

# Effect of Information Technology Maturity Model Process by using Domain Information Technology Acquisition and Implementation in Higher Education

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**Abstract**— Utilization of information technology are needed by the institution generally in institutions of higher education in particular are used to exploit information technology in business process, learning process and provide optimal support to higher education institutions. Therefore, it should be managed with goodness the maturity level of information technology in educational institution. In this study, it will apply information technology maturity model using domain Acquisition and Implementation (AI) to show the success of information technology in higher education achieved and according to the target control of higher education. The results of the analysis were used as materials for constructing and factor the maturity of information technology in the higher education institution. Results showed that the application of information technology maturity model can be applied to institutions of higher education by examining the validity and reliabilas towards maturity model proposed information technology. The results showed that the maturity model as needed. Tests carried out using alpha reliability coefficient 0.75 (75%).

**Keywords**— information technology, maturity model, domain acquisition and implementation, institutions of higher education

## I. INTRODUCTION

In this era of globalization of information technology can be used to deliver learning materials by means of CAI (Computer-Assisted Instruction), for the distribution of learning materials through the Internet, and media communication with experts. Organization of information technology are used to facilitate data acquisition and storage, which by using various software functions, can then be interpreted and transformed into meaningful information, and enables the delivery of this information to users so that it help them to achieve the goals and objectives of higher education institutions in general [ 2].

Globalization is also supported by the increasingly widespread use of smart technology (computers, telecommunications and electronic office equipment) in all arenas of life. This situation has forced the management company in Indonesia to re-engineer their management systems that have been used to produce products and services [5]. The results of researchs carried out by Choe Min showed a positive correlation between the performance of the information technology and the influence of factors such as the participation of users, the ability of information technology staff, and the size of the Organization [4]. Elements of information technology which are including hardware, software, communications and data availability, based on some empirical studies, information technology has benefits for the working integration both vertically and horizontally, to help companies gain competitive

information [3], presents information in a useful form and to send information to other parties as well as other locations [6].

## II. FUNDAMENTAL THEORY

### *Maturity Model Information Technology*

The needs of application and maturity of information technology in higher education institutions require the integration of technology and information. This need will be seen in the top-level decisions that must be supported by information technology. General process of information technology can be seen in Fig. 1.

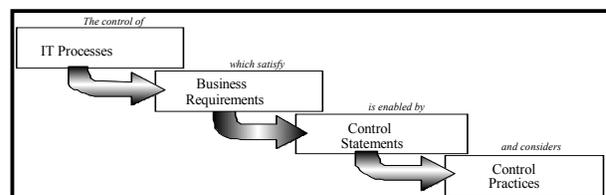


Figure 1. Information Technology Processes

The use of information technology to support the organization or institution in response to the pressure of business / government and to achieve its goal has been regarded as a necessity by each organizations government and corporations. Increasing complexity, interconnectedness, and globalization makes developers of information technology requires huge costs and also cause a variety of risks. At the same time, information

technology also offers tremendous opportunities as a business enabler and change the business pattern of higher education institutions. In Fig. 2. is a pattern of business in higher education institutions.

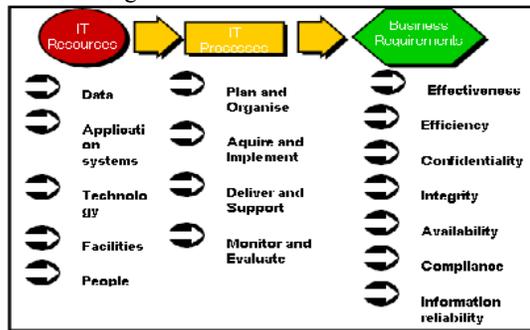


Figure 2. Business Pattern of Higher Education Institutions

### III. METHODS

Development of information technology is a process to plan and restructure the technological information that has been implemented and constructed according to the needs of information on an institution. The purpose of the development of information technology is to make use of and development of information technology as a profitable container investment and provide benefits to higher education institutions. Maturity Model allows an organization to measure itself from nothing to be optimized, so the organization can perform measurements on the maturity level there to know the progress of the internal control of the system [6].

