

# Adoption of Continuous Auditing in The Internal Audit Unit of SKK Migas Using TOE Framework

Bobot Prakoso<sup>1,\*</sup> Yusuf Khudri, T.B.M.<sup>2</sup>

<sup>1,2</sup> *Departement of Accounting, Faculty of Economics and Business, Universitas Indonesia*

*\*Corresponding author. Email: bobot.adi@ui.ac.id*

## ABSTRACT

This study aims to identify the key factors that support the implementation of continuous auditing in the Internal Audit Unit of SKK Migas based on the Technology-Organization-Environment (TOE) Framework. A qualitative case study approach is applied in this study. Primary data was collected with the open-ended questionnaire and semi-structured interviews. The results indicated that the adoption of continuous auditing is affected by technological, organizational, and environmental contexts. This study revealed that top management support, budget availability, and the readiness of information technology infrastructure are the main factors that need to be considered in adopting the concept of continuous auditing. Further study is suggested to continue this study by adding broader scope on cost-benefit analysis and make-or-buy analysis to be more comprehensive.

**Keywords:** *Continuous Auditing, Technology Adoption, TOE Framework.*

## 1. INTRODUCTION

The development of information technology evoked changes in the company's business processes that increased the need for more efficient and effective data processing [1]. Rapidly changing business conditions created the need for more timely and continuous assurance to ensure that controls are working effectively and risks are well mitigated [2]. It raised the expectation of stakeholders for internal auditors to find new ways to continuously monitor, collect, and analyze audit evidence [1].

The challenge to optimize information technology is also faced by Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas), especially in the Internal Audit Unit. However, the Internal Audit Unit is still using traditional auditing. Traditional auditing is carried out periodically at a specific time that can't be used as an early warning if there is a failure in internal control [3]. In addition, tests of controls in traditional audits are carried out retrospectively after business activities have occurred. The audit recommendations can't be issued immediately after the control failure has occurred [2].

Innovation is needed in the audit process by utilizing information technology to overcome the weaknesses caused by traditional auditing [4]. Continuous auditing is an audit transformation through the implementation of modern information technology [5]. At the organizational level, the decision to adopt technological innovations is influenced by three elements: (1) the technological context, (2) the organizational context, and (3) the environmental context [6]. Therefore, this study used the Technology-Organization-Environment (TOE) Framework to describe the process of a company adopting and implementing innovation at the company level.

## 2. LITERATURE REVIEW

### 2.1. Internal Audit

Internal audit is an independent, objective assurance and consulting activity designed to add value and improve an organization's operations [7]. An internal audit was formed to examine and evaluate the company's activities independently as a service provided to the company [8]. There are two approaches to carrying out an internal audit, namely traditional and continuous auditing approaches. The tests of controls based on the

traditional auditing approach are carried out retrospectively and on a cycle-based basis, often months after the business activity has occurred [9]. Traditional auditing seems outdated because it is not in line with the digital economy that prioritizes automation processes [10]. Continuous auditing applied ongoing control evaluation and continuous risk assessment [2]. Based on the continuous auditing approach, internal auditors can report the subject matter in a shorter time than the traditional approach [11].

## 2.2. Continuous Auditing

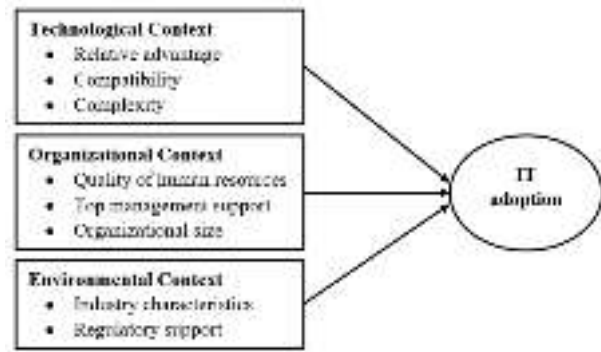
Continuous auditing comprises ongoing risk and control assessment, enabled by technology and facilitated by a new audit paradigm that shifts from periodic evaluations of risks and controls based on a sample of transactions to ongoing evaluations based on a broader proportion of transactions [12]. The continuous auditing approach enabled internal auditors to fully understand the critical points of controls, rules, and exceptions. With automated data analysis, internal auditors can carry out control and risk assessments within a short period after an event has occurred [11]. Internal auditors can analyze anomalies at the transaction level and indicators of control weaknesses and emerging risks. Analysis results of continuous auditing can be integrated into all aspects of the audit process that support strategic management objectives [13].

