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Data-Driven Decision-Making (DDDM) Systems Practices in Private Higher Education Institutions: A Systematic Literature Review

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Abstract—Data-driven decision-making (DDDM) systems are important in strategic planning and resource allocation in private higher education institutions (HEIs). Nonetheless, using data to improve education has challenges in finding the correct data and knowing how to use that data. The objectives of the systematic review were to explore (1) types of data-driven decision-making (DDDM) systems adopted by school administrators in strategic planning and resource allocation, (2) key elements of DDDM systems' successful implementation in the context of private higher education institutions (HEIs), and (3) whether DDDM systems improve quality and productivity in administrative decision-making. A systematic search for peer-reviewed articles on the topic published in 2019–2024 was made using Google Scholar, ERIC, and ScienceDirect databases. These include, but are not limited to, "data-driven decision-making tools," "the impact of higher education data analytics," "factors influencing assessment practices in private higher institutions," "the impact of data mining in education," and "quality and productivity in school management." Of the 48 articles identified, 23 met inclusion criteria focused on DDDM in private HEIs. Data were extracted and thematically analyzed. The review revealed two main uses of DDDM tools: data-driven classroom instruction improvement tools to foster better student outcomes and data analytics to boost operational quality. Institutional culture, collaboration, resource access, and technological infrastructure were key success factors. Hence, the DDDM system seems a laudable tool for improving private HEI operations and student performance outcomes. However, successful implementation needs extensive institutional preparation, robust data governance frameworks, and multiple integrated DDDM tools. Future work should emphasize long-term impacts over time, comparative consideration of diverse contexts, and involvement of various stakeholders.

***Index Terms*—DDDM systems, private HEIs, data-driven, decision-making, literature review.**

1. Introduction

Schools that utilize data-driven decision-making (DDDM) systems operate on the belief that strategic planning is more effective when implemented from the data gathered (Nurzen, 2022). However, challenges arise when identifying the needed data and its proper utilization by the involved leaders. Isaacs (2021) stated that its effectiveness in educational planning depends on what type of principled and moral leadership is in authority. This strategic management practice can be beneficial for identifying areas for school improvement (Fernandes, 2023) and risky for potential data misuse, such as over-reliance on it and neglecting teachers' expertise and judgment (Badawy & Alkaabi, 2023).

Data-driven decision-making (DDDM) systems are being embraced in higher education institutions throughout third-world countries to improve the quality of education and administrative efficiency. For example, in Ethiopia, DDDM systems seem to have been adopted, promising to improve student engagement and learning outcomes. Nevertheless, data privacy concerns and the need for robust data governance frameworks remain prevalent (Asfaw et al., 2023). The other study conducted in Bulgaria, India, and Serbia by Gaftandzhieva et al. (2023) stated the strong support for integrating DDDM technology that improved academic performance among scholars and improved administrative operations. However, according to the survey, a massive problem remains, from lack of educational training to inappropriate infrastructure. These studies demonstrate the potential benefits of DDDM systems in higher education while pointing to critical areas that need attention to ensure the full realization of their advantages.

In the Philippine higher education setting, DDDM systems have been utilized to meet the same sustainable development goals as in the international setting. Still, problems like slow internet connection and lack of awareness among faculty and staff are significant barriers to adopting cloud computing in Philippine universities, hindering a DDDM-cultured practice (Alimboyong & Bucjan, 2021). Addressing these issues through infrastructure improvements and comprehensive training programs is essential for maximizing the benefits of cloud technologies. Purcia and Velarde (2022) see the exact impact of DDDM systems in enrollment practices—lack of admission requirements and non-observance of enrollment schedules. With DDDM systems' good practice, these problems can be addressed by systematically collecting and analyzing data on admissions and enrollment processes. This approach can help identify inefficiencies and areas for improvement, leading to more informed decisions and streamlined operations.

