

# The Impact of Information Technology Governance Maturity Level on Corporate Productivity: a Case Study at an Information Technology Services Company

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**Abstract—** The positive impact of an organization's Information Technology (IT) Governance maturity level on the organization's business performance has been stated by many researchers in the IT governance literature. However, there are reports that casted a doubt on such a claim. This study, yet another exploration on the subject, is aimed at investigating any correlation between a company's IT governance maturity level and its business performance – represented by a number of productivity measures. The company under this study is a publicly-listed company in the IT services industry. The IT governance maturity level is measured using the maturity model provided by Control Objective for Information and Related Technology (COBIT) version 4.1. The productivity measures are the profit per employee and the total factor productivity. Through a non-parametric statistical hypothesis testing method – the Spearman Rank Correlation Test – a positive correlation is found between the maturity level and the profit-based productivity measure, but not the total factor productivity measure. Investigating the latter result, we discovered an interesting observation that might explain why some studies did not find any positive correlation between the maturity level and certain business performance measures. In our case, we found that there was an apparent time lag between the improvement of the company's IT Governance maturity level and the increase in the company's productivity level.

## I. INTRODUCTION

ONE of the main focus areas of Information Technology (IT) Governance is the alignment between organization's business strategy and its IT strategy. The more mature, or well established, an organization's IT Governance the better the alignment of the two strategies. Such alignment is deemed to be a key to an organization's success through the use of IT. In other words, an organization will reap the most

benefit from IT when its IT strategy is aligned with its business strategy, which can be easily achieved if the organization's IT Governance is mature. The positive link between IT Governance maturity level and business performance has been much published. However, there have been many researchers who casted a doubt on such a claim as they did not find such a positive correlation.

The objective of this study is to investigate the correlation between an organization's IT Governance maturity level and a number of the organization's business performance measures, and to find out if there are any inconsistencies amongst the correlation values. The object of the case study is a publicly-listed company whose business is in the IT services industry. At the request of the company, we do not disclose the company's name and, instead, we use an arbitrary name, AA, as the name of the company. AA's vision is to become the best information and communication technology-based solution provider in Indonesia. By the end of 2007, AA had 22 offices throughout the country [1]. AA has been relying on IT to support its business. For this study, we obtained the company's financial reports for year 2005, 2006 and 2007. The reports for year 2008 onward were excluded from the study because the global financial market crash in 2008 had significantly affected the company's financial performance, resulting in data that is out of its normal pattern.

## II. PREVIOUS STUDIES

Many publications have stated that good IT governance increases profit margins, raises market capitalization, and enhances shareholder returns. For example, it was stated that companies with above average IT governance maturity levels are 20% more profitable than similar firms with poorer governance maturity levels [2], investors pay 14%-22% more for well-run, well-governed companies [3], and top-rated corporate governance companies consistently return more than triple to investors than that of lower-rated

companies over 3-, 5- and 10-years [4].

Dodds [5] stated that if an organization improves its IT governance, shareholder return on its IT supported strategy and investment will consequently improve.

A study by Nash [6] measured the impact of an organization's maturity in aligning its IT and its business on the organization's productivity and profitability. The alignment maturity level was measured using the Luftman's maturity model [7], called the Strategic Alignment Maturity Model (SAMA). The organization's productivity was measured using Total Factor Productivity (TFP), and its profitability was measured using Sales Level, Enterprise Value to Sales, and Net Profit Margin. The study that was conducted on nine pharmaceutical companies concluded that:

- Companies with higher profitability and productivity are companies with higher IT/business alignment maturity levels.
- Companies with poor communication between their IT and business units have low sales levels.
- The size of the alignment gap between IT strategy and business strategy has a positive correlation with the size of the company. It was shown that the larger the company the more difficult to build good communication between the IT and business units.

A study by Tugan [8] attempted to determine whether a correlation exists between IT governance – represented by an IT maturity index – and profitability – represented by earnings per share (EPS), return on assets (ROA), and return on equity (ROE) – on 21 publicly-listed companies belonging to the Philippine food, beverage and tobacco industry. The results showed that there is a very weak negative correlation between IT maturity index and EPS, a very weak positive correlation between IT maturity index and ROA, and a weak positive correlation between IT maturity index and ROE. Overall, there was no significant correlation between the IT maturity index and the three performance measures.

