The readiness model of information technology implementation among universities in Indonesia

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Abstract. This study reports on how to combine several models in the context to assess the readiness of IT implementation in Higher Education Institution. Many studies are generated by researchers about the readiness model, that most Readiness models are developed by adopting, combining, and adapting models of some existing models. Researchers develop models based on input-process-output logic and processional models and causal relationships using the E-Readiness model and the ZEN Framework adoption model. The developed model is organized into seven variables and 50 indicators. Relationships between variables are linked with 12 links as hypotheses. For this model research to the break down the level of the assessment instrument. However, this study is limited to the model to be used for research.

1. Introduction

The problem of implementing IT in Higher Education Institution (HEI) in Indonesia is one of the interesting themes for researchers and practitioners in the Information Systems scientific discipline two decades ago. The goal of implementation in HEI is to gain competitive advantage from business opportunities generated by IT, saving costs for infrastructure development in the future, developing successful resources and competencies in the organization. The steps that must be taken to see the readiness of the system are by combining management and business knowledge with technical knowledge, developing business strategies, determining IT strategies, stakeholder interaction with IT and stakeholders' business collaboration vision [1]–[4].

How can the role of IT in HEI be optimal and optimal should there be a study that measures HEI’s readiness for IT implementation [5]–[7]. People have discussed this subject especially about the efficiency and effectiveness of business in IT-based HEI. Then the study was conducted by researchers and professional readiness in the next few periods [8]–[11]. It can be seen clearly that the models are interconnected between one another, and several models are combined with other models. For example, the E-Readiness theory, Service Quality, and ZEN Framework from Indonesia for the adoption of IT in HEI. This is consistent with indications of several previous studies which show that many Readiness models are developed concerning previous theories and are based on empirical studies.

Furthermore, many studies explain that E-readiness is a level where stakeholders are prepared to participate using technology that can help build better institutions and institutions ready to receive the benefits and benefits of implementing IT [12]–[17]. Thus, this is an interesting phenomenon of how to continue the study of Readiness performance by developing new Readiness by adopting, combining or adapting the existing Readiness models [18], [19].
The purpose of this research is to explore the effect of merging, combination and adoption of IT implementation readiness on HEI. Based on the presentation of the research program mentioned above, two research questions were then proposed to be a reference for the implementation of this exploratory research.

Q-1. How to understand the relationship between the E-Readiness model and the implementation of IT in HEI?

Q-2. How can merging, combination, and adoption of IT implementation readiness increase the benefits of using IT in HEI?

Structurally this paper is arranged in seven parts. First, the introduction section which explains the background, problems, and objectives of the study. Second, the Literature Review section which describes the relevant theory references that are used to define the variables to be studied. The three research methods used to combine, combine and adopt IT implementation readiness. Fourth Result and Discussion. The fifth part of the conclusion that concludes this study.

2. Literature Review

It can be seen clearly that the implementation of IT has a significant impact on the progress of HEI, what if it is able and successful in implementing IT by the factors that influence readiness [4], [5], [13], [20]. This means that the successful implementation of IT is a significant challenge for HEI before benefiting. On the contrary, besides the failure of IT implementation will bring financial losses; inhibition of the academic system [21], the delay in the administration and unmanaged services of the needs of stakeholders well [6], [22]. Previous studies that measured IT implementation readiness [5], [12], [23]–[25] showed that the criteria for IT implementation readiness related to People, Process, Technology, Governance, Policy, Work Environment, and Infrastructure. Several surveys about IT implementation readiness [8], [26], [27] studies revealed that one indication of implementation failure was, according to Mohamad Ali Murtadho, because of the incompatibility of the system with business processes and information needed by the organization [28]. According to [29], the failure of the implementation of information systems in organizational business processes includes universities (universities) not only due to technical factors but rather non-technical problems (human factors, work processes and organizations). Unlike Curry, [30] distinguishes failure in the implementation of an information system into two aspects, namely technical aspects and non-technical aspects [31], [32].

Researchers are interested in creating a readiness model that suits the needs and conditions of HEI in Indonesia, research questions are arranged based on Population, Intervention, Comparison, Results, Context (PICOC) [33], [34]. The development of the research model on Readiness is done by adopting, combining, and adapting the previous Readiness model [8], [23], [35], [36].