To implement continuous auditing efficiently, the organization needed adequate Information Technology (IT) infrastructure [14]. Continuous auditing can be implemented using the Embedded Audit Module (EAM) embedded in the company's Enterprise Resource Planning (ERP) system. EAM evaluated transactions that occurred in the ERP system based on pre-programmed audit criteria. Furthermore, EAM can report transaction violations against pre-programmed audit criteria based on continuous transaction monitoring [15].

## 2.3. TOE Framework

Continuous auditing is broadly defined as the transformation of auditing through the utilization of modern information technology [5]. Therefore, in this study, the theoretical framework used is the Technology-Organization-Environment Framework (TOE Framework) which describes the process of adopting and implementing technological innovations at the organizational level [6]. The TOE framework was first introduced by Tornatzky and Fleischer in 1990. The TOE framework is developed in more detail [16], as shown in Figure 1.

**Figure 1** Technology-Organization-Environment Framework.



### 2.3.1. Technological Context

The technological context includes all technology relevant to the company such as relative advantage, compatibility, and complexity [6, 17]. Organizations are more likely to implement technological innovations if the technology can bring perceived organizational benefits such as better organizational performance and higher economic returns [16]. In adopting new technology, it is necessary to consider compatibility with existing technology in the organization. In addition, it is necessary to consider the complexity of the technology to be adopted. In more complex technologies, employees need more time to understand and adapt [16].

### 2.3.2. Organizational Context

Organizational context refers to the characteristics, structures, processes, and resources that facilitate the adoption of technological innovations [16]. IT adoption by a company is influenced by the organization size and organization support [18]. Top management support describes the role of executive leadership in encouraging and facilitating innovation within the organization's overall strategy [16]. In addition, the human resource capacity affects the success chances in implementing new technologies [19].

### 2.3.3. Environmental Context

Industry characteristics and regulations are the dominant factors influencing technology adoption in the environmental context [16]. The higher the complexity of the audited party system, the higher the organization needs to adopt IT [18]. In addition, the support and requirements of regulators and professional bodies influence technology adoption [20].

## 3. RESEARCH METHODOLOGY

The research strategy used in this study is a case study. A case study chose an event or symptom to be investigated by applying various methods [21]. This study carefully observed the activity or process of implementing the concept of continuous auditing carried out by the Internal Audit Unit of SKK Migas. This study used a qualitative research approach. A qualitative

research method is a research method used to examine the condition of natural objects in which the researcher's presence does not affect the dynamics of the object [22].

The data used in this study are primary data and secondary data. Primary data was collected with the open-ended questionnaire and semi-structured interviews. Secondary data is obtained from reports that have been published by SKK Migas. Questionnaires were addressed to managers and staff who carry out the daily operation, while interviews were conducted to senior manager level and above who have more influence on SKK Migas policies. The material asked in the interview and questionnaire focused on elements that influence technology adoption to implement the concept of continuous auditing based on the TOE Framework, namely the technological context, organizational context, and environmental context.

Data analysis in this study used a thematic analysis approach. This approach is carried out by analyzing qualitative data to find the interrelationship of patterns in a phenomenon and explain the extent to which a phenomenon occurs through the eyes of researchers [23]. The theme raised in this research refers to the TOE Framework. Themes in the technology context include relative advantage, compatibility, and complexity. Themes in the organizational context include quality of human resources, top management support, and organizational size. The themes in the environmental context are industry characteristics and regulatory support.

#### 4. RESULT AND DISCUSSION

The findings of the study are presented in Table 1. Table 1 displays the various factors that influence the adoption of information technology identified by the respondents based on the technological context, organizational context, and environmental context. These three contexts are significant aspects that need to be

considered by the Internal Audit Unit in making decisions regarding the continuous auditing concept adoption that is a transformation of auditing through the utilization of modern information technology.

