Modeling an Instrument for Measuring E-Learning use in Learning Processes Based on ISO/IEC 38500:2008

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Abstract

In the context of *E-Learning* development, *E-Learning* technology is part of the Information Technology Governance System in higher education institutions. Sometimes, *E-Learning* implementation is carried out, but administrators do not know whether learners are studying effectively and achieving educational goals, whether the platform provides the expected added value in the learning process, and whether the quality of learning has been achieved. Therefore, accurate and effective *E-Learning* measurement is necessary to ensure that the implementation quality aligns with IT governance objectives in higher education institutions. One strategic approach to measurement is using the ISO 38500 framework. The strategic components of ISO 38500 can serve as the foundation for developing *E-Learning* measurement instruments in higher education. By utilizing these measurement instruments, organizations can identify the strengths and weaknesses of their *E-Learning* system, enabling continuous improvements to enhance the quality of learning materials, teaching methods, and user experience (for both lecturers and students). The *E-Learning* measurement instrument, developed based on ISO 38500 indicators, provides valuable data and insights for managerial decision-making. Based on the measurement results, management can make informed decisions regarding budget allocation for further development, updates or enhancements to the *E-Learning* platform, and the creation of new learning content or more effective training strategies.

Keywords: Instrument Model, *E-Learning*, ISO/IEC 38500, Information Technology Governance

1. Introduction

The scope of the ISO/IEC 38500:2008 standard is to provide guidance on the principles of effectively, efficiently, and acceptably managing information technology within an organizational environment for decision-makers. This standard applies to the governance of management processes (and decision-making) related to an organization's information and communication services (1). These processes can be overseen by IT specialists within the organization, external service providers, or by business units within the organization.This standard also applies to all organizations, including public and private companies, government entities, and non-profit organizations. Furthermore, it's used across all scales of organizations, from small to large, including extensive IT usage. The purpose of this standard is to promote the effective, efficient, and acceptable use of IT across all organizations by assuring all stakeholders (including customers, shareholders, and employees) that, if followed, they can have confidence in the implementation of corporate IT governance. It also aims to inform and guide directors in implementing IT usage governance within their companies and provide a basis for the objective evaluation of IT governance (2).

Before 2008, a complete IT Governance Framework didn't exist. However, several frameworks were available then and could be used as starting points for developing an IT governance

model (3). At that time, at least four frameworks were frequently referenced for IT Governance: COBIT, ITIL, ISO 27001/ISO 27002, and IT Quality Assurance. In 2008, ISO released a new standard called ISO 38500 Corporate Governance of IT.COBIT, ITIL, and ISO 27002 have a mid-to-low scope, while ISO 38500 has a mid-to-high scope. Therefore, COBIT, ITIL, and ISO 27002 are suitable as IT management frameworks, and ISO 38500 is suitable as an IT governance framework (4).

In the context of E-Learning development, E-Learning technology is part of the IT Governance System within a higher education institution (5). There's related research on measurement conducted by (6). which evaluated the quality of an online learning system using ISO/IEC 25010. However, this research only evaluated system quality and did not consider the governance aspect as focused on in ISO/IEC 38500. Another related study is the Evaluation of E-Learning Quality at UIN Raden Fatah Palembang Using COBIT. This evaluation involved user testing with lecturers and students, as well as aspects found in the COBIT standard (7). Based on this, an E-Learning evaluation using the ISO 38500 approach has not yet been conducted.

Sometimes, E-Learning implementation is already underway, but administrators don't know whether participants are learning effectively and achieving educational goals, whether the platform provides the expected added value in the learning process, or if the quality of learning has been met. Therefore, accurate and effective E-Learning measurement is necessary to ensure that the quality of implementation aligns with the objectives of IT governance in higher education. To perform E-Learning implementation measurement, a suitable instrument based on the correct IT governance approach is required. This paper proposes a mechanism for developing an E-Learning measurement instrument based on ISO 38500.

