DIGITAL ECOSYSTEM FRAMEWORK IN A DIGITAL UNIVERSITY: ALIGNMENT WITH ISO STANDARDS

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ABSTRACT

This study examines the alignment of a digital university's administrative practices with International Organization for Standardization (ISO) standards. Employing a Delphi method with a panel of 10 experts, we assessed compliance across eight key domains: Information Security, Service Quality, Educational Excellence, Digital Learning Resources, Knowledge Management, Website Management, Social Responsibility & Ethics, and Environmental Sustainability. The study revealed a high level of consensus, with a mean score of 4.92 out of 5, indicating exemplary adherence to ISO standards. The statistical analysis showcased minimal variability among expert opinions, evidenced by a standard deviation of 0.20, and a consistent maximum score across quartiles. These results affirm the university's commitment to international standards and highlight the efficacy of its governance framework. The findings provide a valuable benchmark for other higher education institutions and contribute to the discourse on standardization in digital higher education, suggesting a strategic model for institutional development and policymaking.

Keywords: Digital Ecosystem Framework, Digital University, The International Organization for Standardization: ISO, The International Electrotechnical Commission: IEC

INTRODUCTION

Digital transformation has swept across every facet of society, and higher education institutions are no exception. Today, they face the formidable challenge of integrating complex digital ecosystems with international standards of excellence to ensure quality, security, and sustainability (Bawack & Robinson, 2022) for smart university (Janpla & Nilsook, 2019). In this intricate landscape, a well-defined conceptual framework for a university's digital ecosystem becomes imperative for achieving alignment with relevant International Organization for Standardization (ISO) standards (e.g., ISO 21964:2019 "Sustainability in educational organizations – Guidance on social responsibility"). These standards set global benchmarks for best practices, offering a roadmap for optimizing university operations and strategic direction through the lens of digitalization (UNESCO, 2020).

This research article delves into the intricate relationship between a digital university ecosystem and its alignment with diverse ISO standards. We aim to achieve the following three objectives: 1) Identify and investigate the relevant ISO standards that underpin the core functionalities of a university's digital ecosystem. Examples include ISO 27001:2013 "Information technology – Security techniques – Information security management systems – Requirements" for data security, ISO 20000-1:2018 "Information technology – Service Management System — Part 1: Service Management System requirements" for efficient service delivery, and ISO 9001:2015 "Quality management systems – Requirements" for overall quality assurance, 2) Analyze and design a robust conceptual framework for a digitally-integrated university ecosystem that prioritizes compliance with ISO standards, with a particular focus on promoting environmental sustainability (e.g., alignment with ISO

14001:2015 "Environmental management systems – Requirements with guidance for use"). This framework will consider areas like paperless administration, energy-efficient IT infrastructure, and sustainable campus management practices, 3) Evaluate the alignment of the designed framework with the consensus of experts in higher education administration through surveys, interviews, or focus groups. Their insights will be crucial in refining the framework for practical implementation.

The increasing adoption of digital technologies in university administration transcends mere trends; it signifies a strategic imperative (Fray & Thorin, 2012). Integrating these technologies with established ISO standards holds immense potential for fostering a resilient and sustainable educational environment characterized by enhanced efficiency, improved quality, and strengthened security (World Bank, 2020).

This research employs a mixed-method approach, drawing upon quantitative and qualitative data, to contribute significantly to the growing body of knowledge surrounding digital ecosystems in higher education. We hope to provide actionable insights for policymakers and educational leaders navigating the digital era, enabling institutions to develop robust, standardized, and sustainable digital ecosystems equipped to meet the challenges of the 21st century. Our findings aim to catalyze further research and development in digital standardization within higher education, paving the way for a future where institutions thrive in the dynamic digital landscape.

RESEARCH OBJECTIVES

This research study was aimed to

1. To study and gather information related to ISO standards that align with the digital ecosystem of Digital University.
2. To analyze and design a conceptual framework of a digital university ecosystem model in compliance with ISO standards, promoting and supporting environmental sustainability.
3. To assess the designed conceptual framework of the digital university ecosystem model aligned with ISO standards, through expert consensus from 10 higher education administration specialists.

