Assessing Application Portfolios of IT Services through Maturity Levels of IT Governance

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***Abstract*—Managing application portfolios of Information Technology (IT) services is not limited to information services. There should be guarantee and integration of synchronization and interoperability of information services. Availability of information services can create risks of IT investment and hinder effectiveness of organizational performance. The aim of this research was to find out to what extent the use of application portfolios of IT services could support IT processes of Acquire and Implement (AI) and Monitor and Evaluate (ME) Domains. This survey research applied the combination method and a convergent triangulation model through a follow-up explanatory design. Quantitative analysis was performed after online questionnaires were filled out by respondents working at 65 credit unions. These respondents have used application portfolios of IT services in West Kalimantan, Indonesia. COBIT (Control Objectives for Information and Related Technology) 4.1 Framework was in use to measure maturity levels of IT governance. Maturity values of IT governance indicate that IT processes are at the scale interval of 2.51 to 3.50. So far, the use of application portfolios of IT services has been restricted to procedure standardization and documentation system. Also, the conduct has not involved appropriateness of obvious synchronization as well as consistency of procedures towards IT service implementation. The priority of this model of IT governance is on IT processes with criterion values which are less than 2.51, i.e. AI4, AI5, ME1, and ME4. These four processes should take immediate anticipation since the use of application portfolios is fundamental in improving IT services given to customers of credit unions in West Kalimantan.**

Keywords—Application Portfolios of IT Services, Maturity Levels, IT Governance, COBIT 4.1 Framework.

I. INTRODUCTION

Along with the development and use of IT, every activity immensely depends on reliability and availability of application portfolios of IT services. Roles and functions of IT have changed and enabled improvement of faster, more accurate, more appropriate information services for all stakeholders [1]. The improvement includes efficiency, transparency of decision making, and empowerment of human resources in digital transformation of administration [2]. Providing application portfolios of IT services is not limited to ownership of proper IT governance based on organizational needs and behavior [3]. IT governance has substantial contributions of ensuring IT service performance [4] in managing businesses to be more effective and more efficient, and has the capability to improve expected values of internal and external needs [4,5]. It is the fact that application portfolios of IT services are significantly required to support all operational activities and provide information. Furthermore, for the management, the significance is on strategic decision making [6].

Nonetheless, achieving appropriateness of information services through application portfolios of IT services is of great complexity and is in relation to maturity values of IT governance. These values importantly contribute to planning and implementation of more effective and more efficient information services [7,8]. Managing application portfolios of IT services pertains to availability of information services as well as integration of synchronization and interoperability in accessing information services [9]. Organizations with good maturity values of IT governance can earn additional 25% of profit in comparison to others [8,9,10]. This statement is in line with previous studies clarifying that maturity values of IT governance become more strategic and emphasize reliability and innovation of providing, improving, and ensuring conformity of information services and organizational strategy [11]. Maturity values of IT governance obviously show IT processes with structures so that current and upcoming IT process values can be easily controlled and evaluated [12]. Such values are essential to achieve goals and prevent risks of business processes [13]. They have become the necessity of controlling IT processes and application portfolios of IT services in the field of financial service offer at current and upcoming conditions [14]. Availability of information services on maturity values of IT governance can make selection of IT control processes biased and have IT investment risks so that initiation and use of these portfolios are affected [15].

IT maturity values give implications to the management and stakeholders managing organizations and credit unions. Credit unions refer to financial institutions of unions or nonbanks providing financial services like banking, for example account transaction, saving, loan, insurance, and delivery [16,17]. Credit unions are owned and controlled by members themselves to improve life quality and welfare by emphasizing a self-help aspect and solidarity [18]. Survey results indicate that credit unions generally have no special IT departments. In addition, contributions pertaining to the use of application portfolios of IT services have not possessed clear measures. Management and investment of IT further tend to be partial for certain units.

A number of existing indications show that control mechanisms and evaluation of information services are prone to be centralized and access rights are in limitation to certain work units. Moreover, short-term decisions of investment and use of application portfolios of IT services are found and only operational funding is prioritized. Besides, human resource capability of IT is still basic and brings insignificant changes. Following these, improvement of IT projects is apt to fail due to inexistence of planning of IT architecture and obvious committee formation. In addition, maturity values of IT governance are only internal data processing.