2. Material and Method

2.1 IT Governance based on ISO 38500

In early 2005, several working groups in Australia developed a standard for corporate governance called AS8015. AS8015 was an Australian standard for the corporate governance of information and communication technology. This AS8015 was eventually adopted as ISO/IEC 38500 in May 2008. ISO/IEC 38500:2008 is the corporate governance of information technology (very closely based on AS8015-2005), providing a framework for effective IT governance to help those at the highest level of an organization understand and fulfill their legal, regulatory, and ethical obligations regarding the use of IT within the organization. ISO/IEC 38500 is applicable to organizations of all sizes, including public and private companies, government entities, and not-for-profit organizations (8). This standard provides guiding principles for organizational directors to ensure the effective, efficient, and acceptable use of IT within their organizations. The core concept in ISO 38500 is that IT governance encompasses principles dictating that strategic decisions about IT should rest with the board of commissioners and directors, not solely with the CIO. ISO 38500 also aims to provide guidance to those involved in designing and implementing management systems for policies and processes that support governance. The objectives of the ISO 38500 standard are as follows (3):

1) Ensure stakeholders can gain confidence in the corporate governance of IT within the organization.
2) Inform and guide directors regarding the governance of IT utilization and use within their organization.
3) Provide a basis for objective evaluation of corporate governance of IT.

The ISO/IEC 38500 standard consists of three main chapters:

1) Scope, Application and Objectives
2) Framework for Good Corporate Governance of IT
3) Guidance for Corporate Governance of IT

The content of ISO 38500 is largely derived from AS8015, whose guiding principles are:

1) Establish responsibilities

2) Plan to best support the organization
3) Acquire validly
4) Ensure performance when required
5) Ensure comformance with rules
6) Ensure respect for human factors

The IT Governance Diagram Based on ISO 38500 is shown in Figure 1.

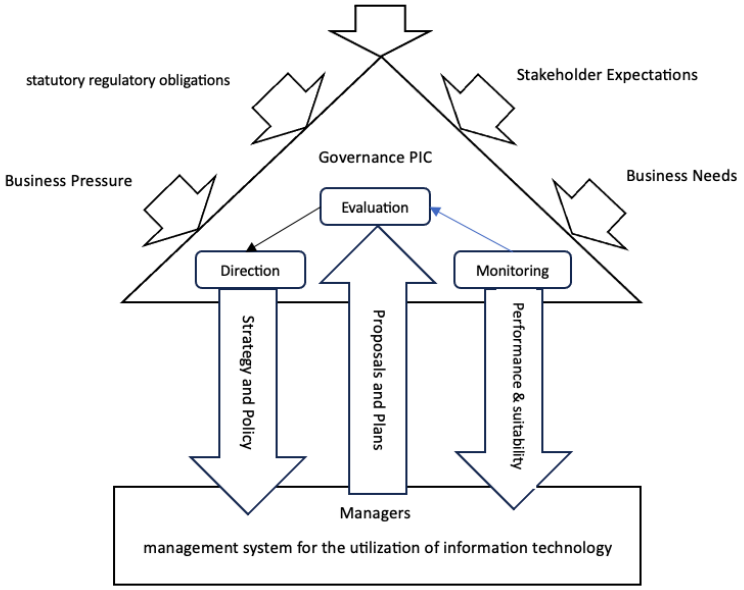


Figure 1. IT Governance System for *E-Learning based on ISO 38500*

2.2 IT Governance Framework & Principles Based on ISO 38500:2024

There are six (6) principles that must be followed to achieve good IT governance [5]:

1. Responsibility
   Individuals and groups within the organization understand and accept their responsibilities in addressing IT demands and needs. Everyone accountable for these activities also has the authority to carry them out.
2. Strategy
   The organization's business strategy must consider current and future IT capabilities. IT strategic plans must adequately address the needs of the organization's current and future business strategy.
3. Acquisition
   IT acquisitions are made in appropriate response to needs, based on ongoing suitability and analysis, with clear and transparent decisions. There is an appropriate balance between benefits, opportunities, costs, and risks, both in the short and long term.
4. Performance
   IT must align with the organization's purpose/needs, providing services, service levels, and service quality that meet current and future business requirements.
5. Conformance
   IT complies with all rules and legal requirements. Policies and practices are clearly defined, implemented, and enforced.
6. Human Behavior
   IT policies, practices, and decisions reflect a response to human behavior, including current needs and the development of all human processes themselves.

2.3 Evaluation

Directors should examine and make judgments regarding current and future IT use, including strategies, proposals, and provision arrangements (whether internal, external, or both). When evaluating IT use, directors should also consider external or internal business pressures, such as technological changes, economic and social trends, and political influences. Directors should conduct continuous evaluations as pressures change. Directors should also factor in current and future business needs in line with current and future organizational objectives that must be achieved, such as maintaining competitive advantage, as well as the specific goals of the strategies and proposals being evaluated (3).

