Mediating Roles of IT Governance Effectiveness in E-Service Quality of Higher Education

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***Abstract*—The objective of conducting this research was to assess the extent of roles of IT governance effectiveness in mediating influences of constructs of IT innovation adoption and organizational culture when boosting E-service quality of schools in higher education. The study applied a convergent, triangulated combination method and an explanatory design through follow-up explanation. The population incorporated all private schools of informatics management and computing in Indonesia. Questionnaires were filled out by 112 respondents (heads, deputy heads, and structural staff members) out of a total of 133 respondents. Analysis was quantitatively through SEM-PLS and qualitatively through in-depth interviews and FGDs with 5 key informants. A finding shows that only several hypothesis tests have significant values despite constructs with positive relationships and influences. Another interesting finding is that IT innovation adoption and organizational culture are insignificant for improvement of E-service quality of respective schools when excluding IT governance effectiveness. Nonetheless, existence of IT innovation adoption and organizational culture remain a crucial, inseparable part of the model of this study.**

Keywords—IT Governance Effectiveness, E-Service Quality, IT Innovation Adoption, Organizational Culture, Higher Education.

I. INTRODUCTION

Engagement of roles and functions of Information Technology (IT) in universities is the same as the activities of managing businesses of companies [1]. Transparent, accountable information communication with all academics is necessary. Actualization and improvement of E-service quality are principally required by them [2]. Various online information services without apparent, structured arrangements when implementing application portfolios of IT services [2,3] can lead to less accurate information. E-service quality is no longer limited to academic data processing of schools. It further has an important role in encouraging implementation of the three main duties in higher education, i.e. education and lecturing, research, and community services [3,4]. E-Service quality has become a critical instrument in school operation. Additionally, IT service mechanisms should include academic information quickly and responsively to anticipate processing and decision making and to assure fine academic activities meeting the needs of stakeholders for enhanced competitiveness of schools [5]. It should be noted that almost 90% of all routine activities of higher education institutions process and provide academic information services in education and lecturing, research, and community services [6]. It is also realized that exponential growth in IT is from a number of circumstances that have never happened before. UNESCO reports that the biggest impacts of the development and progress of IT services occur in a higher education sector [7].

Numerous previous studies aver that E-service quality has a crucial role in guaranteeing the effectiveness of processing academic data. In this context, linkages of flows of E-service quality of each work unit become a platform of establishing and developing communication to achieve synchronization and interoperability of academic data [8]. Also, E-service quality quickly facilitates anticipation of every academic process requirement and ensures smooth operation. In fact, however, its implementation using investment funds spent to procure equipment and develop application portfolios of IT services occasionally fails due to poor skills [9,10], disintegration of IT services, difficulties of synchronization and interoperability of such portfolios, and failure to provide optimal IT services [11,12,13]. Previous research also reveals that average, measured maturity levels of E-service quality of higher education are still very low (generally in a repeatable but intuitive position) [14,15,16]. This fact shows that implementing application portfolios of IT services requires effective IT governance [17] in order to further have the

capability to provide IT services in processing academic data of schools. Proper IT governance can unnecessarily show real effectiveness provided that interrelationships of structures, processes, and mechanisms are unable to be actualized [17,18]. Primarily, IT governance effectiveness is more essential as it can actualize work methods and strategies in achieving the diversity of needs of E-service quality [19].

Moreover, varieties of information without effective IT governance are apt to cause inappropriateness of adopting IT innovation resulting in less accurate information of schools [20]. In order to achieve IT governance effectiveness, the ability to manage human resources to adopt IT innovation should exist [21]. The success of IT innovation adoption reflects relationships of the three main elements such as technology, organization, and environment [22,23]. Understanding and implementing IT innovation adoption always refer to skills in preventing and reducing risks of failure in eminently facing dynamic environment changes. Such adoption also becomes one of the determinants of successful implementation of application portfolios of IT services [24]. Apart from capabilities of IT infrastructure and IT configuration, readiness of organizational culture to accept all changes of procedures and policies of managing organizational structures of schools is another extra determinant [25]. It has positive, significant influences on IT innovation adoption, but is insignificantly related to E-service quality [26]. Organizational culture of higher education grows and develops from conducive conditions in coping with the whole process changes of IT innovation adoption of functional work structures.

