Improving Competitive Advantages of Higher Education Institutions through IT Governance, IT Excellence, and IT Innovation: A Case Study in School of Informatics Management & Computing in Indonesia

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***Abstract*—School of Informatics Management & Computing (Sekolah Tinggi Manajemen Informatika & Komputer - STMIK) in Indonesia currently needs to improve its competitive advantages, which are inseparable from capabilities to empower Information Technology (IT) for management activities. The research aims to develop IT innovation theories by studying the influences of IT governance, IT excellence, and IT innovation on the competitive advantages of STMIK in Indonesia. A sequential explanatory model is applied to collect and analyzes quantitative data in the first stage and qualitative data in the second stage. Focus Group Discussions (FGDs) method is also used to receive respondents' statements to strengthen the research findings. The analysis unit involves private STMIK in Indonesia with heads of schools, deputies, and heads of study programs. Quantitative and qualitative research dimensions and an empirical survey, with the active participation of 85 schools, are implemented. The results emphasize that IT maturity is insignificant as a moderating variable between IT innovation and competitive advantages. Similarly, IT governance is also insignificant for the improvement of competitive advantages. However, competitive advantage is directly and favorably impacted by IT innovation initiatives. These findings demonstrate how much easier it is for universities to improve their competitive edge using their greater IT innovations. This circumstance demonstrates the enormous potential of STMIK's IT innovation capability in Indonesia, allowing institutions to implement novel strategies to generate value by introducing new services.**

***Index Terms*—Competitive Advantage, Higher Education Institutions, IT Governance, IT Excellence, IT Innovation**

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I. Introduction

INDONESIA has entered the era of the Industrial Revolution 4.0 [1, 2]. At present, the higher education sector essentially supports the economy and strengthens the competitiveness of this country. Hence, it has become a challenge for universities [3, 4]. Their quality should be sustainably improved to produce quality graduates [5–7]. Furthermore, higher education institutions must maintain their characteristics for competition [8]. Educational excellence strategy is indispensable in achieving competitive advantages [9, 10]. Universities should also further strengthen competitive advantages and competitiveness to maintain their existence [11–13]. These are in strong relation with resources, regions, and stakeholders in terms of business strategy [12]. Therefore, adjustment is required to make it effective. In several previous studies on competitiveness, competitive advantages are complete, diverse, and strong systems requiring reinforcement [14, 15]. For example, private universities in Indonesia use information systems [16]. Innovation of this system is a fundamental element in realizing competitive advantages [16].

The increasing competition of private universities positively impacts service quality improvement. On the other hand, they cause the number of students to decrease. This phenomenon occurs commonly due to strict dependency on funding sources from students. Thus, each university should build its competitive advantages [17]. This determinant is crucial for its sustainability as competition can occur in global, regional, national, and local contexts [17, 18].

However, for the School of Informatics Management & Computing (Sekolah Tinggi Manajemen Informatika & Komputer - STMIK) in Indonesia, there is no one with an A accreditation status. Therefore, the best current STMIK ranking is B accreditation. The current situation is not good for higher education in Indonesia. The better the value of accreditation will affect the perception of outsiders on the quality of learning programs and higher education [19]. Given the existing conditions, higher education needs to improve its competitive advantage, which is inseparable from improving Information Technology (IT) skills in higher education management [20, 21]. Competitive advantages are inseparable from capabilities to empower IT for management activities, as observed from the existing conditions. Innovation skills are essential to enhance the performance and competitiveness of an institution [22]. Similar to other organizations, universities are also involved in implementing IT innovation, viewed as the key to enabling the changes [23].

Research on IT innovation has ever been conducted with an exploratory analysis of its persistence [24]. Then, the innovation is developed and is related to the network of ideas in organizations [25]. It is found that they should consistently innovate with IT [26]. By viewing IT innovation as a process in that IT will be adopted, spread, and assimilated, previous research presents a conceptual framework of growing innovation through spiral collaboration [27]. However, this innovation requires technical skills, communication, and other specific skills which are needed in a number of business cases [28]. Other studies pertain to the impacts of IT innovation on company performance [29–31]. Additionally, they develop a research model to examine the effects of such innovation on competitive advantages. A conceptual framework and a specific model designed to describe the relationship between these two variables are proposed. Then, other studies mention that the basic elements of competitive advantages are cost advantages and differentiation [32, 33].

Research on IT governance planning is also carried out, discussing the evaluation of the application of IT in private universities in Yogyakarta using a COBIT framework model [34]. It is found that the maturity of IT processes is above scale three (defined). Next, previous study has further explored the relationship between corporate governance and innovation to build firm competitive advantages [35]. Another study affirms that IT governance positively influences competitive advantages [36]. It notes that the use of IT infrastructure is a strategic response to higher education institutions to increase competitiveness through IT governance, IT excellence, IT innovation, and IT maturity.

IT excellence has relationships with IT governance. There is an explanation of how such governance uses three vital objects: regulations, operational excellence, and risk management. However, Operational excellence is related to IT governance, which is concerned with facilitating, overseeing, and supporting strategic decision-making [37]. Operational excellence will be more responsive to business needs. So, improving IT effectiveness supports business processes, governance, and risk management [38, 39]. Another research documents a positive relationship between IT excellence and company performance. Competitiveness is the concept of comparing capabilities and performance [40].

The research aims to develop IT innovation theories by studying the influences of IT governance, IT excellence, and IT innovation on the competitive advantages of STMIK in Indonesia. However, there is very limited research conducted to examine this kind of influence moderated by IT maturity. The research consequently fills the gaps in existing literature focusing on such a problem. The novelty of the research is the use of IT excellence as the potential for maximizing the use and management in higher education to improve institutional competitive advantage.

II. Literature Review

A. IT Governance

IT governance refers to a pattern of authority or policy on IT processes, including IT infrastructure management, efficient, effective, and safe use of IT by end-users, and effective IT project management [41]. Regarding COBIT standards, ISACA Institute in the United States defines IT governance as a structure of relationships and processes to direct and control companies to achieve corporate goals based on values by balancing the risks and returns of IT [41].