##### 4.1. Technological Context

The factors in the technological context that affect the adoption of technology in an organization are relative advantage, compatibility, and complexity. The benefit obtained by the organization when implementing continuous auditing is an increase in the efficiency of the audit process. The audit team can optimize audit execution time to collect and evaluate data accurately. Based on the interview, a senior auditor explained that placing a key indicator on continuous auditing will automatically provide information as soon as an anomaly occurs against predetermined criteria. Continuous auditing produces more accurate and timely information. Previous research explained that the use of technology in continuous auditing increased the efficiency and effectiveness of the audit process in supporting real-time assurance to produce higher quality information [4]. Continuous auditing also reduced risk and enabled better internal control. Similarly, a senior auditor stated that by studying data patterns and data mapping, continuous auditing help to prevent fraud that can strengthen the internal control function in maintaining organization movement.

The compatibility of new technology with existing organization technology becomes a significant factor in technology adoption. The Head of Strategic Management and Information Technology Division (MSTI Division) explained that continuous auditing can be developed and implemented in SKK Migas ERP system if the Embedded Audit Module (EAM) configuration in continuous auditing is adjusted to the existing ERP system. In addition, data storage capacity and bandwidth

**Table 1.** IT adoption factors in Internal Audit Unit of SKK Migas

Context	Category	Adoption factor
Technology	Relative advantage	Audit process efficiency
		Accurate and timely information
		Better internal control
	Compatibility	Compatible with existing IT infrastructure
		IT infrastructure readiness
	Complexity	Ease of use
Required budget		
Technology features		
Organization	Quality of human resources	Experts availability
		Organizational learning culture
	Top management support	Commitment management
	Organizational size	Organizational coordination
Bureaucratic inertia		
Environment	Industry characteristics	Supplier availability
		Client's needs and expectations
	Regulatory support	Government support
		Compliance with auditing standards

availability are considered adequate to support the readiness of information technology infrastructure.

The complexity of the new technology affects the IT adoption process. A senior information technology specialist stated that the audit module created must be user-friendly and adapted to the needs and behavior of the auditor so that the interpretation of the resulting data can be carried out properly. Previous research explained that technological features also affect the adoption of new IT [18]. These features help auditors in preparing scenarios and determining critical indicators based on business processes and organizational goals. In addition, another aspect to consider is the budget. The cost of technology implementation can affect an organization's decision to adopt new technology. According to the Head of MSTI Division, the cost-benefit in new technology adoption should be considered because SKK Migas operational funds come from State Budget.

#### **4.2. Organizational Context**

The factors in the organizational context that affect the adoption of technology in an organization are the quality of human resources, support from management, and the size of the organization. The quality of human resources affects the success chances in implementing new technologies [19]. A senior auditor stated that auditors in the Audit Internal Unit have sufficient audit competence. Competency improvement for adopting new technology provided through training and certification or sharing knowledge from other functions. In addition, auditors have a strong willingness to learn to improve their abilities independently or facilitated by the office.

The commitment from top management has a significant role in driving technology initiatives. Based on interviews conducted with the management of SKK Migas explained that the management of SKK Migas supports the implementation of continuous auditing. A chief executive auditor explained that management commitment is needed in the continuous auditing implementation that is beneficial for management. However, the management approved new technology adoption selectively. A senior information technology specialist stated that not all technologies that have been built are utilized optimally by the division.

In adopting new technology, factors that need to be considered related to the organization size are organizational coordination and bureaucratic inertia. Large organizations tend to have bureaucratic inertia so that they have difficulty accepting and implementing technological changes [24]. A senior auditor stated no bureaucratic issues so far, both from the Internal Audit Unit and the management. In addition, good coordination with other divisions as audited parties is needed in implementing continuous auditing. A senior auditor explained that the Internal Audit Unit has good

coordination with other divisions. The audit recommendations provided by the Internal Audit Unit are used as an improvement for other divisions.

#### **4.3. Environmental Context**

Environmental context is an external factor that influenced the adoption of new technology. The dominant factors in the environmental context consist of industry characteristics and support from regulators. The availability of suppliers is a crucial factor in adopting technology. The Head of MSTI Division explained that SKK Migas is more likely to choose vendor procurement in adopting continuous auditing for reasons of limited time, knowledge, and less experienced in developing its own software. Furthermore, there are several suppliers that provide continuous auditing software both in the domestic and foreign markets. In addition, the client's needs and expectations contribute toward technology adoption. The Head of Office Facilities and Finance Division expected that continuous auditing could improve the audit process related to data requests, audit database, and the time needed to complete the audit.