Scale maturity model will help professional to explain to the management of higher education where the shortage of information technology management is and to determine targets to compare the organizational control practices against best practice examples. The advantage of the maturity model approach is that it's easy for management to put higher education institutions on a scale and pay attention to what is involved whether they would improve the performance [6]. Process maturity model can be seen in Fig. 3.

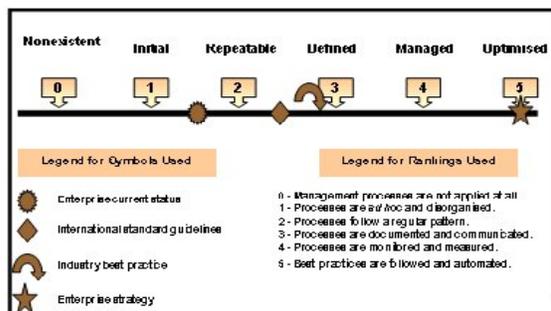


Figure 3. Maturity Model Process

The concept of maturity of information technology is used to determine the extent to which managers use computer-based information technology. The use of information technology will improve the efficiency of

effectiveness, quality, and consumer response. Infrastructure differences can impede or accelerate the activities of the organization in responding to the environment.

According to Chenhall and Morris says that the reliability of information is determined by a broad-scope information, which is information technology which represent the focus dimension, time horizon, and quantification, and timeliness of information, the accuracy of information to support the managers face the uncertainty that occurs in the workplace [1]

### IV. EXPERIMENTAL RESULTS

In the domain Acquisition & Implementation (AI) encompassing functional purpose in Higher Education in developing studies organization in achieving its outcome of the process of information technology. In addition, developing the policy to provide information technology and procurement procedures in accordance with procurement policies in Higher Education. In the assessment process of maturity level in higher education institutions which is based on domain information criterion Acquisition & Implementation (AI), are including, efficiency effectiveness, acquisition, implementation, compliance, availability, and management of information technology applications and information technology infrastructure. In Figure 5 is a process maturity level assessment in higher education institutions

DOMAIN	PROCESS	Information Criteria					IT Resources							
		Efficiency	Effectiveness	Acquisition	Implementation	Compliance	Availability	Integrity	Confidentiality	Information reliability				
Acquire and Implement	A11 Identify external relations	P	S											
	A12 Acquire and maintain application software	P	P	S	S	S								
	A13 Acquire and maintain technology infrastructure	P	P	S										
	A14 Develop and maintain procedures	P	P	S	S	S								
	A15 Install and accreditation	P		S	S									
	A16 Manage changes	P	P	P	P	S								

Figure 5. Assessment Process Maturity Level of Higher Education

In Fig. 6. This is an example of a table showing the maturity model which show the statement on the level of maturity. This can be seen in the table there are three statements, each of which has a weight value and weight to a level of maturity is the amount of weight that is worth three. On every question will be given four choices that determine the maturity value statement, namely:

- *Not at all* (Weight = 0), if none of the statement are not met
- *A Little* (Weight = 0,33), if the statement are met only slightly.
- *To some degree* (Weight = 0,66), if the statement are met but not perfect.
- *Completely* (Weight = 1), if the statement are suited with actual circumstances.

