University Level Management Toward Industrial Revolution 4.0 using COBIT 5 Framework

Seri Hartati¹*, Amir Syamsuadi², Diki Arisandi³

¹,²Department of Govermental Science, ³Department of Informatics Engineering Universitas Abdurrab, Indonesia

*seri.hartati@univrab.ac.id

Abstract. The Industrial Revolution 4.0 (IR 4.0) has escalating the demands for accountability and transparency for every organization, yet changing the organizational design paradigm. Adaptive power and fast responsive are the critical points in IR 4.0 to achieve the vision and mission of the organization. This is a challenge for organizations such as universities to adapt in the era of disruption. The transformation of educational organizations is becoming the preference toward an excellent public services oriented and preparing the competent human resources in their expertise. This research proposes a formulation for universities to investigate the readiness of the university to prepare the era of IR 4.0 using Cobit 5 Framework. The descriptive method with a qualitative approach are conducted in this work. By using purposive and snowball sampling from Universities in Riau, we found the Universities was on the level of managed process. The results can be delivered to the university as an outlook of readiness toward disruption era in the IR 4.0.

1. Introduction

Education is an area to develop the next human brilliant generations [1]. The current generation in Industrial Revolution 4.0 (IR 4.0) is characterized by artificial intelligence, automation, cellular supercomputers, intelligent robots, self-driving cars, improved neuro-technology brains, genetic editors, online learning, recruitment of students and employees online, and others [2]. Nowadays, in Indonesia, the RI 4.0 era has been implemented and has an intense impact on society [3]. Almost all kinds of activities have been digitalized. The challenges in the industrial era 4.0 were identified as follows; 1) improvement of information technology security; 2) The reliability and stability of production machines; 3) improvement of skills; 4) the reluctance of stakeholders to change; and 5) loss of many jobs due to automation [4]. To answer the challenges, as part of the society, the universities are required to change. All stakeholders in higher education must be willing to change, so as the Lecturers, education staff, and students must change. All parties must strive to learn, improving self-competence, and adapt to the needs of this era [5].

To deal with the RI 4.0, education is needed to build a creative, innovative, and competitive generation [6],[7]. It can be achieved by optimizing the use of technology as educational support that is expected to produce output that can follow or change the times for the better [8]. Indonesia also needs to improve the quality of graduates according to the world of work and the demands of digital technology [9]. It is time for us to leave the learning process which tends to prioritize memorization or just find one right answer from the problem. The method of learning Indonesian education must begin to turn into visionary
thought processes, including honing the skills of creative and innovative ways of thinking [10]. This is needed to deal with various technological and scientific developments [11].

The leadership of the university is necessary to deliver the competency [12]. Physical facilities such as sophisticated equipment in the laboratory and workshops must be provided [13], while non-physical facilities; training, and certification can be carried out both independently and in collaboration with other institutions [14]. The leader of the University must assure all the graduates can be accepted by employment with short waiting times. A Survey of market needs must be routinely conducted so that it can be used as preliminary data in compiling a curriculum that inlines the market's needs. The lecturers are also required to keep up to date of technological developments and the job market so that teaching materials and teaching methods always adapt to the market needs [15],[16],[17]. IT as a service provider in technology is needed to be a linking point for all aspects of higher education management. When the idea is beginning to initiate, The existence of IT governance is shown in figure 1 as a basis to establish IT planning in higher education is necessary.

![IT Governance in Higher Education](image)

Figure 1. IT Governance in Higher Education

COBIT 5 is a framework that provides standards in a domain framework that consists of a set of IT processes that represent controlled and structured activities [18]. COBIT auditing is the process of gathering and evaluating evidence to determine the IT system has been able to protect the assets of the organization, maintain data integrity, achieve the organization's goals, and the use of their resources [19],[20]. A COBIT-based audit is conducted to measure IT governance of the Strategic Plan at a university or higher education regarding the use and level of IT maturity [21],[22]. COBIT 5 offers a comprehensive framework supporting the company to achieve its goals on IT management and IT governance [23]. COBIT 5 allows IT to be organized and managed holistically for the whole company, auditing in full end-to-end business and functional areas of IT responsibilities, also internal account, and external IT-related interests [24]. COBIT 5 is generic and fits for all types of companies from the commercial, nonprofit, or public sector [23].
Based on the explanation mentioned above, a model based on COBIT 5 is needed to investigate the readiness of the universities for their management area to face the challenges of RI 4.0. So that the readiness of higher educational institutions can deliver to the goal of educating the people in the nation.

