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Research paper

IT-Based Change Resistance in Higher Education

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Abstract

With the transformation from Education 3.0 to Education 4.0, changes in higher education cannot be avoided in various aspects of universities, including in learning technology and methods, as well as the learning targets. Adaptation is essential for the academic and administrative processes in higher education to maintain the continuity of information technology (IT) quality management. Flexibility is one major factor for higher education to maintain sustainability and increase the universities values. However, differences in university conditions can lead to differences in the ability to adopt the concept of flexibility. There are inhibiting factors that cause resistance in adopting IT-based changes, which should be managed using the right strategy. A good management is expected to minimize the cause of resistance so that the flexibility of IT management in universities can be improved.

Currently, the discussion of handling resistance focuses on companies and organizations in general. This paper focused specifically on analyzing factors that cause resistance to IT-based changes in universities supported by empirical evidence. The stages of the research consisted of the identification of variables, building survey instruments, data collection, and testing variables. The results show that the variables of financial support, human resources, and management support, simultaneously affecting IT-based change resistance in universities. The simultaneous influence percentage obtained in this study was 79%.

Keywords: *resistance, flexibility, higher education, change*

1. Introduction

The higher education must change. This was stated by Alex Halavais [1], that in order to survive in the present and the future, universities must adapt to change. In further studies M. Harkins delivering that it is necessary to identify the major changes that occur in the coming decades in the teaching and learning process [2]. The education system has changed from Education 3.0 to Education 4.0 [3]. Many aspects of higher education have changed. These aspects include: technology and methods used, and changes in learning targets.

Universities are required to adapt to change. Adaptation in the academic process and in the process of universities administration. Adaptation to changes needs to be done in universities to maintain the continuity of information technology (IT) quality management. Flexibility promises sustainability, competitive improvement and overcomes uncertainty [2][4]. This makes flexibility as an important factor for universities.

Flexibility can maintain sustainability and guarantee the increased value for universities. However, differences in university conditions can lead to differences in the ability to adopt the concept of flexibility. There are inhibiting factors that cause resistance in adopting IT changes, which should be managed using the right strategy. The right management is expected to minimize the cause of resistance so that the flexibility of IT management in universities can be improved.

To overcome the various conditions of change in universities, the flexibility design needs to consider some of the increasing needs that arise as a result of changes, including increasing the need for IT resources and IT management. However, the increase must meet the limitations of each university. To optimize the flexibility of managing IT in universities and minimizing resistance, it is essential to conduct further analysis and appropriate handling of the factors causing the resistance [5][6]

Currently, the discussion of resistance focuses on companies and organizations in general. This paper aimed to determine the factors influence university resistance to adopt IT-based changes. The research was done by analyzing the causes of resistance and testing the effects using statistics, accompanied by empirical evidence. The rest of this paper is organized as follows. Section I is the introduction that describes the background and the aim of the research. Section II is related works with supporting theories of the research. Section III describes the stages to analyze the IT-based change resistance in higher education. Section IV is the results regarding financial support, human resource, and management support. Finally, Section V is the conclusion.

2. Flexibility and Resistance

2.1. Definition of Flevibility and Resistance

Flexibility is defined as an ability to change or be changed easily according to the situation. Similarly, the Oxford dictionary defines that flexibility is the quality of bending easily without breaking. Some studies define flexibility in different ways. Backhouse and Burn [4] define flexibility as a firm's ability to respond to various customer requirements. Meanwhile, Sherehiyet al [7] defines it as the ability to adjust and respond to change. Flexibility is generally defined as flexible, easy, and fast adjustments. Meanwhile, resistance is defined as refusing to accept something [28], while the

Oxford dictionary [29] defines resistance as the refusal to accept or comply with something.In this study, IT management flexibility was defined as the ability of IT management at universities to adapt to IT-based change. Meanwhile, resistance is defined as an inhibiting factor for IT management in universities to adapt to IT-based changes. Based on this definition flexibility and resistance are like two sides of a coin [8].