Maturity Level		
		<b>1</b>
N <sup>o</sup>	Statement	Weight
1	Have awareness of the need to manage service levels, in the process is formal and reactive.	1
2	The responsibility and accountability for defining and measuring service levels are not defined.	1
3	If performance measurement exists, they are qualitative only with imprecisely defined goals. Reporting is formal, infrequent and non-stand	1
Total Weight		3

Figure 6. Maturity Model Table

The value of each statement in the maturity level will be added and divided by the level of maturity, so we can obtain compliance for every level of maturity. Fig. 7. is showing the calculation due on the maturity level of information technology

Not at all	A little	To some degree	Completely	VALUE
0,00	0,33	0,66	1,00	
				11,111
				1,111
				1,00
<b>Compliance</b>				<b>0,0067</b>

Figure 7. Calculation of Maturity Model Table

The value of compliance at each level will processed to get the IT process maturity. Each value of compliance will be multiplied by the contribution of each maturity level. The value of this contribution for each level of maturity varies in accordance with the provisions of COBIT, the higher the level of maturity, the higher its contribution.

The calculation process for measuring the maturity level domain based Acquisition & Implementation (AI) can be seen in Fig. 8. In this case the maturity value to process that information technology maturity level is 2.828. It has been noted previously that the maturity value of an information technology process are between 0-5, but not necessarily the whole process of institutions of higher education information technology has a perfect maturity value.

Maturity Level (ML)	Sum of statements compliance values (A)	Number of maturity level statements (B)	Not normalized compliance (C=A/B)	Normalized compliance values [D=C/sum(C)]	Contribution (ML*D)
0	0,00	2	0,000	0,000	0,000
1	1,98	4	0,495	0,195	0,195
2	2,32	3	0,773	0,304	0,608
3	1,98	5	0,396	0,156	0,468
4	1,32	3	0,440	0,173	0,692
5	2,64	6	0,440	0,173	0,865
		Total	<b>2,544</b>	<b>Maturity Values</b>	<b>2,828</b>

Figure 8. Result of calculation of Maturity Level on the Domain AI

Further testing conducted are using the Cronbach Alpha reliability test-(1). Questionnaire testing has satisfactory reliability if it have Alpha-Cronbach reliability coefficient greater than 0.6. The formula used to

calculate the Alpha-Cronbach [7]. The results of the test reliability and validity of domain acquisition and implementation (AI) can be seen in Fig. 9.

$$r_i = \frac{k}{(k-1)} \left\{ 1 - \frac{\sum S_i^2}{S_t^2} \right\} \dots\dots\dots (1)$$

$$S_t^2 = \frac{\sum X_i^2}{n} - \frac{(\sum X_i)^2}{n^2} \dots\dots\dots (2)$$

$$S_i^2 = \frac{JK_i}{n} - \frac{JK_s}{n^2} \dots\dots\dots (3)$$

**Information:**  
 k = amount of item  
 $\sum S_i^2$  = sum of varian item  
 $S_t^2$  = total varian  
 $JK_i$  = sum of squares of all score items  
 $JK_s$  = sum of squares subject

Item	Cronbach's Alpha	Critical Value	Result
AI1	0,902	0,75	Reliabel
AI2	0,921	0,75	Reliabel
AI3	0,885	0,75	Reliabel
AI4	0,919	0,75	Reliabel
AI5	0,855	0,75	Reliabel
AI6	0,918	0,75	Reliabel
AI7	0,920	0,75	Reliabel

Figure 9. Result of Reliability and Validity Test on the Domain AI

AI-1 Identify Automated Solutions :

- Define business functional and technical requirements
- Establish processes for integrity/currency of requirements
- Identify, document and analyse business process risk
- Conduct a feasibility study/impact assessment in respect of implementing proposed business requirements
- Assess IT operational benefits of proposed solutions
- Assess business benefits of proposed solutions
- Develop a requirements approval process
- Approve and sign off on solutions proposed

AI-2 Acquire and Maintain Application Software :

- Translate business requirements into high level design specification
- Prepare detailed design and technical software application requirements
- Specify application controls within the design
- Customise and implement acquired automated functionality
- Develop formalised methodologies and processes to manage the application development process

- Create a software quality assurance plan for the project
- Track and manage application requirements
- Develop a plan for the maintenance of software applications

AI-3 Acquire and Maintain Technology Infrastructure :