An institution's goals can be directed and controlled by using an IT governance framework of relationships and processes. It adds value while managing risk by modifying the company's IT and business processes [42]. IT is a competitive resource in some industries to differentiate and provide competitive advantages. Meanwhile, in other tertiary institutions, it helps to maintain higher education [43]. The roles of good IT governance are fundamental. Processes begin with

the arrangement of IT goals in higher education and the provision of initial guidance. After that, iteration occurs, and performance is measured and compared with an initial target, resulting in the redirection of required activities and appropriate changes in goals [44]. A combination of various structures, processes, and relational mechanisms of different institutions can be used [45, 46]. Designing IT governance is necessary since there is reliance on various conflicting internal and external factors [45, 46]. There should be five crucial aspects of IT governance: strategic alignment, scoring, risk management, resource management, and performance management, in all areas of IT development [47, 48].

B. IT Innovation

Innovation is the introduction of something new into the system to create its print of changes [49]. The degrees are associated with adopter characteristics (education level and innovation) and innovation characteristics (relative advantages, complexity, and compatibility) [49]. Universities are involved in implementing IT innovation viewed as the key to enabling changes [23]. Another definition of innovation is the process of translating ideas into new products, processes, or services through the consideration of usefulness and usability [50]. Moreover, it combines activities leading to marketable products, new production, and delivery system. Hence, product innovation capabilities are required [51]. Innovation is an essential new creation, including better products and unique processes to support the previous definitions [52]. Companies need to innovate to win the competitions permanently [40].

C. IT Excellence

There is a synergy of functions between IT and operational excellence [39]. IT excellence bridges the relationship between IT and businesses by building an integrated framework to provide quality IT services. IT excellence capabilities of a company represent the maintenance of the IT landscape and IT services in line with business needs and plans. Most recent studies show that IT excellence significantly influences company costs and performance. There is a relationship between superior IT capabilities and firm performance [40]. However, it is controversially argued that IT is no longer a problem and should be managed as a commodity [53].

It is also revealed that IT excellence becomes the ability to improve the company's business performance [54]. It determines whether universities can manage IT and create greater business values [55, 56]. In a digital capability framework, it represents the use of new technology comprising cellular connectivity, cloud computing, big data, and social media [55]. It includes real-time insights into critical company data, stability, agility, security, and dynamic plug-and-play functionality [55]. New technology offers big business opportunities. Despite creating huge challenges, IT units can develop into innovation engines and transfer knowledge that they have to business leaders [55]. IT excellence is the third key area of digital capabilities having its maturity model [36, 55].

D. IT Maturity

Maturity levels are immensely required to determine the operational levels of an organization. The higher the level of maturity is, the better the IT governance process becomes [57]. Understandably, there is more dependency on IT support in the process of achieving organizational goals. The concept of IT maturity is used to determine the extent of using computer-based information systems by managers. IT maturity has formalization of planning, controlling, organizing, and integrating IT activities [58]. With its levels, the management can measure the positions of information system processes and assess improvement requirements. Information reliability levels are determined based on broad scopes, especially IT representing the dimensions of focus, time horizon, quantification, and timeliness (information accuracy of supporting managers to deal with uncertainties happening in the work environment) [59]. Then, Capability Maturity Model Integration (CMMI) is an approach model used to assess the maturity scales and capabilities of the software. In this model, 22 measurable process areas are grouped into 4 categories, namely process management, project management, engineering, and support [60, 61].

A previous study on a process maturity model of academic management engages higher education institutions in evaluating and determining the maturity level of each academic management process [61]. Another one reviews the relevancy of process areas, objectives, and practices used in the business process maturity model [60]. Therefore, management can make decisions about including, adapting, or removing [60]. Researchers have used IT maturity as a moderating variable based on theories by Yunis [62]. It is affirmed that it can strengthen competitive advantages and be a driver of global competitiveness [63]. Following this, the relationship between innovation and competitive advantages is mapped [31].

E. Competitive Advantages

Michael Porter, with strategic management, introduces the five forces which the heads of universities must observe by adopting business approaches and competitive advantages [64]. It is of great importance for policymakers to consider technology and globalization. The excellence of competitiveness provides a strong incentive for competition and the establishment of partnerships among universities. Institutional competitiveness performs as a frame for the concept of the international one [65]. Therefore, higher education institutions need to design a more effective strategy by understanding the perception gaps among levels [10] as they are considered companies producing and selling courses.

The development of research on innovation-based competitive advantages indicates high interest among academics and practitioners in this topic [66] and the capabilities of institutions to perceive and respond strategically to opportunities and threats [67]. A recent discussion on these advantages has expanded the scope of chains and the creation capabilities of values [68]. Two categories are identified, such as external and internal advantages [66]. The measure of internal ones primarily uses items covering student innovation capabilities, experiences and knowledge, and satisfaction [69, 70]. Some researchers have utilized indicators to assess how a higher education institution can strengthen the competitive advantages of entering new markets and providing better service quality [66, 69, 71].

III. Research Method

A. Research Design

The research applies a sequential explanatory-mixed methods model. The quantitative data are collected and analyzed in the first stage. Then, the collection and analysis of qualitative data are performed in the second stage. Lastly, a conclusion is drawn based on the data analysis.

B. Population and Sample Size

A simple random sampling method is applied in STMIK in Indonesia. There are 131 questionnaires sent online. However, only 85 of the totals are answered and returned. The 85 respondents consist of heads of schools, deputies, and heads of study programs. Hence, the response rate is 64.89%.

C. Data Collection Techniques

Indicators of questionnaires with six-point Likert scales are used referring to previous research. Such scales have a gradation of very positive to very negative or vice versa. The description includes Strongly Agree (SA), Agree (A), Tend to Agree (TA), Tend to Disagree (TD), Disagree (D), and Strongly Disagree (SD). Then, a qualitative sampling technique named purposive sampling is implemented. The number of qualitative informants is determined based on data saturation. Respondents should meet inclusion criteria, such as being willing to be interviewed, becoming the heads of STMIK in Indonesia, and having served for more than five years. Researchers also conduct interviews in the session of Focus Group Discussions (FGDs).