2.4 Direction

Directors should delegate responsibilities, directly oversee work, and ensure the implementation of all plans and policies. Plans should constitute a set of directives for investments in IT projects and operations (3). Policies should align with common IT usage practices. Directors should also ensure that the transition from project to operational status is well-planned and managed, taking into account the business impact, current IT operational practices, and existing infrastructure. Furthermore, directors should foster a culture of good IT governance within their organization by utilizing managers who provide timely information, adhere to directives, and uphold the six (6) principles of good governance. If deemed necessary, directors should guide the planning of identified needs.

2.5 Monitor

Directors should monitor IT performance through appropriate measurement systems. They must ensure that performance aligns with plans, especially concerning business objectives (1). Directors should also ensure that IT complies with both external and internal organizational policies and regulations.

3. Methodology

The methodology used in this research is as shown in Figure 2.

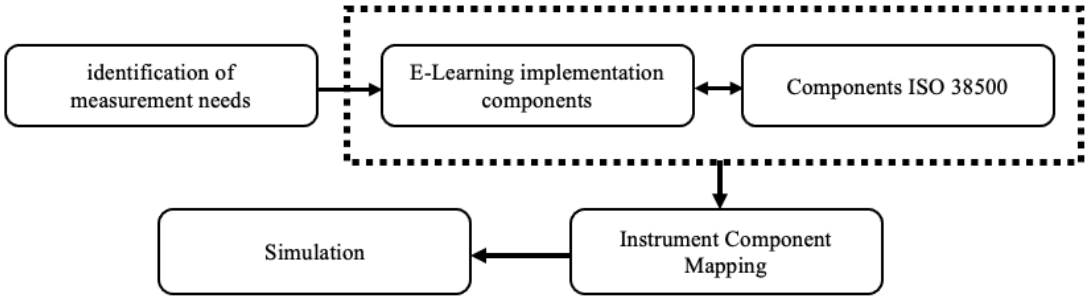


Figure 2. Methodology used in the research

Based on Figure 2, the detailed workflow is as follows:

1. Identify of measurement Needs.
   This step involves identifying which measurement needs will be evaluated in the context of E-Learning Implementation at Higher Education Institutions.
2. E-Learning Implementation Components & ISO 38500 Components

The next step is to break down the E-Learning Implementation Components and ISO 38500 Components. This will provide the necessary material for mapping, aligned with the requirements for developing the measurement instrument.

3. Instrument Component Mapping
   The final step is to perform the mapping based on the E-Learning Implementation Components and the ISO 38500 Components.
4. Simulation
   This stage is to conduct a trial of the instrument based on a case study to obtain an analysis.

4. Discussion

4.1 Building E-Learning Implementation with ISO 38500

As explained previously, IT governance aims to maximize the potential of existing resources, avoid overlapping allocations of time, cost, and human resources, and mitigate risks in IT development, thereby ensuring that IT investments yield optimal results. The ITGI defines IT governance as the responsibility of the board of directors and executive management. IT governance is an inseparable part of corporate governance, comprising leadership, organizational structures, and processes that ensure the organization's IT supports and extends its strategies and objectives (9). Consistent with the principles of information technology governance, the objectives of the ISO 38500 standard are as follows:

1) To assure stakeholders that they can have confidence in the organization's corporate governance of IT.
2) To inform and provide guidance to the board of directors regarding the governance of IT utilization and implementation within their organization.
3) To provide a basis for conducting an objective evaluation of the corporate governance of IT.

Based on the *Board Briefing on IT Governance*, IT governance focuses on two main aspects: the value that IT brings to the business and the mitigation of IT-related risks (9). IT value is driven by the strategic alignment between IT and business, while risk mitigation is driven by accountability to the organization. Both aspects require adequate and measurable resources to ensure that the expected outcomes are achieved (10). This leads to five key areas of IT governance that are driven by the value delivered to stakeholders. Two of these areas represent outcomes: value delivery and risk management. The remaining three are enablers: strategic alignment, resource management, and performance measurement. The relationships among these five areas are illustrated in Figure 3.