Previous research stated that regulatory support was identified as the main factor in the environmental context that influences technology adoption. Indonesia's National Government Internal Auditor (BPKP) supports the use of advanced technology in internal auditing by issuing Regulation BPKP Regulation number 2 of 2018 concerning the Grand Design of Implementation of Continuous Auditing and Continuous Monitoring within BPKP. A principal coordinator of Internal Audit explained that in the Government Internal Audit Supervision Coordination Meeting, BPKP also provided encouragement and support to implement continuous auditing. In addition, a Chief Executive Auditor stated that the Ministry of Finance and the Ministry of Energy and Mineral Resources as stakeholders are also interested in implementing continuous auditing in order to improve the supervisory function in SKK Migas. Not only from government agencies but the implementation of continuous auditing is also supported by professional bodies. The Institute of Internal Auditors (IIA) encourages the implementation of continuous auditing by issuing Global Technology Audit Guides for continuous auditing. In the Audit Standards published by the IIA, it is stated that in exercising professional care, internal auditors should consider the use of technology-based auditing and other data analysis techniques. Therefore, the implementation of continuous auditing did not violate the Audit Standards issued by the IIA.

### **5. CONCLUSION**

Based on the thematic analysis of interview results, this study revealed the factors that influenced the decision to adopt technological innovations by the Internal Audit Unit of SKK Migas. Factors in the

technological context that influenced technology adoption decisions were the relative advantage, the compatibility of the new technology with existing technologies within the organization, and the complexity of the new technology. In the organizational context, technology adoption decisions were influenced by the availability of human resources, organization learning culture, and support from top management. In addition, it is also necessary to pay attention to organizational coordination and bureaucratic inertia. In the environmental context that was an external factor of the organization, the factors that influenced the adoption of new technology consist of industry characteristics and support from regulators.

Results of this study explained that based on the TOE Framework, the Internal Audit Unit of SKK Migas can implement the continuous auditing concept adoption. The results of the interview analysis showed that top management support, budget availability, and the readiness of information technology infrastructure are the main factors that need to be considered in adopting the concept of continuous auditing.

## **AUTHORS' CONTRIBUTIONS**

The results of this study are expected to provide insight into the implementation of the continuous auditing concept in SKK Migas. This study also contributes to previous research gaps regarding the implementation of continuous auditing in the Enterprise Resource Planning (ERP) environment in the private sector [25] and the implementation of continuous auditing in the public sector in Nigeria [26]. Both studies discussed the application of continuous auditing in the private and public sectors. However, previous research did not discuss the application of continuous auditing in the semi-government sector in the oil and gas industry.

## **ACKNOWLEDGMENTS**

We would like to express our deepest thanks to the Internal Audit Unit of SKK Migas for their willingness to be the analysis unit of this research. We should also appreciate the Strategic Management and Information Technology Division, the Office Facilities and Finance Division, and all the officials who have taken their valuable time to provide the information we need.