A formulated research problem was on improved E-service quality of schools as a result of influences of IT innovation adoption and organizational culture through roles of IT governance effectiveness. This problem formulation was in line with the purpose of the study, i.e. to determine the extent of roles of IT governance effectiveness mediating the influences of IT innovation adoption and organizational culture when boosting E-service quality of schools. This research only focused on schools of higher education and emphasized E-service quality. It is noted that there has been none of similar research exploring relationships of E-service quality and IT governance effectiveness of schools. In addition, previous research examining possible influences of IT innovation adoption and organizational culture of schools is absent. E-service quality researched beforehand only tends to be connected to the skill of developing application portfolios of IT services as integrated information system.

II. Literature Review

A. IT Innovation Adoption

IT innovation adoption represents the decision of generally applying innovation as the best action to empower IT [27]. When it is moderate, there should be supports of IT governance performed in a decentralized manner. Knowledge of conducting it in IT governance fundamentally contributes to transformation of school performance [28]. The suitability of IT innovation adoption is the key to success in accepting changes and influences of culture in higher education institutions [29]. Adopting IT innovation, planned, acceptable communication strategies are requisite. Dimensions of this adoption refer to technology recipient models in forms of perceived benefits, perceived ease of use [30], as well as innovation of processes and products [31].

B. Organizational Culture

The success of implementing IT governance is inseparable from culture of higher education institutions. The ability to adopt changes is also a crucial part of it [32]. Ignoring this factor can lead to failure of IT governance implementation based on the perspective of adjusting the culture of work changes [33]. Organizational culture of schools has firm connections with IT governance management of describing a set of assumptions, belief, and values as the whole elements. In this study, organizational culture of schools is influenced by collaborative, creative, competitive, controlled indicators [34].

C. IT Governance Effectiveness

IT governance adds values to organizations while balancing risks and returns of IT and its processes [35]. Its effectiveness is affected by IT steering committee, centralized IT decision making control, involvement of senior management in IT, IT functions in organizations, and measurement system of organization performance [36]. It can guarantee smooth organization mechanisms and consistent management levels [37]. IT governance is effective given that it contributes positively to overall organizational levels of school governance.

D. E-Service Quality

E-service quality is defined as a form of IT services offered online through the internet and managed by users interactively through availability of information [38,39]. Such the quality has indicators of completeness, interactivity, information, availability, reliability, and security [39]. It should exceed commercial transaction services based on interaction before, during, and after delivering IT services. In website context, E-service quality means the extent to which information services delivered can efficiently and effectively facilitate IT service needs to satisfactorily meet needs of academics and the community [40].

III. Research Method

This study applied a convergent, triangulated combination method and an explanatory design through follow-up explanation [41]. It particularly focused on private schools in higher education with a specific major of IT. The population incorporated 133 private schools of informatics management and computing in Indonesia. However, several of them were no longer active, coped with institution form changes based on higher education system, and made no submission of completed questionnaires. There were, therefore, only 112 schools returning questionnaires with answers (response rate = 84.21%). Processes of this research involved definition of background, presentation of literature review, formulation of problems, design of research and hypotheses, collection and analysis of data, description of research results, and provision

of conclusion [42]. The questionnaire design referred to the one used in the previous research with adjustment. Its validity and reliability were tested beforehand [42]. Questionnaires were completed by respondents (heads, deputy heads, and structural staff members) working in study programs, IT divisions, internal quality assurance units, university database departments, libraries, as well as research and community service departments. Their deliveries were through Google Form and data were processed by using Likert Scales with intervals noting strongly agree (Score 6) to strongly disagree (Score 1) [43].

After all data were collected, analysis and interpretation were performed through Structural Equation Modeling (SEM) and Partial Least Square (PLS). Examination included conceptual models, algorithm analysis methods, bootstrapping, path diagram models, model evaluation, and conclusion and suggestions [44]. In addition, quantitative analysis results were validated through justification referring to informants' explanation [45]. Qualitative data were, nevertheless, obtained through in-depth interviews and FGDs with a number of informants selected based on criteria of inclusion and exclusion [46]. Studied models focused on contributions of the extent of roles of IT governance effectiveness mediating the influences of IT innovation adoption and organizational culture when boosting E-service quality of private schools of informatics management and computing in Indonesia. (see Figure 1).