D. Research Model

Figure 1 is a conceptual framework that will be used in the research. Then, nine hypotheses are examined to achieve the research goals. It can be seen as follows.

H1: IT governance increases IT excellence.
H2: IT innovation is positively impacted by IT excellence.
H3: IT innovation is positively impacted by IT governance.
H4: IT innovation enhances institutional competitive advantage.
H5: IT innovation enhances institutional competitiveness, supported by IT maturity.
H6: Institutional competitive advantage is positively impacted by IT excellence.
H7: Institutional competitive advantage is positively impacted by IT governance.
H8: Through IT innovation, IT excellence enhances institutional competitive advantage.
H9: Through IT innovation, IT governance enhances institutional competitive advantage.

E. Validity and Reliability of Instruments

A questionnaire instrument is declared to be valid if it has a Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO MSA) value of ≥ 0.60 [72] and a loading factor value of ≥ 0.7. Nevertheless, a range of loading factor values (0.5–0.6) is still acceptable [73]. Factor analysis used in the research is Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). CFA results integrate with Structural Equation Modelling (SEM) to interpret the loading factor that has a large correlation between indicators and latent constructs. The three most important outputs need interpretation, namely the Critical Ratio value (CR), the significance value (p), and the estimated value (Estimate). The former results from dividing an estimated parameter and standard error [74]. It is 1.96

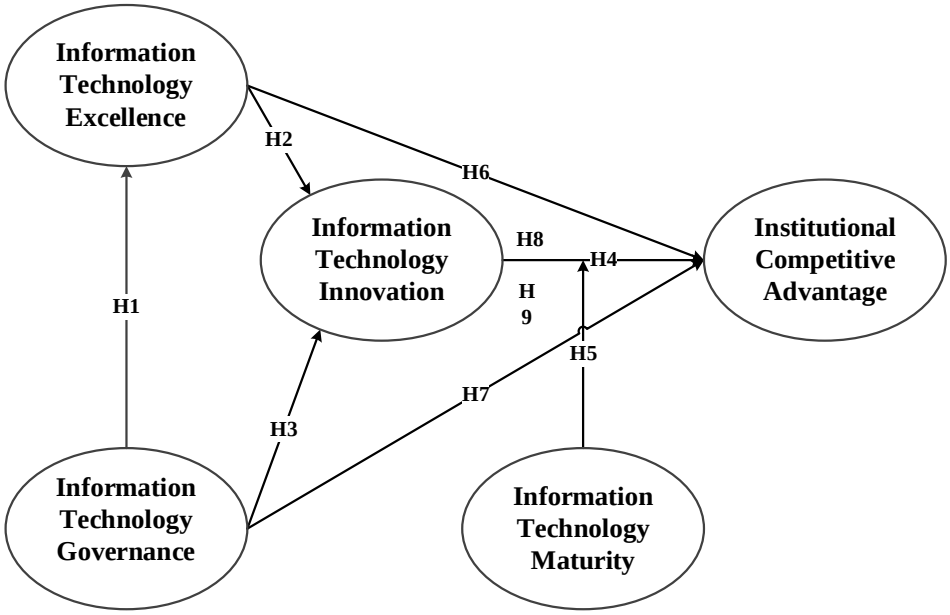

Fig. 1. Research model.

TABLE I
CHARACTERISTICS OF RESPONDENTS.

No	Characteristics		Number of Respondents	(%)
1	Positions	Heads of Schools	14	16.47
		Deputies	28	32.94
		Heads of Study Programs	43	50.59
2	Formal Education	Doctorate Degree	11	12.94
		Master's Degree	74	87.06

(Source: Compilation of Research Results, 2020)

TABLE II
RESPONDENTS' PERSONALITIES DEPENDING ON YEARS OF SERVICE.

Years of Services	Amount	Percentage (%)
> 20	5	5.88
16–20	10	11.76
11–15	16	18.82
5–10	27	31.76
< 5	27	31.76

(Source: Compilation of Research Results, 2020)

for regression weighting and has a significance of 0.05 for the path coefficient [74].

Cronbach's alpha is used to test the reliability of research instruments. It indicates the average correlation among items measuring the same constructs. For acceptable reliability, the standard is greater than 0.70 [75]. Next, the design of structural model analysis design has constructs of the second and the first orders and indicators, as displayed in Fig. 2 in Appendix. Figure 2 in Appendix explains three endogenous latent variables (IT innovation, IT excellence, and competitive advantage), two intervening variables (IT innovation and IT excellence), and two exogenous latent variables (IT governance and IT maturity) in the research. The details can be seen in Table A1 in Appendix.

IV. RESULTS AND DISCUSSION

The respondent's profiles in the research scope are descriptively analyzed. It is to be aware of the conditions of IT excellence, governance, and innovation on competitive advantages moderated by IT maturity at STMIK in Indonesia. In general, they are used as a representation of the respective schools. The characteristics of respondents are presented in Table I. First, respondents include heads of schools (16.47%), deputies (deputy heads I, deputy heads II, and deputy heads III) (32.94%), and heads of study programs (50.59%).

Second, in formal education, respondents have a doctorate (12.94%) and a master's degree (87.06%). It is assumed that they wholly have sufficient capabilities and knowledge. Therefore, they can provide information in line with the present competitiveness of schools.

Third, the respondents are mapped in accordance with their work time. It has several categories of < 5 years, 5–10 years, 11–15 years, 16–20 years, and > 20 years (see Table II). The highest percentage is those who have worked less than 5 years (31.76%) and in the range of 5–10 years (31.76%). Hence, they have sufficient knowledge, capabilities, and experiences to

TABLE III
OUTER LOADINGS: TEST RESULTS OF ESTIMATION AND VALIDITY.

