Implementing Outcome-Based Education in Accordance with ISO 21001 Requirements

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Abstract. This paper aims to discuss the implementation of Outcome-Based Education (OBE) in the relevant ISO 21001 requirements. These requirements include understanding the organization and its context, needs of students and other beneficiaries, actions to address risks and opportunities, delivery and assessment of learning, evaluation, and corrective/improvement actions. The research method examines the requirements of ISO 21001 relevant to the implementation of OBE and provides an example of its application in one of the study programs. The study results show that ISO 21001 in higher education can be used as a management system platform to achieve the desired results under the organization's vision, mission, and goals and implement OBE. An example of the application shows that the study program carried out the delivery of OBE in a more structured and systematic manner by referring to the requirements in ISO 21001. Structured, the study program uses an input-process-output/outcome approach in managing OBE. Meanwhile, systematic, the study program uses the PDCA cycle to improve OBE performance. Practically, study programs in Indonesia can use the ISO 21001 standard to harmonize the application of Education Standards in the National Standards for Higher Education, especially competency, content, learning process, and assessment. Furthermore, the study program uses the PDCA cycle to continuously meet and improve OBE performance.

Keywords: ISO 21001 · OBE · curriculum · learning and assessment process · learner competence

1 Introduction

To stay afloat, competitive, and succeed in the long term, a university can apply the principles, concepts, and quality management (Total Quality Management, TQM) to all its activities and business processes [1, 2]. This approach can ensure the quality of academic programs based on input-process-output factors. Input factors include the quality of pedagogy, infrastructure, and learning environment. While the process factor consists of the quality of students and staff, the output factor provides for the program's quality [3, 4]. In addition to the TQM approach, several universities have also adopted the ISO 9001 quality management system standard to manage the planning process, human resources, and infrastructure, measure satisfaction levels, and handle customer

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complaints and claims [5, 6]. Both of these approaches have an impact on organizational performance as occurs in improving the quality movement in the learning process through the application of principles, concepts, and quality management [2], and organizational knowledge management [7, 8], improvement of the work environment, documentation and archives management, infrastructure maintenance, information, and communication technology [5]. However, despite a number of these successes, researchers rarely discuss the achievement of learning outcomes and student competencies [9].

In creating student competencies, universities and study programs can adopt an Outcome-based Education (OBE) approach. The OBE approach emphasizes the quality of the curriculum [10], teaching and learning activities, the assessment process, and the benefits of multi-stakeholder programs [11]. On the other hand, accredited universities/study programs have often shown success in OBE and improved the quality of education through continuous improvement [1].

Certain educational institutions employ ISO 9001 and accreditation standards to achieve the vision, purpose, and goals and develop high-quality student competencies. Unfortunately, because ISO 9001 is not explicitly for educational organizations, universities frequently struggle to interpret standards in terms of educational organizations' contexts [12], particularly when developing student skills. As a result, ISO produced ISO 21001:2018, a management system standard for educational institutions, in 2018. This standard requires educational institutions to demonstrate their ability to facilitate the acquisition and development of competencies through teaching, learning, and research and promote learner, beneficiary, and other staff satisfaction.

In Indonesia, the ISO 21001 standard has become popular since the National Standardization Agency (BSN) adopted the bar to become SNI ISO 21001:2018 in June 2019. BSN often disseminates ISO 21001:2018 to many universities in Indonesia through the Higher Education Service Institute and some universities. The question frequently asked by socialization participants is whether the standard can support the implementation of OBE? Whether in implementing OBE, educational organizations consider ISO 21001 requirements related to planning stages, such as identifying external and internal issues, understanding the needs and expectations of students and other beneficiaries, and carrying out risk management in achieving goals and controlling the OBE learning process? [13]. Therefore, this paper aims to discuss how educational organizations utilize the ISO 21001 standard in implementing OBE through an example of application, especially at the planning stage.

1.1 Accreditation and OBE

Accreditation is a process of ensuring the quality of education and continuous improvement. Educational organizations must develop a strategy to establish a Quality Assurance System by accreditation criteria. Accreditation emphasizes the quality of student education achieved through the OBE system. At the end of each lesson, learning outcomes indicate students' competencies. Assessment of learning outcomes is one of the critical aspects of the OBE model. This new approach to setting competency targets for graduates will improve the teaching and learning process. The literature survey provides an overview of the OBE approach to quality assessment and curriculum improvement in higher education [10]. OBE represents a paradigm shift in educational practice, shifting

learning that focuses on what students know and can do. OBE begins with curriculum design and development, implementation of learning and assessment processes, and improving the quality of educational methods, products, and services [14]. Although the learning outcomes approach is functional, educational organizations need to consider learning outcomes from different perceptions than those of multi-stakeholders [11].