2. Methodology
As one of the nonprofit sectors, it is necessary to conduct an investigation related to IT governance in higher education or university, particularly the management area to discover the existing planning and monitoring process in the university accordance with COBIT-5 framework as seen in figure 2.

![Management And Governance Area](image)

This research is descriptive with a qualitative approach at the University in Riau. The data sources were conducted purposively. The sample determined by a snowball, data triangulation, qualitative data analysis, and the results emphasizing the generalization. We also adopt the Ordinal method as a Likert scale, the ordinal is used where the numbers contain the level of maturity. The determination of maturity is calculated using formula 1.

\[
\text{index} = \frac{\sum \text{(answers)}}{\sum \text{(questions)}} \quad (1)
\]

For the maturity level as a standard of Maturity model refers to the ISACA [25] in the table 1.

| Index | Interval       | Maturity Level                          |
|-------|----------------|----------------------------------------|
| 0     | 0 – 0.25       | Incomplete process / non existence     |
| 1     | 0.26 – 1.26    | Performed process / initial            |
| 2     | 1.27 – 2.77    | managed process / repeatable           |
| 3     | 2.78 – 4.28    | established process / defined          |
| 4     | 4.29 – 5.79    | predictable process / managed          |
| 5     | 5.8 – 7.3      | optimizing process / optimized         |

We interviewed the respondent who had in charge of making IT governance policies at Universities. Some aspects observed were EDM (Evaluate, Direct, and Monitoring), APO (Align, Plan, and Organise), DSS (Deliver, Service, and, Support), dan MEA (Monitor, Evaluate, and Assess).

3. Result and Discussion
The problem that occurs in some Universities in Riau is the absence of a standardized governance system in IT management so that problems are found in each user and there is still no overall data management integration system. The development of information systems in the future affect university management to be more adaptable toward the demand of clients. Supervision and evaluation of IT performance have not been done optimally. To realize the vision and mission of the university, the evaluation/analysis in IT management at the University is required by using the COBIT Framework 5. In mapping to a certain level of maturity, Cobit 5 able to deliver information regarding the current state of IT governance in the University. The success of university governance is determined by the management of Information Technology that is well managed. The application of IT will run well if it is supported by good IT governance as well. Universities in Riau frequently encounter the various problems related to Information Systems. This issue is critical because it provides services to the entire academic community.

The following table is the result of assessment of IT governance in the University in Riau based on COBIT 5 framework:

| No | Aspect                                      | Score |
|----|---------------------------------------------|-------|
| 1  | Evaluate, Direct, and Monitoring (EDM) 03   | 2.60  |
| 2  | Evaluate, Direct, and Monitoring (EDM) 04   | 2.69  |
| 3  | Align, Plan, and Organise (APO) 01          | 2.66  |
| 4  | Align, Plan, and Organise (APO) 02          | 2.69  |
| 5  | Align, Plan, and Organise (APO) 06          | 2.81  |
| 6  | Align, Plan, and Organise (APO) 07          | 2.79  |
| 7  | Deliver, Service, and, Support (DSS) 01     | 2.77  |
| 8  | Deliver, Service, and, Support (DSS) 03     | 2.80  |
| 9  | Monitor, Evaluate, and Assess (MEA) 01      | 2.60  |
|    | **Average Score**                          | **2.71** |

Our focus was on assessing the EDM, APO, DSS, and MEA. The BAI (Build, Acquire, and Implement) were not our focus because based on our findings, the universities in Riau already have IT governance, including information systems but have not integrated and have not been audited yet. The results showed that the average maturity level of all Universities was 2.71. Referring to table 1, it can be seen the level of maturity is 2 (managed process). This indicates that the universities in Riau are implementing IT governance properly, already have a strategic plan, but need to improve the IT governance to be better governance. By COBIT 5, it is also a collection of instruments that support bridging the gap between control requirements, technical issues, and business risk. In addition, COBIT 5 made a very clear separation between the governance and the management area.