2.2. Change Models

The ability to respond positively to change and initiate innovation is a hallmark of modern society. Some models propose approaches to change in the organization. In organizational change, there are several important things to be considered to achieve success in change. Lewins model defines the change model consisting of three stages: unfreezing, changing, and refreezing [10]. Unfreezing is a preparation stage for adopting changes. The next stage is changing where changes really occur. Changes will occur if the driving force is greater than holding strength. Resistance to change is often defined by the thermology associated with Lewin's physics, which involves resistance factors and factors driving change. Changes take place in behavior, systems, structures, etc. Furthermore, the refreezing stage is strengthening through feedback and organizational awards [5]. In the eight-step model, Kotter highlights eight important lessons.The model handles Several power issues in making changes happen. Kotter uses important concepts towards successful change such as urgency, strength, vision, and communication [5][9]. In addition to the Kotter model, the Nadler congruence model comes with a different approach. The approach in this model emphasizes the existence of mutual dependence on managerial, strategic, technical, and social aspects of the organization in implementing change. Subsystems in organizations influence the success of the change process. This model aims to help organizations understand the dynamics of what is happening when they make changes. This model proposes that an effective change management must pay attention to the four components, namely work, people, informal organization, and formal organization. Changes in one component require adjustment to other components in the organization.
Nonetheless, many studies reveal frequent rejection when changes are made [8]. In the change model, Scott states that rejection is the initial stage faced by the organization when it will make changes. Scott's model states that there are four phases faced when an organization will make changes, namely rejection, rejection, exploration, and commitment [10] Each phase occurs for certain reasons and needs to be handled in a certain way. This was stated in the context of Kottler [11], that a successful change requires an effort to address the factors that hindered the change.

2.3. IT-Based Changes in Universities

At present, the management process in higher education continues to grow, starting from Education 1.0 to Education 4.0 [3]. Automation resulting from the industrial technology revolution (4IR) changes the way of life and working [12]. These changes take place in the world of education, including changes in technology used, teaching methods, and orientation of learning outcomes. The results-oriented Education 1.0 focused on students' ability to memorize knowledge. Whereas Education 2.0 orientates students to consume knowledge. Meanwhile, Education 3.0 empowers students to produce knowledge. Finally, Education 4.0 focuses on empowering students to produce innovation and verify the knowledge.
Changes in the type of work in the organization will affect the other components that need to be adjusted, including changes in work with individual skills, suitability of the job with changes in the way of work, and suitability of the formal organization with changes in work practices. Changes in technology, work culture, and learning methods at higher education institutions will affect the changing needs of the relevant elements. This condition requires proper management so that the target value is achieved.

2.4. Review of the Factors that Cause Resistance

Resource-based view (RBV) theory argues that the ability of a compliant organization is influenced by the type of resources used. Resources that is owned by heterogeneous organizations can cause organizations to have different abilities in adopting change. IT-based changes are related to changes in the way work needs to be done, which is linked to tools, people, and policies [11]. These changes require infrastructure support, human resource competence, and management support.

2.4.1. Financial Support

An increase in infrastructure requirements due to changes in universities has an impact on the high-cost requirements in IT investment. There are some limitations to universities including the availability of costs. Consideration of the cost problem is important because cost leadership is one of the elements in increasing competitive advantage [13], which is one of the functions of flexibility [4].
The cost dimension is related to fixed cost and variable cost. Infrastructure and maintenance costs of information systems are fixed costs, where the cost element is not affected by the intensity of the process. Unlike the case with variable costs, where this type of cost correlates with variable quantity and productivity. Variable costs relate to operational costs. Cost associated with productivity is called operational cost [4].
The distribution of costs in higher education includes the procurement of infrastructure and the cost of maintaining information systems, human resources, and operational costs. Procurement costs are in the form of IT infrastructure to support academic services, libraries, and computer laboratories. In addition to the maintenance costs of information systems, providing internet access requires adequate financial ability. Without adequate financial capability support, universities will be resistant to change.
X1: Financial factor is resistance factor for adopting IT-based changes in universities.

