Effectiveness of IT Governance of Online Businesses with Analytical Hierarchy Process Method

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***Abstract*- IT governance is indisputably required to ascertain accountability of the use of IT resources when providing additional business values. Therefore, there should be deep comprehension on effectiveness of appropriate IT governance based on business characteristics and strategic alignment of IT and businesses. This research aimed to find out essential entity of representativeness of each domain of IT governance for managers when making decisions to reach strategic alignment of IT and businesses effectively and efficiently. The survey was applied to 118 respondents, including online business managers in Pontianak, West Kalimantan, Indonesia. Analytical Hierarchy Process (AHP) Method was applied to map relative necessities of each domain and element of IT governance. Outcomes indicate that the highest score of effectiveness of strategic decisions applying IT governance of process domain is 3.114. Meanwhile, alternative elements of structures, processes, and relational mechanisms show that the highest score (11.043) noting that CIO should always report to CEO/COO exists. While the score of strategic planning of information system is 4.416, IT leadership has an absolute value.**

***Keywords*- Effectiveness, IT Governance, Online Businesses, Strategic Alignment of IT and Businesses, Analytical Hierarchy Process.**

I. INTRODUCTION

Apart from data processing, IT has become an integral part of actualizing continual business innovation. Success of implementation of information system and IT governance and businesses is synergy of goals and strategy [1]. It is realized that alignment of IT and businesses brings success of improving business performance. Effectiveness of the use of IT is linked to organizational capacities to possess fine IT governance [2]. This need reflects that IT governance is an integral part of organizing and expediting business activities sustainably [3].

Managing IT services of organizations dynamically, flexibly, innovatively, and consistently with good responsiveness is a crucial need to anticipate strategic alignment of IT and businesses [4]. Roles and functions of IT possess alignment in organizations. Complex dynamics of business processes cause imbalance of each level of organizations when maintaining business growth to achieve goals and competitiveness continually [5].

IT governance is of great importance since it ensures accountability of the use of IT resources when providing additional business values. It mainly supports business transformation [6]. IT governance is initially defined as the form of responsibility of managing IT functions. Next, it becomes the organizational capacity by the board of directors, executive management, and IT managers to control formulation and implementation of IT strategy with business functions [7]. IT advancement brings significant changes. The foci are on efficiency, strategic roles of fulfilling principal needs of organizations and academicians, and task completion [8]. It is obvious that IT governance is a capacity for the top management to control formulation and implementation of IT strategy through structures and processes of organizations when actualizing alignment of business attitudes. It also assures sustainable use of IT in achieving organizational goals [9].

The fact fundamentally implies that effectiveness of IT governance remains an important need at current and upcoming time for the management and stakeholders. Possessing proper, accurate, relevant IT governance can enhance expected values of all stakeholders [10]. IT governance provides guarantees of achieving business goals and prevents risks of failure or inappropriateness of business processes by concerning data processing [11] considering that IT governance should always ensure strategic alignment of IT and businesses to reach optimum of organizational growth [12].

Effectiveness of implementing IT governance has direct relationships with strategic alignment of IT and businesses [13]. It is noted that formulation of fine IT governance and clear strategy of IT by referring to organizational environment is divided into three primary categories such as structures, processes, and relational mechanisms [14]. IT governance represents decision rights and accountability framework specified to direct expected behavior by using IT [15]. The use of IT allows organizations to get new business opportunities and give maximal benefits through management system of IT empowerment and IT risks. IT should be controlled by IT departments and corporations through integration of all units of IT processes to justify perception of short-term and long-term goals [16].

Effectiveness of IT governance can be actualized through domain relationships of structures, processes, and relational mechanisms. Every domain influences the success of implementing IT governance in an organization. Structures involve roles and responsibility of steering committee and IT strategy committee. Meanwhile, processes refer to decision

making, planning of IT system strategy, management supervision, and mechanisms supporting relationships of IT and organizations. Finally, mechanisms cover active participation of executives and IT management, organizations, dialogs, training, experience exchange, knowledge, and communication of all organizations [17]. Effectiveness of implementing IT governance refers to three elements (domains) such as structures, processes, and relational mechanisms (see Figure 1).