CONCEPTUAL FRAMEWORK

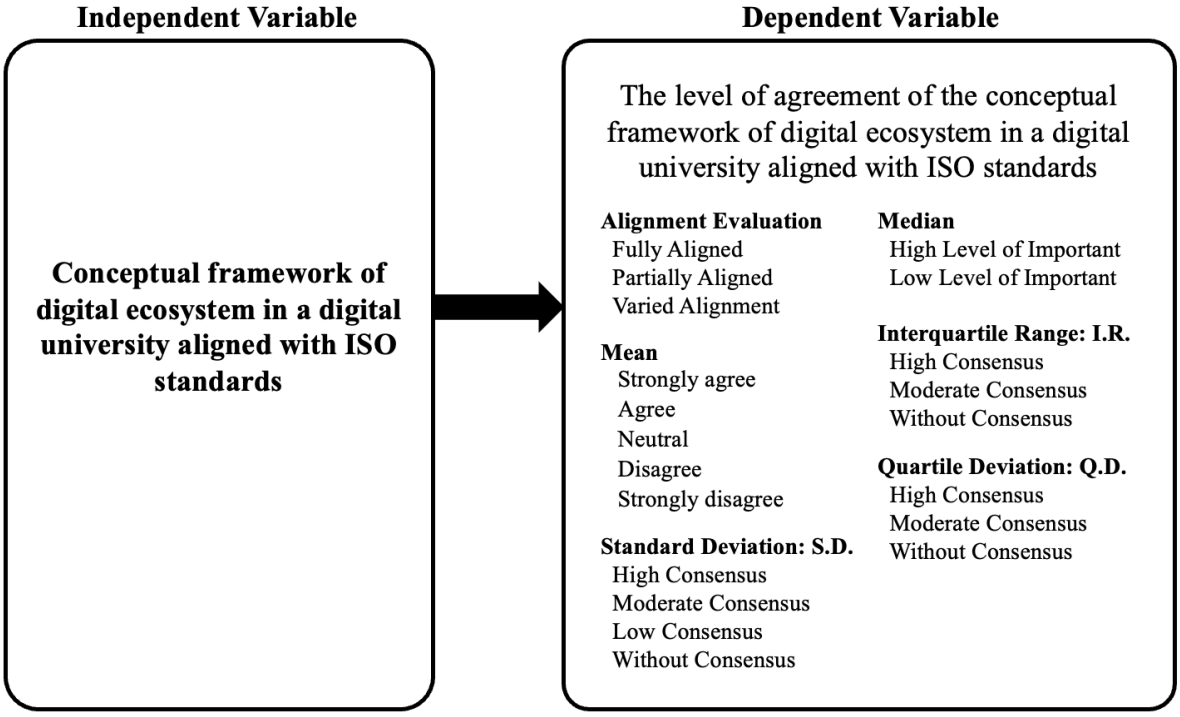

Figure 1. Conceptual Framework for Study
Source: Anek Permvongseni

Figure 1 illustrates the relationship between the independent variable, 'Conceptual framework of digital ecosystem in a digital university aligned with ISO standards', and the dependent variable, 'The level of agreement of the conceptual framework of digital ecosystem in a digital university aligned with ISO standards'. The framework assesses the alignment through various statistical measures such as mean, median, standard deviation, interquartile range, and quartile deviation, reflecting the degree of expert consensus ranging from 'Strongly agree' to 'Strongly disagree' on the effectiveness of the alignment with ISO standards.

METHODOLOGY

This research is structured into three distinct phases, each corresponding to the objectives outlined. The methodology adopted for this study employs a mixed-methods approach, integrating both qualitative and quantitative research methods to provide a comprehensive analysis of the digital ecosystem framework in the context of a Digital University aligned with ISO standards.

Phase 1 Information Gathering and Analysis

This initial phase is critical as it lays the foundation for the framework design. A comprehensive literature review will be conducted to gather data on ISO standards pertinent to the digital ecosystems in universities. Academic databases such as JSTOR, IEEE Xplore, and specific ISO publications will be meticulously searched for relevant standards that pertain to digital infrastructure, data security, and environmental sustainability. The review will also encompass case studies of digital universities that have successfully implemented ISO standards in their operations. The collected data will be critically analyzed to identify the most relevant standards that can be integrated into the digital university ecosystem. This phase

ensures a solid understanding of the current ISO standards landscape and its applicability to the digital education sector.