### III. COBIT-BASED MATURITY LEVEL

Among the models that are commonly used for measuring the maturity level of an organization's IT Governance is one of the Control Objective for Information and Related Technology (COBIT) from the Information Technology Governance Institute (ITGI) [9]. COBIT version 4.1 is a globally accepted framework that defines controls that must be in place for IT management processes to be effective. The controls are mechanisms formed by organizational structures, procedures, and relational or communication mechanisms, designed to ensure that IT strategy is aligned with business strategy, IT delivers values to business, IT risks are managed, IT resources are utilized optimally, and IT performance is measured for continual improvement [10].

COBIT 4.1 also provides indicators and criteria for

measuring the maturity level of each of its 34 IT management processes. The maturity level of a process refers to the maturity of the controls embedded in the process. The COBIT maturity model uses the same approach as the Capability Maturity Model (CMM) from the Software Engineering Institute [11], which defines 5 levels of maturity: 0 - non-existent, 1 - ad-hoc, 2 - repeatable, 3 - defined, 4 - managed, and 5 - optimized.

It should be noted that it is not necessary for an organization to implement all of the 34 COBIT's IT processes, but only processes that support its IT goals which are derived from its business goals. COBIT 4.1 provides mappings from business goals to IT goals, and from IT goals to IT processes.

ITGI also published mapping tables between the control objectives of COBIT 4.1 and many other IT-related standards as well as frameworks, including the IT Infrastructure Library (ITIL) version 3 from the British Office of Government Commerce [10].

### IV. PRODUCTIVITY MEASURE

Productivity is the amount of output produced divided by the input used to produce the output. AA, the company in our case study, defines its productivity index – referred to here as the profit per employee (*PPE*) – as follows:

$$PPE = \frac{IFO}{MF} \quad (1)$$

where

*IFO* : is the income from operation or operating income, defined as revenue subtracted by operation expenses;

*MP* : is the number of employee or man power used to produce the income.

Another commonly used productivity index is the total factor productivity (TFP). TFP measures the change in profit per employee by taking into account changes in the company's revenue and asset. The definition of TFP used in this study is the same as that of Nash [6], i.e.:

$$TFP = \Delta RE \times K \quad (2)$$

where

$\Delta RE$  : is the percentage of change in revenue amount per employee,

$\Delta AE$  : is the percentage of change in assets per employee, and

*K* : is a constant representing the impact of IT investment on productivity. We use  $K = 0.19$  based on the data from the APO Productivity Databook 2010, published by the Asian Productivity Organization [12].

It is worth noting that, since this study is only concerned with the trend over time, the choice of *K* has no impact on the result of this study.

## V. METHODOLOGY

The study is conducted as follows. First, we identify the company's Critical Success Factors (CSF) during the time span of the data being studied, i.e., 2005-2007, based on the company's past business strategy documents. Next, we identify COBIT-based IT management processes that are relevant to the company's annual business strategy. The IT processes are obtained based on the relevant COBIT's IT goals, which are identified based on the relevant COBIT's business goals, which, in turn, are identified based on their relevance to the company's CSF.

The next step is to measure the maturity level of the relevant IT management processes based on the maturity of the controls as defined in COBIT. However, since the time references of the study are in the past, historical maturity data is required. Fortunately, such data is available as the company had been routinely, i.e., annually, measuring the maturity of its IT Service Management (ITSM) based on the ITIL framework. The COBIT-based maturity level cannot be directly obtained from the ITIL maturity data. The data must first be translated by extracting the maturity data of control items in ITIL that contribute to the COBIT IT processes being measured. The control items are identified using the COBIT 4.1 and ITIL 3 mapping published by ITGI [10].

The final step of the study is to measure the correlation between the maturity level of the company's IT governance, on one hand, and the company's PPE and TFP, on the other hand. A non-parametric statistical hypothesis testing using the Spearman rank correlation coefficient [13] is used to measure the significance of the correlation. The hypotheses being tested are:

H1: the company's IT governance maturity level correlates positively with the company's profit per employee.

H2: the company's IT governance maturity level correlates positively with the company's total factor productivity.

## VI. IT GOVERNANCE MATURITY LEVEL

The IT governance maturity level of AA is the average maturity level of the company's IT management processes that are relevant to the company's business strategy. In order to identify the relevant IT processes, first, we identify the company's CSFs from its business strategy. Then, use the CSFs to identify the relevant COBIT's business goals, map the business goals to COBIT's IT goals, and finally, identify the COBIT's IT processes that support the achievement of the IT goals. This is performed for each of the time periods, i.e., 2005, 2006, and 2007. Due to space limitation, we only show the mapping process for the period of 2005 to provide some idea how the method is performed.