## **REFERENCES**

- [1] Z. Rezaee, R. Elam, A. Sharbatoghlie, Continuous auditing: The audit of the future, *Managerial Auditing Journal*, 2001, pp. 150-158. DOI: <https://doi.org/10.1108/02686900110385605>
- [2] D. Coderre, Recommendations for an effective continuous audit process, *Internal Auditor*, 2007, pp. 1-7.
- [3] A. KPMG, Continuous auditing and continuous monitoring: Transforming internal audit and management monitoring to create value, 2008.
- [4] D. Y. Chan, M. A. Vasarhelyi, Innovation and practice of continuous auditing, in *Continuous Auditing*, Emerald Publishing Limited, Bingley, 2018, pp. 271-283. DOI: <https://doi.org/10.1108/978-1-78743-413-420181013>
- [5] M. G. Alles, F. Tostes, M. A. Vasarhelyi, E. L. Riccio, Continuous auditing: the USA experience and considerations for its implementation in Brazil, *JISTEM-Journal of Information Systems and Technology Management*, 2006, vol. 3, no. 2, pp. 211-224.
- [6] J. Baker, The technology-organization-environment framework, *Information systems theory*, Springer, New York, 2012, pp. 231-245. DOI: [https://doi.org/10.1007/978-1-4419-6108-2\\_12](https://doi.org/10.1007/978-1-4419-6108-2_12)
- [7] The Institute of Internal Auditors, All in a day work. The Institute of Internal Auditors, Florida, 2016.
- [8] L. B. Sawyer, Audit Internal Sawyer Buku 1 Edisi 5, Salemba Empat, Jakarta, 2005.
- [9] D. Coderre, R. C. M. Police, Global technology audit guide: continuous auditing implications for assurance, monitoring, and risk assessment, The Institute of Internal Auditors, Florida, 2005, pp. 1-34.
- [10] P. E. Byrnes et al., Evolution of Auditing: From the Traditional Approach to the Future Audit1, in *Continuous auditing*, Emerald Publishing Limited, Bingley, 2018, pp. 285-297. DOI: <https://doi.org/10.1108/978-1-78743-413-420181014>
- [11] American Institute of Certified Public Accountants, Audit analytics and continuous audit: Looking toward the future, American Institute of Certified Public Accountants, Inc., New York, 2015.
- [12] The Institute of Internal Auditors, Coordinating continuous auditing and monitoring to provide continuous assurance. *Global Technology Audit Guide (GTAG) 2nd Edition*, The Institute of Internal Auditors, Florida, 2015.
- [13] KPMG, Continuous auditing and continuous monitoring: transforming internal audit and management monitoring to create value. CACM Brochure, KPMG, Amstelveen, 2018.
- [14] M. A. Vasarhelyi, M. Alles, S. Kuenkaikaw, J. Littley, The acceptance and adoption of continuous

- auditing by internal auditors: A micro analysis, *International journal of accounting information systems*, Elsevier, Amsterdam, 2012, vol. 13, no. 3, pp. 267-281. DOI: <https://doi.org/10.1016/j.accinf.2012.06.011>
- [15] H. Wierginck, *Internal continuous auditing: How can the implementation of continuous auditing be facilitated, in order to improve the adaption of continuous auditing in practice?* University of Twente, Enschede, 2019.
- [16] J. L. Chong, K. Olesen, *A Technology-Organization-Environment perspective on eco-effectiveness: A Meta-analysis*, Australian Computer Society, 2017.
- [17] E. M. Rogers, *Diffusion of innovations*, Simon and Schuster, 2010.
- [18] A. Ahmi, S. Z. Saidin, A. Abdullah, *IT adoption by internal auditors in public sector: A conceptual study*, *Procedia-Social and Behavioral Sciences*, Kuala Lumpur, 2014, vol. 164, pp. 591-599. DOI: <https://doi.org/10.1016/j.sbspro.2014.11.151>
- [19] V. A. Cooper, A. Molla, *Absorptive capacity and contextual factors that influence green IT assimilation*, *Australasian Journal of Information Systems*, Sydney, 2014, vol. 18, no. 3.
- [20] R. Widuri, B. O'Connell, P. W. Yapa, *Adopting generalized audit software: an Indonesian perspective*, *Managerial Auditing Journal*, Emerald Publishing Limited, Bingley, 2016, Vol. 31 No. 8/9, pp. 821-847. DOI: <https://doi.org/10.1108/MAJ-10-2015-1247>
- [21] R. E. Stake, *The art of case study research*, sage, 1995.
- [22] Sugiyono, *Memahami penelitian kualitatif*, Alfabeta, Bandung, 2005.
- [23] J. Fereday, E. Muir-Cochrane, *Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development*, *International journal of qualitative methods*, University of Alberta, Edmonton, 2006, vol. 5, no. 1, pp. 80-92. DOI: <https://doi.org/10.1177/160940690600500107>
- [24] M. I. Effendi, D. Sugandini, Y. Istanto, T. Adisti, R. Arundati, *The Technology-Organization-Environment Framework: Adopsi teknologi pada UKM*, 2020.
- [25] I. h. Shin, M. g. Lee, W. Park, *Implementation of the continuous auditing system in the ERP - based environment*, *Managerial Auditing Journal*, Emerald Publishing Limited, Bingley, 2013, Vol. 28 No. 7, pp. 592-627. DOI: <https://doi.org/10.1108/MAJ-11-2012-0775>
- [26] J. O. Orumwense, *Implementation of continuous auditing for the public sector in Nigeria*, *Journal of Accounting, Business and Finance Research*, 2017, vol. 1, no. 1, pp. 19-23. DOI: <https://doi.org/10.20448/2002.11.19.23>