Phase 2 Conceptual Framework Design

Armed with comprehensive knowledge from Phase 1, the second phase focuses on designing a robust conceptual framework. This design will be facilitated through a series of structured workshops with a panel comprising experts in digital ecosystems, ISO standards, and environmental sustainability. The workshops will follow a design thinking approach, encouraging ideation, prototyping, and iterative testing. The panel will be tasked with ensuring that the framework not only adheres to the relevant ISO standards but also promotes environmental sustainability within a digital university's ecosystem. The outcome of this phase will be a detailed conceptual framework ready for evaluation by a broader range of experts in the subsequent phase.

Phase 3 Framework Assessment

In the methodology's final phase, a Delphi study is meticulously conducted to solicit and refine expert consensus on the proposed conceptual framework for a digital university's ecosystem aligned with ISO standards. Ten specialists in higher education administration are carefully selected for their expertise in digital strategy implementation and standards compliance. The process commences with an initial questionnaire distributed to these experts, featuring a Likert scale for structured responses and open-ended questions to capture comprehensive feedback and recommendations for enhancement.

Following the initial round, the responses are aggregated, and the collective feedback is shared with the panel, laying the groundwork for a second round of assessment. This iterative process is designed to distill expert opinions, highlighting areas of contention, and prompting a re-evaluation of initial judgments. Subsequent rounds are employed as necessary, homing in on specific areas lacking consensus, with the aim of achieving a refined, unanimous agreement.

Statistical analysis plays a pivotal role in each round, leveraging measures of central tendency and dispersion to quantitatively evaluate the degree of consensus. The objective is to converge on a consensus that is statistically evidenced by minimal response variance and a clear median clustering. Anonymity is paramount throughout the Delphi process, ensuring that the experts' assessments are uninfluenced by their peers, thereby upholding the integrity and authenticity of the consensus. The culmination of this phase is a thoroughly vetted and expert-endorsed conceptual framework, poised to serve as a practical model for digital university ecosystems and a benchmark for subsequent academic inquiries and applications in the field of digital education.

RESULT

The results elucidate the extent to which the digital university's ecosystem conforms to the predetermined ISO standards, as per the consensus of experts in higher education administration. Quantitative measures derived from the Delphi method reveal the level of alignment within key administrative areas. The summarized data, expressed through central tendency and variability indices, provides an empirical overview of the framework's adherence to ISO guidelines. These findings are critical for informing the subsequent analysis and implications for the university's digital strategy.