1.2 ISO 21001 as an OBE Approach

In facing global competition, universities require a systematic quality management approach in line with international standards. This approach must support an accreditation and certification model that focuses on meeting the requirements and satisfaction of stakeholders [12]. Generally, universities have worked with the ISO-9001 quality management system standard in terms of certification. However, universities often have difficulty interpreting their requirements according to the context of the educational organization. For this reason, ISO publishes a management system standard for educational organizations, namely ISO 21001:2018. Educational organizations can adopt the ISO 21001 to demonstrate their ability to create student competencies following program objectives, and the needs of the labor market and further studies [15].

In implementing OBE, educational organizations need to understand the ISO 21001 management framework, which consists of three main aspects: risk-based thinking, process approach, and the Plan-Do-Check-Act (PDCA) cycle for continuous improvement [16]. Educational organizations need to plan and implement actions to address the risks and opportunities arising from identifying external and internal problems to achieve the desired results and meet the requirements of interested parties [17, 18]. The process approach allows organizations to control the interrelationships and dependencies between processes and systems so that organizations can achieve performance and satisfy students and other beneficiaries. Furthermore, organizations continuously improve the learning process by implementing a data/information-based Plan-Do-Check-Act (PDCA) cycle [19, 20].

1.3 The Relationship Between the Clauses of ISO 21001:2018 with the OBE Approach

Figure 1 shows the relationship between the OBE approach and some clauses in ISO 21001. The OBE approach begins with the study program establishing its vision, mission, and strategic plan. Then the study program determines the Educational Objective (PEO) Program in the form of a graduate profile. The study program measures PEO after alumni have a career about 2–5 years after graduation. Next, the study program determines the Learning Outcome (LO) based on the PEO or graduate profile. The study program measures the LO when students graduate from the program. Based on the PEO and LO, the program establishes a body of knowledge in curriculum design and development. All courses in the curriculum must refer to the LO. Then, in each subject, the lecturer determines the Course Learning Outcomes (CLO), which is a competency that students must possess. Each course must have a Semester Learning Plan (SLP), and the lecturer reviews the SLP periodically following the development of science and technology.

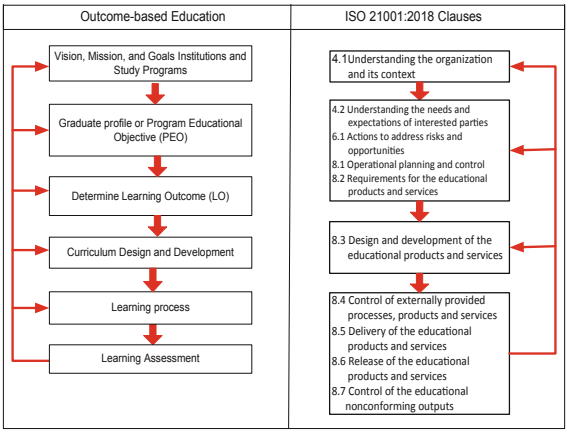

Fig. 1. The relationship between the clauses of ISO 21001:2018 with the OBE approach

Lecturers carry out the learning process according to SLP. Next, the lecturer evaluates student learning outcomes to fulfil the LO. Finally, lecturers carry out the assessment process and provide feedback to students. There are two results of the assessment of learning achievement, namely in each semester called the Semester Achievement Index (SAI) and the results of the evaluation of learning achievement at the end of the study program called the Cumulative Achievement Index (GPA). Undergraduate program students are declared to have passed if they have taken all of the specified study loads and have graduate learning outcomes targeted by the Study Program.

To fulfil the OBE, study programs use clauses 4.1 and 4.2 of ISO 21001:2018. Clause 4.1 relates to the determination of the graduate profile, which considers the suitability of the study program's vision, mission, and objectives. In addition, clause 4.2 administers that the study program must also consider the requirements of students, users, and applicable regulations. Then, the study program must take action to manage the risks and opportunities associated with developing student competencies (clause 6.1). After that, the study program plans and controls the learning process (clause 8.1), establishes PEO and LO (clause 8.2), designs and develops the curriculum (clause 8.3), and manages educational operations, products, and services provided by partners (clause 8.4). Furthermore, the study program carries out a learning and assessment process and conducts a tracing study of graduates (clause 8.5). In addition, educational organizations must control the release of educational products and services by establishing an authorized party (clause 8.6). Furthermore, study programs must manage non-conforming educational products and services (clause 8.7). Finally, through the PDCA cycle, the study program continues to improve the quality of the curriculum, learning process, and assessment.

