members to collaborate on research projects, share teaching materials, and establish a resource repository that enhances the overall educational experience for students. The attitude, especially that of top management, sets the tone for the overall organizational culture within Dubai University. A wellness-oriented culture values the holistic well-being of faculty, staff, and students. Analyzing enrollment trends and feedback helps the university stay responsive to evolving educational requirements. iewee 4, 8, 13, 15) (Lasrado et al., 2021); (Kuleto et al., 2021)
4. (11) Senior Vice President, IT Sector, RAK	Aligning the curriculum with industry needs ensures that graduates are well-prepared for the workforce. The university can leverage data analytics to assess learning outcomes, optimize teaching methodologies, and tailor educational experiences. A resilient organization can quickly adjust its strategies, curriculum, and resources to maintain the quality of education. This adaptability ensures continuous learning even in the face of disruptions, such as global crises or unexpected events. Technology acceptance entails individual's willingness and capability to adopt and utilize emerging technologies. In the university context, embracing technology can significantly improve the efficiency and effectiveness of learning processes. (Interviewee 2, 3, 10, 14) (Hooda et al., 2020)
5. (12) HR Manager Higher Education Sector, Dubai	Connection between academia and industry promotes a dynamic learning environment that prepares students for real-world challenges. Through partnerships and community involvement, the university gains insights into societal needs, industry requirements, and emerging trends. Embracing educational technologies fosters a tech-savvy learning environment, preparing students for the digital age. In instances where faculty, staff, and students embrace technology, Dubai University can swiftly transition to alternative learning methods during unexpected disruptions such as pandemics or natural disasters. (Interviewee 8, 12, 18), (Martínez-Peláez et al., 2023)
6. (10) Public Sector Finance Manager Sharjah	Embracing educational technologies fosters a tech-savvy learning environment, preparing students for the digital age. The university actively encourages faculty and students to collaborate on interdisciplinary projects, leading to the sharing of research findings, teaching materials, and resources. A positive attitude towards personal and collective wellness encourages the adoption of practices and policies that prioritize mental health, work-life balance, and the overall well-being of employees and students. Top management can use this feedback to invest in leadership development programs, ensuring that leaders within the institution are equipped to guide the organization effectively. Continuous assessment and feedback play a pivotal role in shaping various aspects of organizational learning at Dubai University (Interviewee 4, 8, 12, 16) (Manchanda et al., 2023)
7. (5) General Manager Bank Operations, Sharjah	Emerging technologies can have a significant impact on the digital transformation of companies. The Internet of Things (IoT) enables various devices to communicate with each other via the Internet to collaborate. Artificial Intelligence (AI) can make predictions by analyzing large Data. AI technology can help Dubai University to optimize its operations, reduce downtime, and improve safety. Data strategy is a plan or framework that outlines how Dubai University will collect, store, manage, and use its data. System thinking approach that considers the interconnectedness of factors such as student enrolment, faculty development, curriculum-to-industry adaptation, technology integration, community engagement, and sustainable resource management contributes to the overall organizational learning of Dubai University (Interviewee 1, 3,10); (Gaftandzhieva et al., 2023)