The complexity tends to confine effectiveness of information services and productivity of providing services to credit unions. Such the statement is strongly related to IT service processes of AI and ME Domains at current and upcoming conditions. The research novelty is to improve, map, and conform all IT processes based on maturity values of IT governance. Besides, more flexible application portfolios of IT services are assured to avail easier information access for credit union customers.

Referring to existing background, research problems formulated are (a) to what extent are maturity values of IT governance through application portfolios of IT services of AI and ME Domains?, (b) how are managerial implications related to the use of application portfolios of IT services?, and (c) how to describe IT governance model to actualize expected values based on previous maturity values of IT governance? The aim of this research was to find out to what extent the use of application portfolios of IT services could support IT processes of AI and ME Domains to improve IT services for credit union customers.

II. Literature Review

A. IT Governance

IT governance represents the form of responsibility of the top management and becomes an integral part of organization governance [19]. It covers decision rights and accountability framework used to support expected behavior of using IT and ensuring that IT goals are achieved efficiently and effectively [20,21]. IT governance suitably directs the use of application portfolios into organization goals and expedites accurate dissemination of information [22]. A set of processes of managing and aligning IT, business goals, IT project resources, and IT performance control are a part of IT governance [23]. All IT processes always need assessment so that quality and compliance of organization needs are guaranteed [24]. IT governance assures that IT management processes applied by the board of directors, executive management, and IT management are conformed [25]. The design of IT governance should reach external efficiency and ensure that media and goals are documented well [25,26].

B. Model of IT Maturity Levels

The model of IT maturity includes grouping criteria of the capability to manage IT processes. The lowest level is Level 0 (zero/non-existent), while the highest one is Level 5 (optimized). The objective is to ease the comprehension of the management through description of each maturity level of IT governance [27]. Maturity values are designed as IT process profile [28]. Therefore, current and upcoming probability description is identifiable [28]. Maturity levels should be improved and several maturity criteria of IT processes should be fulfilled [29].

C. AI Domain

AI Domain covers technical feasibility and measurable investment solutions ascertaining improvement of application portfolios of minimal budget, efficient and effective infrastructure procurement, maintenance of human resource skills of IT, risk reduction of IT service implementation, change control of infrastructure, applications, and technical solutions. Acquisition and implementation require planning, communication management, and functioned IT infrastructure [30]. AI Domain comprises AI1 (identify automatic handling), AI2 (acquire and maintain application software), AI3 (acquire and maintain IT infrastructure), AI4 (enable operation and use), AI5 (fulfil IT resources), AI6 (manage changes), and AI7 (install and accredit solutions and changes) [31].

D. ME Domain

ME Domain includes strategy and tactics. IT mechanisms can contribute to control of conformity of achieving business goals. Moreover, actualization of observation strategy and evaluation should be planned, communicated, and managed. Also, IT infrastructure should be functioned as it is [30]. IT processes of ME Domain consist of ME1 (control and evaluate IT performance), ME2 (manage and evaluate internal control), ME3 (ensure fulfillment of external needs), and ME4 (provide IT governance) [31].

III. Research Method

This survey research applied a combination method and a convergent triangulation model trhough an explanatory design and follow-up explanation [32]. The research involved data collection. Specifically, data given by respondents working at 65 credit unions were obtained, computed, and quantitatively analyzed. All of them have applied application portfolios of IT services. Likert scales were used [33]. Next, computation results and quantitative data analysis were described based on qualitative analysis made through exclusion and inclusion approaches through a number of key informants [34].

In addition, maturity values of IT processes are calculated by using COBIT 4.1 [35]. It is framework of IT governance aimed to the management, control department, audit function, business process owners, and IT service staff. The goal is to ensure confidentiality, integrity, and availability of data in giving sensitive, critical information to reach organization goals [36,37]. This activity starts with the average of maturity values of IT processes. Next, aggregation values are calculated. The maturity value of IT processes is determined by using this formula: Index = $\{\Sigma$ (answers x maturity value) : (questions x respondents)$\}$ [38]. Calculation results of aggregation values are provided in forms of the table and radar chart (see Table 1).