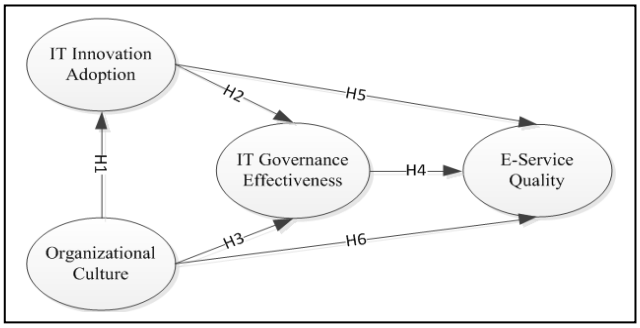

Fig. 1. Research Model

IV. Results and Discussion

Analyzing the path diagrams of outer and inner models using SmartPLS Program was made. An initial step taken was estimating the path diagram model through PLS Algorithm and bootstrapping. The design comprised constructs of IT innovation adoption, organizational culture, IT governance effectiveness, and E-service quality. IT innovation adoption included indicators of perceived benefits (ITIA1), perceived ease of use (ITIA2), process innovation (ITIA3), and product innovation (ITIA4). Next, indicators of the second construct were collaboration (OC1), creativity (OC2), controls (OC3), and competitiveness (OC4). IT governance effectiveness, nonetheless, covered indicators of IT steering committee (ITGE1), centralized IT decision making control (ITGE2), involvement of senior management in IT (ITGE3), IT functions in organizations (ITGE4), and measurement system of organization performance (ITGE5). Lastly, indicators of E-service quality were completeness (ESQ1), interactivity (ESQ2), information (ESQ3), availability (ESQ4), reliability (ESQ5), and security (ESQ6).

Following this, two types of validity (convergent validity and discriminant validity) were tested based on calculation outputs of Average Variance Extracted (AVE). Construct influences were represented through the path diagram model in Figure 2.

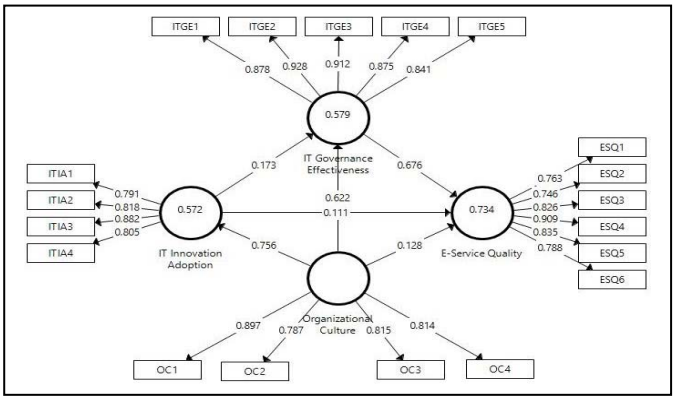

Fig. 2. Research Model of Path Diagram

Figure 2 represented that outer loading scores of all indicators were valid as they were greater than 0.70. In other words, all indicators could be directly used in the research model. Furthermore, discriminant validity of each construct was tested by using Fornell-Larcker Criterion. The contents of Table I indicated the testing results of discriminant validity of constructs, whereas those of table II represented results of reliability and validity based on computation of Composite Reliability (CR), Cronbach's Alpha, and AVE. Good reliability is noted from CR > 0.80, Cronbach's Alpha > 0.70, and AVE > 0.50 [44].

TABLE I. Discriminant Validity

Fornell-Larcker Criterion	E-Service Quality	IT Governance Effectiveness	IT Innovation Adoption	Organizational Culture
E-Service Quality	0.813			
IT Governance Effectiveness	0.844	0.887		
IT Innovation Adoption	0.642	0.643	0.825	
Organizational Culture	0.721	0.752	0.756	0.829

TABLE II. Reliability and Validity of Constructs

Constructs	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
E-Service Quality	0.896	0.900	0.921	0.661
IT Governance Effectiveness	0.932	0.934	0.949	0.788
IT Innovation Adoption	0.843	0.847	0.895	0.680
Organizational Culture	0.848	0.853	0.898	0.688

Next, an inner model was analyzed through selection of bootstrapping with path coefficients indicating that all original samples possessed relationships and positive influences. Thus, it could be interpreted that all indicators of each construct influenced each other. Respective values meant that the better a construct was, the better it boosted performance of other constructs. Another step was to refer to results of t-statistics used to consider significance influences of independent variables on a dependent variable. It is claimed that a construct with its indicators has a significant value if t-statistics is greater than 1.96 and probability value of t-value used to test construct relationships is less than 0.05 [45].