Interviewee no, (Experience in years), Designation, Location	Main Comments on the Usefulness of Big Data and IoT/AI at Dubai University (Other Interviewees agreeing to these comments)
8. (7) Head of Operations, IT Solutions, Dubai	An adaptable university like Dubai University might invest in virtual learning environments, adaptive learning systems, and emerging technologies that align with the dynamic needs of education, ensuring the institution remains at the forefront of advancements. Security & compliance are also crucial considerations in the digital transformation of the education sector. . Understanding these demographics helps the university anticipate and respond to the unique needs and challenges that students may bring, contributing to the institution's resilience in accommodating diverse learning requirements (Interviewee 3, 5, 10); (Mohamed Hashim et al., 2022)
9. (5) Ministry, Government Company, Abu Dhabi	Utilizing systems thinking in the context of student enrollment enables the university to consistently observe and analyze enrollment patterns. This empowers the institution of Dubai University to proactively adapt its programs, services, and support mechanisms in response to changes in student numbers or shifts in educational preferences. Given that student enrollment significantly influences resource needs such as faculty, infrastructure, and support services, systems thinking aids the university in optimizing resource allocation by acknowledging the dynamic nature of enrollment. Embracing technology allows the implementation of strategies such as online mental health resources, virtual counseling services, and wellness apps to support the well-being of both students and faculty (Interviewee 4, 6, 8), (Biju et al., 2023)
10. (8) Commercial Manager Airport Authority, Dubai	The adoption of systems thinking prompts Dubai University to take a proactive stance on student well-being. Through ongoing monitoring of enrollment-related data, the institution can pinpoint emerging wellness trends. This data-driven approach facilitates timely interventions and modifications to wellness programs, enhancing the support provided to students throughout their academic journey. Systems thinking encourages the university to perceive student enrollment not just as a numerical aspect but as a determinant of financial requirements and investments. By scrutinizing enrollment projections and trends, the university can strategically plan investments in areas like infrastructure, technology, and faculty development. This forward-looking approach ensures that investments align with the evolving needs of the student body, thereby contributing to the long-term success of the institution (Interviewee 3, 6, 8, 14), (Papadopoulos et al., 2023)
11. (6) Vice President, Real Estate Operations, Dubai	A positive attitude toward technology increases the likelihood of the university allocating resources for advanced learning management systems, virtual reality tools, and other innovative technologies. Dubai University with high technology acceptance may invest in state-of-the-art virtual labs, interactive learning platforms, and advanced data analytics to enhance the overall learning experience for students. System thinking encourages the university to diversify its revenue streams and investments. This may involve exploring alternative funding sources, partnerships, or programs that can help mitigate the impact of enrolment variability on the institution's financial stability. Faculty development programs that promote interdisciplinary knowledge and collaboration help build a diverse skill set among educators. This diversity of skills enables faculty to contribute to various academic disciplines, fostering resilience in times of changes in enrolment patterns or shifts in educational priorities. (Interviewee 1, 5, 8, 11, 12) (Mohamed et al., 2021)
12. (11) Senior Manager, Paint Company, Sharjah	System thinking encourages the university to invest in robust digital platforms and connectivity, ensuring resilience in the face of unforeseen challenges. Recognizing the value of informal knowledge transfer, Dubai University can encourage social learning through mentorship programs, where experienced individuals share insights and expertise with their peers. The interconnected nature of teamwork contributes to a dynamic, adaptive, and collaborative learning environment within Dubai University. (Interviewee 1, 6, 8, 13) (Guerrero et al., 2021)
13. (3) Mall Stores Entrepreneur, Dubai	Global collaboration exposes students and faculty to cultural diversity, fostering resilience by preparing them to navigate and adapt to different cultural perspectives. This exposure enhances their ability to thrive in diverse and changing environments. By regularly reviewing assessment outcomes, leaders at Dubai University can make data-driven decisions that align with the institution's strategic goals, contributing to overall effectiveness and success. Assessment results contribute to strategic planning processes. Wellness programs, mental health initiatives, and a focus on work-life balance contribute to the overall well-being of students and faculty. A mentally and emotionally healthy community is better equipped for effective learning, collaboration, and sustained engagement in educational activities (Interviewee 2, 7, 13, 14), (Swartz et al., 2020)
14. (4) General Manager Maintenance Group, Sharjah	Efficient resource sharing reduces redundancy, fosters collaboration among departments, and creates a culture of openness and cooperation. Shared resources contribute to a diverse and enriched learning environment, enhancing the overall educational experience. Leadership commitment to innovation, collaboration, and a digital learning culture sets the tone for the entire organization. Dubai University can systematically gauge the impact of academic activities on the mental and emotional health of students, emphasizing a holistic approach to education. Continuous assessment data assists in making strategic investment decisions. (Interviewee 1, 6, 10, 11, 13) (Suleymanova et al., 2023)
15. (11) Logistics and Transport Manager, Dubai	Strategic investments in educational technologies, programs, and infrastructure contribute significantly to organizational learning at Dubai University Effective top management fosters a dynamic and interconnected organizational culture, ensuring that the institution adapts to emerging trends, invests strategically, and remains aligned with its long-term vision. Continuous assessment outcomes may reveal areas where faculty and staff require additional training. This information guides strategic investments in professional development programs, enhancing the skills and capabilities of the educational workforce. (Interviewee 7,8, 10) (Porath, 2023)