DDDM systems have become partners of school leaders over

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the years now. Even so, there is still a need to systematically analyze its effectiveness and challenges in planning and operation in the different landscapes of our educational system. Hence, this systematic literature review focused on how school administrators utilize DDDM systems in private higher education practices. This paper will analyze recent studies conducted from 2019 to 2024. This aimed to identify practical tools and factors influencing successful data utilization in implementing educational programs across different research conducted in the context of private higher education institutions (HEIs). Specifically, it sought to answer the following research questions:

1. What are the various types of DDDM systems that most school administrators use in their strategic planning and resource allocation?
2. What are the critical factors that influence the success of the DDDM system process in private HEIs?
3. How much do these DDDM systems impact the quality and productivity of the administrative decision-making processes in school management?

2. Methodology

This review follows a systematic approach to ensure a comprehensive and unbiased synthesis of existing literature. The methodology comprises the following steps:

A. Search Strategy

Peer-reviewed and open-access articles published between 2019 and 2024 were retrieved from Google Scholar, which journal matches with ERIC and ScienceDirect databases. Keywords such as “data-driven decision-making tools,” “impact of higher education data analytics,” “factors affecting private higher institution evaluation practices,” “impact of educational data mining,” and “quality and productivity in school management" were used to identify relevant studies.

B. Inclusion and Exclusion Criteria

Only studies focusing on the application of DDDM in private HEIs were included. Articles addressing other educational sectors or outside the specified timeframe were excluded.

C. Selection Process

During the article identification, 48 articles were initially identified and considered from Google Scholar, 23 were from ScienceDirect, 20 were found related to the ERIC databases, and three were from another open database linked to Google Scholar. After reviewing abstracts and full texts, 23 studies were deemed relevant based on the inclusion criteria.

D. Data Extraction and Analysis

Data were extracted and categorized into three themes aligned with the research questions: types of DDDM systems, success factors, and impacts on decision-making quality and productivity. Thematic analysis was employed to identify patterns and gaps.

E. Flowchart of Selection Process

Records identified through database searching (n = 91)
↓
Records after duplicates removed (n = 80)
↓
Records screened using related terms (n = 80)
Records excluded because of timeline requirement (n = 57)
↓
Full-text articles assessed for eligibility (n = 23)
Full-text articles excluded, with reasons (n = 0)
↓
Studies included in qualitative synthesis and quantitative synthesis (meta-analysis) (n = 23)

3. Results

The table 1 shows the summarized studies utilized in this review to answer the research questions.

A. Utilizing Various DDDM Tools for Educational Administration.

From the systematic review, four articles from ERIC

Table 1

Research Question	Key Findings	Included Studies
Types of DDDM systems used in strategic planning	*Tools Used:* SIS, LMS (e.g., Moodle), analytics platforms (e.g., PROF-XXI, BSC, SM, BMC), financial management systems, SERVQUAL Framework, LPAE. *Applications:* Resource allocation, outcome-based education (OBE), tracking budgets, improving student outcomes, strategic planning.	Sun & Lee (2020), Abusalem et al. (2024), Suganya et al. (2024), Smucker & Grant (2022), Al-Filali et al. (2023), Kotorov et al. (2024), Ashaari et al.
Critical factors influencing success	*Institutional Culture:* Collaborative environments, equity-focused assessments, positive perceptions of data value among administrators.	Gilson (2023), Carney et al. (2022), Singer-Freeman & Robinson (2020), Chen (2024)
	Access and Resources: Availability of data, resource constraints, need for policies supporting infrastructure and incentives.	Usher & Hershkovitz (2023), Vasiliev (2021), Maniyan et al. (2024), Chen (2024)
	Technology: LMS satisfaction, hybrid models, decision support systems, advanced analytics for competitiveness and academic excellence.	Toring et al. (2023), Maniyan et al. (2024), Vasiliev (2021)
Impact on administrative decision-making quality	*Strategic Innovation:* Enrollment command centers, tools like PROF-XXI for competency identification, predictive analytics for tactical planning.	Dei et al. (2023), Kotorov et al. (2024), Ashaari et al. (2021), Abusalem et al. (2024), Suganya et al. (2024)
	Institutional Performance: Big data analytics, IA tools for retention and targeted interventions, integration with technology-based education systems.	De Silva et al. (2022), Murad et al. (2019), Marchena Sekli & De La Vega (2021), Asfaw et al. (2023)
	Stakeholder Engagement: Collaboration during implementation enhances system success. Digital tools enable broader adoption and pandemic resilience.	Haile & Mekonnen (2024), Haukland (2020), Dei et al. (2023)