1.4 Examples of Implementation at the Planning Stage

This paper only discusses examples of OBE planning based on clauses 4.1, 4.2, and 6.1 of ISO 21001. The planning stage begins with identifying external and internal issues that affect the implementation of the mission, achievement of the vision and objectives of the institution, and study program (Tables 1, 2 and 3).

Table 1. Identification of university and study program's external issues

Factors	Issues
Technology	Students' competence in aspects of technology, data, and human literacy Application of automation, AI (Artificial Intelligence), which allows the development of smart classes, virtual labs, and data mining in all sectors
Competition	Universities must adopt digital systems to facilitate distance learning needs
Market	Graduate competencies must be by market needs and or further studies.
Culture	Flexibility of time and place in carrying out work
Social	Mobility and flexibility of the workforce
Economy	The emergence of the Covid 19 pandemic affects the economic level of the community

Table 2. Identification of university and study program's internal issues

Factors	Issues
Values	Digitization and automation
Culture	Technology makes work more accessible and more efficient
Knowledge	Students can solve problems and interact socially
Performance	Workers have control in determining their career path

Table 3. Needs and expectations of interested parties

Interested parties	Needs and expectations
Students	become a professional worker, entrepreneur, and can take studies to a higher level
Government	Educational institutions comply with applicable laws/regulations
Job market	Accept graduates who are competent, adaptive, and ready to work
Staff	Improvement of competence, welfare, and job satisfaction

Next, educational organizations identify the needs and expectations of learners, the government, the job market, and staff (Table 4). As a result of this identification, educational organizations use it as input for determining the requirements for educational products and services (graduate profiles) in clause 8.2, curriculum design and development in clause 8.3, and fulfills the learning and assessment process in clause 8.5. Furthermore, interested parties provide feedback to educational organizations through satisfaction surveys of learners, graduate users, and staff.

To address these external and internal issues and meet the needs and expectations of interested parties, educational organizations must create a SWOT matrix to define development programs (Table 4). Furthermore, the development program sets performance indicators and targets that must be achieved over a certain period, for example, three years (Table 5).

Furthermore, the educational organization establishes actions to address risks and opportunities (risk management) by resolving external and internal issues (clause 4.1) requirements of interested parties (clause 4.2). It refers to the development of the EOMS (clause 4.4) contained in the development program and performance indicators (Table 6).

Table 4. SWOT Matrix for development programs

	Opportunity 1. Students' competence in aspects of technology, data, and human literacy. 2. Application of automation, AI (Artificial Intelligence)	Threat 1. Universities must adopt digital systems to facilitate distance learning needs 2. The emergence of the Covid-19 pandemic affects the economic level of the community
Strength 1. Provision of information technology facilities 2. Delivery of quality learning	Development programs 3. Develop an innovative class, a virtual lab in the learning process 4. Increasing the number of lecturers from business and industry	Development program 1. Opening distance learning at affordable prices
Weakness 1. Lack of competence in the use of information and communication technology 2. Mobility and flexibility of the workforce	Development programs 1. Carrying out training on digital technology	Development program 1. Improving the innovation of learning management system content

Table 5. Development program for three years

No	Development programs	Performance indicators	PIC	Baseline	Target per year		
				2021	2022	2023	2024
1.	Develop an innovative class, a virtual lab in the learning process	Number of courses that apply innovative classes or virtual lab	Director of Educational Development Directorate	N/A	3	5	7
2.	Increasing the number of lecturers from business and industry	Number of collaborative classes in each study program	Vice Chancellor for Education, Dean of Faculty, Head of Department	N/A	5/study program	10/study program	15/study program
3.	Open distance learning at affordable prices	Number of study programs for bachelor's degree and master's degree level	Vice-Chancellor for Education, Dean of Faculty, Head of Department	N/A	1 for bachelor degree and 1 for post graduate	1 for bachelor degree and 2 for postgraduate	1 for bachelor degree and 3 for post graduate
4.	Carry out training on digital technology	Enhanced Lecturer Achievement Index (LAI) in the management of the learning process and assessment	Director of Educational Development Directorate, Head of Quality Assurance Agency	N/A	Minimum 80% LAI > 3.25	Minimum 90% LAI > 3.25	Minimum 95% LAI > 3.25
5.	Improving the innovation of learning management system content	Number of learning content innovations based on the Learning Management System	Director of Educational Development Directorate	N/A	5/study program	10/study program	15/study program