It is necessary to develop regulations and policies for IT management at Universities which fully support the vision, mission, and goals of the University. An intense awareness is necessary from university top leaders regarding the urgency of better IT governance toward the era of IR 4.0. The universities should be at a predictable and optimization level. This level is completely ready to meet the needs of the industrial Revolution 4.0 and sustainability in the future. Universities are also required to provide a platform to be ready to innovate in global competition.

4. Conclusion
COBIT 5 contributes to providing a framework for assessing the performance of IT governance and has been performed properly to deliver the expected results. Based on our findings, the level of IT maturity of Universities in Riau toward the IR 4.0 era is at the level of managed processes. Some of the Universities, we found that IT Management has good performance, but at the level of EDM and MEA...
needs to do some improvement treatment. The process is still at levels 1 and 2. To achieve a better result, it is expected that Universities to intensify the support for system implementation in managing IT services. The combination of the COBIT 5 and CMMI framework can contribute, particularly at the aspect of security. Another further concern by the university management is aspects of procedures and policies to improve the effectiveness of IT governance to be the better policy and management.

References

[1] B. Hariadi, M. J. D. Sunarto, and P. Sudarmaningtyas, “Development of Web-Based Learning Application for Generation Z,” Int. J. Eval. Res. Educ., vol. 5, no. 1, p. 60, 2016.

[2] A. Richert, M. Shehadeh, L. Plumanns, K. Gros, K. Schuster, and S. Jeschke, “Educating engineers for industry 4.0: Virtual worlds and human-robot-teams: Empirical studies towards a new educational age BT - 2016 IEEE Global Engineering Education Conference, EDUCON 2016, April 10, 2016 - April 13, 2016,” IEEE Glob. Eng. Educ. Conf. EDUCON, vol. 10-13-April, no. April, pp. 142–149, 2016.

[3] D. Sudrajat et al., “The Implementation of Innovation in Educational Technology to Improve the Quality of Website Learning in Industrial Revolution Era 4.0 Using Waterfall Method,” J. Phys. Conf. Ser., vol. 1364, no. 1, pp. 0–6, 2019.

[4] J. M. Müller, D. Kiel, and K. I. Voigt, “What drives the implementation of Industry 4.0? The role of opportunities and challenges in the context of sustainability,” Sustain., vol. 10, no. 1, 2018.

[5] K. Zhou, T. Liu, and L. Zhou, “Industry 4.0: Towards future industrial opportunities and challenges,” 2015 12th Int. Conf. Fuzzy Syst. Knowl. Discov. FSKD 2015, pp. 2147–2152, 2016.

[6] Y. J. Winarto, “Efforts to Increase the Pedagogies of Teachers in Making IT-Based Learning Media in the 4.0 Era,” in 3rd International Conference on Education Innovation (ICEI 2019), 2020, vol. 387, no. Icei, pp. 113–116.

[7] A. M. Abubakar, H. Elrehail, M. A. Alatailat, and A. Elçi, “Knowledge management, decision-making style and organizational performance,” J. Innov. Knowl., vol. 4, no. 2, pp. 104–114, 2019.

[8] A. Benešová and J. Tupa, “Requirements for Education and Qualification of People in Industry 4.0,” in Procedia Manufacturing, 2013, pp. 1–194.

[9] J. W. Lee and D. Wie, “Technological change, skill demand, and wage inequality in Indonesia,” 2013.