databases and two articles in ScienceDirect discuss tools that can be used to formulate data-driven decisions for school improvement purposes. Integrating DDDM's various data analyses and interpretations to guide decision-making in multiple settings is crucial for private HEIs worldwide. It can be presented that private HEIs utilized DDDM system tools for two main reasons: classroom instruction tools to improve student outcomes and to enhance operation quality through data analytics.

1) DDDM Tools for Student Outcomes

School administrators of private HEIs in Malaysia leverage various Data-Driven Decision-Making (DDDM) systems, such as *Student Information Systems (SIS)* and *Learning Management Systems (LMS),* to enhance strategic planning and resource allocation in the context of Outcome-Based Education (OBE). These systems provide critical insights into student performance and program effectiveness, enabling administrators to evaluate whether learning outcomes are being met and to make informed decisions about curriculum and resource investments (Sun & Lee, 2020). A good example is Australia, which uses Moodle as a comprehensive *LMS* that effectively analyzes student engagement and performance data (Abusalem et al., 2024). By utilizing comprehensive data analysis and benchmarking tools, administrators can foster continuous improvement in educational practices and ensure that resources are allocated effectively to support OBE initiatives. Suganya et al. (2024) also established that learning analytics using retention policy impacts attainment and employability. Hence, utilizing data-informed decisions from the LMS and SIS will allow private HEIs to improve the hiring rate of their graduates in different fields.

2) Enhancing Quality and Performance through Data Analytics

Another study by Smucker and Grant (2022) introduces a new rubric for formatively assessing strategic plans in higher education, which serves as a valuable DDDM tool for school administrators in strategic planning and resource allocation. This rubric emphasizes *assessment and evaluation tools* that provide insights into student learning outcomes and program effectiveness, allowing institutions to refine their strategies based on continuous feedback. It further incorporates using *financial management systems* to track budgets and expenditures, ensuring that resource allocation is aligned with institutional goals, as in the study by Al-Filali et al. (2023). To enhance the analysis of planning financial sustainability at King Abdulaziz University (KAU), the authors modified versions of three strategic planning tools: a strategy map (SM), the balanced scorecard (BSC), and the business model canvas (BMC).

Utilizing *data analytics platforms* within the rubric formulated by Smucker and Grant (2022), administrators can analyze trends and metrics, enabling informed decision-making that aligns resources with strategic objectives and the dynamic needs of their communities. Also, models like Learning Partnerships in Adult Education (LPAE) and the SERVQUAL Framework help assess and improve the quality of educational services by fostering collaboration and measuring the gap between student expectations and perceptions (Abusalem et al., 2024). Another website tool that emerges from the literature review is the use of PROF-XXI, which has aided teaching and learning centers in conducting structured competency identification and reflection processes (Kotorov et al., 2024).

B. Factors Affecting the Successful Use of DDDM Systems in Private HEIs

From the screening using the databases mentioned in this review, factors that affect the successful implementation of DDDM systems in Private HEIs are found in open-access publications from Johns Hopkins (1), ERIC (4), and ScienceDirect (3).

1) Institutional Culture and Collaboration

According to a thesis study by Gilson (2023) from Johns Hopkins Publish research, a positive perception of a collaborative culture will give college administrators a positive outlook on data value, and many are confident in their data skills. Indeed, frustrations with the institutional culture surrounding data use can get in the way of effective DDDM. A culture of collaboration serves as a core component in an enriched atmosphere where data is purposefully used to inform decision-making. Carney et al. (2022) further strengthen the need for a cultured quality type of formative assessment that will help balance the summative and formative assessment benefits and will allow for integrated, equitable, responsive private HEIs.