2.4.2. Human Resources Support

Changes in the work procedure require human resource competence, which can be assessed by the ability to use new technology. Organizations need to place staff with the appropriate competencies to respond to these needs. Culture, in particular, is often considered essential for the success of business processes and changes driven by information technology [14]. In addition to appropriate competencies, other important factors are individual culture and organizational culture [11][15]. One reason for the rejection of change is the culture of surviving with the comfort of the work environment and old ways of working. The individual discomfort towards change causes less motivation in making changes [5][10].
Human resources involved in managing higher education are the upper level of management, middle level management, operational level, and lecturers. Each element has a different job description. The support and competence of each element have an important role in the success of IT-based change. Without human resource support, universities will be resistant to changes.
X2: Human resource is one resistance factor for adopting IT-based changes in universities.

2.4.3. Management Support

Management must understand the goals of the change [7]. In this context, the management consisted of university leaders and upper level management level. Innovative leaders in universities should have a vision for innovation and commitment to the availability and management of IT resources needed by universities. Innovations in universities are conducted on the improvement of the learning process, research, and community service by improving the quality of technology, methods, and human resources. The process can succeed if it is supported by the availability of facilities and infrastructure needed. This can be fulfilled with manage-

ment support. C. Bowman [16], states that companies that succeed in implementing change by overcoming the resistance are usually supported by leadership with a foresight. Without the support of the management, universities will be resistant to changes.
X3: Management support is one resistance factor for adopting IT-based changes in universities.

2.4.4. Value Enhancement

A university is a service-based organization. Thus, the quality of service is the primary target for universities. Service quality includes the quality of services by the lecturers, students, and related parties. It is closely linked to the quality of information produced. In manufacturing companies, the quality is measured by the quality of the produced goods. Meanwhile, universities quality is linked to service provision [17]. Quality dimensions can be reviewed based on two points of view, namely internal quality and external quality. External quality is quality measured from the customer side and related to customer satisfaction of the product or service, which focuses on how the service is executed. While internal quality is related to the extent to which process participants feel they are in a controlled work environment [18].
Therefore, the design of flexibility in higher education must be directed towards achieving value enhancement for higher education managers and stakeholders. Value for universities is assessed by the increased productivity which includes cost efficiency, while the value for stakeholders is assessed by an increase in service quality in the form of availability, robustness, and security [19][13]. Availability is related to the fulfillment of IT infrastructure. Limitation of IT infrastructure at the university causes poor service quality [13]. Robustness is a level where the system can function correctly even though there is different input. Security is needed related to data sensitivity in universities[21], which also supports Mark's statement[22] that privacy is one of the measurement elements in an online service.

3. Research Method

This research was conducted in four stages namely: identifying variables, building instruments, collecting data, and testing. Activities at each stage are described as follows:

3.1. Identify Variable

This stage was done by identifying the inhibiting factors in increasing the flexibility of IT management in universities through literature studies and expert judgment. The selected experts were based on the experience of managing IT in universities and the academic background in the field of information technology [20] [2].

3.2. Design Instrument

Indicators of each variable were specified as the basis for designing questionnaire questions. The questionnaire used closed-questions type. Alternative answers were given in the form of the Likert scale. Face validity test was done to measure the quality of the questionnaire. Analysis of the face validity used the inter-rater reliability (IRR) method. IRR value shows the level of agreement of the rater pair in assessing the survey instrument. The level of agreement by rater was measured using Cohen's Kappa coefficient. The formula of Cohen's Kappa coefficient [21][22] calculation is as follows:

$$k = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(e)} \quad (1)$$

$$\text{Expected Agreement} = \frac{\left(\frac{cm^1 \times rm^1}{n}\right) + \left(\frac{cm^2 \times rm^2}{n}\right)}{n} \quad (2)$$

Where:

cm^1 represents column 1 marginal
cm^2 represents column 2 marginal
rm^1 represents row 1 marginal
rm^2 represents row 2 marginal.