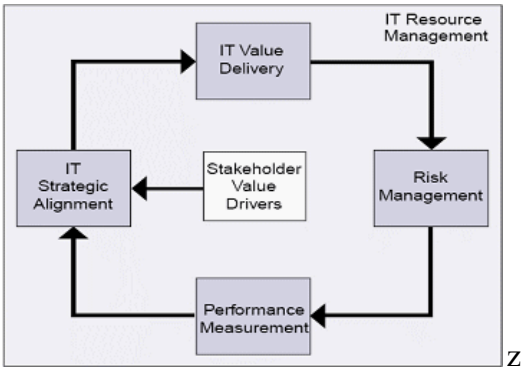


Figure 3. IT Governance Implementation Focus Areas

To establish effective information technology governance, it is advisable to focus on the five aforementioned areas. However, the approach and content of that focus should be adapted to the organization's specific corporate model. In principle, the process of building or implementing IT governance can begin from any point, as governance is a lifecycle process, but it should be aligned with the targeted objectives (11)(9). The initial step may begin with understanding the business context faced by the organization managing the e-Learning system, as illustrated in Figure 4.

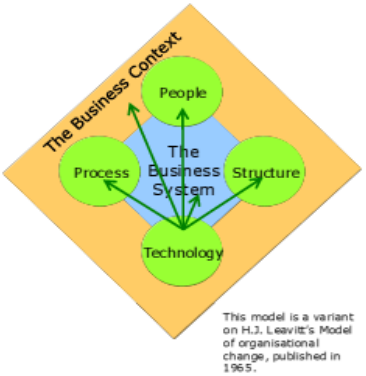


Figure 4 Organizational business context

Figure 4 illustrates the interconnection between process, people, and structure, all of which are fully supported by technology. These four elements explain that *people* refer to who is involved, *process* refers to what business activities are being conducted, *structure* refers to where the business takes place, and *technology* pertains to the support capacity and activity traceability in the implementation of e-Learning. By analyzing the relationships among these elements, an organization can identify which program changes are needed and what kind of governance should be established. Once the perspective on change has been understood, the next question is: *What actions should be taken?* To facilitate this, the ISO 38500 principles can be applied by posing a series of guiding questions, as illustrated in Figure 5.

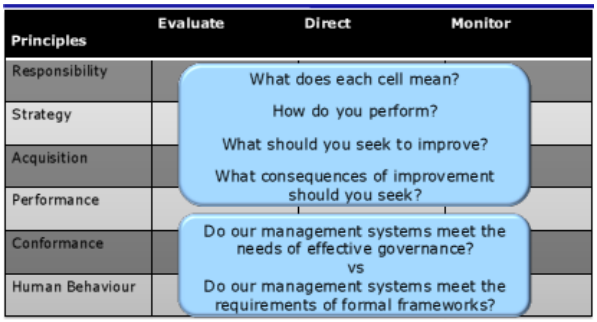


Figure 5. Matrix of ISO 38500

To address these questions, various models are required to support the objectives of IT governance, such as:

a. The organizational element model for e-Learning management
b. The process model of the e-Learning management organization
c. The policy foundation model for e-Learning governance
d. Other models necessary for developing governance

These models should be developed in accordance with the organization's or company's specific conditions and needs; therefore, there is no standardized or universally accepted form to follow. Once these models have been articulated, described, and interconnected, a governance framework based on ISO 38500 can be developed to define the governance objectives to be achieved. Figure 6 illustrates

the policy objectives along with their hierarchical structure, which includes strategic policy, operational policy, and usage policy (3).

1) Strategic policy reflects the current conditions in relation to the established principles,
2) Operational policy governs how various projects and day-to-day operations are executed effectively, and
3) Usage policy regulates how people utilize and apply technological resources and business systems.

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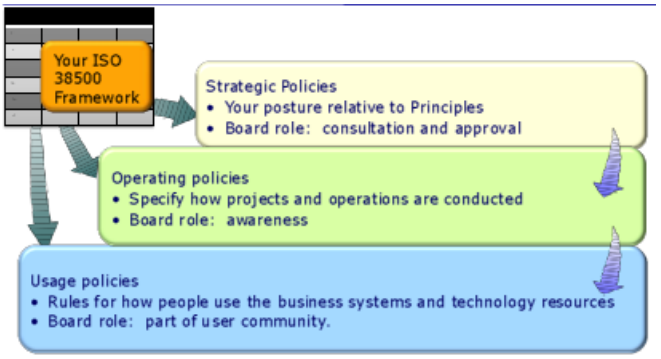


Figure 6. Objectives of the ISO 38500 Framework

Thus, it is expected that alignment will be regulated within the governance system in accordance with the business context of the organization or company. Through a governance system, the responsibilities and performance flow of information technology within the organizational elements are expected to be properly realized and managed in a holistic manner (8).