As Singer-Freeman and Robinson (2020) emphasized in a multidisciplinary study, mitigating grand challenges requires institutions to use assessment results to address equity and immediate pedagogical improvements. When cultivated into a culture, data-informed insights can lead to better decision-making that drives improved education outcomes.

2) Access to Data and Resources

Other factors that influence the DDDM system's successful usage are physical accessibility and resource limitations. Administrators struggle to access the data physically and lack the resources to support data and analytics projects. It can also be excruciatingly painful to base decisions on data (Gilson, 2023). Moreover, a non-supportive policy ecosystem and poor infrastructure can hinder effective DDDM, calling for instant action to overcome these barriers. As Chen (2024) stated, any resource, such as incentives, is necessary. Therefore, carefully analyzing the motivations behind green innovation and how it functions inside is necessary to strike a balance between sustainable and economic growth. Additionally, it might give private HEIs a competitive advantage.

During the transition from face-to-face (F2F) to emergency remote teaching (ERT) as a result of the COVID-19 pandemic, Usher and Hershkovitz (2023) highlight the significance of drawing on the wide variety of data emerging from diverse sources. Their analysis indicates that educators in ERT were more inclusive and made data-driven decisions in areas such as adapting courses, collaborating, and providing social and emotional support. This starkly contrasts F2F teaching, where decisions were typically more focused on immediate educational needs. Faculty and administrators, who often

manage multiple simultaneous responsibilities, need access to relevant data and adequate resources to make informed decisions. Proper use of resources ensures they have the tools to thrive amidst the complexities of remote teaching environments.

3) Technology and Infrastructure

The quality of technology and systems per se influences the effectiveness of DDDM. A cross-sectional survey of the literature shows that other variables such as system content, interaction, and technology affect student satisfaction with using LMS, which strongly affects the associated benefits that, in turn, impact student satisfaction, engagement, and affect (Toring et al., 2023).

Using hybrid models and decision support systems to aid informed decision-making demonstrates the need for advanced technology in education practices. Organizations that invest in strong technological frameworks will have a more remarkable ability to analyze educational information and yield better outcomes that can be supported by evidence to make policy (Maniyan et al., 2024). As a result, Vasiliev (2021) highlighted that utilizing competitiveness indicators in evaluating academic excellence can increase institutional performance, which is vital for successful DDDM.

C. The Impact of the DDDM System on Quality and Productivity of the In Private HEIs

Five pieces of literature were found in ERIC and four in the ScienceDirect Database that discuss the impact of DDDM systems on the quality and productivity of private HEIs.

1) Strategic Decision-Making and Innovation Enhancement

With this in mind, the urgency to implement DDDM systems has become transformative, particularly for the role of private higher education institutions as an innovation driver and their contribution to advancing teaching and learning strategies. Analytic instruments like PROF-XXI have aided teaching and learning centers in conducting structured competency identification and reflection processes (Kotorov et al., 2024). This tool's power lies within four pillars: systematically reflecting on the level of competency across the organization, broadening the understanding of strengths and weaknesses, informing short- and long-term decision-making, and providing a mechanism to report on strategy and initiatives over time. The scale of these gains in analytics capability was further demonstrated by current Malaysian HEIs in a study conducted by Ashaari et al. (2021), achieving 83% accuracy in predictive performance using complex inductive deep learning analytics techniques.

This exquisite level of prediction has been critical for tactical planning and asset assignment. The importance of DDDM systems grew even further during the COVID-19 pandemic when universities established enrollment command centers to coordinate decisions across domains such as student access, recruitment, admission, and retention (Dei et al., 2023). These centers showed how such data-driven approaches could efficiently and effectively help institutions through approaches to rising challenges without diminishing the quality of education and operations.