3.3. Data Collection

Data collection involved universities as samples. Determination of the sample was done using a random sampling method and an approximate approach. In this study, the sample data was pilot data which included 20 respondents from universities

3.4. Testing

This stage contained the test of variable validity, variable reliabi lity testing, and influence test. The resulting data were analyzed and tested to analyze if the designed research instrument produced variables that were valid and reliable. Furthermore, the effect test between dependent and independent variables was performed. At this stage, valid and reliable factors were generated. The impact test produced factors that influence resistance. Data analysis in the validity, reliability, and influence test in this study used statistical package for the social science (SPSS) software.

4. Result and Discussion

The implementation of the research stages carried out sequentially produces output consisting of research instrument, face validity results, results of validity and reliability test, and result of simultaneous influence test.

4.1. Identification of survey variables and instruments

The identification process produced four variables, which were three independent variables and one dependent variable. Then an indicator of each variable was determined. The resulting variables and indicators are listed in table 1.

Table 1: Research Instrument

Variable	Definition of the Operational	Indicator
Finansial support (X1)	Higher education perceptions about the need for budget support for information technology-based change	Availability of IT infrastructure procurement budget (x11)
		Availability of information system maintenance budget (x12)
		Availability of information system development budget (x13)
		Availability of HR development budget (x14)
		Percentage of budget allocation for IT changes (x15)
Human Resources (X2)	Higher education perception about the need for human resource support for IT-based change	Human resource competence (x21)
		Motivation of human rsources (x22)
		Human resource insight (x23)
Management Support (X3)	Higher education perceptions of the need for management support for IT-based change	Innovative vision and mission (x31)
		Giving reward (x32)
		Giving punishment (x33
Decreasing Resistance (Y)	Higher education perceptions of the need for value target for IT-based changes	Availibility of services (y1)
		Robustness of services (y2)
		Security of services (y3)

The face validity process in this study consisted of three raters. The rater was developed from the interviewed expert IT managers. Data analysis of the three raters was done in SPSS software. The face validity results from the three raters are shown in table 2.

Table 2: The face validity results

Symmetric Measures			
		Value	Approximate Significance
Rater 1- Rater 3			
Measure ofAgreement	Kappa	.718	.000
Rater 2- Rater 3			
Measure of Agreement	Kappa	.796	.000
Rater 1- Rater 2			
Measure of Agreement	Kappa	.632	.000

Face validity produces kappa coefficients 0.718, 0.796 and 0.632. This shows that the three rater have an agreement on the design of the questionnaire question. This is in accordance with the requirements Kappa coefficients that are feasible to receive are coefficient values above 0.6 [23][24].

4.2. Validity and reliability Test

Validity testing was done to analyze the validity of each indicator (item) defined. The item was considered to be valid if the calculated r-value (Corrected Item-Total Correlation) > r-table. Furthermore, to note the consistency of the data produced, reliability testing was performed. Cronbach alpha value was used as a reference to reliability testing. Cronbach's Alpha reliability score limit is 0.6 [24]. Variables were declared acceptable if they met the standard values of validity and reliability tests. Test results for variables' validity and reliability are listed in table 3.