Construct	Dimension	Cronbach's Alpha	rho_A	Composite Reliability	AVE
IT Innovation		0.8862	0.8880	0.9114	0.5955
	Product Innovation	0.9096	0.9098	0.9432	0.8471
	Process Innovation	0.8753	0.8784	0.9145	0.7281
Competitive Advantages		0.8793	0.8813	0.9171	0.7346
	External Advantages	1.0000	1.0000	1.0000	1.0000
	Internal Advantages	0.8470	0.8494	0.9078	0.7668
IT Maturity		0.9789	0.9799	0.9805	0.7064
	Process Management	0.8851	0.8887	0.9207	0.7438
	Project Management	0.9523	0.9547	0.9619	0.8082
	Engineering	0.9358	0.9381	0.9493	0.7577
	Supports	0.9532	0.9555	0.9642	0.8434
IT Governance		0.9141	0.9171	0.9317	0.6617
	Relational Mechanisms	1.0000	1.0000	1.0000	1.0000
	Processes	0.8807	0.8807	0.9264	0.8075
	Structures	0.8881	0.8919	0.9310	0.8185
IT Excellence		0.9570	0.9670	0.9620	0.4970
	Changes	1.0000	1.0000	1.0000	1.0000
	IT	1.0000	1.0000	1.0000	1.0000
	IT Advantages	0.9703	0.9722	0.9737	0.7413
	Meta Management	0.7130	0.7363	0.8732	0.7751
	Moderating IT Management	1.0000	1.0000	1.0000	1.0000
	Processes	0.8562	0.8562	0.9329	0.8743
	Programs	0.9023	0.9043	0.9534	0.9109
	Training	0.8932	0.8947	0.9493	0.9034
	Values	0.9096	0.9105	0.9432	0.8471

(Source: Data Processed through SmartPLS, 2020)

TABLE IV
THE RESULTS OF COMPOSITE RELIABILITY, CRONBACH'S ALPHA, AND AVERAGE VARIANCE EXTRACTED IN THE RESEARCH.

	Cronbach's Alpha	Composite Reliability	AVE
Competitive Advantages	0.8793	0.9171	0.7346
IT Innovation	0.8862	0.9114	0.5955
IT Excellence	0.9703	0.9737	0.7413
IT Governance	0.9141	0.9317	0.6617
IT Maturity	0.9789	0.9805	0.7064

(Source: Data Processed through SmartPLS, 2020)

provide information linked to the present competitiveness of schools. It reflects that the third category is the determinant for schools in improving the quality and competitiveness of graduates. For this reason, the management of study programs should have high academic management competence.

After removing indicators, Fig. 3 in Appendix displays the path diagram of the research model (outer model) for the subsequent iteration. The level of validity of variable indicators with loading values less than 0.700 is low. Hence, they should be discarded or removed from the model. Based on the testing results of an outer model, all outer loadings of all indicators are valid since the loading factor values obtained are greater than 0.70. Thus, they can be directly used in the research. The details of outer loadings are shown in Table III. Table III reveals that the discriminant validity is at a variable level. All Average Variance Extracted (AVE) values are greater than 0.50. In addition, the roots of AVE values are greater than the correlation coefficients of other variables. Hence, all variables or constructs are declared to be valid.

Next, a reliability test is conducted to determine the consistency of the research results. Reliability test results are indicated by Composite Reliability (CR), Cronbach's alpha, and AVE. If the CR value obtained is greater than 0.80, it has good reliability. Moreover, AVE and Cronbach's alpha values must consecutively be greater than 0.50 and 0.70 [75]. Table IV shows the results obtained.

The variables in the research have Cronbach's alpha values of more than 0.700. As seen from the SmartPLS data processing findings displayed in Table IV, they are considered legitimate [75]. The average AVE with a bigger value than 0.5 is employed as a gauge of convergent validity. Then, internal consistency is demonstrated by CR. A high composite reliability value for each variable indicates how well each indicator measures its construct [75]. Next, Fig. 4 in Appendix displays the path coefficient value in proportion to the strength of each construct's association with or impact over each research dimension. It shows each path coefficient value when referring to the examination of the studied path diagram outcomes. It indicates bootstrapped outputs of an inner model, essentially reflecting the significance values of all indicators.

TABLE V
SIGNIFICANCE TEST OF INDICATORS USED.

Path Significance Test	Original Sample (O)	T-Statistics	P-Values	Notes
IT Innovation → Product Innovation	0.8465	17.2214	0.0000	Significant
IT Innovation → Process Innovation	0.8992	38.9333	0.0000	Significant
IT Innovation → Competitive Advantages	1.5668	16.9788	0.0000	Significant
IT Maturity → Engineering	0.9409	60.9619	0.0000	Significant
IT Maturity → Competitive Advantages	0.0004	0.0137	0.9891	Insignificant
IT Maturity → Process Management	0.9431	71.0571	0.0000	Significant
IT Maturity → Project Management	0.9526	74.9983	0.0000	Significant
IT Maturity → Supports	0.9476	78.8611	0.0000	Significant
Competitive Advantages → External Advantages	0.8606	22.8455	0.0000	Significant
Competitive Advantages → Internal Advantages	0.9775	146.7058	0.0000	Significant
IT Excellence → Changes	0.8925	27.303	0.0000	Significant
IT Excellence → IT	0.7707	13.3873	0.0000	Significant
IT Excellence → IT Innovation	0.7101	10.774	0.0000	Significant
IT Excellence → Competitive Advantages	-0.8325	9.8701	0.0000	Significant
IT Excellence → Meta Management	0.9144	33.4597	0.0000	Significant
IT Excellence → Processes	0.8439	17.0629	0.0000	Significant
IT Excellence → Programs	0.9439	53.8685	0.0000	Significant
IT Excellence → Training	0.9458	39.2611	0.0000	Significant
IT Excellence → Values	0.9869	365.8828	0.0000	Significant
Moderating IT Maturity → Competitive Advantages	-0.0227	1.8265	0.0684	Insignificant
IT Governance → Relational Mechanisms	0.7175	9.727	0.0000	Significant
IT Governance → IT Innovation	0.2622	3.5611	0.0004	Significant
IT Governance → Competitive Advantages	0.0373	1.3758	0.1695	Insignificant
IT Governance → IT Excellence	0.5599	6.1237	0.0000	Significant
IT Governance → Processes	0.9380	55.7869	0.0000	Significant
IT Governance → Structures	0.8995	19.9818	0.0000	Significant

(Source: Data Processed through SmartPLS, 2020)

TABLE VI
RESULTS OF R-SQUARED COEFFICIENTS.