2) Institutional Performance and Quality Enhancement

DDDM systems' impact on institutional performance and quality measures has been exhibited over multiple operational dimensions. Institution Database Tools: The application of institutional analytics (IA) has been particularly successful in helping institutions address student retention issues by enabling them to identify and understand three important categories of dropout-related influences: institutional experience, education goals, and personal factors (De Silva et al., 2022). This holistic view helps institutions formulate more targeted and effective intervention strategies. The case of Ahlia University, as studied by Murad et al. (2019), indicated that technology-based education implementation complemented with a well-developed DDDM system has a tremendous positive effect on student performance that can be derived from the students' perceived ease of use and usefulness. Meanwhile, big data analytics have positively affected institutional performance through knowledge management processes, as in the study by Marchena Sekli and De La Vega (2021). The importance of this relationship has been especially significant at universities in Latin America since big data analytics, generated openly, represent opportunities for open innovation and the scene of knowledge creation.

3) Stakeholder Engagement and System Implementation

This shows that the success of the DDDM system in private HEIs is highly dependent on stakeholder engagement and its quality in the implementation process. Research has shown that stakeholder engagement positively correlates with curriculum implementation success, underscoring the importance of ongoing interaction and feedback collection in system success (Haile & Mekonnen, 2024). Another paper notes that institutional autonomy and decision-making power in the DDDM systems have important implications, as shown in the case study of the Norwegian higher education system by Haukland (2020).

External support, compatibility, and a good organizational data environment are crucial factors for adopting big data analytics (Marchena Sekli & De La Vega, 2021). Dei et al. (2023) emphasized that utilization of various stakeholders, including digital learning experiences through apps and websites, virtual tour services, and other usages in social media, was successful privately but was also emphasized through general stakeholder engagements on institutions, including schools or universities during pandemic. These examples showed how successful stakeholder engagement could facilitate the proper adoption of systems and change institutional environments, even in the most challenging situations.

4. Discussion and Future Works

The systematic review aimed at analyzing and discovering the implementation and impacts of DDDM systems in private HEIs and proposed three primary themes of observations: (1) Availability and usage of numerous DDDM tools for the administration of education, (2) Influencing factors for the successful implementation of DDDM systems, (3) The effectiveness of DDDM systems on institutional quality and productivity. Private HEIs majorly use DDDM tools for two

types of work: first, student outcome–improvement work based on classroom instruction tools, and second, operational quality–improvement work related to the analytics of data.

The reviewed studies exhibit several significant strengths that improve the reliability and applicability of their findings. Case studies, quantitative analyses, and systematic reviews collectively provide a thorough understanding of the status of DDDM implementation. Spanning multiple regions around the globe, such as Malaysia, Australia, Norway, and Latin America, the geographic coverage of this study provides valuable perspectives on how DDDM is implemented and the educational and cultural contexts that shape them. In addition, most of the studies performed between 2020 and 2024, including analyses during the COVID-19 pandemic, offer timely insights into system adaptation in times of crisis. The practical examples of these DDDM tools, particularly PROF-XXI, Moodle, and various analytics platforms, highlight what can be achieved in practice.

However, some limitations in the current evidence base deserve to be considered. Several studies are limited in scope, so findings may not generalize to other contexts or systems of education. Limitations of the method include the few longitudinal studies examining the long-term effects of DDDM implementation, few comparative studies of similar DDDM systems in the same institutional context, and a lack of commonly defined metrics to assess system effectiveness. This review also utilizes open-access literature. Other themes predominantly emphasize developed or emerging economies, potentially overlooking the dynamics and knowledge of DDDM in developing countries or resource-constrained settings. Moreover, as pointed out, there is a focus on administrative and institutional views rather than investigating staff or faculty relationships with DDDM systems.

The implications for practice in private HEIs are substantial. They highlight the need for broad institutional preparedness before the implementation of DDDM, which can involve examining cultural readiness and evaluating the efficacy of the technology infrastructure. Everyone has to ensure data quality and access, and the study shows that integrating diverse DDDM tools can help universities serve diverse institutional needs by having various institutional data on one platform while ensuring the institutional integrity of the system.