Contents of Table III showed results of path significance tests of the whole indicators of each construct. It was clear that through the t-statistics test, not all constructs and indicators had values which were more than 1.96, meaning that there were some of them contradicting this condition. To be precise, IT innovation adoption had relationships and positive, yet insignificant influences on E-service quality and IT governance effectiveness, and organizational culture had relationships and positive, yet insignificant influences on E-service quality.

TABLE III. PATH SIGNIFICANCE TEST

Path Coefficients	Original Sample (O)	T Statistics (|O/ST DEV|)	P Values
IT Governance Effectiveness → E-Service Quality	0.676	8.949	0.000
IT Innovation Adoption → E-Service Quality	0.111	1.525	0.128
IT Innovation Adoption → IT Governance Effectiveness	0.173	1.324	0.186
Organizational Culture → E-Service Quality	0.128	1.368	0.172
Organizational Culture → IT Governance Effectiveness	0.622	5.738	0.000
Organizational Culture → IT Innovation Adoption	0.756	19.385	0.000

Additionally, a computed R-squared-adjusted value of E-service quality was 0.727 (73%), while the remaining (27%) was influenced by other factors excluded in the researched model. The respective value had critical interpretation that each indicator of constructs of this research had positive influences and relationships with each other. This becomes a new finding and gives important contributions to private schools of informatics management and computing in Indonesia to actualize and improve E-service quality. The model of this research also emphasizes that the main factor was to have fine, effective IT governance in accordance with influences of IT innovation adoption and organizational culture.

This proof was in reinforcement by another finding revealing effective IT governance (0.676). The value obtained was higher than the ones of direct influences of IT innovation adoption on E-service quality and indirect influences of IT innovation adoption on E-service quality through IT governance effectiveness (0.111 and 0.290 consecutively). Besides, insignificant values of the two influence models meant that there was no ascertainment of improved IT governance effectiveness and E-service quality when there was improved IT innovation adoption. Organizational culture, on the other hand, had positive, yet insignificant influences on E-service quality (0.128). Interpreting this, boosting organizational culture brought no guarantee of E-service quality enhancement; even a worse condition could exist. A number of these findings were different from previous ones [2,3,4,6,11,20,24]. It was further found that organizational culture had positive, very significant influences on IT innovation adoption (0.756). Such the value was greater than the ones on IT governance effectiveness and E-service quality (0.622 and 0.128 consecutively). This finding was in line with [25,26,29,32,34]. Contrarily, it was irrelevant to [35,36,39].

Contextually, in supports of the previous statement, organizational culture apparently had positive, very significant influences on E-service quality when mediated by IT governance effectiveness, a construct excluded in previous findings. Consequently, IT governance effectiveness, IT innovation adoption, and organizational culture were a dominant, important, inseparable part of this research model in boosting E-service quality.

Apart from these, R-squared-adjusted value of IT governance effectiveness was 0.571 (57.1%). It could be implied that effective IT governance should have supports and readiness of adopting IT innovation. Conversely, calculated R-squared-adjusted value of IT innovation adoption was 0.568 (56.8%), meaning that the success of adopting IT innovation was strongly influenced by organizational culture in improving E-service quality.

In order to cognize R-Squared predictive relevance, the formula Q2 = 1 – (1 - R2 E-Service Quality) * (1 - R2 IT Governance Effectiveness) * (1 - R2 IT Innovation Adoption). could be used. It was found in this study that the value of such the relevance was 0.949 (94.9%), approaching 100%. It could be implied that this research model had very large predictive relevance due to its essence. More understandably, it brought large influences to ensure the success of improving E-service quality.