TABLE I. Rounding Index Scales

Scale	Level of Maturity Model
4.51 – 5.00	5 – Optimized
3.51 – 4.50	4 – Managed and Measurable
2.51 – 3.50	3 – Defined Process
1.51 – 2.50	2 – Repeatable but Intuitive
0.51 – 1.50	1 – Initial/Ad Hoc
0.00 – 0.50	0 – Non-Existent

IV. Result and Discussion

Assessing maturity levels of IT governance should refer to appropriate levels to fulfil the standard of each IT process in relation to management of application portfolios of IT services. Planning of procurement and implementation of IT processes should have clear criteria related to IT investment risks. In order to avoid failure of procuring and implementing such processes, control and evaluation are needed. The maturity value can be a basic platform used to determine priority criteria of investment decisions and avoid

IT process failure. Through clear mapping of current condition, the basic of improving maturity values of appropriate portfolios can be actualized.

Based on computation results, maturity values of IT governance of AI and ME Domains show a number of gaps. Some IT processes are still unable to reach expected maturity values of IT governance. In other words, they lack the capability to support the activity of providing IT services for stakeholders. Obtained values are further not wholly at the third level (defined process) yet. The average of maturity values is at the scale of 2.51-3.50. However, there are two IT processes of each domain with values which are less than 2.51 such as AI4 (enable operation and use), AI5 (fulfil IT resources), ME1 (control and evaluate IT performance), and ME4 (provide IT governance). They are respectively 2.395, 2.466, 2.356, and 2.235 (see Tables II and III).

TABLE II. MATURITY LEVEL GAPS OF AI PROCESSES

Domain	Process	Testing Result	Maturity Level
AI1	Identify automatic handling	2.935	3
AI2	Acquire and maintain application software	2.863	3
AI3	Acquire and maintain IT infrastructure	2.822	3
AI4	Enable operation and use	2.395	3
AI5	Fulfil IT resources	2.466	3
AI6	Manage changes	2.742	3
AI7	Install and accredit solutions and changes	2.520	3

TABLE III. MATURITY LEVEL GAPS OF ME PROCESSES

Domain	Process	Testing Result	Maturity Level
ME1	Control and evaluate IT performance	2.478	3
ME2	Manage and evaluate IT control	2.889	3
ME3	Ensure fulfillment of external needs	2.876	3
ME4	Provide IT governance	2.489	3

For the average, AI Domain value is 2.678. This value is still low for the fulfillment of defined process standard. AI4 and AI5 Processes are less than 2.51. These two processes indicate that the use of application portfolios of IT services has not possessed formulation of IT services in conducting the operation. Specifically, there has been no manual support of procedures and measured standard. Also, availability of IT services is unable to manage IT resources. No obvious IT description on training materials is further found so that complexity of understanding and conduct exists. Besides, appropriateness of stating process standard and procedure manual is not found. Referring to the conduct, there has been no measured documentation system. IT training further tends to vary without structured and comprehensive mechanisms. Moreover, IT governance is improved without similar approaches for all business functions and work units, and are only oriented toward each individual. Then, planning and socialization on training and conduct of IT do not exist. Finally, IT processes still tend to be inconsistent and generally rely on conditions of individuals (see Figure 1).

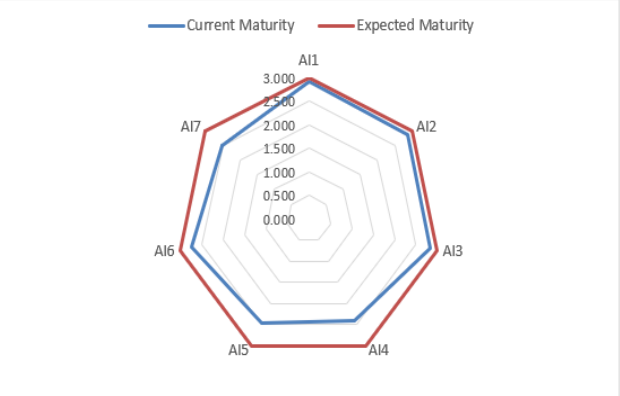

Fig. 1. Maturity Level Model of AI Domain

From the viewpoint of ME Domain, the average is 2.683. This value represents the use of application portfolios of IT services that is more centralized to needs of individuals of work units. There are two IT processes with values which are less than 2.51. Comprehensibly, the third level (defined process) is not reached. It is apparent that all credit unions have not owned clear planning on the program of effective, internal IT control through finely defined observation. In addition, there has been no effective IT governance defining organization structure, processes, IT leadership, and roles and responsibility assuring that IT investment services are appropriately conducted based on strategy and goals. Furthermore, control of IT processes has not gained serious observation and report. At last, possession of internal control used to guarantee operation effectiveness based on valid laws is absent (see Figure 2).