Key areas to further the understanding of DDDM implementation in private HEIs to be potentially covered in future research directions. There is a need for longitudinal studies to (1) assess the longer-term implications of DDDM systems on institutional performance, (2) study how implementation strategies evolve, and (3) evaluate the sustainability of DDDM initiatives beyond their initial rollout. Comparative analyses should explore DDDM implementation in various economic and cultural environments, comparing approaches and applications of tools. We must emphasize stakeholder experiences—faculty and student perspectives—and their place in the system's success. In addition, studies are needed to establish standard measures to assess DDDM systems and implementation guide frameworks for under-resourced institutions.

At the level of the institution itself, recommendations include establishing a comprehensive framework for data governance within the organization, allocating resources toward adequate training and development for staff, and implementing mechanisms for ongoing evaluation and improvement of the system. At the policy level, the recommendations lean towards formulating data privacy and security guidelines for educational institutions, devising standards for implementing DDDM systems in private HEIs, and frameworks for inter-institutional data sharing and collaboration.

While the importance of DDDM systems in private HEIs is growing widely, there is a need for more empirical research to overcome the limitations and gaps that currently persist. Future research should focus on developing standard evaluation metrics, investigating long-term impacts, and ensuring broader coverage of institutional contexts and stakeholder perspectives

References

[1] Abusalem, A., Bennett, L., & Antonelou-Abusalem, D. (2024). Engaging and Retaining Students in Online Learning. *Athens Journal of Education*, *11*(1), 51–70.

[2] Al-Filali, I. Y., Abdulaal, R. M. S., Alawi, S. M., & Makki, A. A. (2023). Modification of Strategic Planning Tools for Planning Financial Sustainability in Higher Education Institutions. *Journal of Engineering Research*, *12*(1).

[3] Alimboyong, C. R., & Bucjan, M. E. (2021). Cloud computing adoption among state universities and colleges in the Philippines: Issues and challenges. *International Journal of Evaluation and Research in Education (IJERE)*, *10*(4), 1455–1461.

[4] Asfaw, Z., Alemneh, D., & Worku Jimma. (2023). Data-Driven Decision-Making and Its Impacts on Education Quality in Developing Countries: A Systematic Review. *2023 International Conference on Information and Communication Technology for Development for Africa (ICT4DA)*.

[5] Ashaari, M. A., Singh, K. S. D., Abbasi, G. A., Amran, A., & Liebana-Cabanillas, F. J. (2021). Big data analytics capability for improved performance of higher education institutions in the Era of IR 4.0: A multi-analytical SEM & ANN perspective. *Technological Forecasting and Social Change*, *173*, 121119.

[6] Badawy, H. R. I., & Alkaabi, A. M. (2023). From Datafication to School Improvement. *Advances in Educational Marketing, Administration, and Leadership Book Series*, 301–325.

[7] Carney, E., Zhang, X., Charsha, A., Hoshaw, J., Carney, E., Zhang, X., Charsha, A., Taylor, J., Hoshaw, J., Note, E., & Carney. (2022). *Formative assessment helps students learn over time: Why aren't we paying more attention to it?*

[8] Chen, L. (2024). Digital Transformation, Executive Incentives, and Bachelor's Education in Chinese A-share Listed Companies. *Heliyon*, e39290.

[9] De Silva, L. M. H., Chounta, I.-A., Rodríguez-Triana, M. J., Roa, E. R., Gramberg, A., & Valk, A. (2022). Toward an Institutional Analytics Agenda for Addressing Student Dropout in Higher Education: An Academic Stakeholders' Perspective. *Journal of Learning Analytics*, *9*(2), 179–201.

[10] Dei, D.-G. J., Kankam, P., Anane-Donkor, L., Peasah, T. E., & Puttick, C. P. (2023). Strategies for enrolment management in private universities in Ghana during the COVID-19 pandemic. *International Journal of Educational Research Open*, *5*, 100294.