Referring directly to the measured model, path coefficients of endogenous and exogenous constructs were in discussion. IT governance effectiveness performing as an endogenous construct possessed an indicator with the highest loading factor value which was greater than 0.80, meaning that all indicators had very firm relationships in general. One of the five indicators, measurement system of organization performance (ITGE5), nevertheless, required more attention as it had the lowest loading factor value (0.841). Higher education institutions, hence, should always and periodically evaluate maturity levels pertaining to application portfolios of IT services and provide information services when managing academic operation. Concerning the aforesaid outcome, it could be affirmed that IT governance effectiveness had a fundamental role in actualizing system and mechanisms of information services in E-service quality improvement.

In respect of another endogenous construct, i.e. E-service quality construct, it was visible that indicators with loading

factor values failed to show strong relationships. Obviously, completeness (ESQ1), interactivity (ESQ2), and security (ESQ6) with respective loading factor values of 0.763, 0.746, and 0.788 failed to reach 0.80 and, thus, principally needed immediate enhancement to support other indicators. This circumstance represented numerous gaps and an inability to provide information services for the academic operation needs of schools investigated. It was suggested that the whole indicators of E-service quality had collaboration with one another in maintaining and ascertaining the consistency of quality of IT services to satisfy information needs of each functional unit of organizations. In terms of completeness, information presented on websites and other sources should be interactive. Also, guaranteed information service security was needed for supports and deliveries of information to the heads and all school academics. The combination of ESQ1, ESQ2, and ESQ6 frequently created gaps, further raising performance problems of filling out all reporting instruments of private schools of informatics management and computing in Indonesia.

It was clearly noted that roles and functions of effective IT governance becoming a prerequisite in managing standardization, procedures, and mechanisms of information services could be empowered by referring to the value of each indicator. A certain action to take was to balance and harmonize roles of IT innovation adoption and organizational culture of schools. These two constructs facilitated and expedited by effective IT governance should have transparent structures, processes, and relational mechanisms. Therefore, implementation of management system of information services could become finer. However, in implementation, it was unable to run based on principles, policies, and process platforms specified. In addition, effective IT governance comprehended was still prone to be associated with IT management patterns without perspectives on alignment of school strategies with IT service quality strategies.

Despite insignificant improvement, the construct of E-service quality was influenced by and positively associated with IT innovation adoption and organizational culture. Interpretatively, the enhanced ability of IT innovation adoption could factually lower E-service quality due to unclear order and standardization pertaining to each indicator of such the quality. IT innovation adoption, however, had strong relationships of indicators. The reflection was that the only indicator with the lowest loading factor value approaching 0.80 was perceived benefits (ITIA1 = 0.791). The other three indicators (perceived ease of use (ITIA2), process innovation (ITIA3), and product innovation (ITIA4)) were, contrarily, more than 0.80. It was, then, requisite to make enhancement through application portfolios of IT services by referring to effective IT governance and organizational culture.

At last, the capability to manage influences and strong relationships from organizational culture could become a great determinant of the success of IT innovation adoption because of positive, very significant influences it brought. Creative, cultural relations had strong indications of the ability to adopt IT investment and understanding of perceived benefits. An effort should be made considering the lowest path coefficient of creativity (OC2) with loading factor = 0.787. This value was below those possessed by other indicators. This condition occurred as only several school stakeholders comprehended strategic functions and benefits of empowering application portfolios of IT services. The tendency was that majority of heads and staff members were eager to independently learn IT services and technology but infrequently share their knowledge to others. Accordingly, gaps of managing academic operation of schools emerged. Contextually, understanding of creative culture of sharing the information was necessary to expedite IT innovation adoption of private schools of informatics management and computing in Indonesia.

V. Conclusion and Future Research

Based on testing results of each hypothesis and feedback by five selected respondents, it can be concluded that there are positive, direct, indirect influences and relationships in spite of insignificant values possessed by IT innovation adoption on E-service quality and IT governance effectiveness, and organizational culture on E-service quality. Findings reveal that the success of IT innovation adoption and IT governance effectiveness is strongly influenced by organizational culture in improving E-service quality of private schools of informatics management and computing in Indonesia. Errors have so far emerged since IT governance effectiveness is absent from a strategic position. As a matter of fact, problems encountered by the respective schools have never been solved well. For betterment, this study can be developed through the focus on all institutional forms of private schools in higher education and inclusion of the construct of IT service management to gain more accurate, comprehensive results in relation to the capability to improve E-service quality.

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