Variables	R-Squared	Adjusted R-Squared
IT Innovation	0.7814	0.7760
Competitive Advantages	0.9773	0.9759
IT Excellence	0.3135	0.3053

(Source: Data Processed through SmartPLS, 2020)

Table V additionally presents the significance test results of indicators of all research variables. All t-values are significant because they are greater than 1.96. Hence, the research model can be used without any improvement. Computation results of the significance test of each indicator show that almost all the original sample values are positive. In other words, there are indicators with positive influences. Better exogenous constructs can improve the performance of endogenous constructs, including their indicators. It has several dominant dimensions. It is represented by the path coefficient of IT excellence on values (0.9869), competitive advantages on internal excellence (0.9775), and IT maturity on supports (0.9476). However, a negative value of the original sample is represented by IT excellence on competitive advantages (-0.8325), meaning that the former has negative influences. A similar case happens to moderate IT maturity on competitive advantages (-0.0227).

The p-value of IT maturity on competitive advantages (0.9891) reflects that IT maturity does not influence IT innovation and competitive advantages. Meanwhile, once the maturity is moderated, the p-value becomes 0.0684. Despite the insignificance, IT maturity has moderation potential. Understandably, it can become a moderating variable.

T-statistics emphasizing the significant influences of independent variables on dependent variables are also discussed. In Table V, all variables have greater t-values than the ones in the t-table, which is 1.96. In addition, probability values are less than 0.05. Comprehensibly, they have positive and very significant influences.

Next, R-squared coefficients (R2) determine the influences of independent variables on dependent variables. The results can be seen in Table VI. The R-squared value of IT innovation is 0.449. It can be explained by the percentage of IT governance and IT excellence (78.14%). Competitive advantages have 97.73%, meaning that the superiority of competitiveness can be explained by IT governance, IT excellence, and IT innovation moderated IT maturity. Finally, IT excellence (0.3135) can be explained by IT governance (31.35%). The following stage is to find out the predictive relevance of R-squared values. After utilizing the formula of $Q^2 = 1 - (1 - R^2$ of Competitive Advantages$) \times (1 - R^2$ of IT Innovation$) \times (1 - R^2$ of IT Excellence$)$, it obtains 0.9842 or 98.42% reflecting that this research model is very good.

Table VII reveals that the performance of IT excel-

TABLE VII
RESULTS OF DIRECT AND INDIRECT INFLUENCES OF PATH COEFFICIENTS.

Path	Direct Influences	Indirect Influences	Total Influences
IT Governance → IT Excellence	0.5599	None	0.5599
IT Governance → IT Innovation	0.2622	None	0.2622
IT Excellence → IT Innovation	0.7101	None	0.7101
IT Governance → Competitive Advantages	0.0373	Via IT Innovation	
		0.2622 × 1.5668 = 0.4108	0.0373 + 0.4108 = 0.4481
IT Excellence → Competitive Advantages	-0.8325	Via IT Innovation	
		0.7101 × 1.5668 = 1.1126	-0.8325 + 1.1126 = 0.2801
IT Innovation → Competitive Advantages	1.5668	None	1.5668
IT Innovation → Competitive Advantages Moderated by IT Maturity	-0.0227	None	-0.0227

(Source: Data Processed through SmartPLS, 2020)

lence is directly and favorably impacted by IT governance activities. Similarly, IT innovation is directly and favorably impacted by IT governance. Competitive advantage is directly and adversely impacted by IT excellence. Then, competitive advantage is directly and favorably impacted by IT innovation. However, the influence of IT maturity in mitigating the impact of IT innovation on competitive advantage is minimal. Meanwhile, IT governance has a favorable and indirect impact on competitive advantage. Last, IT excellence has a positive, substantial, and one-way effect on competitive advantage.

FGDs reveal several results. It shows the necessity of using IT to improve institutional advantages and achieve a competitive edge. The benefits of IT can reduce the expense of the company's business procedures. Moreover, the application of IT can minimize competition. IT can also offer innovation for new products. IT maturity considers a person's ability to innovate and age. It is crucial for leaders in IT innovation and policymakers in creating innovation-based initiatives to understand how short-term competitive advantages can be produced through IT innovation.

A. Influences of IT Governance on IT Excellence of STMIK in Indonesia

The results shows that IT excellence is directly and favorably impacted by IT governance activities. Findings are in line with previous research affirming that IT excellence highly requires good governance as a primary element [37]. Such excellence, especially in terms of operations, is more responsive to the needs of businesses and automation. Hence, every school needs to improve IT effectiveness, IT governance, and risk management to support business processes [38, 39].

B. Influences of IT Governance on IT Innovation of STMIK in Indonesia

An exploration of the relationship between IT innovation and IT governance is found in the previous study. However, ambiguous findings pertain to mature IT governance processes helping or hindering innovation. For example, previous research states that IT governance will hinder innovation [76]. However, another previous research believes that the former is the supporter of the latter [77]. Then, previous research proves a theoretical relationship between IT governance and IT innovation-based adoption [78]. Therefore, this finding is useful for higher education organizations like the previous research [79].

The research proves that IT governance positively and significantly influences the innovation of products and processes when there are high experiences [80]. On the other hand, when the experiences of applying such governance are low, the influences on innovation become negative [80]. IT has been specifically described as responsibilities for IT functions in organizations. Adoption of innovation contextually refers to organizational decisions to take technological advantages. Hence, the research fills the gaps in existing knowledge through a literature review and examination of the interaction of IT governance and IT innovation. It is noted that mechanisms and systems of governance used by senior IT managers can manage initiatives of IT innovation [81].