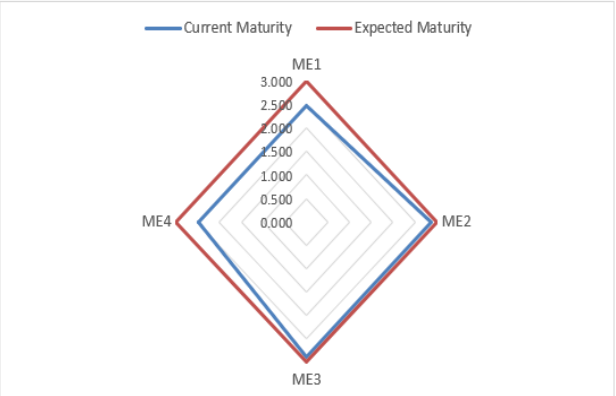

Fig. 2. Maturity Level Model of ME Domain

Research results show that description of IT processes is different. Not all IT processes are at the third level (defined process) yet. This fact remains important implications for heads of credit unions. There should be serious attention to ensure that information service performance can operate well to process credit union businesses. Improving AI4 Process (enable operation and use) can be through planning of addition, implementation, and maintenance of IT infrastructure to fulfil business functions and technical needs based on IT directions, implementation of internal control, security and audit size during confuguration, integration and treatment of hardware and software infrastructure used to protect resources and ensure availability and integrity, as

well as strategy development and planning of infrastructure treatment. Control changes should be in line with change management and procedures. AI5 Process (fulfil IT resources), nevertheless, immediately requires allocation to configure IT resource procedures. Procurement includes computing resources, servers, network devices, operation system, application software, programs and modules of software/internet, as well as consultants and other external human resources. Management and procurement of IT should not always be purchased. IT procurement can be conducted through independent application portfolios of IT services, hire of internet connection providers, workshops of IT infrastructure, relationships of the third party, cooperation with industries or service exchange with other vendors.

On the other hand, ME1 Process (control and evaluate IT performance) can be improved by defining all indicators of imformation services, especially content of the procurement schedule and IT infrastructure maintenance, using the technique and mechanism of measurement pertaining to the use of application portfolios of IT services, creating analysis results or reports by referring to each division when implementing IT services, and analyzing all measurement results. Mechanisms of control and evaluation are needed to ascertain that IT services are implemented based on directions and policies stated to control credit union businesses. ME4 Process (provide IT governance), conversely, can have betterment through processing and delivery of IT services. In this case, the management should take remedial actions on inappropriateness of existing processes through existing standard and improve effectiveness of IT governance by clearly defining organization structures, IT processes, leadership, rules, and responsibility to ensure that procurement and application of IT investment are based on strategy of businesses and IT services. Also, effectiveness of IT governance should refer to indicators becoming priorities based on results of maturity values.

It is noted that success of all IT service processes requires readiness to implement structures, functions, and relation mechanisms of content of IT governance by referring to expected maturity values. Besides, updates are needed to investigate all IT processes. This is essential for services and comfort given to customers. Availability and easiness of having offered IT services should be accessible. An additional suggestion is that IT governance is improved to guarantee more accurate mechanisms of control and evaluation of IT investment, generate business values, and anticipate impacts of IT risks.