Source: Developed by the Author.

The findings summary provides a comprehensive overview of the conducted and analyzed interviews, aligning them with the research questions to establish a connection between the two. It delves into how Dubai University formulates strategies for organizational learning. The expert opinions from key informants in higher education hold significant importance, unveiling the challenges facing the industry. The summarized responses serve as valuable support for our arguments (Buzzelli et al., 2023).

Quantitative Analysis Using ADANCO Output

Analysis of the Measurement Model

For ADANCO 2.3, the construct validity was assessed using Dijkstra-Henseler's rho (ϱA) coefficient. A coefficient exceeding 0.70 indicates the reliability of the measurement method in this study. In the context of PLS path modeling, ϱA serves as a consistent estimate of construct score reliability (Schuberth et al., 2023); (Schamberger et al., 2020). The obtained result revealed that the Dijkstra-Henseler's rho (ϱA) coefficient in this study exceeded 0.8, signifying the reliability of the constructs. Concurrently, convergent validity was evaluated using outer loading indicators and the average variance extracted (AVE). An AVE value of 0.50 or higher is deemed acceptable, indicating that, on average, the construct explains more than 50% of the variance in its indicators. The AVE result, as presented in Table 2, surpassed the 0.50 threshold (Dirsehan et al., 2023).

Table 2: Analysis of Measurement Model.

Latent Variables	Convergent Validity		Construct reliability	
	AVE >0.50	ϱA reliability >0.70	Pc reliability >0.70	Cronbach's alpha(α) >0.70
Individual Learning Factors	0.5342	0.7532	0.8033	0.8362
System Thinking Factors	0.5912	0.7561	0.8243	0.8179
Connectivism Factors	0.5725	0.8126	0.7745	0.8067
Dubai University Organization Learning	0.5957	0.7902	0.7643	0.8432

Source: ADANCO result, 2023.

In terms of outer loading, it is recommended to have a value of 0.70 or higher for standardized outer loading (Hair et al., 2022). In this study, the indicator variables were employed, and their outer loading values, as depicted in Table 3, exceeded the 0.7 threshold.

Table 3: Shows the Discriminant Validity Heterotrait-Monotrait Ratio.

Construct	Individual Learning Factors	System Thinking Factors	Connectivism Factors	Dubai University Organization Learning
Individual Learning Factors				
System Thinking Factors	0.7854			
Connectivism Factors	0.7324	0.8258		
Dubai University Organization Learning	0.6894	0.7356	0.8534	

Source: ADANCO Results, 2023.

All p-values significantly fall below 0.05, affirming the validity of the relationships. The results data corroborate and validate the authentication of all hypotheses (Jhantasana, 2023).

Table 4: Convergent Validity.

Construct	Average variance extracted (AVE)
Individual Learning Factors	0.5397
System Thinking Factors	0.5467
Connectivism Factors	0.5716
Dubai University Organization Learning	0.5258

Table 4 illustrates that all AVE values surpassing 0.5 provide substantiation for convergent validity. This implies that the respective latent variable elucidates more than half of the variance in its associated indicators, with all other latent variables explaining less than half. In our specific case, all AVE values, standing between 0.5258 and 0.5716, validate the presence of convergent validity (Hair et al., 2022).