C. Influences of IT Excellence on IT Innovation of STMIK in Indonesia

This condition emphasizes that improved IT innovation is requisite to enable sustainable operation, further supporting other indicators of the product innovation dimension. It indicates that STMIK in Indonesia still lacks the readiness for sustainable IT innovation. It is found that launching new services is rarely conducted.

The research finding contradicts previous research describing IT innovation as not providing sustainable competitive advantages and well-managed IT increasing company shares [54]. Furthermore, IT innovation can be risky and prone to fail, so there is no guarantee that it will result in competitive advantages or financial success [54]. However, IT excellence should be a part

of organizational culture rather than depending on one or two negative projects [54].

D. Influences of IT Innovation on Competitive Advantages of STMIK in Indonesia

IT innovation can create competitive advantages that are difficult to sustain long-term. This situation raises crucial implications for heads and policymakers engaged in building programs to drive it [82]. Innovation can increase profits in competition through external factors [83]. The other supporting affirmation is that IT innovation strongly and positively influences competitive advantages [31, 84]. It is a strategic tool in competitiveness for business enhancement to create equal or better competitive advantages and realize sustainable development [83].

Moreover, service innovation has significant and positive influences on competitive advantages [66]. Consequently, products and processes become the core [85]. Innovation capabilities can also create competitive advantages for companies. Other evidence suggests that innovation of products and processes has positive influences on competitive advantages [86].

E. Influences of IT Innovation on Competitive Advantages Moderated by IT Maturity of STMIK in Indonesia

Results have not indicated that IT maturity as a moderating variable can influence IT innovation on competitive advantages. In previous conceptual research, IT maturity is the driver of global competitiveness [62]. In other research, nevertheless, it influences competitive advantages, which are a part of company performance through the activation of organizational processes [46]. Based on the investigation, relational maturity plays a moderating role in the relationship between IT maturity and organizational performance [46]. Then, other research has proven significant influences of innovation on competitive advantages through moderation effects [31].

F. Influences of IT Governance on Competitive Advantages of STMIK in Indonesia

There is a relationship between corporate governance and innovation to build competitive advantages for organizations [35]. It reveals that IT governance positively influences competitive advantages [36]. As seen in Table VII, IT governance has a favorable and indirect impact on competitive advantage. Other research has produced a comprehensive, integrated IT governance roadmap and a framework for organizations to implement appropriate approaches. Those are applicable to their environment, plans, priorities, capabilities, and existing resources to lead to competitive advantages [36].

G. Influences of IT Excellence on Competitive Advantages of STMIK in Indonesia

The use of IT is requisite for competitive advantages and profit increases. Competitiveness can be measured through financial performance, purchase cost reduction, and the use of IT excellence [87]. It supports the theory that IT excellence should be a part of organizational culture rather than rely on one or two negative projects [54].

The results show that the alignment of IT innovation and IT excellence is an important platform for achieving competitive advantage. The research reinforces the theory that the benefits of information technology require good governance [37], and IT governance supports innovation [77]. The research also shows that IT excellence has both direct and negative effects on competitive advantage. It suggests that an increase in IT advantage is closely followed by a decline in competitive advantage and vice versa. The results are also confirmed by previous research showing the impact of IT innovation on competitive advantage [84]. The finding further reinforces that IT innovation supported by product innovation dimensions and process innovation has a positive impact on competitive advantage [85, 86].

V. Conclusion

Based on the results and discussion of the empirical research, conclusions concerning the influences of IT governance, IT excellence, and IT innovation on competitive advantages moderated by the IT maturity of STMIK in Indonesia are drawn. IT governance has direct and positive influences on IT excellence. This condition emphasizes a need to notice the importance of the IT steering committee collaborating with those in charge of IT portfolio application development. Next, IT governance also has direct and positive influences on IT innovation. Understandably, the existence of such governance should be recognized since it represents essential activities for the success of improving IT innovation.

Additionally, IT excellence has direct yet negative influences on competitive advantages. In other words, depending on institutional culture, capabilities to identify institutional values are needed to realize the importance of institutional leadership. Moreover, IT innovation has direct and positive influences on competitive advantages. IT innovation capabilities allow schools to take unconventional steps and add value by launching new services. Furthermore, the influences of IT maturity moderating IT innovation on competitive advantages are insignificant. In other words, the rise or fall of IT maturity insignificantly influences IT

innovation on competitive advantages. In addition, IT governance has direct, positive, yet indirect influences on competitive advantages. Lastly, the influences of IT excellence on competitive advantages are very strong and significant, yet not unidirectional. Meanwhile, the ones of IT excellence on competitive advantages through IT innovation are powerful, significant, and unidirectional.

There are still gaps in the research. Yet, these restrictions can be viewed as a chance to perform additional study to enhance the research. Limits on the entire population include STMIK institutions in Indonesia, which are dispersed around the country and have a total of 85 units of analysis from institutions leadership components. As all of these STMIK institutions are categorized as having received accreditation scores from BAN-PT, the data utilized for study do not accurately capture all tertiary institutions' real events. Hence, the research results do not apply to all higher education programs offered in Indonesia because they only concentrate on institutions that offer instruction in the field of information technology.

For further research, it is advisable to use a combination method and a concurrent triangulation design at stages of qualitative analysis and data collection. This approach will make the research results complete, valid, reliable, objective, and efficient. A mixed method in a balanced manner maintains the independent nature of each key informant or participant in solving similar problems. Research can be developed by expanding the scope, including state higher education institutions.

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APPENDIX

The Appendice can be seen in the next page.

TABLE A1
VARIABLES AND INDICATORS USED IN THE RESEARCH.