4.2 Instrument Mapping of E-Learning Implementation on the ISO 38500 framework as the basis for the Instrument

The following is a mapping of E-Learning Implementation in the ISO 38500 framework:

Objective:

To define the use of E-Learning to support student learning activities, and how effective, efficient, and acceptable it is within the higher education institution (referring to the use of IT, specifically E-Learning, in this context).

Evaluation:

1) In the implementation of E-Learning acquisition and usage, full responsibility lies with the student. Therefore, students who use the device are consciously aware of the impacts and consequences of its use. Regarding the evaluation step, it is necessary to measure the students' level of awareness of the device's usage concerning the resulting impacts. (This description relates to the Responsibility principle).
2) The use of E-Learning will provide convenience for students in their learning activities, such as ease of reading literature in softcopy format. Therefore, it needs to be evaluated whether the device is truly effective in downloading and opening the said literature. (This description relates to the Strategy principle).
3) The provision of E-Learning is highly effective and efficient for students to read softcopy literature. In this regard, it is also necessary to evaluate the cost of obtaining the service and the effectiveness of its acquisition. (This description relates to the Acquisition principle).
4) Can E-Learning enhance students' reading performance compared to using their existing devices (such as notebooks)? This is what needs to be further evaluated. (This description relates to the Performance principle).

5) Does the use of E-Learning within the school environment violate regulations? Does it violate generally accepted norms? These are the aspects that need further evaluation. (This description relates to the Conformance principle).
6) In essence, humans strive to find ease in all their affairs. Does the use of E-Learning align with the human instinct to seek convenience in the learning process or the opposite? This is what needs further evaluation. (This description relates to the Human Behavior principle).

Measurement Model:

Table 1. Measurement Model Table

		Evaluate	***Direct***	***Monitor***
		Setting goals in using E-Learning (IT implementation) in teaching and learning activities		
Responsibility	Determining the need for effective, efficient and acceptable use of E-Learning by universities			
Strategy				
Acquisition				
Performance				
Conformance				
Human Behaviour				

Determining Measurement Objectives

- *Evaluate Demand*
  - What are the current business processes for teaching and learning activities, and what is the desired use of **E-Learning**?
  - How will the adoption of new IT (E-Learning) make learning more acceptable to students?
- *Evaluate Supply*
  - How is the current learning system functioning?
  - How does using E-Learning enable students to understand and easily grasp teaching and learning activities?
  - What other support is needed for E-Learning implementation, such as suitable desks for E-Learning, power outlets, internet connection, etc.?
- *Direct*
  - What changes are desired, and what do the organization/board/executives hope to achieve with the implementation of E-Learning usage?
  - What policies and rules need to be established?
- *Monitor*
  - Were the defined objectives achieved?
  - Were the established policies and rules implemented in practice?

Defining 6 Principles

1. Responsibility (Assigning responsibility)
   - What are the responsibilities related to E-Learning usage?
     - On the demand side: defining how the organization operates and how IT (E-Learning usage) is employed to enhance teaching and learning activities.
     - On the supply side: defining how IT (E-Learning usage) is managed to provide a good environmental performance.
   - Who are the individuals/parties responsible for E-Learning Usage?
   - Do these individuals/parties understand their responsibilities?
   - Do they possess the skills to execute those responsibilities?

- Are they performing as expected (meeting objectives)?