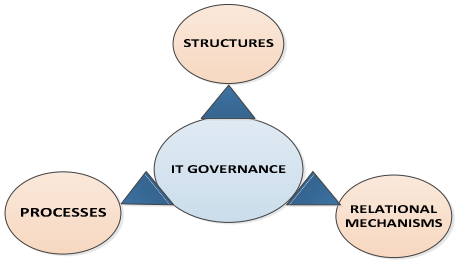

Fig. 1. Model of IT Governance

Actualizing fine organizations should be completed with clear goals based on vision and mission approved by founders. To reach them, special efforts consisting of strategy, preparation planning, achievement policies, and action programs are needed. Every organization has strategic planning encouraging periodical evaluation and assuring achievement of goals, organizational growth, and expansion of market shares. A successful determiner of strategic planning is well-planned IT management as effective use of IT heavily relies on fine IT governance [18]. In other words, organizations should possess planning and strategy of proper IT governance and implement strategic steps in prioritizing certain parts based on readiness of organizational resources.

Several previous studies show that substantial entity and accurate consideration of making decisions are required to achieve and enhance strategic alignment of IT and businesses based on organizational needs [19]. All elements of this research refer to research results [20], involve steering IT committee, CIO of executive committee, portfolio management, report and control of IT budget, IT strategy committee at the level of the board of directors, IT leadership, strategic planning of information system, steering IT project committee, CIO's report to CEO and/or COO, and IT project governance. It is noted that efforts of determining choices become important issues of building and implementing IT governance to achieve strategic alignment of IT and businesses.

The tendency of failure in achieving strategic alignment of IT and businesses happens due to inexistence of effectiveness of proper IT governance based on organizational conditions. IT is found that previous research discussed the entity without evidently comprehending relationships of domains and instruments of IT governance. Thus, this research aimed to find out essential entity of representativeness of each domain of IT governance for managers when making decisions to reach strategic alignment of IT and businesses effectively and efficiently by using AHP Method.

II. Research Method

In this research, effective steps of implementing IT governance with AHP Method were determined. This method is in the form of simulation and applied to decide best choices of a number of criteria (domains) and alternatives (subdomains). AHP Method is in hierarchical structures of criteria and sub criteria. The limit of inconsistent tolerance and analysis of sensitivity produces alternative decisions [21, 22]. AHP Method starts with definition of problems and elucidation of final goals. Furthermore, decomposition of problems in hierarchical structures with decision elements of criteria and alternatives, pairwise comparison of decisions in the form of the matrix, and estimation of relative weight of decision elements are conducted. Ultimately, hierarchical consistency is checked [22, 23].

In the implementation, goals were divided into several sub goals with the order of hierarchy, criteria, and objective, alternative levels. The collection of decomposition criteria became more detailed. After making identification, scores given were related to above levels. Relative scores of decisions were computed in hierarchical levels and synthesized. Next, composite scores of layer decisions and the total score were produced. This computation was relative and produced matrix scores. Following these, inconsistency of cognizing and identifying probable mistakes of inputting the data was tested. A matrix (i,j) is consistent if the whole elements follow transitivity (see Table I) [24, 25, 26].

TABLE I
Basic Scales of The Order of Importance

Order of Importance	Definition
1	As important as others
3	Moderately important
5	Strongly important
7	Very strongly important
9	Extremely important
2,4,6,8	Scores between two adjacent computations
Reciprocal	If Element i has one of the scores above in comparison to Element j, Element j has a reverse score.

A matrix score produced from random comparison is absolute, inconsistent. A determined limit of inconsistency is measured by using the Consistency Ratio (CR). The comparison of the Consistency Index (CI) and the Random Index (RI) yields reference scores used to determine consistency levels in the matrix. CR is calculated by using this formula: CR = CI / RI. On the other hand, CI is obtained through this formula: CI = (λmax-n)/n-1. RI refers to the stated average of consistency and the standard of CR calculation (see Table II) [27, 28].