- Define acquisition procedure/process
- Negotiate acquisition and acquire required infrastructure with (approved) vendors
- Define strategy and plan maintenance for infrastructure
- Configure infrastructure components

AI-4 Enable Operation and Use :

- Develop strategy to operationalise the solution
- Develop knowledge transfer methodology
- Develop end user procedure manuals
- Develop technical support documentation for operations and support staff
- Develop and deliver training
- Evaluate training results and enhance documentation as required

AI-5 Procure IT Resources :

- Develop IT procurement policies and procedures aligned with procurement policies at the corporate level
- Establish/maintain a list of accredited suppliers
- Evaluate and select suppliers through a request for proposal (RFP) process
- Develop contracts that protect the organisation's interests
- Procure in compliance with established procedures

AI-6 Manage Changes :

- Develop and implement a process to consistently record, assess and prioritise change requests
- Assess impact and prioritise changes based on business needs
- Assure that any emergency and critical change follows the approved process
- Authorise changes
- Manage and disseminate relevant information regarding changes

AI-7 Install and Accredite Solutions and Changes :

- Build and review implementation plans
- Define and review a test strategy (entry and exit criteria) and an operational test plan methodology
- Build and maintain a business and technical requirements repository and test cases for accredited systems
- Authorise changes Perform system conversion and integration tests on test environment
- Deploy test environment and conduct final acceptance tests

- Recommend promotion to production based on agreed accreditation criteria

Based on the recapitulation and the test results, we obtained results on the maturity level domain Acquisition & Implementation (AI) is located at around 2828 à 3459, the highest value lies in the AI-2 (Obtain and Maintain Application Software), and AI-7 (Install and Accreditation Solutions and changes). Results summary of mature domain Acquisition & Implementation (AI) can be seen in Fig. 10.

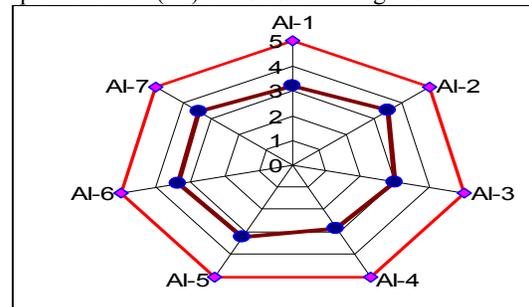


Figure 10. Result of Maturity Domain Acquire & Implement (AI)

The overall result of the maturity of information technology of higher level education institution is presented in graphical form, and can be seen in Fig. 11. which indicates that the presence of information technology and good infrastructure contribute to higher education institutions, students and lecturers. Fig. 11 is a graph of the maturity level of information technology, higher education institutions.

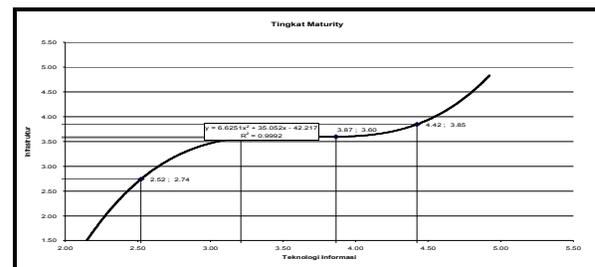


Figure 11. Graphic of information technology maturity level higher education institutions

## V. CONCLUSIONS

Conclusions that can be drawn from this study are as follows:

- From the measurement results using maturity model, it is known that the level of information technology in higher education institutions at the recurrent level with an average score of 2828. In general, to achieve a further level of maturity models it need to manage and regulate the process of information technology services, applications and internal information technology infrastructure.
- From the results of mapping the level maturity model, that the process of information

technology and information technology management needs to make adjustments and modifications to information technology, so it can be applied widely to institutions of higher education.

Based on the reliability and validity test, it is shown that maturity model can be accepted by the institution with a measurement with trust level (cronbach's alpha) of 0.921 and the level of validity of 0.75 (75%).

#### VI. REFERENCES

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