Table 5: Discriminant Validity.

Construct	Individual Learning Factors	System Thinking Factors	Connectivism Factors	Profit Related Strategy Factors
Individual Learning Factors	0.6013			
System Thinking Factors	0.5854	0.6781		
Connectivism Factors	0.5308	0.6272	0.7793	
Dubai University Organization Learning	0.5156	0.6042	0.6508	0.8235

Discriminant validity measures, as presented in Table 5, gauge the degree to which a variable correlates with others in the structural model. This assessment is conducted through the Fornell-Larcker criterion and cross-loadings. The diagonal bold figures, positioned at the highest points in both rows and columns, serve as evidence that discriminant validity is established, as indicated by the Adanco 2.3 output (Foroughi et al., 2023).

**Table 6:** Loadings of Indicator Loadings.

Indicator	Individual Learning Factors	System Thinking Factors	Connectivism Factors	Dubai University Organization Learning
(ILF1)	0.7158			
(ILF2)	0.7224			
(ILF3)	0.7664			
(ILF4)	0.8438			
(ILF5)	0.8233			
(STF1)		0.5105		
(STF2)		0.5320		
(STF3)		0.6327		
(STF4)		0.8120		
(STF5)		0.7878		
(STF6)		0.7260		
(CF1)			0.7432	
(CF2)			0.7542	
(CF3)			0.7322	
(CF4)			0.6877	
(CF5)			0.7767	
(CF6)			0.5983	
(DUOL1)				0.6783
(DUOL2)				0.8239
(DUOL3)				0.7138
(DUOL4)				0.7543
(DUOL5)				0.6653

Table 6 displays the cross-loadings to examine the impact of variables on each other. The coefficient of determination (R^2) elucidates the extent to which the construct influences all the constructs in the research study as shown in Table 8. Meeting the minimum requirement of R^2, set at 0.2, indicates the relevance and significance of the construct. In accordance with the results, the R^2 value for Dubai University Organization Learning was 0.7428, signifying the construct's high relevance and significance in explaining all variables in the research.

Table 7: Predictive relevance (R^2).

Construct	Coefficient of determination (R^2)	Adjusted R^2
System Thinking Factors	0.4129	0.3912
Connectivism Factors	0.5145	0.4986
Dubai University Organization Learning	0. 7428	0.7198

Figure 3: PLS-SEM Validation
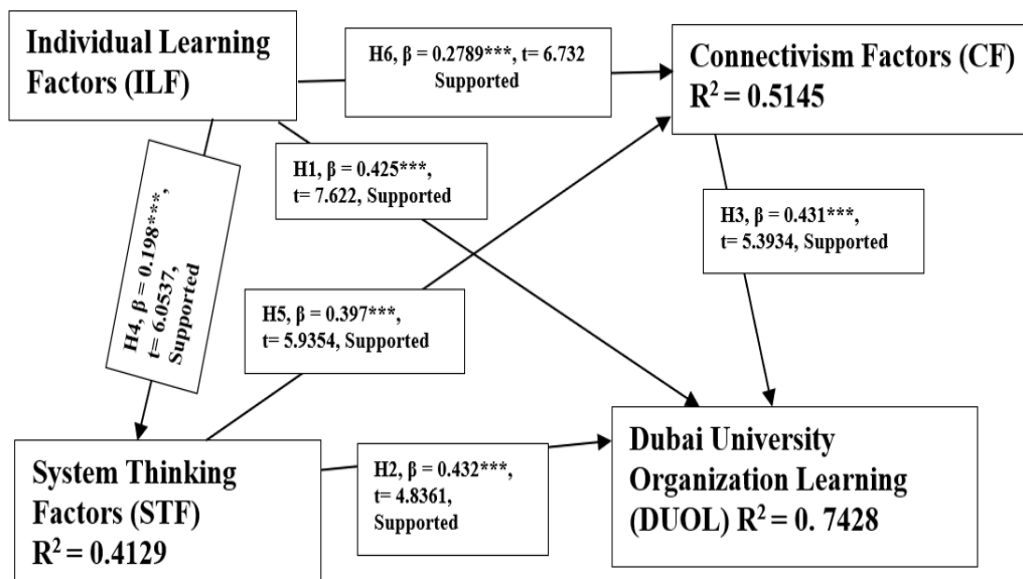
Figure 3: PLS-SEM Validation.