Measurement results of IT governance of AI Domain, especially AI4 and AI5 Processes bring implications of managerial sides. The fact shows that document planning should have clear and structured standard, knowledge transfer of business management is conducted to inform IT service quality to customers, patterns and mechanisms of training of continually using application portfolios of IT services are planned, training materials, reference books, and procedures are prepared for customers making online transaction, and training is given to the whole staff so that knowledge and skills of using application portfolios of IT services are obtained. More things to cover are consistent improvement and fulfillment of several procedures and standards based on organization business process and guarantee of complete infrastructure of IT operation, facility supports, hardware, software, and services. The management of credit unions should clear procedures of modification and termination of contracts for all suppliers. Besides, procedure manuals should include validity of all documents, financial, organizational mechanism, document completion, performance, appropriate application portfolios of IT services, security, copyright, and responsibility mechanism. Finally, commitment should be built with external parties, especially IT industries.

These recommendations of IT governance model are more prioritized for domains with IT processes including values of criteria which are less than 2.51 such as AI4, AI5, ME1, and ME4. All of them have not reached the third level (defined process). Previous research did not specifically discuss context of application portfolios of IT services based on AI and ME Domains. Only DS Domain tended to be concerned [39,40,41]. Accordingly, real actions should be taken to improve IT processes through interrelationships of each input and output of control objective. Each IT process domain represents a detailed activity of each objective control when actualizing conformity of relationships with other domains, that is Plan and Organize (PO) and Deliver and Support (DS) Domains. This study is relevant to previous study [42,43]. Therefore, the findings of the study might impose some limitations. The following are strategic solutions of improving maturity values of IT governance based on inputs and outputs of control objectives, especially AI4, AI5, ME1, and ME4.

1) AI4 Process (enable operation and use) based on control objective input should include project planning of improving application portfolios of IT services completely, comprehension of needs of business units and proper installation, knowledge of used software applications and developing IT infrastructure, as well as document updates. Meanwhile, in terms of control objective output, procedure manuals expediting IT services, knowledge of mechanisms, and training supports should be available.

2) AI5 Process (fulfil IT resources) based on control objective input should include acquisition strategy of IT services, standard acquisition and procedures, detailed planning projects of IT service operation, suitable decisions and functions of IT procurement, and catalog supports of vendors which are appropriate with system needs and IT infrastructure ownership. Meanwhile, in terms of control objective output, there should be relationships with the third party, appropriateness of procurement and use of each item, and guarantee through clear appointments.

3) ME1 Process (control and evaluate IT performance) based on control objective input requires reports on use and costs of procurement. Project performance of improving application portfolios of IT services, information on change status of reports and performance of processes, clarity on planning, information on customer satisfaction, and reports of all complains are also needed. Meanwhile, in terms of control objective output, there should be input of IT service performance on IT planning, obvious, understandable activity planning, and reports of evaluation performance in using application portfolios of IT services.

4) ME4 Process (provide IT governance) based on control objective input requires clarity of IT process framework, reports of risk evaluation based on IT

implementation and effectiveness of IT service control, and validity of clear rules in relation to IT service deliveries. Meanwhile, in terms of control objective output, there should be improvement of IT process framework, reports of IT governance status, business investment involving capabilities of IT service strategy, and directions of business strategy aligned with IT service strategy.

V. Conclution and Future Research

The averages of values of IT governance of AI and ME Domains are respectively 2.678 and 2.683. They are already at the third maturity level (defined process). However, it is found that IT processes of AI4, AI5, ME1, and ME4 possess maturity values which are less than 2.51 and are at the second level (repeatable but intuitive). They are respectively 2.395, 2.466, 2.478, and 2.489. All these four processes need immediate anticipation due to the fact that the use of application portfolios of IT services is substantial for customers of credit unions in West Kalimantan.

Other IT processes are, nevertheless, at the third maturity level (defined process) as the values are at the interval of 2.51-3.00. In other words, the use of application portfolios of IT services is restricted to procedure standardization and documentation system ownership. Appropriateness of obvious synchronization and consistency of procedures, and implementation of IT services are, however, absent. Also, the use of automation media and software are very limited.

This research can be continued by emphasizing analysis of IT governance on interrelationships of AI, ME, PO, and DS Domains to obtain Key Performance Indicators (KPI) and Key Goal Indicators (KGI) of IT processes. Determining KPI and KGI through combination of each domain gap can contribute to more detailed information on each weakness aspect of IT process of IT governance for all credit unions in West Kalimantan. This stimulus is important for achievement of strategy conformity of businesses and IT. Thus, information service performance can have improvement.

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