TABLE II
AVERAGES OF CONSISTENCY (RI)

N	RI
1	0.00
2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49
11	1.51
12	1.48
13	1.56
14	1.57
15	1.59

Sources of quantitative data were interviews and questionnaires. Managers of organizations operating online businesses in Pontianak were the sample. Based on survey results, 118 respondents implemented IT governance and operated online businesses. Interviews were conducted in groups by using a social media application, i.e. WhatsApp. Meanwhile, questionnaires sent through email were filled out by respondents. Validation engaged several experienced informants implementing IT governance of online businesses. Such the activity reinforced results of quantitative data analysis through qualitative description. All data were processed based on steps of AHP Method afterwards to obtain relative priority scores of categories with the entity in actualizing strategic alignment of IT and businesses.

III. RESULTS AND DISCUSSION

Determining effectiveness of IT governance implementation starts with decisions of criteria based on preference comparison of each domain in the hierarchy. The criteria refer to models of IT governance implementation covering structures, processes, and relational mechanisms. On the other hand, alternatives of each criterion refer to all instruments frequently used in IT governance implementation. Requirements of this research depend on the results [20] indicating 10 main instruments such as steering IT committee, CIO of executive committee, portfolio management, report and control of IT budget, IT strategy committee at the level of the board of directors, IT leadership, strategic planning of information system, steering IT project committee, CIO's report to CEO and/or COO, and IT project governance. These instruments are alternatives of criteria based on the source of IT governance model (see Figure 2).

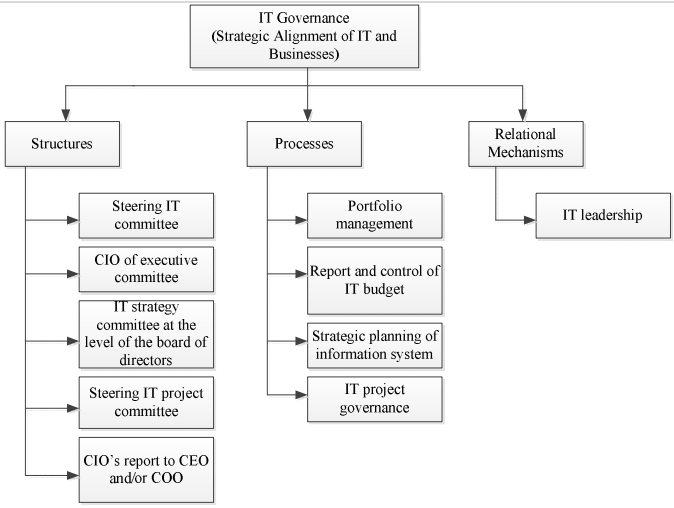

Fig. 2. Hierarchical Model of Criteria and Alternatives

IT governance provides a basic structure aligning IT processes, IT resources, and organizational needs of implementing strategy to achieve more effective values through relationships of organizations. IT governance is inseparable from organizational success of ascertaining measureable improvement of online business processes. It enables effective organizational strategy through strategic alignment of IT and businesses. IT governance is the structure of relationships and processes directing and controlling organizations by providing additional values of the use of IT. IT also reflects organizational actions taken by the board of directors, executive managers, and IT management to control formulation and implementation of IT strategy. Settings pertaining to IT in online businesses should be aligned with existing organizational devices and expected goals. Also, Organizing IT should become a part of online businesses.

Structures, processes, and relational mechanisms of IT governance are comprehensively related to each other in fulfilling the needs of business information services. This condition is also a part of success of online businesses in Pontianak. Mechanism effectiveness of relationships of structures and processes of IT governance can prevent failure of IT alignment when giving online business services. Structures are the limitation of components building the system whereas processes are sets of mechanisms of component relationships. These two kinds of elements essentially function as the controller and determiner of IT decision makers to reach the success of IT governance implementation of online businesses.