3. Research Method

The study of the development of this model was carried out in four main stages (Figure 1). First, a preliminary study (S1) is carried out by retrospectively reviewing the behavioral, organizational, and social themes of the Information System (IS) study, one of which is Readiness [37]. In addition to reviewing the literature to formulate research programs. Then followed by modeling in the second stage (S2). The development phase of this model begins with the first sub-step (S2.1) to develop assumptions based on the chosen theory.
Figure 1. Research Methodology

Following the assumptions developed by Nur Mardhiyah Aziz's technology readiness model [38] and the ZEN Framework readiness model, later adopted, combined, and adapted respectively in the second (S2.2), third (S2.3), and fourth sub-stages (S2.4). The model developed was then broken down into the level of the next research instrument entered into the operational phase (S3). Finally, the research model developed and the data collection instruments are then proposed in the reporting phase.

4. Result and Discussions

Figure 2 presents the proposed IT Implementation Readiness (ITIR) model. This development was inspired by previous model development research [8], [12] following for the trend of developing models from Nur Mardhiyah Aziz [38] and Zen Framework [8], [39], studies showing that most IS research models tend to be developed practically using the previous model rather than based on empirical studies. Generally, this model was developed by adopting, combining, and adapting technology readiness [5], [10], [12], [13], [26], [35], [40], [41] models with seven variables, namely IT Content (ITC), Institutional Context (INC), People (PPL), Process (PRC), Technology (TCG), Service Quality (SVQ) and IT Implementation Readiness (ITIR).

Figure 2. Propose ITIR Model
Referring to previous research [4], [8], [12], [13], [40], [42]–[44] which uses input-process-output logic (IPO) in the development of research models, researchers assume that the combination process and the adoption of readiness can also be assumed in the logic mentioned above. Conceptually, IT Content and Institutional Context are Inputs from the developed model, while People, Process, Technology and Service Quality are the phases of the process of developing the readiness model, while for IT implementation and the output of the process, ITIR. The definition of seven variables and 50 indicators can be seen in table 1, table 2 and table 3.

### Table 1. List of The Variables

| Variable | Definitions | Reference |
|----------|-------------|-----------|
| ITC      | This variable is defined as an internal condition of IT use that expresses its characteristics regarding IT implementation | [8], [12], [40] |
| INC      | This variable describes the point into the internal property and the external conditions of the institution that affect IT implementation | [12], [45] |
| PPL      | Variables that explain the readiness factors influenced by people such as Workforce Capability, Leadership, Competency, Resources, Change Management, HR and Cultural Infrastructure | [8], [13], [40] |
| PRC      | Variables that explain the readiness factors influenced by the Process such as Culture, Governance, Awareness, Strategy and Management Commitment | [8], [13], [40] |
| TCG      | Variables that explain the readiness factors that are influenced by Technology such as Infrastructure, Security, Networking, Data and Telecommunication | [8], [13], [40] |
| SVQ      | The degree of the excellence of the IT services into its users | [13], [39], [40] |
| ITIR     | The achievement of the IT based on its implementation planning | [13], [39], [40] |