Variable	Indicator	
IT Governance	Structure	IT steering committee (ITG1)
		IT strategy committee (ITG2)
		IT project steering committee (ITG3)
	Process	IT application portfolio management (ITG4)
		Information systems strategic planning (ITG5)
		Project governance (ITG6)
	Relationship Mechanism	Information technology governance awareness (ITG7)
		Information technology leadership (ITG8)
IT Innovation	Process Innovation Dimension	New external innovation process (ITI1)
		Internal service development process (ITI2)
		New internal management (ITI3)
	Product Innovation	Service change indicators (ITI4)
		Expanding service coverage (ITI5)
		Service prepositions (ITI6)
		Launching new services (ITI7)
IT Excellence	Meta Management	System culture (ITE1)
		Institutional leadership (ITE2)
		Institutional values (ITE3)
	Strategy	Institutional vision and objectives (ITE4)
		Institutional business model (ITE5)
		Institutional strategy (ITE6)
	Risk	Identifying institutional risk (ITE7)
		Institutional risk management plan (ITE8)
		Reducing institutional risk (ITE9)
	Value	Recognition value indicators (ITE10)
		Value realization plans (ITE11)
		Implementing value realization (ITE12)
	Process	Institutional governance indicators (ITE13)
		Complete method (ITE14)
		gradual process optimization (ITE15)
	Transformational Information Technology	Conducting information analysis (ITE16)
		Having commercial applications (ITE17)
		Applying technology communication (ITE18)
	Organizational Change	Implementing change impact analysis (ITE19)
		Having a change management plan (ITE20)
		Changing management implementation (ITE21)
	Competence and Training	Conducting training needs analysis (ITE22)
		Curriculum development (ITE23)
		Educational training (ITE24)
	Program and Project Management	Having an institutional framework (ITE25)
		Managing institutional planning (ITE26)
		Implementing institutional plans (ITE27)
IT Maturity	Process Management	Institutional process (ITM1)
		System process definition (ITM2)
		Institutional training (ITM3)
		Institutional process performance (ITM4)
		Institutional innovation (ITM5)
	Project Management	Institutional project planning (ITM6)
		Institutional project control monitoring (ITM7)
		Stakeholder agreement management (ITM8)
		Implementing risk management (ITM9)
		Implementing integrated project management (ITM10)
		Quantitative project management (ITM11)
	Engineering	Demand management (ITM12)
		Demand development (ITM13)
		Having technical solutions (ITM14)
		Implementing higher education product integration (ITM15)
		Higher education product verification (ITM16)
		Institutional product testing (ITM17)
	Support	Configuration management (ITM18)
		Implementing quality assurance (ITM19)
		Analysis of supporting institutions (ITM1620)
		Analysis of decision-making solutions (ITM21)
		Analysis of reasons for supporting institutions (ITM22)
Competitive Advantage	External Advantage	New market indicators to gain competitive advantage (ICA1)
		Better service quality (ICA2)
	Internal Advantage	Increasing student satisfaction (ICA3)
		Increasing student experience and knowledge (ICA4)
		Increasing student innovative abilities (ICA5)

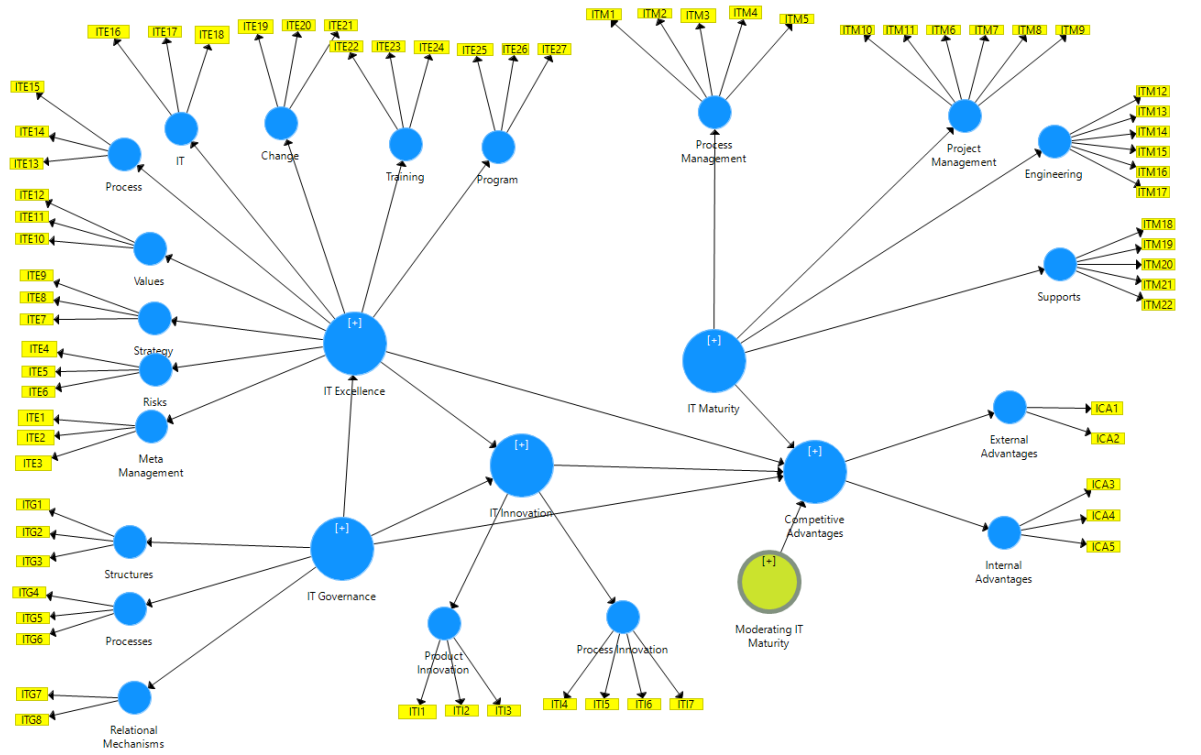

Fig. 2. Structural Equation Modelling (SEM) in the research.