2. Strategy (Putting plans in place)
   - What are the organization's future goals and objectives (sustainability objectives)?
     - On the demand side: does the implementation of E-Learning Usage enable better teaching and learning activities in the future?
     - On the supply side: is it appropriate to establish E-Learning usage to provide continuous comfort in future teaching and learning activities?
   - How is the proposed IT, in this case, E-Learning usage, prioritized in the allocation of existing resources?
   - Can the organization cope with the proposed level of change?
   - Are the right people skilled in managing such changes?
3. Acquisition (Decision to invest or not invest)
   - Every IT procurement/usage proposal must align with analysis:
     - Is the purchase of E-Learning consistent with benefits for the organization and measurable in the future?
     - Are the risks acceptable?
     - Has feasibility been tested?
4. Performance (Delivering on the promise)
   - What are the appropriate measures and measurement tools for E-Learning usage?
   - What was your initial situation (before E-Learning usage was implemented)?
   - Has it met the expected objectives?
   - What actions will you take if objectives are not met?
   - Who is responsible for IT Usage?
5. Conformance (Sticking to the rules)
   - What are the organization's obligations regarding E-Learning usage?
     - Applicable regulations and laws.
     - Business relationships.
     - Environmental expectations.
   - What are your organization's internal rules for E-Learning usage?
     - Who defines the rules?
     - Who enforces the rules, including those responsible for enforcement?
6. Human Behavior (The ultimate variable)
   - Which communities/groups/sections are affected/influenced by the implementation of E-Learning usage?
     - Various communities/groups/sections within the organization's environment must be documented.
     - Suppliers and customers.
     - Regulators and investors.
     - Every stakeholder.
   - What role do they play in the implementation of E-Learning usage?

- How do they typically respond to IT implementation?
- Does E-Learning usage affect their behavior?
- Can their inherent behaviors integrate with the implementation of E-Learning usage in accordance with objectives?

  - What techniques do you use to encourage their willingness to engage with E-Learning usage and their current behavior?

An overview of the mapping of Instruments to the ISO 38500 Framework is shown in Table 2.

Table 2. Target Setting with ISO 38500 based on case studies

		Evaluate	Direct	Monitor
		Setting goals in using E-Learning (IT implementation) in teaching and learning activities		
Responsibility	Determining the need for effective, efficient and acceptable use of E-Learning by universities	Contect Business		
Strategy				
Acquisition			Set the Goal	
Performance				
Conformance				Business Changed
Human Behaviour				

4.3 Measurement Simulation using ISO 38500 Framework Instruments

Table 3 shows the survey results based on the ISO 38500 instrument at University X.

Table 3. Results of E-Learning measurement survey based on ISO 38500 Framework Instrument

ID	User	*Responsibility (1-5)*	*Strategy (1-5)*	*Acquisition (1-5)*	*Performance (1-5)*	*Conformance (1-5)*	*Human Behaviour (1-5)*
1	*User A*	4	5	3	4	5	4
2	*User B*	3	4	4	3	4	3
3	*User C*	5	4	5	5	5	4
4	*User D*	4	5	4	5	5	5
5	*User E*	3	3	3	4	3	4
6	*User F*	5	5	5	5	4	5
7	*User G*	4	3	4	3	4	3
8	*User H*	5	4	5	5	5	5
9	*User I*	3	3	3	4	3	3
10	*User J*	4	4	4	4	4	4

Table 3 shows that each ISO 38500 principle (Responsibility, Strategy, Acquisition, Performance, Conformance, Human Behavior**)** was assigned a value between 1 and 5 based on the respondents' level of satisfaction or conformity. The total number of users surveyed was 10, consisting of 8 students and 2 lecturers who use e-Learning technology. The average measurement results from the e-Learning survey using the ISO 38500 principles are shown in Figure 7.

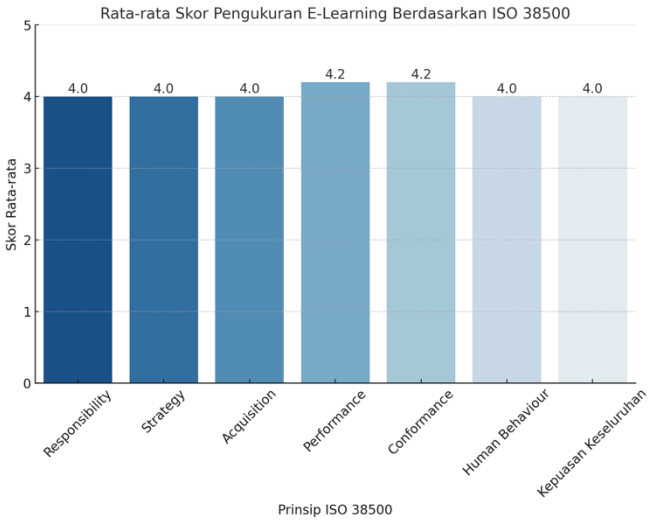


Figure 7. Average E-Learning measurement score

The graph in Figure 7 above illustrates the distribution of average scores for each ISO 38500 principle in e-Learning measurement. Here's a more detailed analysis:

Analysis of ISO 38500 Principles in E-Learning Measurement

1. Highest Scores in Performance and Conformance (4.2)
   - This indicates that e-Learning generally aligns with organizational needs and applicable regulations.
   - It may suggest that the e-Learning system is performing well in terms of service provision and compliance.
2. Balanced Scores in Acquisition, Strategy, and Responsibility (4.0)
   - This implies that the management strategy for e-Learning and resource allocation are reasonably effective.
   - However, further analysis is needed to determine if there's potential for improvement in the planning and execution aspects of e-Learning policies.
3. Relatively Similar Score for Human Behavior (4.0)
   - This suggests that user habits in utilizing e-Learning are fairly good.
   - It might warrant consideration of any resistance or difficulties in e-Learning adoption that need attention.

In the context of ISO 38500, each principle in e-Learning measurement can be linked to three main processes:

1. Evaluate Assessing the condition and effectiveness of the e-Learning system.
2. Direct Establishing policies and strategies for e-Learning implementation.
3. Monitor Ensuring that e-Learning implementation proceeds according to objectives.

Based on the score analysis, the relationship between these principles and the three processes can be mapped as shown in Table 5.

Table 5. The relationship of the Three Main Processes with the principles of ISO 38500

ISO 38500 Principles	*Evaluate*	*Direct*	*Monitor*
Responsibility	✅	✅	✅
Strategy	✅	✅	
Acquisition	✅	✅	
Performance		✅	✅
Conformance		✅	✅
Human Behaviour	✅		✅

Based on this mapping, an analysis of the relationship with the average measurement scores can be performed as follows:

1. Evaluate → Focus on Responsibility, Strategy, Acquisition, Human Behavior
   - Strategy (4.0) and Acquisition (4.0) scores indicate that e-Learning planning is fairly good.
   - However, there's an opportunity to improve Responsibility (4.0) by clarifying user roles.
   - Human Behavior (4.0) needs deeper evaluation to understand user adaptation to e-Learning.
2. Direct → Related to Responsibility, Strategy, Acquisition, Performance, Conformance
   - Performance (4.2) and Conformance (4.2) indicate that implementation policies are quite effective.
   - Strategy (4.0) and Acquisition (4.0) could be improved with policies that better support user needs.
3. Monitor → Related to Responsibility, Performance, Conformance, Human Behavior
   - Performance (4.2) and Conformance (4.2) indicate that monitoring is reasonably effective.
   - Human Behavior (4.0) suggests the need for further monitoring of student engagement in e-Learning.

5. Conclusion

IT Governance is a currently evolving and crucial concept for IT companies/organizations or those utilizing IT. In principle, the developed concept focuses on measuring the maturity of an organization's IT capabilities. ISO 38500, which is an advanced concept derived from AS8015, provides a framework that can be employed to define policies and their derivatives for managing an organization's/company's information technology. The six (6) core principles of ISO 38500 encompassing responsibility, strategy, acquisition, performance, conformance, and human behavior provide a robust foundation for defining the Information Technology Governance of an organization/company. In principle, ISO 38500 can be integrated with other frameworks, given that ISO 38500 serves as a basis for establishing strategic directions. These components can form the foundation for developing an e-Learning measurement instrument in Higher Education Institutions. By utilizing such a measurement instrument, organizations can identify strengths and weaknesses within their e-Learning system. This enables continuous improvements to enhance the quality of materials, learning methods, and user experience (for both lecturers and students).

The developed e-Learning measurement instrument, based on ISO 38500 indicators, can provide valuable data and insights for decision-making at the management level. Based on the measurement results, management can make informed decisions regarding budget allocation for further development, updates or enhancements of the e-Learning platform, and the development of new learning content or more effective training strategies. Simulation results indicate that the focus of improvement should be on Evaluate & Direct, emphasizing a deeper evaluation of whether the implemented strategies truly support student needs. Furthermore, ensuring clearer user responsibilities (Responsibility) is crucial for more effective e-Learning. Additionally, monitoring is already quite good but requires continuous oversight, especially for well-functioning systems, and user behavior monitoring needs to be strengthened to prevent any obstacles in e-Learning adoption.

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