The research framework presented above underwent rigorous validation and reliability testing using PLS-SEM (figure 3), making a valuable contribution to this research paper. Drawing consensus from 416 respondents, who are stakeholders in the education sector, adds strength to the methodology. The approach taken not only addresses the scarcity of pertinent data but also lays a foundation for future researchers to build upon, either by refining this model or exploring similar ones. While the theories cited have relevance in stable economies with equal education opportunities and infrastructure availability, they may fall short in explaining various factors during times of recession, the COVID pandemic, or under sanction regimes. Consequently, a robust, research-driven framework has been established to fill these gaps and contribute to further studies (Foroughi et al., 2023).

Table: 8 Showing the Direct Relationships.

Hypotheses no	Construe Description	β- value	t-value	Significance t ≥2.59 1.96 ≤ t ≤2.59	Hypotheses Supported or not supported
H1	Individual Learning Factors -> Dubai University Organization Learning	0.425	7.622	Strong	Yes
H2	System Thinking Factors -> Dubai University Organization Learning	0.432	4.836	Strong	Yes
H3	Connectivism Factors -> Dubai University Organization Learning	0.431	5.393	Strong	Yes
H4	Individual Learning Factors -> System Thinking Factors	0.198	6.0537	Strong	Yes
H5	System Thinking Factors -> Connectivism Factors	0.397	5.9354	Strong	Yes
H6	Individual Learning Factors -> Connectivism Factors	0.278	6.732	Strong	Yes

The relationships at the next level are deemed irrelevant (Table 8), as the β value is anticipated to be significantly below the 0.01 threshold. Consequently, these relationships are not considered in this study (Sarstedt et al., 2023).

Table 9 summarizes the Similarity in the Outcomes ascertained by Qualitative and Quantitative methodologies

Table 9: Similarity in Outcomes.

Qualitative Outcomes	Quantitative Outcomes
The Individual Learning Factors, System Thinking Factors, Connectivism Factors, for the Dubai University Organization Learning	H1- Individual Learning Factors influencing Dubai University Organization Learning Factors, $\beta_{ILF-DUOLF}$ = 0.425***, t=7.622 indicates a Strong relationship. H2- System Thinking Factors influencing Dubai University Organization Learning Factors, $\beta_{STF-DUOLF}$ = 0.432***, t= 4.8361, indicates a Strong relationship H4- Individual Learning Factors influencing System Thinking Factors, $\beta_{ILF-STF}$ = 0.198***, t= 6.0537, indicates a Strong relationship H5 – System Thinking Factors influencing Connectivism Factors, β_{STF-CT} = 0.397***, t= 5.0354, indicates a Moderate relationship (t > 1.96) H6- Individual Learning Factors influencing Connectivism Factors, β_{ILF-CT} = 0.2789***, t= 6.732, indicates a Strong relationship (t > 2.59)

This exactly coincides with both the methodologies so; it is validated, and reliability tested to greater extent (Gonçalves et al., 2023)

Differences in Outcomes

The primary areas of divergence in both methodologies exhibit less stringency, particularly towards the None- category (indicating no direct significance) for H3 and H4 in the table, and H5, H6, H7 as observed in the Quantitative methodology, where statistical significance is established. However, in terms of indirect relationships, evidence indicates their existence. The disparity in results may be attributed to the stakeholders' (Survey Participants) lack of awareness regarding Dubai University's successes in various applications, whereas Education experts (Interview Participants) possess exposure to these issues. Another notable difference pertains to the susceptibility of Big Data, IoT/AI to information security concerns; many stakeholders are acquainted only with the term "Cybersecurity" and may not grasp the nuanced values and modes associated with this complex initiative (Reyad et al., 2020).