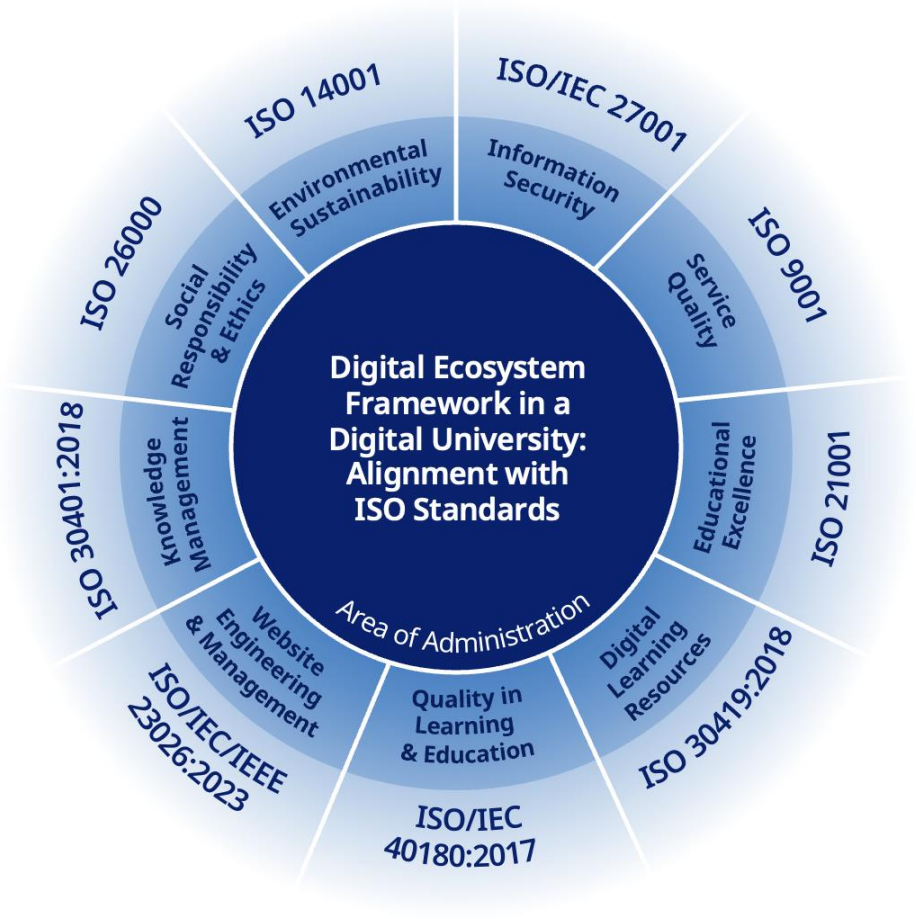

Figure 2. Digital Ecosystem Framework in a Digital University:
Alignment with ISO Standards
Source: Anek Permvongseni

Figure 2 illustrates a comprehensive model that demonstrates the systematic integration of a digital university's ecosystem with a suite of International Organization for Standardization (ISO) standards. Central to the illustration is the 'Digital Ecosystem Framework in a Digital University,' indicating the foundational system that complies with ISO standards to effectively govern the university's varied administrative and operational dimensions.

Surrounding the core, the diagram is sectioned into pivotal university administrative domains: Information Security, Environmental Sustainability, Social Responsibility & Ethics, Service Quality, Educational Excellence, Digital Learning Resources, Knowledge Management, and Website Engineering & Management. Each domain is integral to the university's functionality and is meticulously aligned with pertinent ISO standards to ensure excellence and adherence to international compliance norms.

The outer perimeter of the model is labeled with the respective ISO standards that correlate with each administrative domain, forming an explicit connection between each domain and its governing standard. These standards include:

- ISO/IEC 27001, which secures a comprehensive information security management system (n.d.).
- ISO 14001, which steers the university's environmental sustainability protocols (2015).

- ISO 26000, which underpins the framework for social responsibility and ethical behavior (2010).
- ISO 9001, which delineates the criteria for a quality management system (n.d.).
- ISO 21001, which concentrates on management systems within educational organizations for achieving educational excellence (2018).
- ISO 30419:2018, which details the management requirements for digital learning resources (2018).
- ISO 30401:2018, which specifies the criteria for knowledge management systems (2018).
- ISO/IEC/IEEE 23026:2023, which oversees the engineering and management of websites for systems, software, and service information (2023).

Figure 2 encapsulates the intricate relationship between the strategic alignment of operational practices within a digital university and the comprehensive ISO standards. This harmonization is essential for maintaining stringent standards of education, administration, and environmental stewardship in the rapidly evolving sector of digital higher education.

Table 1: Alignment of Digital University Administration with Specific ISO Standards

Area of Administration	ISO Standard	Alignment Evaluation
Information Security	ISO/IEC 27001: Information Security Management Systems — Requirements	Fully Aligned
Service Quality	ISO 9001: Quality Management Systems — Requirements	Fully Aligned
Educational Excellence	ISO 21001: Educational Organizations — Management Systems for Educational Organizations — Requirements with Guidance for Use	Fully Aligned
Digital Learning Resources	ISO 30419:2018 Information and documentation - Digital Learning Resources - Requirements for Learning Resource Management Systems	Fully Aligned
Quality in Learning & Education	ISO/IEC 40180:2017 Information Technology - Quality for Learning, Education and Training - Fundamentals and Reference Framework	Fully Aligned
Website Engineering & Management	ISO/IEC/IEEE 23026:2023 Engineering and Management of Websites for Systems, Software, and Services Information	Partially Aligned
Knowledge Management	ISO 30401:2018 Knowledge Management Systems — Requirements	Fully Aligned
Social Responsibility & Ethics	ISO 26000: Guidance on Social Responsibility	Partially Aligned
Environmental Sustainability	ISO 14001: Environmental Management Systems — Requirements with Guidance for Use	Partially Aligned