Table 6. Risk management for development programs

Development programs	Performance indicators	Potential problems/ opportunities	Impact	Risk assessment			Risk evaluation	Control the current risk	Additional risk control	Residual risk		
				P	S	R				P	S	R
Develop an innovative class, a virtual lab in the learning process	Number of courses that apply innovative classes or virtual lab	Increased LO and CLO (opportunity)	Enhancement of graduate competence	2	3	6	Medium risk	Provision of infrastructure	Lecturer training for apply innovative classes or virtual lab	1	3	3
Increasing the number of lecturers from business and industry	Number of collaborative classes in each study program	Increased LO and CLO (opportunity)	Enhancement of graduate competence	3	3	9	High risk	Grants for case-based or project-based learning	Increased collaboration with industry	1	3	3
Open distance learning at affordable prices	Number of study programs for bachelor's degree and master degree level	Increased student intake (opportunity)	Sustainability of financial resources	2	3	6	Medium risk	Provision of infrastructure	Increased collaboration with partners in the region for the implementation of distance learning	1	3	3
Carry out training on digital technology	Enhanced Lecturer Achievement Index (LAI) in the management of the learning process and assessment	Reducing the lack of competency in the use of learning technology for senior lecturers (problem)	Improving the skills of using learning technology	3	3	9	High risk	Learning through hybrid classes	Increasing number of trainings related to technology for learning	1	3	3
Improving the innovation of learning management system content	Number of learning content innovations based on the Learning Management System	Reducing the lack of competency in the use of learning technology for senior lecturers (problem)	Improving the skills of using learning technology	3	3	9	High risk	Training related to Learning Management System	Grants related to learning product innovation	1	3	3

· P = Probability is the occurrence of an event that affects a negative (problem) or positive (opportunity) outcome. P has a value of 1: very rarely, 2: rarely, and 3: often occurs; S = Severity is the level of impact of the achievement or non-achievement of performance indicators (positive or negative). S has a value of 1: small impact, 2: medium impact, and 3: significant impact; R = Risk obtained by multiplying the values of P and S. R has a score of R = 1–3 (low risk); 4–6 (medium risk); and 7–9 (High risk)

2 Discussion

The OBE approach is learner-centered, which focuses on creating student competencies [10]. This approach begins with establishing the institution and study program's vision, mission, and goals (VMG). Furthermore, in carrying out the journey of achieving VMG, educational organizations must identify external and internal issues, requirements of students, graduate users, regulations, and laws that affect the strategic direction and social

responsibility in the delivery of educational services. The study program must meet the students' competency needs so that when graduate, they can immediately work, become entrepreneurs, or continue their studies. As a result, the study program designs curriculum and instruction according to current trends and considers the perspectives of stakeholders involved in establishing student learning outcomes [10, 11]. Additionally, the study program developed several related programs, including intelligent classes, incorporating virtual labs into the learning process, increasing collaboration with industry, enhancing learning management system innovation through the addition of new features, and conducting staff training on digital technology. Additionally, universities and study programs must manage risk by developing controls for the development program's implementation. As an example, suppose the program is successfully implemented. In that instance, the university and study program will work together to improve the program's performance. Simultaneously, if it fails, the university and study program must determine the core cause of the failure and take corrective steps to assure the program's future success [21].

Study programs can use the ISO 21001:2018 clause to deliver OBE learning. However, this approach is generic and can be integrated with national standards for higher education, national accreditation criteria, or international accreditation for study programs/faculty. For example, for a national accreditation scheme on education criteria, the OBE approach must refer to the Indonesian National Qualifications Framework (INQF). For this reason, the application of the ISO 21001 clause related to the determination of the graduate profile and curriculum development must refer to the INQF. As for international accreditation schemes, study programs that apply ISO 21001 must refer to the criteria of each of these international accreditation institutions.

3 Conclusion

Educational organizations use the ISO 21001 standard to achieve the desired results by the vision, mission, and goals and having the ability to produce graduate competencies under stakeholder requirements. In addition to achieving the desired results, educational organizations obtain it with several acknowledgments from external parties, such as recognizing excellent universities at the national and international levels. While the ability to produce graduate competencies, educational organizations can obtain recognition from study program accrediting institutions at national and international levels.

Leaders of educational organizations can use the ISO 21001 standard as a platform for the management system of educational organizations. Many literature that discusses ISO 21001 still focuses on accreditation of study programs, not debating aspects of the model related to prominent organizations. Of course, educational organizations can adopt superior models such as Total Quality Management, Malcolm Baldrige National Quality Award, and European Foundation for Quality Management to complement the ISO 21001 standard.