Conclusion and Recommendation

Implications of this Research

Practical Implications: The research study offers valuable insights into leveraging Big Data, IoT, and AI technologies to enhance the educational experience at Dubai University. Practical implications encompass optimizing curriculum design, personalizing learning experiences, and improving student engagement through data-driven strategies. The findings provide recommendations for streamlining administrative processes, such as resource allocation and infrastructure management, leading to operational efficiencies. Decision-makers at Dubai University can use these insights for informed choices in adopting and integrating these technologies. The study aids in strategic planning by understanding challenges and opportunities in digital transformation, guiding resource allocation, and providing recommendations for data analytics to support at-risk students. Implementing AI-driven student support systems contributes to early intervention and improves success rates. The study also recommends fostering a culture of innovation, collaborating with industry partners, and addressing ethical concerns related to technology adoption. Insights contribute to strategic planning for sustainable implementation, considering scalability, resource requirements, and environmental impact. Recommendations extend to professional development programs for faculty and staff to enhance digital literacy and skills, ensuring readiness for the digital future of education (Mallik et al., 2023).

Social implications: The research study illuminates the potential of employing Big Data, IoT, and AI technologies to ensure equitable access to education, emphasizing personalized learning experiences for diverse student needs. It explores the social implications of these technologies, particularly in terms of digital inclusion, addressing concerns related to data privacy and security. The study advocates for ethically handling student data and suggests strategies to foster community understanding and support. Socially, it underscores the importance of integrating emerging technologies into education for future job market readiness, emphasizing the cultivation of essential digital literacy skills. The research delves into how community stakeholders perceive and engage with these technologies, considering potential disparities in access and proposing initiatives to bridge the technological gap. It also highlights the cultural diversity in Dubai, recommending culturally sensitive adoption of technology aligned with the values and norms of the diverse student population. The study examines ethical considerations in AI use in education, advocating for transparency, accountability, and fairness to prevent bias and discrimination. It aims to uncover social attitudes towards these technologies and recommends transparent communication to build public trust. Socially responsible suggestions include integrating programs promoting digital citizenship and responsible technology use, fostering ethical responsibility and online etiquette among students (Hays et al., 2023).

Managerial implications: The study guides university administrators in developing a strategic plan for integrating Big Data and IoT/AI technologies. This involves setting clear objectives, timelines, and milestones for their incorporation into academic and administrative functions. Managerial decisions on resource allocation can be informed by the study's findings, including recommendations for investing in technology infrastructure, personnel training, and necessary tools. It emphasizes the need to recruit or develop talent with expertise in these technologies, suggesting decisions like creating training programs or partnerships with industry experts. Encouraging collaborations with industry partners specializing in Big Data, IoT, and AI can enhance the university's academic and research capabilities. The study underscores the

importance of establishing robust data governance policies, guiding managerial decisions to create frameworks for compliance with data protection regulations and ethical standards. Recommendations from the study inform decisions on streamlining administrative processes using data-driven insights, potentially adopting AI for administrative tasks, optimizing resource utilization, and improving operational efficiency. Managerial decisions may be influenced by the study's insights into adaptive learning strategies, tailoring educational experiences based on real-time data to enhance student engagement and improve learning outcomes. The study's findings may lead to decisions on developing risk management and contingency plans for technology implementation, addressing potential risks such as data breaches or system failures. Managerial decisions may involve communication strategies to engage stakeholders, including students, faculty, and staff, in adopting and integrating Big Data and IoT/AI technologies. Clear communication helps manage expectations and garner support for technological initiatives. Focusing on establishing Key Performance Indicators (KPIs) and evaluation mechanisms ensures that investments align with strategic goals, contributing to the overall success of the institution (Saadé et al., 2023).