Effectiveness with IT governance consists of structures, processes, and relational mechanisms. Calculation results of all hierarchical criteria before simplification are that the pairwise comparison of scores between (a) structures and processes, (b) structures and relational mechanisms, as well as (c) processes and relational mechanisms are consecutively 0.143, 0.250, and 0.625. Eigenvectors of the three domains are respectively 0.182, 0.703, and 0.115.

In the next step, CR of each criterion was computed. The aim was to assess the comparison result of validity. CR was obtained through comparison of CI and RI. The formula of CI is (λmax-n)/n-1 whereas RI is the score determined by using AHP Method. For requirements, the used RI is 0.58 (see Table II). It is further found that CI is 0.027 and CR is 0.047 (4.67%). This implies that effectiveness of success of implementing IT governance of online businesses in Pontianak should focus more on belief of online transaction in comparison to other criteria. The indicator is Eigenvector = 3.114 (see Table III).

TABLE III
MEASUREMENT OF CRITERION CONSISTENCY

Alternatives	Structures	Processes	Relational Mechanisms	Total	Summary
Structures	0.182	0.141	0.230	0.553	3.033
Processes	0.911	0.703	0.575	2.189	3.114
Relational Mechanisms	0.091	0.141	0.115	0.347	3.016
				Total	9.163
				λ Max	3.054

Referring to measurement results, it is clear that processes have the highest score. Hence, online businesses in Pontianak immensely depend on processes of online transaction. In order to achieve strategic alignment of IT and businesses, clarity of measurable processes is requisite.

The first decision determines IT principles of blueprint designs of the use and development of IT. It remains the reference of developing strategy, programs, policies, standards, and procedures pertaining to business activities and IT. There should be determination of decision processes of IT architecture for needs of managing data logic, applications, and infrastructure of IT in achieving integration and standardization of all business activities. This is continued by planning of IT capabilities to provide information services to fulfill online business applications, determination of IT investment priority in the form of the spent budget, as well as measurement of investment feasibility and portfolio distribution of IT applications between corporation levels and business units. The next step is to find out the most important alternative of each element of IT governance (see Tables IV and V).

TABLE IV
PAIRWISE COMPARISON OF ALTERNATIVES ON STRUCTURE CRITERION

Structure Criterion		A1	A2	A3	A4	A5
Steering IT Committee	(A1)	1.000	3.000	6.000	4.000	2.000
CIO of Executive Committee	(A2)	0.333	1.000	4.000	2.000	3.000
IT Strategy Committee at the Level of the Board of Directors	(A3)	0.167	0.250	1.000	3.000	5.000
Steering IT Project Committee	(A4)	0.250	0.500	0.333	1.000	4.000
CIO's Report to CEO/COO	(A5)	0.500	0.333	0.200	0.250	1.000

TABLE V
SUPERMATRIX OF PAIRWISE COMPARISON OF ALTERNATIVES ON STRUCTURE CRITERION

Structure Criterion	A1	A2	A3	A4	A5	Eigen vectors
A1	0.444	0.590	0.520	0.390	0.133	0.416
A2	0.148	0.197	0.347	0.195	0.200	0.217
A3	0.074	0.049	0.087	0.293	0.333	0.167
A4	0.111	0.098	0.029	0.098	0.267	0.121
A5	0.222	0.066	0.017	0.024	0.067	0.079

Based on Eigenvectors shown, the order of alternatives of IT governance of the structure criterion is steering IT committee (0.416), CIO of executive committee (0.217), IT strategy committee at the level of the board of directors (0.167), steering IT project committee (0.121), and CIO's report to CEO/COO (0.079). CI is measured through multiplication of scores in columns and obtained Eigenvectors. For a 5x5 matrix, CR should be less than 10%. Based on CI calculation, 0.089 exists. However, CR equals 0.079 (7.91%). Therefore, it is acceptable. The index (11.043) shows that the structure element of alternatives that should be concerned is CIO's report to CEO/COO (see Table VI).