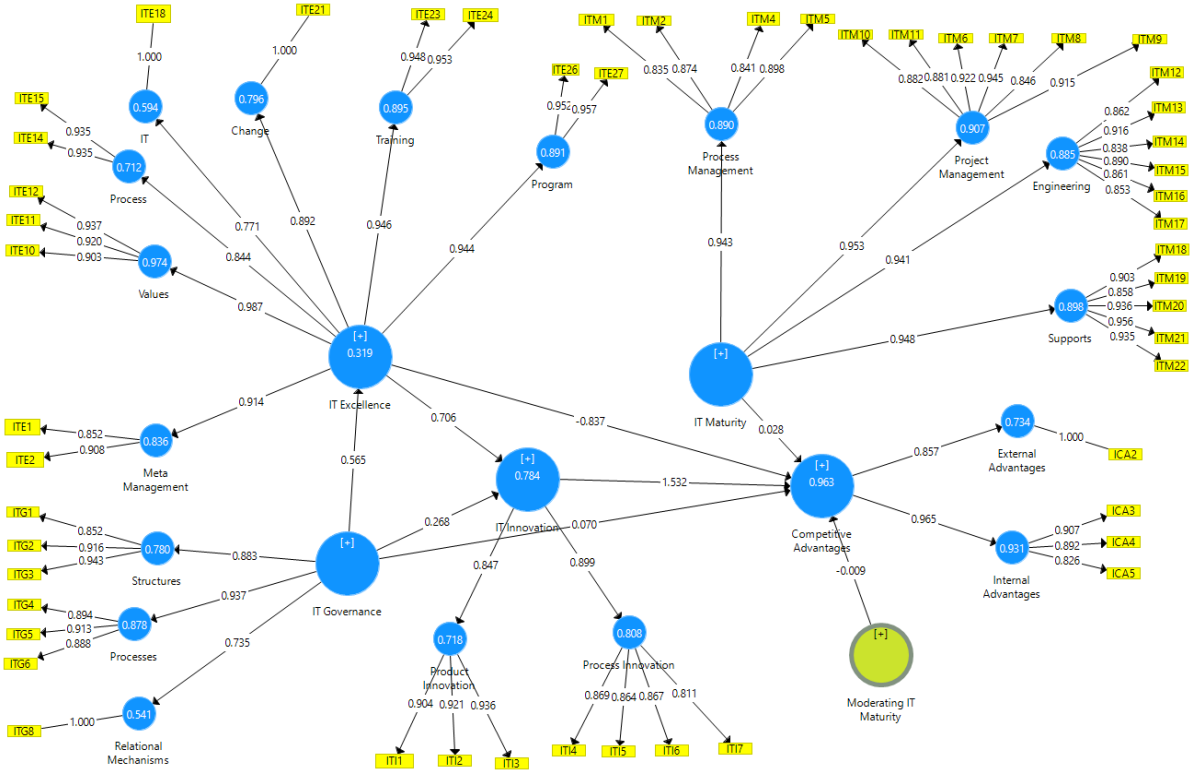

Fig. 3. Path diagram of an outer model: The second iteration.

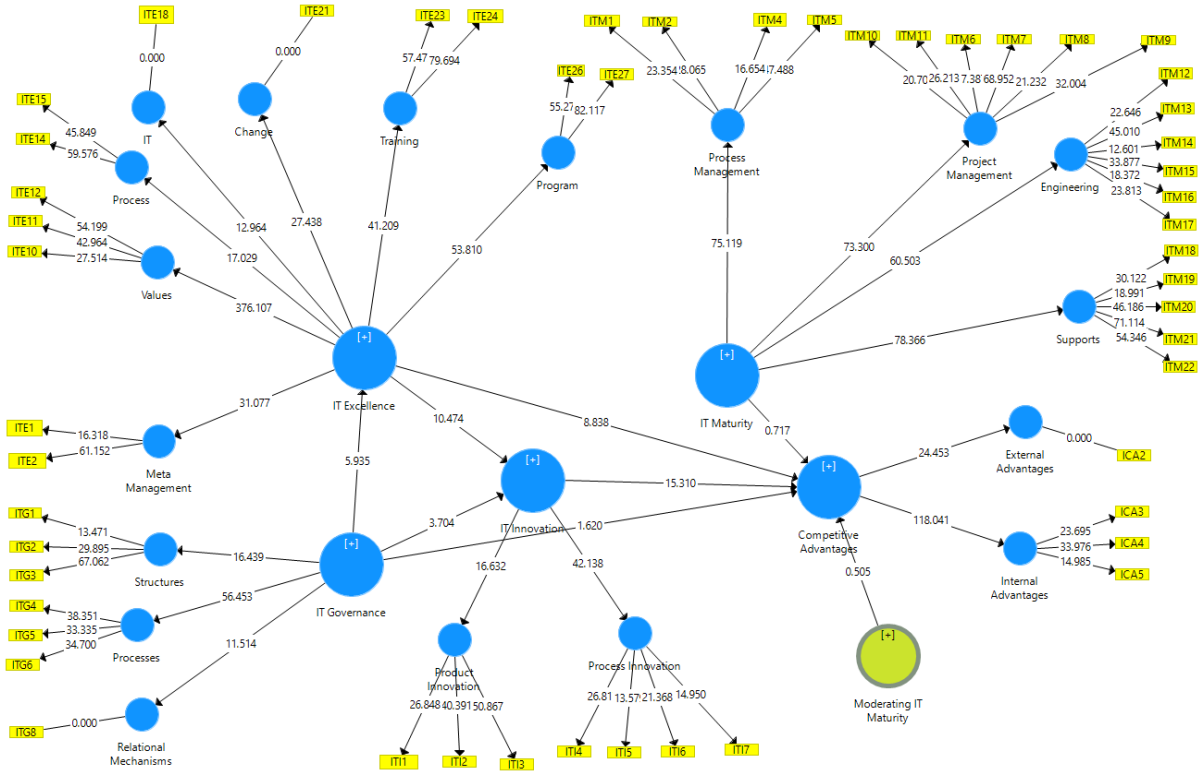

Fig. 4. Bootstrapped outputs of an inner model.