Limitations and Future Research

The study's findings may have limited generalizability due to its focus on a specific context (Dubai University), caution is needed when extrapolating results to other universities or educational systems. The sample size, while practical, might limit the diversity of perspectives and not fully represent all university stakeholders. The cross-sectional design provides a snapshot but may not capture dynamic changes over time; a longitudinal approach could offer a more comprehensive understanding of the evolving impact of Big Data and IoT/AI. Reliance on self-reported data introduces the possibility of response bias, and the effectiveness of technology applications may depend on the existing technological infrastructure of Dubai University. Ethical implications are not deeply explored, necessitating further investigation into issues like student privacy and algorithmic bias. Future research could involve comparative analyses across multiple universities, dedicated exploration of ethical considerations, and quantitative analyses of learning outcomes associated with adaptive learning technologies. Exploring cultural and societal implications in the unique context of Dubai, investigating technological preparedness, and incorporating experimental designs for establishing causal relationships are suggested avenues for future research. Additionally, focusing on feedback mechanisms within technological systems and their impact on refining educational approaches can contribute to continuous improvement in technology-assisted learning environments (Hazzam et al., 2023).

The Contribution and Originality

Value of the Research

The research study provides empirical insights into the adoption of Big Data and IoT/AI technologies in higher education, specifically at Dubai University. It offers a real-world understanding of challenges, successes, and impacts, providing practical guidance for institutions, including Dubai University, on strategic integration and leveraging of these technologies. The findings aid administrators and decision-makers in strategic planning, informing decisions on technology integration, resource allocation, and talent development. By examining the usefulness of Big Data and IoT/AI, the study enhances teaching and learning practices, contributing insights into adaptive learning strategies and personalized education. It

identifies areas for operational efficiencies, streamlining administrative processes, optimizing resource allocation, and improving institutional effectiveness through data-driven approaches. The study addresses ethical considerations, promoting responsible technology adoption, safeguarding student privacy, and addressing biases in algorithmic decision-making. It serves as a benchmark for other institutions considering technology integration, offering adaptable insights. The research contributes to academic literature, providing empirical evidence on the intersection of technology and education in the UAE context. Stakeholders benefit from practical recommendations, guiding them in maximizing technology benefits while mitigating challenges. The study may inform educational policies at institutional and governmental levels, helping policymakers create frameworks for responsible technology adoption. By exploring cutting-edge technologies, the study encourages a culture of innovation within educational institutions, enhancing Dubai University's competitiveness globally (Chan, et al, 2023).

Conclusion

The infusion of Big Data and IoT/AI technologies into education has significantly transformed the educational landscape at Dubai University. These technologies have not only revolutionized teaching methodologies but have also enriched student engagement and elevated learning outcomes, a transformation supported by concrete empirical evidence from our study. The operational efficiency and administrative functions of the university have experienced a positive shift, leading to resource optimization and improved decision-making processes. However, these advancements have not been without challenges. The implementation journey has encountered technological constraints, ethical considerations, and unforeseen hurdles. The research study underlines the paramount importance of ethical considerations and privacy concerns associated with the use of Big Data and IoT/AI technologies. Dubai University has proactively employed technological safeguards to protect the rights and privacy of its students and stakeholders. Dubai University's innovative use of Big Data, IoT/AI technologies in crafting platforms and systems for enhanced educational guidance serves as a beacon. The institution generously shares its lessons learned, best practices, and insights, providing valuable assistance to other educational institutions seeking to maximize the benefits of these transformative technologies. The Research findings extend beyond the university walls; they serve as a compass for policy decisions related to technology adoption, data governance, and educational innovation in future endeavors. A noteworthy contribution lies in the utilization of Structural Equation Modeling (SEM), marking a significant advancement in research methodologies. Additionally, integrating System Thinking and Connectivism theories to construct the conceptual model represents another substantial contribution to the field. This holistic approach signifies a creative leap forward in understanding the intricate interplay between technology and education.