### Table 2. List of Indicators

| Indicator | Definitions |
|-----------|-------------|
| Timeliness (ITC1) | The degree related to the measurement towards the time precision of data processing to be information at the most suitable time. |
| Completeness (ITC2) | The degree related to the information form of being whole or perfect without nothing missing. |
| Consistency (ITC3) | The degree related to the ability to remain the same in actions, treatments, or qualities. |
| Relevance (ITC4) | The degree related to the subject of matter appropriately. |
| Data Processing Use (ITC5) | The degree related to the IT use for the data processing needs |
| Data Storage Use (ITC6) | The degree related to the IT use for the data storage needs |
| Data Communication Use (ITC7) | The degree related to the IT use for the data communication needs |
| Information Distribution Use (ITC8) | The degree related to the IT use for the data distribution needs |
| Intensity of use (ITC9) | The degree related to the amount of time a system is used. |
| Extent of use (ITC10) | The degree related to the scope of system utilizations based on the use or nonuse of basic and advanced system capabilities. |
| Institutional Culture (INC1) | The degree related to the institutionalized norms, values, and beliefs that shape the behavior or actions in an institution. |
| Institutional Policies (INC2) | The degree related to the institutionalization of behaviors and actions that influences the determination of the standard rules and its operational procedures in an institution. |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Institutional Project Experience (INC3) | The degree related to the knowledge, understandings, and the capabilities of an institution from the previous development IT projects. |
| System Existence (INC4) | The degree related to the state of a current system as the results of the prior project implementations. |
| Infrastructure Availability (INC5) | The degree related to the assurance that the infrastructure requirement of the IT implementation is provided adequately. |
| External Environments (INC6) | The degree related to the environmental conditions of an IT project in the context of the local, national, regional, and the international scopes. |
| Legal Environment (INC7) | The degree related to the Legal environment which determines the required legal conditions for IT adoption in Institution. |
| Institutional Policies (INC8) | The degree related to the institutionalization of behaviors and actions that influences the determination of the standard rules and its operational procedures in an institution. |
| Institutional Project Experience (INC9) | The degree related to the knowledge, understandings, and the capabilities of an institution from the previous development IT projects. |
| Workforce Capability (PPL1) | The degree related to the effectiveness of ICT training and capability of human resources |
| Leadership (PPL2) | The degree related to the highest hierarchy in organization or stakeholders |
| Competency (PPL3) | The degree related to skills, experience, and knowledge |
| Resources (PPL4) | The degree related to human resources, ICT resources, and budget resources |
| Change Management (PPL5) | Refers to change commitment and change the efficacy |
| HR and Cultural Infrastructure (PPL6) | The degree related to the quality and quantity of IT workers and cultural circumstance for IT adoption |
| Culture (PRC1) | The degree related to activities in the environment of an organization |
| Governance (PRC2) | The degree related to structure, procedures, and routines, and communications involving business and IT |
| Awareness (PRC3) | The degree related to the understanding of the concept, sharing of experience and raising the level of knowledge |
| Strategy (PRC4) | The degree related to business and ICT strategy |
| Management Commitment (PRC5) | The degree related to the policy which determines the status of organizational plans and management commitment for IT Adoption |
| Infrastructure (TCG1) | The degree related to technology, including software and hardware |
| Security (TCG2) | The degree related to policy, information safety, and the legal and regulatory environment. |
| Networking (TCG3) | The degree related to the Internet connectivity and data connectivity |
| Data (TCG4) | The degree related to Mechanism to collect, store and retrieve information, standards formats for information organization, storage, and retrieval |
Telecommunication (TCG5) The degree related to the infrastructure which determines the status of telecommunication and technical infrastructure
Responsiveness (SVQ1) The degree related to the quick reaction in the way that is needed, suitable, or right for a particular situation
Availability (SVQ2) The degree related to ensuring that the information is available when it is required.
Security (SVQ3) The degree related to the safety from attack, harm, or damage that unexpected.
Functionality (SVQ4) The degree related to the scope which appropriated to the functional requirements.
Extension (SVQ5) The degree related to scope whereas the system is able to provide the addition purposes.
Reliability (SVQ6) The degree related reliable problem-solving service and reliable system
Efficiency (SVQ7) The degree related to the system performance based on a comparison of the value of the output of the system and the resources needed to achieve the output
Effectiveness (SVQ8) The degree related to the system capacity to fulfill the requirements of the users to achieve their goals
Flexibility (SVQ9) The degree related to the adaptive ability of a system appropriate to the required demands.
Overall satisfaction (SVQ10) The degree related to the adequacy based on the overall aspect of a project
Technology Management (ITIR1) The degree related to the management of technology to create a competitive advantage
IT skills (ITIR2) The degree related to education, competence and Experience from using IT
IT Partnership (ITIR3) The degree related to creating business value
Quality Improvement (ITIR4) The degree related to identify and measure quality indicators in IT services
IT acquaintance (ITIR5) The degree related to education, Experience from participation in IT projects Experience from using IT