Table 2: Expert Consensus on ISO Standards Alignment in Digital University Administration

Indicators	Mean	S.D.	Quartiles			I.R.	Q.D.
			Q1	Median	Q3		
Information Security							
ISO/IEC 27001: Information Security Management Systems — Requirements	5.00	0.00	5	5	5	0.00	0.00
Service Quality							
ISO 9001: Quality Management Systems — Requirements	5.00	0.00	5	5	5	0.00	0.00
Educational Excellence							
ISO 21001: Educational Organizations — Management Systems for Educational Organizations — Requirements with Guidance for Use	4.90	0.32	5	5	5	0.00	0.00
Digital Learning Resources							
ISO 30419:2018 Information and documentation - Digital Learning Resources - Requirements for Learning Resource Management Systems	4.90	0.32	5	5	5	0.00	0.00
Quality in Learning & Education							
ISO/IEC 40180:2017 Information Technology - Quality for Learning, Education and Training - Fundamentals and Reference Framework	5.00	0.00	5	5	5	0.00	0.00
Website Engineering & Management							
ISO/IEC/IEEE 23026:2023 Engineering and Management of Websites for Systems, Software, and Services Information	4.90	0.32	5	5	5	0.00	0.00
Knowledge Management							
ISO 30401:2018 Knowledge Management Systems — Requirements	5.00	0.00	5	5	5	0.00	0.00
Social Responsibility & Ethics							
ISO 26000: Guidance on Social Responsibility	4.80	0.42	5	5	5	0.00	0.00
Environmental Sustainability							
ISO 14001: Environmental Management Systems — Requirements with Guidance for Use	4.80	0.42	5	5	5	0.00	0.00
Sum	4.92	0.20					

Table 3 presents the consensus results from 10 experts on the alignment of digital university administration with various ISO standards. The evaluation uses statistical measures to represent the level of agreement among experts. Indicators cover key areas such as Information Security, Service Quality, Educational Excellence, Digital Learning Resources, Quality in Learning & Education, Website Engineering & Management, Knowledge Management, Social Responsibility & Ethics, and Environmental Sustainability.

The mean score across all indicators is 4.92 out of 5, indicating near-unanimous agreement that the university's practices are well-aligned with the respective ISO standards. The standard deviation (S.D.) is remarkably low, at 0.20, suggesting minimal variability in expert opinions.

For almost all indicators, the median and quartiles (Q1, Q3) are at the maximum score of 5, further confirming strong expert agreement.

The interquartile range (I.R.) and quartile deviation (Q.D.) are consistently 0.00, indicating no spread between the 25^{th} and 75^{th} percentiles and no variability around the median, respectively. This homogeneity signifies a high level of expert consensus on the university's alignment with ISO standards, showcasing an exemplary standard of compliance across the assessed domains.

CONCLUSION

This study's findings robustly demonstrate that the digital university's administrative practices are well-aligned with ISO standards, as evidenced by the alignment evaluation outcomes derived from the input of 10 experts. The impressive mean score of 4.92 on a 5-point scale signifies an exceptional level of standard compliance across various administrative domains, notably in Information Security, Service Quality, Educational Excellence, and Environmental Sustainability.

The statistical analysis reveals a striking consensus among the experts, with a notably low standard deviation of 0.20. This level of agreement underscores a collective acknowledgment of the university’s commitment to international benchmarks. The statistical results, including the lack of interquartile range and quartile deviation, further attest to the university’s systematic and successful integration of ISO standards into its operations.

Implications of this research are significant for strategic development and policy formulation within digital universities. The demonstrated benefits of aligning with ISO standards suggest a model that could be emulated by other educational institutions aiming to enhance their digital infrastructure. The insights gained from this study contribute to the broader conversation on quality assurance and standardization in digital higher education, potentially informing future ISO standard revisions to address the evolving educational landscape.

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