TABLE VI
CONSISTENCY MEASUREMENT OF ALTERNATIVES ON STRUCTURE CRITERION

Structure Criterion	A1	A2	A3	A4	A5	Total	Summary
A1	0.416	0.652	1.003	0.030	0.040	2.141	5.150
A2	0.139	0.217	0.669	0.060	0.026	1.111	5.113
A3	0.069	0.054	0.167	0.040	0.016	0.347	2.074
A4	0.104	0.109	0.056	0.121	0.020	0.409	3.391
A5	0.208	0.072	0.033	0.482	0.079	0.875	11.043
						Total	26.771
						λ Max	5.354

Criteria with the highest priority are processes of four main alternatives, i.e. portfolio management, report and control of IT budget, strategic planning of information system and IT project governance. The next step is to cognize the highest score of every alternative of implementing IT governance effectively and efficiently (see Tables VII and VIII).

TABLE VII
PAIRWISE COMPARISON OF ALTERNATIVES ON PROCESS CRITERION

Process Criterion		B1	B2	B3	B4
Portfolio Management	(B1)	1.000	3.000	6.000	4.000
Report and Control of IT Budget	(B2)	0.333	1.000	4.000	2.000
Strategic Planning of Information System	(B3)	0.167	0.250	1.000	3.000
Project Governance	(B4)	0.250	0.500	0.333	1.000

TABLE VIII
SUPERMATRIX OF PAIRWISE COMPARISON OF ALTERNATIVES ON PROCESS CRITERION

Process Criterion	B1	B2	B3	B4	Eigen vectors
B1	0.273	0.375	0.268	0.216	0.283
B2	0.045	0.063	0.107	0.027	0.061
B3	0.545	0.313	0.536	0.649	0.511
B4	0.136	0.250	0.089	0.108	0.146

Based on Eigenvectors shown, the order of alternatives of IT governance of the process criterion is strategic planning of information system (0.511), portfolio management (0.283), project governance (0.146), and report and control of IT budget (0.061). CI is measured through multiplication of scores in columns and obtained Eigenvectors. For a 4x4 matrix, CR should be less than 9%. Based on CI calculation, 0.076 exists. However, CR equals 0.085 (8.46%). Therefore, it is acceptable. The index (4.416) shows that the process element of alternatives that should be concerned is strategic planning of information system (see Table IX).

TABLE IX
CONSISTENCY MEASUREMENT OF ALTERNATIVES ON PROCESS CRITERION

Process Criterion	B1	B2	B3	B4	Total	Summary
B1	0.283	0.363	0.255	0.292	1.193	4.217
B2	0.047	0.061	0.102	0.036	0.246	4.069
B3	0.566	0.303	0.511	0.876	2.255	4.416
B4	0.141	0.242	0.085	0.146	0.615	4.212
					Total	16.914
					λ Max	4.228

A final criterion is relational mechanisms of IT governance. It is influenced by IT leadership and online business management. Previous research shows that IT leadership becomes a crucial part of success in determining appropriateness of structures and processes. Ownership of structures and processes without IT leadership in managing cooperation of business units and IT causes digital disruption of online businesses in Pontianak. Previous research also suggests that the growth rate of online businesses in Pontianak is low due to complexity of building business communication of IT units with different aims and needs.

Improving effectiveness of alignment in mapping strategy of IT and businesses is inseparable from IT leadership enabling digital business models. Effectively encouraging business performance of online businesses, assuring transparency and accountability of marketing products online, as well as building effective communication through training and work rotation of units are others to consider. Currently, the majority of business performers market products online without optimalizing competitiveness and completely understanding work culture and online business processes. Besides IT empowerment, there should be dissemination, socialization, and attitude changes. Accordingly, changes of individual, industrial, and societal environment can flexibly and rapidly adapted.

IV. CONCLUSION AND FUTURE RESEARCH

The highest score of effectives of IT governance in online businesses is the process criterion. Processes determine IT principles, IT architecture decisions, IT capabilities, online business applications, IT investment priority, and IT application distribution at the level of corporations and all business units in order to achieve strategic alignment of IT and businesses. Meanwhile, an alternative with the highest score is CIO's report to CEO/COO so that blueprint designs can be developed in strategic information system planning through IT leadership. It is expected that future research can reach the area of West Kalimantan and involve respondents other than online business managers.

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