

Management Information System based Leadership to Improve Higher Education in Industry 4.0

Iswanto

Abstract: *In its development, a university cannot keep progressing all the time. A university could experience a setback after advancing rapidly. The decline could harm the existence of the university. The process of establishment to the destruction of a university can be detected by the TRIZ method using the S curve. With the curve it can be identified which year the decline of a university is. The decline of a university is due to the decline of the university ranks assessed by the directorate general of higher education. Universitas Muhammadiyah Yogyakarta had increased rapidly since it was established, but this last year it has experienced declining. It can be seen from the S curve. To maintain and improve the rank, a management information system is needed. The system is used to provide data used by leadership to improve and direct the data so that it can be used for university rank improvement. It is based on the TRIZ and S curve. It collected Scopus data, web journals of science, research data, community service data and intellectual property right data from the lecturers of Universitas Muhammadiyah. By applying this system, the university which experiences setbacks can improve its rank and progress.*

Index Terms: *Triz, University Rank, S curve, higher education.*

I. INTRODUCTION

Universitas Muhammadiyah in Yogyakarta was originated a religious social movement namely Muhammadiyah founded in Yogyakarta city by KH. Ahmad Dahlan in 1912. The Muhammadiyah movement progressed rapidly in the educational field encouraging Muhammadiyah activists to establish Universitas Muhammadiyah in Yogyakarta. When the Muhammadiyah Central Board of Teaching inaugurated the Faculty of Teacher Training and Education (FKIP) in Yogyakarta on November 18, 1960, the charter explicitly included FKIP as a part of Universitas Muhammadiyah.

Universitas Muhammadiyah was established in March 1981 with high efforts of several Muhammadiyah activists who were persistent getting students and supported by the Muhammadiyah National Executive Chairperson at the time, K.H. A. R. Fakhruddin and Muhammadiyah Regional Chairperson H. Mukhlis Abror, Universitas Muhammadiyah was officially founded. The director of Universitas

Muhammadiyah was entrusted to Brig. Gen. TNI (Ret.) Drs. H. Bakri Syahid. The next period director was entrusted to Ir. H. M. Dasron Hamid, M.Sc. However, because the process of permit documents has not been completed, the Muhammadiyah elder, H. M. H Mawardi, was appointed as the director.

Since its establishment, Universitas Muhammadiyah Yogyakarta had developed rapidly. It reached its peak in 2018. However, in the following year it seems declining. This is due to the establishment of many public and private universities in Indonesia that progress well to reach top ranks, while Universitas Muhammadiyah Yogyakarta has been performing a setback in the university ranks held by the Directorate General of Higher Education.

Based on the problem, an information management system to manage data information university ranks is needed. Some previous researchers have conducted research using management information systems. The education management information system in primary schools was investigated by Nagar. It aimed to identify the infrastructure of information communication technology available in schools to implement information management systems [1]. Several key factors for the successful implementation of executive information systems in higher education were examined by Winanti. These factors consisted of technology, data and universities. The technological factors consisted of educational technology, technical support, and computer experience, the data factors comprised of data management, and clear links to business objectives, and the university factors consisted of university support, sponsorship operations, appropriate information service staff, management development and system evolution, financial resources, attitude, and social influences [2].

A management information system of the education management of doctoral program (DOCPEM) was examined by Mukhtar. The information system used in the DOCPEM was designed to meet the needs of students, lecturers and study coordinators in accordance with the main functions and tasks of the university. The study of the design, implementation, management, and use of information technology applications in an organization are known as MIS or management information systems [3]. Designing a framework for institutional research management system for higher education was examined by Noerlina.

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The design process began by carrying out the engineering of requirement process consisted of three phases namely background identification, collection of requirements, and needs analysis. The requirements obtained were then used as the basis for the next phase of the system design. An activity diagram, case diagram, and class diagram were used to describe dynamic workflows, rules & scenarios, and static relationships [4].

The study of digitalization of Russian higher education as the basis for intelligent education involving three dimensions of the intelligent education namely technology, organization and teaching was examined by Dneprovskay. The technological dimension consisted of the ICT infrastructure of a university, the organizational dimension assumed the creation of business models and management processes for universities, and the teaching dimension included the content of educational programs and teaching materials. The factual basis of the research consisted of the data from official statistics and educational institutions, as well as evaluations by community experts [5]. A learning framework in the industrial era 4.0 in higher education was examined by Winanti. The impact of the industry 4.0 on universities both externally and internally can be seen in terms of technology and information systems namely assets consisting of technology, facilities, equipment, regulations, budget and management. Human resources in the university include leadership, lecturers, staff, maintenance, and students. Learning materials and learning curricula must be synchronized and evaluated continuously because the suitability between the two determines the learning success. Learning Methods consisting of online learning, social learning, virtual learning, open learning and Blended Learning as well as innovation in accordance with technological developments and collaboration with industry [6].

Based on the previous research, management information systems have been studied for universities, doctoral programs, and elementary schools. The information system is aimed at managing and displaying the data needed. In this paper, an information system for universities is presented. This system is different from the system studied by the previous researchers. This system is used to rank universities by collecting some data and then displaying the data on web pages to improve the ranks.

II. PROCEDURE FOR PAPER SUBMISSION

Universitas Muhammadiyah Yogyakarta had developed rapidly and reached the top of the S curve in 2018 as shown in Figure 1. The figure shows that Universitas Muhammadiyah Yogyakarta was established in 1981. In 2012, the university began to improve and reached the top in 2018, while in 2019, the universities is setback.