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Annexures

Developing the Questionnaire and the Interview Questions

Demographic Profile

This section is a collection of demographics of the participants for further analysis.

1. Please specify your age group

• 18–25
• 26–35
• 36–45
• 46–60
• 60 +

2. Please specify your gender

• Male
• Female

3. Please specify your highest qualification achieved

• High School
• Undergraduate
• Masters
• Doctorate

4. Please indicate your field of work

• Education
• IT / Technology
• Logistics / Transportation
• Hospitality & Tourism
• Medical Field
• Sports
• Jewelry & Fashion Design
• Construction / Engineering
• Others

5. What is your involvement with Dubai University?

a. Customer
b. Supplier
c. Part of Government
d. General Public

e. Environmentalist
f. Researcher
g. Employee
h. Others

Relation Study between the Independent Variables and the Dependent Variable

6. Individual Learning Factors (ILF) –Individual Learning Factors are a major issue as they depend on Individual Technology Acceptance, Mindset, Adaptability, Attitude, and Culture.

I believe that the Individual Learning Factors that will influence Dubai University Organization Learning are: (Express your opinion on the statement by marking the most appropriate one)

Individual Learning Factors (ILF)	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Technology Acceptance (ILF 1)					
Mindset (ILF 2)					
Adaptability (ILF 3)					
Attitude (ILF 4)					
Culture (ILF 5)					

7. System Thinking Factors (STF) – The System Thinking Factors are a major issue as they depend on Student Enrolment, Faculty Development, Curriculum to Industry Adaptation, Technology Integration, Community Engagement, and Sustainable Resource Management.

I believe that the System Thinking Factors that will influence Dubai University

Organization Learning are: (Express your opinion on the statement by marking the most appropriate one)

System Thinking Factors (STF)	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Student Enrolment (STF 1)					
Faculty Development (STF 2)					
Curriculum to Industry Adaptation (STF 3)					
Technology Integration ((STF 4)					
Community Engagement (STF 5)					
Sustainable Resources Management (STF 6)					

8.) Connectivism Factors (CF) – The Connectivism Factors are a major issue as they depend on Digital Networks, Social Learning, Teamwork, Global collaboration, Lifelong learning, and Continuous Assessment & Feedback.

I believe that the Connectivism Factors that will influence Dubai University

Organization Learning are: (Express your opinion on the statement by marking the most appropriate one)

Connectivism Factors (CF)	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Digital Networks (CF1)					
Social Learning (CF 2)					
Teamwork (CF 3)					
Global collaboration (CF4)					
Lifelong learning (CF 5)					
Continuous Assessment & Feedback (CF6)					

9. Dubai University Organization Learning (DUOL) – The Dubai University

Organizational learning will depend on Resilience, Resource sharing, Wellness Emphasis, Investments, and Top Management.

I believe that the factors for Dubai University Organization Learning depends on: (Express your opinion on the statement by marking the most appropriate one)

Dubai University Organization Learning (DUOL)	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Resilience (DUOL1)					
Resource sharing (DUOL2)					
Wellness Emphasis (DUOL3)					
Investments (DUOL4)					
Top Management (DUOL5)					

Interview Questions

1. How do the Individual Learning Factors of Individual Technology Acceptance, Mindset, Adaptability, Attitude, and Culture influence the Dubai University Organization Learning?
2. How do the System Thinking Factors of Student Enrolment, Faculty Development, Curriculum to Industry Adaptation, Technology Integration, Community Engagement, and Sustainable Resource Management influence the Dubai University Organization Learning?
3. How do the Connectivism Factors of Digital Networks, Social Learning, Teamwork, Global Collaboration, Lifelong Learning, and Continuous Assessment & Feedback influence the Dubai University Organization Learning?
4. How the Dubai University Organization Learning will depend on Resilience, Resource sharing, Wellness Emphasis, Investments, and Top Management factors?