Table 3. List of Questionnaire Statements

| Indicator | Definitions |
|-----------|-------------|
| ITC1      | The system is able to process data into information that is needed to influence the readiness of IT implementation in HEI |
| ITC2      | The system provides complete information affecting the application of IT in HEI |
| ITC3      | The ability of the system to be consistent in action, care, or quality influences the readiness of the application of IT to HEI |
| ITC4      | The system becomes a material subject that correctly influences IT implementation readiness in HEI |
| ITC5      | Systems that use IT for data processing needs affect IT implementation readiness in HEI |
| ITC6      | Systems that use IT for data storage needs affect IT implementation readiness in HEI |
| ITC7      | Systems that use IT for data communication needs influence IT implementation readiness in HEI |
| ITC8      | Systems that use IT for the needs of data distribution to several clients affect IT implementation readiness in HEI |
| ITC9      | The amount used by the system to do the process influences the readiness for IT implementation in HEI |
| Number | Explanation |
|--------|-------------|
| ITC10  | The system used based on basic and advanced capabilities influences IT implementation readiness in HEI |
| INC1   | Institutional Culture influences the readiness of IT implementation on HEIs |
| INC2   | Institutional Policies affect the readiness to implement IT on HEIs |
| INC3   | Institutional Project Experience influences IT implementation readiness on HEIs |
| INC4   | System Existence influences the readiness of IT implementation on HEIs |
| INC5   | Infrastructure Availability affects IT implementation readiness on HEIs |
| INC6   | External Environments affect IT implementation readiness on HEIs |
| INC7   | Legal Environment influences the readiness of IT implementation on HEIs |
| PPL1   | Workforce Capability affects the readiness of IT implementation on HEIs |
| PPL2   | Leadership influences the readiness of IT implementation in HEIs |
| PPL3   | Competency affects the readiness of IT implementation on HEIs |
| PPL4   | Resources affect the readiness of IT implementation on HEIs |
| PPL5   | Change Management affects the readiness of IT implementation on HEIs |
| PPL6   | HR and Cultural Infrastructure affect the readiness of IT implementation on HEIs |
| PRC1   | Culture influences the readiness of IT implementation on HEIs |
| PRC2   | Governance influences IT implementation readiness on HEIs |
| PRC3   | Awareness influences IT implementation readiness on HEIs |
| PRC4   | Strategy influences the readiness of IT implementation on HEIs |
| PRC5   | Management Committees affect the readiness of implementing IT on HEIs |
| TGY1   | Infrastructure affects IT implementation readiness on HEIs |
| TGY2   | Security influences IT implementation readiness on HEIs |
| TGY3   | Networking affects IT implementation readiness on HEIs |
| TGY4   | Data affects the readiness of IT implementation on HEIs |
| TGY5   | Telecommunication affects IT implementation readiness on HEIs |
| SVQ1   | Responsiveness affects the readiness of IT implementation on HEIs |
| SVQ2   | Availability affects the readiness of IT implementation on HEIs |
| SVQ3   | Security influences IT implementation readiness on HEIs |
| SVQ4   | Functionality affects IT implementation readiness on HEIs |
| SVQ5   | Extension affects the readiness of implementing IT on HEIs |
| SVQ6   | Reliability affects the readiness of IT implementation on HEIs |
| SVQ7   | Efficiency affects the readiness of IT implementation on HEIs |
| SVQ8   | Effectiveness affects IT implementation readiness on HEIs |
| SVQ9   | Flexibility affects IT implementation readiness on HEIs |
| SVQ10  | Overall satisfaction affects the readiness of IT implementation on HEIs |
| ITIR1  | Technology Management influences IT implementation readiness on HEIs |
| ITIR2  | IT skills affect the readiness of IT implementation on HEIs |
| ITIR3  | IT Partnership affects IT implementation readiness on HEIs |
| ITIR4  | Quality Improvement affects the readiness of IT implementation on HEIs |
| ITIR5  | IT Acquaintance affects IT implementation readiness on HEIs |

Based on the research questions above, the following is an explanation of the research questions. First, the relationship between technology readiness and construction IT implementation readiness can be illustrated sequentially throughout the retrospective analysis of the factors used to measure readiness. For example, Marcel tried to integrate the G-Readiness model with the ZEN Framework that produced a combination of the two models. Then I. B. Batoya, F. Wabwoba, and J. Kilwake combined the E-Readiness model with Technology in teaching, resulting in a model of technology use readiness. Finally, Aang Subiyakto combines readiness and success models to produce a readiness model for success. This is consistent with indications of previous studies which indicate that the adoption, combination, or adaptation of the previous model in social studies is development models from existing ones, in terms of exploring new models.

Second, the ITIR model developed (Fig. 2) is one of developing new models. Adoption, combination, and adaptation techniques of readiness applied by researchers based on the assumption of input-process-
output (IPO) [45], as also presented by previous studies [4], [8], [12], [13], [40], [42]–[44]. In the context of social engineering assessment, the model developed was also broken down into data collection instruments by adopting and adapting the context of the study.

Simply stated, it can be clearly seen that the development of the ITIR model proves the possibility of developing new models by combining, adopting, and adapting several models of readiness. This research can contribute theoretically by proposing the ITIR model.

To build a model can use the basic assumptions of the development of models, research methods, and understanding of the author may be a limitation of the study of model development. Differences in assumptions, methods and understanding can produce different models. Thus, the limitations of studies on building a readiness model can be assessed and corrected in subsequent studies.

5. Conclusion

IS performance issues have become one of the interesting studies for researchers and practitioners since a few decades ago. Studies show that many IS models are developed based on existing theories rather than developing from empirical studies. Thus, researchers develop the ITIR by adopting, combining, and adapting readiness. The proposed model consists of seven variables with 50 indicators. The researcher also submitted 50 items of questions for the development of the questionnaire for the next stage. In addition to this exploratory study can contribute theoretically regarding the readiness of IT implementation in HEI, the process of developing the proposed model and its data collection instruments can be practical points of consideration for future studies.

Even though the assumptions used in the development of models, research methods and understanding of the author may be a limitation of the study. Other studies that use different assumptions, methods, and understandings can present different results. Therefore, the limitations of this study can be refined by subsequent studies.

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