Table 3: Results of Validity and Reliability Test

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
x11	18.10	3.253	.890	.833	.906
x12	18.00	3.789	.968	.938	.889
x13	18.10	4.095	.761	.700	.925
x14	18.10	4.095	.761	.700	.925
x15	18.10	4.095	.761	.700	.925
x21	9.10	.937	.742	.680	.899
x22	9.10	.937	.742	.680	.899
x23	9.00	.842	.913	.833	.750
x31	8.90	.937	.736	.688	.899
x32	8.90	.937	.736	.688	.899
x33	8.80	.800	.918	.842	.737
y11	9.00	.947	.742	.686	.900
y12	9.00	.947	.742	.686	.900
y12	8.90	.832	.916	.839	.747

4.3. The Influence Test

After the validity and reliability tests were done, the influence test was performed. The strong/weak correlation between independent variables (x1, x2, and x3) to the dependent variable (y) was analyzed based on the correlation coefficient (R). Meanwhile, to the influence of the independent variable was assessed by the R Squared value. The simultaneous influence test was done using the ANOVA test. The simultaneous test produced a value of sig 0.00, as showed in table 4.

Table 4: Result of Simultaneous influence Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.328	3	9.776	20.520	.000[b]
	Residual	7.622	16	.476		
	Total	36.950	19			

a. Dependent Variable: y

b. Predictors: (Constant), x3, x1, x2

Furthermore, the effect of these variables simultaneously can be seen in the R square value shown in table 5.

Table 5: Results of the R Square Test

Model Summary

Model	R	R Square	Adjusted R Square
1	.891[a]	.794	.755

a. Predictors: (Constant), x3, x1, x2

Table 3 describes the results of the validity and reliability tests for each instrument variable. The results show that in a sample of 20 respondens and 5% significant level, the r (table) value was 0.404. The results of the data analysis show that all items had a value that was larger than 0.404, which means that all items were considered valid.

Hypothesis X1 focused on the financial supporting (x11, x12, x13, x14, and x15). The correlation values were 0.890, 0.968, 0.761, 0.761, and 0.761. Meanwhile, the reliability values were shown by the Cronbach values of 0.906, 0.889, 0.925, 0.925, and 0.925. The results indicate that the availability of information system maintenance budget, procurement budget, information system development, human resource development budget, and certainty of sources are considered as indicators of the requirement for IT-based change budget in universities. Budget allocation to procurement relates to the need for changes in IT infrastructure. Budget allocation to the maintenance and development of information systems related to changes in needs in service provision. While the allocation of budget for human resource development is related to the need for workshop budget, training for competency improvement. Fulfillment of these needs is closely related to the availability of financial support. The cost limitations can cause universities to resist adopting changes. However, the demand for quality standards that must be met requires universities to adopt changes as it is essential to maintain the existence of universities. This is supported by Alex Halavais [1] who states that to be in a position to survive, universities must make changes.

Hypothesis X2 focused on human resources (x21, x22, and x23). The correlation values were 0.742, 0.742, and 0.913. Meanwhile, the reliability values were shown by the Cronbach values of 0. 899, 0.899, and 0.750. The results show that competence, motivation, and insight from human resources were valid indicators for X2 variables. Competency limitations, insights, and motivation of human resources in universities can lead to resistance in adopting IT-based changes. Human resource competence relates to changes in the way work occurs in the learning process, library management, and academic administration management in universities. Changes in the way work is needed adjustments to other elements in the organization [11]. This shows that to be able to succeed in adopting IT-based changes, universities need to ensure that lectu rers, IT human resources, and non-IT human resources have appropriate competencies on duty. This can be done through several businesses including through scheduled training and workshops. Syaful Ali [25] explains that IT-based change should be supported by human resources who have the required competencies and skills.

In addition, there is also a need for HR motivation to achieve the goal of change. This is related to the need for efforts to get out of the comfort zone in carrying out routine activities. Motivation will be a source of strength for individuals in the face of discomfort that arises out of change. This is as stated by Scott [5] that individual rejection of change is caused by discomfort in the early stages of change. This is similar to the characteristics of individuals who tend to maintain the flow of situations, individuals tend to reject change because they do not like difficult adjustments at the beginning of change. In this regard, programs in universities are needed that can increase the motivation of human resources. One effort that can be made to foster motivation is the addition of insight and knowledge about the benefits and objectives of change.