[11] Fernandes, J. (2023). The Role of Data-Driven Decision-Making in Effective Educational Leadership. *Academy of Educational Leadership Journal*, *27*(2), 1–3, 2023.

[12] Gaftandzhieva, S., Hussain, S., Hilčenko, S., Doneva, R., & Boykova, K. (2023). Data-driven Decision Making in Higher Education Institutions: State-of-play. *International Journal of Advanced Computer Science and Applications*, *14*(6).

[13] Gilson, J. (2023, May 22). *Supports and Barriers to Data-Driven Decision-Making for Institutional Improvement in Higher Educational Settings*.

[14] Haile, T. M., & Mekonnen, E. A. (2024). Impacts of stakeholder engagement on curriculum implementation in Ethiopian Defense University. *Pedagogical Research*, *9*(2), em0201–em0201.
[15] Haukland, L. H. (2020). The Bologna Process and HEIs Institutional Autonomy. *Athens Journal of Education*, *7*(4), 365–384.
[16] Isaacs, J. (2021). The Problem with Data-Driven Decision Making in Education. *Journal of Educational Thought/Revue de La Pensée Educative*, *54*(1).
[17] Kotorov, I., Krasylnykova, Y., Pérez-Sanagustín, M., Mansilla, F., & Broisin, J. (2024). Supporting Decision-Making for Promoting Teaching and Learning Innovation: A Multiple Case Study. *Journal of Learning Analytics*, *21*(1), 21–36.
[18] Maniyan, S., Ghousi, R., & Haeri, A. (2024). Data mining-based decision support system for educational decision-makers: Extracting rules to enhance academic efficiency. *Computers and Education: Artificial Intelligence*, *6*, 100242.
[19] Marchena Sekli, G. F., & De La Vega, I. (2021). Adoption of Big Data Analytics and Its Impact on Organizational Performance in Higher Education Mediated by Knowledge Management. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(4), 221.
[20] Murad, M., Razzaque, A., Hamdan, A., & Benhamed, A. (2019). *Impact Of Educational Technology on Students' Performance*.
[21] Nurzen, M. S. (2022). Data-based decision making for education planning: strategies for principal success. *Jurnal Konseling Dan Pendidikan*, *10*(4).
[22] Purcia, E., & Velarde, A. (2022). Student Registration and Records Management Services of the Three Private Universities in the Philippines: Basis for Academic Records Digitization. *American Journal of Multidisciplinary Research and Innovation*, *1*(4), 1–10.
[23] Singer-Freeman, K., & Robinson, C. (2020). *Grand Challenges for Assessment in Higher Education*.
[24] Smucker, A., & Grant, L. (2022). A Formative Tool and Approach to Assessing Strategic Plans in Higher Education. *Educational Planning*, *29*(3).
[25] Suganya, S., Anilkumar. R, Joe, P., Indumathi.V, & Mahabub Basha. S. (2024). Enhancing Employability by Design: Optimizing Retention and Achievement in Indian Higher Education Institution. *Naturalista Campano*, *28*(1), 472–481.
[26] Sun, P. H., & Lee, S. Y. (2020). The Importance and Challenges of Outcome-Based Education – A Case Study In A Private Higher Education Institution. *Malaysian Journal of Learning and Instruction*, *17*(Number 2), 253–278.
[27] Toring, H., Legaspi, G., Omolon, J., Amadeo, R., Amadeo, E., Opolentisima, Q., Barina, V., Cacho, T., Illustrimo, F., & Cortes, S. (2023). Evaluating students' satisfaction toward an adopted learning management system at Indiana Aerospace University: A structural equation modeling approach. *Asia Pacific Management Review*, *28*(3).
[28] Usher, M., & Hershkovitz, A. (2023). Data-Driven Decisions of Higher Education Instructors in an Era of a Global Pandemic. *Online Learning Journal*, *27*(2).
[29] Vasiliev, A. (2021). Competitiveness and Academic Excellence with Emerging Technologies: Methods for Assessing the Quality of University Education. *International Journal of Instruction*, *14*(4), 1013–1032.