[10] Rafzan, D. Budimansyah, Rahmat, and S. Fitriasari, “Development of Critical Thinking Skills Through the Citizenship Education Course in the Era of Industrial Revolution 4.0,” in 2nd Annual Civic Education Conference (ACEC 2019), 2020, vol. 2018, no. Acec 2019, pp. 256–261.

[11] W. Warni Tune Sumar, W. Tune Sumar, and N. Lamatenggo, “The Strategy of Teachers in Developing Curriculum for Learning Process in Facing Challenges in Era of Industrial Revolution 4.0,” in 5th International Conference on Education and Technology (ICET 2019), 2019, vol. 382, no. Icet, pp. 183–186.

[12] A. Das, V. Kumar, and U. Kumar, “The role of leadership competencies for implementing TQM: An empirical study in Thai manufacturing industry,” Int. J. Qual. Reliab. Manag., vol. 28, no. 2, pp. 195–219, 2011.

[13] D. Arisandi, L. Elvitaria, S. Hartati, L. Trisnawati, and D. Nababan, “Depreciation Measurement on Computer Lab Inventory using Straight-Line Method,” in Journal of Physics: Conference Series, 2019, vol. 1175, no. 1.

[14] T. Bartin, “Strengthening The Role of Private Training Institutions for The Preparation of Skilled and Professional Workers,” vol. 2018, no. Nfieic 2018, pp. 130–136, 2019.

[15] J. L. Cahill, “The collaborative benefits of Google Apps Education Edition in higher education,” Northcentral University, 2011.

[16] M. RUDIC, “Course Curriculum Planning and Management System,” Mälardalen University, 2012.
[17] F. Sulaiman, “The effectiveness of Problem-Based Learning (PBL) online on students’ creative and critical thinking in physics at tertiary level in Malaysia,” University of Waikato, 2011.

[18] H. Tanuwijaya and R. Sarno, “Comparation of CobiT Maturity Model and Structural Equation Model for Measuring the Alignment Between University Academic Regulations and Information Technology Goals,” *IJCSNS Int. J. Comput. Sci. Netw. Secur.*, vol. 10, no. 6, pp. 80–92, 2010.

[19] M. Gehrmann, “Combining Itil, Cobit and Iso/iec 27002 for Structuring Comprehensive Information Technology for Management in Organizations,” *Navus - Rev. Gestão e Tecnol.*, pp. 53–65, 2012.

[20] S. J. Lincke, R. Kumar, and V. Tiwari, “Security of Information Systems in Schools: An Evaluation using Audit and COBIT Interviews,” *J. Inf. Syst. Secur.*, vol. 6, no. 3, 2010.

[21] D. F. Murad, E. Fernando, M. Irsan, R. R. Kosala, B. Ranti, and S. H. Supangkat, “Implementation of COBIT 5 Framework for Academic Information System Audit Perspective: Evaluate, Direct, and Monitor,” in *Proceedings of ICAITI 2018 - 1st International Conference on Applied Information Technology and Innovation: Toward A New Paradigm for the Design of Assistive Technology in Smart Home Care*, 2018, pp. 102–107.

[22] A. Cobo, A. A. Vanti, and R. Rocha, “A fuzzy multicriteria approach for it governance evaluation,” *JISTEM-Journal Inf. Syst. Technol. Manag.*, vol. 11, no. 2, pp. 257–276, 2014.

[23] R. D. S. De Haes, W. Van Grembergen, “COBIT 5 and Enterprise Governance of Information Technology: Building Blocks and Research Opportunities,” *COBIT 5 Enterp. Gov. Inf. Technol. Build. Blocks Res. Oppor.*, p. 25, 2013.

[24] H. Nugroho, “Conceptual model of IT governance for higher education based on COBIT 5 framework,” *J. Theor. Appl. Inf. Technol.*, vol. 60, no. 2, pp. 216–221, 2014.

[25] S. El, K. Youssfi, and J. Boutahar, “CAT5:A Tool for Measuring the Maturity Level of Information Technology Governance Using COBIT 5 Framework,” *Int. J. Adv. Comput. Sci. Appl.*, vol. 7, no. 2, pp. 385–391, 2016.