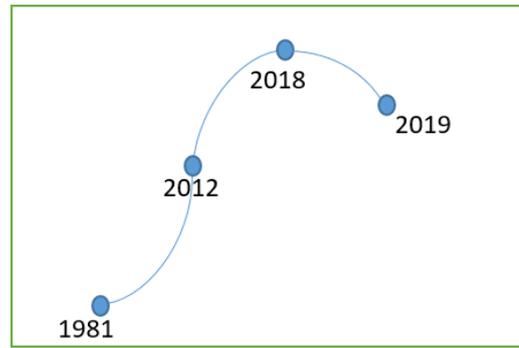


Figure 1. S curve of Universitas Muhammadiyah Yogyakarta

Scopus		
<u>Nama</u>	Journal	<u>Proceeding</u>

Figure 2. Scopus indexed journal and proceedings data display

With the predictions of university decline in 2019 using the S curve, a management information system for university ratings was created. This system collected Scopus data, web journals of science, research data, community service data and intellectual property right data from the lecturers of Universitas Muhammadiyah. The first design of the management information system contained the Scopus view as shown in Figure 2. It can be seen that Scopus data consists of the lecturer’s name for the number of journals, and the number of proceedings. Based on the view, it can be identified how many lecturers are less active in writing Scopus indexed journals and proceedings.

Research		
<u>Nama</u>	Output Scopus Journal	Output IPR

Figure 3. Research data display

The second design management information system contains a research display as shown in Figure 3. There are three columns namely lecturer name column, Scopus indexed journal output and IPR output. The display contains the output of the lecturers’ research in the form of Scopus indexed journal, Scopus indexed proceeding and intellectual property right.



Community service			
Name	Output Journal	Output IPR	Output appropriate technology

Figure 4. Lecturers carrying out internal community service data display

The third design management information system contains a community service display as shown in Figure 4. It can be seen in the figure that there is a column for lecturer names, journal output, IPR output, and appropriate technology output. The display shows that the lecturers who propose the community service must produce journal, IPR and appropriate technology as his outputs.

III. DISCUSSION

The management information system test is performed in stages. There are three stages of the test namely the Scopus management information system stage, the research management information system stage, and the community service management information system stage.

Scopus management information system test.

The Scopus management information system, as shown in figure 5, contains a list of the lecturers' names and their outputs. It is used to identify the participation of the lecturers in journal and proceeding writings to improve the university ranks. Figure 5 shows that the lecturer named Iswanto in 2019 has two publications of Scopus indexed journals, while Rama Okta has no publication. Therefore, Rama Okta may be summoned and given a warning from the leader or director of the university.

Scopus		
Nama	Journal	Proceding
<u>Iswanto</u>	2 Journal	0 Proceding
<u>Agus Jamal</u>	1 Journal	1 Proceding
<u>Rama Okta</u>	0 Journal	0 Proceding
<u>Slamet Suripto</u>	0 Journal	1 Proceding

Figure 5. Display of lecturers who submit Scopus indexed journals and proceedings

Research management information system test

The research management information system is used to find out the outputs of the lecturers as shown in figure 6. It can be seen that the lecturer named Iswanto has written two research papers published in Scopus indexed journals and one IPR. Nur Hudha neither has written any research paper nor have IPR. Tatiya has written one research paper published in Scopus indexed journals, but doesn't have IPR. Rama Okta has written one research paper published in Scopus indexed journal, but doesn't have IPR. Based on the data, the lecturer named Nur Hudha may be summoned by the leader or director

to complete the output data.

Research		
Nama	Output Scopus Journal	Output IPR
<u>Iswanto</u>	2 Journal	1 IPR
<u>Nur Hudha</u>	0 Journal	0 IPR
<u>Tatiya</u>	1 Journal	0 IPR
<u>Rama Okta</u>	1 Journal	1 IPR

Figure 6. Display of lecturers conducting researches and writing research papers, proceedings, and IPR

Community service management information system test

Community service management information system is used to identify the outputs of community service as shown in Figure 7. The figure shows that the lecturer named Joko does not produce any output in community service, IPR, or appropriate technology, while Danang hasn't written any research paper. Both lecturers may be summoned by the leader or director to complete the outputs of the community service.

Community service			
Name	Output Journal	Output IPR	Output appropriate technology
<u>Iswanto</u>	1 Journal	1 IPR	1 appropriate technology
<u>Joko</u>	0 Journal	0 IPR	0 appropriate technology
<u>Anto</u>	1 Journal	1 IPR	1 appropriate technology
<u>Danang</u>	0 Journal	1 IPR	1 appropriate technology

Figure 7. Display of lecturers who conduct community service.

IV. CONCLUSION

The designed management information system based on TRIZ and S curve can be used to maintain and improve the university rank. This system collected Scopus data, web journals of science, research data, community service data and intellectual property right data from the lecturers of Universitas Muhammadiyah. Referring to the data in the system, the numbers and names of the lecturers who do not write research papers and proceedings published in Scopus indexed journals can be identified so that a warning letter can be given. Additionally, the lecturers who do not produce outputs from research and community service can also be summoned to be asked about the matters. Based on the data provided by the system, the leader or the director can provide guidance for lecturers who are lack of interest in researches, services, or journal writings. With their significant contribution in paper writing and research, it will improve the rank of the university.

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Iswanto was born in Sleman, Yogyakarta, Indonesia, in 1981. He received the B.S degree and M.Eng degree from Universitas Gadjah Mada, Yogyakarta, Indonesia in 2007 and 2009. Now, he is on Phd Program at Universitas Gadjah Mada. He has been a Lecturer and Researcher in the Electrical Engineering Department at Universitas Muhammadiyah Yogyakarta since 2010. His current research is focused on formation control, path planning and Control UAV.