The addition of insight is an important factor, related to lack of insight can lead to refusal to support changes [11][26].

Hypothesis X3 focused on support management (x31, x32, and x33). The correlation values were 0.736, 0.736, and 0.918. Meanwhile, the reliability values were shown by the Cronbach values of 0.899, 0.899, and 0.737. The results show that innovative vision, the percentage of budget allocated for change, and reward and punishment were valid indicators for X3 variables. Leaders who have an innovative vision will prioritize investment in IT. The allocation of budget for the success of IT-based changes in higher education will receive high attention, the vision and mission of the universities are made in harmony with the need for change. This is an important factor to support the success of IT-based change. One approach to change is the behavioral approach [5] [27], using ideas about rewards and punishments, addition and reduction of positive and negative stimuli. This approach focuses on how one can explore the behavior of others using reward and punishment, to achieve the desired results.

Reward and punishment are one to achieve the success of changes [5][6][9]. The management's policy is tantamount to give awards if human resources behave according to the policy of change, and give punishment if they do not behave according to the policy of change. The reward and punishment can be located in the form of financial, non-financial and social strengthening. Finance use can be in the form of payment of bonuses, prices and other tangible. While non-financial can be in the form of job awards or other awards. This can be achieved with management support. Without support from the management, the change will not work. This requires an innovative vision, availability of facilities, support of policies, and appropriate approaches to adopting IT-based changes in universities. Kotter [5] states that a successful change requires communication, appreciation, and facilities support.

Simultaneous effect test produced a significant value of 0.000. This shows that simultaneously the variables of financial support, human resources, and management support affect universiti resistance in adopting IT-based changes. The percentage of simultaneous influence shows a high number of 79%. This shows that all variables were linked to one another in supporting/inhibiting IT-based changes. One variable that plays a valuable role can cause resistance in adopting change if it is not supported by the other two variables. In theory, universities with an established availability of budget have a higher flexibility to change. However, the availability of budget cannot increase flexibility or decrease resistance without management support as it is related to the prioritization of budget allocation. Leaders who do not have an IT vision will limit investment in IT and tend to prioritize investment in other fields in universities. Likewise, the support of human resources is essential for improving flexibility. Human resources with competencies required for implementing IT-based change, motivation, and support for change are essential to minimize. This requires appropriate management support and strategy from the management. Kotter explains that management needs to manage human resources in adapting to change because failure to implement change is largely due to lack of for human resources' motivation [11] [27].

The three factors of financial support, human resource support, and management support are interrelated. The weakness in one factor will affect the strength of another factor in achieving the objective. This is similar to Nadler's [11] theory that changes in one subsystem will affect other subsystems in the organization.

Addition to these three variables, there are another 21% that can also affect resistance. This factor is an opportunity to come from external factors that come from outside universities, such as: social norms, customs, and group dynamics. A person's reluctance to act outside group norms can be caused by fear of being dismissed or punished. The existence of legal regulations from the government as an external party is one factor that is also needed by the university in reducing its resistance in adopting IT-based changes. It is required by universities to increase the flexibility of IT management in universities.

5. Conclusion

The study identified three independent variables and one dependent variable. Face validity test was done to analyze items to be used as survey instruments. The face validity tests involved three experts. The level of the expert agreement shows a high similarity of perception in all pairs. Variables and indicators for each variable were tested for validity and reliability. These variables were financial support, human resources support, and management support. Validity test results show that the four defined variables and indicators were valid and reliable. The results of the simultaneous influence test show that all variables simultaneously affect resistance to adopt IT-based changes in universities. The percentage of variables' simultaneous influence shows a high value of 79%, which means that 21% of IT-based change resistance in universities is influenced by other factors than the financial, human resource, and management support**.** Further research can be done by adding organizational culture factors, such as the culture work, differences in state and private universities. Differences in management, culture and funding sources have the potential to have a level of resistance or level of flexibility between public and private universities.

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