Higher education leaders can use ISO 21001 to answer the challenge that this standard is in line with the NAB-HE criteria and the ability to create graduate competencies following the requirements of students and other beneficiaries. This standard can increase the score of the NAB-HE criteria assessment on qualitative criteria. Meanwhile, in the

creation of competencies, universities/study programs can refer to the INQF, requirements from associations of similar study programs or professional associations at the national level, and international accreditation criteria for study programs. The ISO 21001 standard is aligned with national standards and national accreditation within the global framework through the conceptual model developed.

This paper only discussed ISO 21001 in higher education. For this reason, future research can expand its discussion to education in primary and secondary schools or large training institutions with a curriculum.

References

1. Sahney, S. (2016). Use of multiple methodologies for developing a customer-oriented model of total quality management in higher education. *International Journal of Educational Management*.
2. Aldabbas, H., Pinnington, A., & Lahrech, A. (2020). The role of innovation in the relationship between university–industry collaboration in R&D and ISO 9001. *International Journal of Innovation Science.*
3. Venkatraman, S. (2007). A framework for implementing TQM in higher education programs. *Quality Assurance in Education.*
4. Dwaikat, N. Y. (2020). A comprehensive model for assessing the quality in higher education institutions. *The TQM Journal.*
5. Moturi, C., & Mbithi, P. M. F. (2015). ISO 9001: 2008 implementation and impact on the University of Nairobi: A case study. *The TQM Journal*.
6. Rodríguez-Mantilla, J. M., Carrascosa, V. L., & Martínez-Zarzuelo, A. (2021). ISO 9001 standard and their impact on school management and planning and support systems–Comparative study on perception between heads–teachers. *The TQM Journal.*
7. Papadimitriou, A., & Westerheijden, D. F. (2010). Adoption of ISO-oriented quality management system in Greek universities: Reactions to isomorphic pressures. *The TQM Journal.*
8. Wilson, J. P., & Campbell, L. (2016). Developing a knowledge management policy for ISO 9001: 2015. *Journal of Knowledge Management*.
9. Bae, S. H. (2007). The relationship between ISO 9000 participation and educational outcomes of schools. *Quality Assurance in Education.*
10. Tam, M. (2014). Outcomes-based approach to quality assessment and curriculum improvement in higher education. *Quality Assurance in Education, 22*(2), 158–168.
11. Gunarathne, N., Senaratne, S., & Senanayake, S. (2019). Outcome-based education in accounting: The case of an accountancy degree program in Sri Lanka. *Journal of Economic and Administrative Sciences.*
12. Vilchez-Sandoval, J., Vasquez-Paragulla, J., Andrade-Arenas, L., & Cortez-Maldonado, W. (2020). Appraisal of the provision of educational products and services according to the ISO-21001 standard in the faculty of sciences and engineering from the Sciences and Humanities University. In *2020 IEEE world conference on engineering education (EDUNINE)* (pp. 1–4).
13. Medne, A., Lapina, I., & Zeps, A. (2020). Sustainability of a university's quality system: Adaptation of the EFQM excellence model. *International Journal of Quality and Service Sciences.*
14. MacKenzie Jr, W. I., Scherer, R. F., Wilkinson, T. J., & Solomon, N. A. (2019). A systematic review of AACSB International accreditation quality and value research. *Journal of Economic and Administrative Sciences.*

15. Pantović, V., & Milovanović, D. (2020). The role of international standards in education.
16. Elahi, F., & Ilyas, M. (2019). Quality management principles and school quality: Testing moderation of professional certification of school principal in private schools of Pakistan. *The TQM Journal*.
17. Assmuth, T., & Hildén, M. (2008). The significance of information frameworks in integrated risk assessment and management. *Environmental Science & Policy, 11*(1), 71–86.
18. Chiarini, A. (2017). Risk-based thinking according to ISO 9001: 2015 standard and the risk sources European manufacturing SMEs intend to manage. *The TQM Journal, 29*(2), 310–323.
19. Chen, H. R., & Cheng, B. (2012). Applying the ISO 9001 process approach and service blueprint to hospital management systems. *The TQM Journal*.
20. Singh, J., & Singh, H. (2015). Continuous improvement philosophy–literature review and directions. *Benchmarking: An International Journal*.
21. Bretaña, R. M. G., Azcuy, F. J. R., & González, R. R. (2020). Standard ISO 21001: 2018's application to the quality of academic postgraduate programs. *Revista Cubana de Educación Médica Superior, 34*(1), 1–17.