Table I summarizes AA's business strategy for year 2005 and the CSF of each of the strategy items as written in the company's strategic plan document.

TABLE I  
AA'S BUSINESS STRATEGY FOR 2005 AND THE CRITICAL SUCCESS FACTORS OF EACH STRATEGY ITEM

05S1	<b>Business Strategy 1:</b> Improve competence in providing IT-based solutions.	
05S1-CSF1	Develop IT services business by optimizing the portfolio of products under the services business division.	
05S1-CSF2	Strengthen quality management by renewing ISO9001 certification.	
05S1-CSF3	Improve the quality of corporate data.	
05S2	<b>Business Strategy 2:</b> Strengthen competitiveness and increase value creation/contribution.	
05S2-CSF1	Improve marketing network effectiveness through policies that are oriented toward better market leadership.	
05S2-CSF2	Improve employee productivity through motivational training programs and knowledge upgrading.	
05S2-CSF3	Improve employees' expertise, both in the sales processes and product/solution knowledge.	
05S3	<b>Business Strategy 3:</b> Integrate solutions with orientation toward increasing customers' value and satisfaction.	
05S3-CSF1	Develop services business portfolio using the VSS (corporate's proprietary) methodology.	

Using COBIT's mapping tables, the COBIT's IT goals relevant to AA's business strategy are obtained, as shown in Table II.

TABLE II  
MAPPING OF AA'S CSFs TO COBIT'S BUSINESS GOALS, AND THE BUSINESS GOALS TO COBIT'S IT GOALS FOR THE COMPANY'S BUSINESS STRATEGY OF 2005

CSF	Business Goal	IT Goals No.
05S1-CSF1	BG05 - Offer competitive products and services	ITG05, ITG24
05S1-CSF2	BG12 - Provide compliance with external laws, regulations and contracts	ITG02, ITG19, ITG20, ITG21, ITG22, ITG26, ITG27
05S1-CSF3	BG09 - Obtain reliable and useful information for strategic decision making	ITG24, ITG12, ITG20, ITG26
05S2-CSF1	BG15 - Improve and maintain operational and staff productivity	ITG07, ITG08, ITG11, ITG13
05S2-CSF2	BG15 - Improve and maintain operational and staff productivity	ITG07, ITG08, ITG11, ITG13
05S2-CSF3	BG17 - Acquire and maintain skilled and motivated people	ITG09
05S3-CSF1	BG04 - Improve customer orientation and service	ITG03, ITG23

Table III shows the list of codes representing the IT processes relevant to AA's business strategy. Codes that begin with 'PO' indicate processes in COBIT's

Plan & Organize domain, the 'AI' prefix is for processes in the Acquire & Implement domain, 'DS' for processes in the Deliver & Support domain, and 'ME' for processes in the Monitor & Evaluate domain.

TABLE III  
MAPPING OF AA'S CSFS TO COBIT'S BUSINESS GOALS, AND THE BUSINESS GOALS TO COBIT'S IT GOALS FOR THE COMPANY'S BUSINESS STRATEGY OF 2005

IT Goal	Process Codes
ITG02 - Respond to governance requirements in line with board direction	PO1 PO4 PO10 ME1 ME4
ITG03 - Ensure satisfaction of end users with service offerings and service levels	PO8 AI4 DS1 DS2 DS7 DS8 DS10 DS13
ITG04 - Optimise the use of information	PO2 DS11
ITG05 - Create IT agility	PO2 PO4 PO7 AI3
ITG07 - Acquire and maintain integrated and standardised application systems	PO3 AI2 AI5
ITG08 - Acquire and maintain an integrated and standardised IT infrastructure	AI3 AI5
ITG09 - Acquire and maintain IT skills that respond to the IT strategy	PO7 AI5
ITG11 - Ensure seamless integration of applications into business processes	PO2 AI4 AI7
ITG12 - Ensure transparency and understanding of IT cost, benefits, strategy, policies and service levels	PO5 PO6 DS1 DS2 DS6 ME1 ME4
ITG13 - Ensure proper use and performance of the applications and technology solutions	PO6 AI4 AI7 DS7 DS8
ITG19 - Ensure that critical and confidential information is withheld from those who should not have access to it	PO6 DS5 DS11 DS12
ITG20 - Ensure that automated business transactions and information exchanges can be trusted	PO6 AI7 DS5
ITG21 - Ensure that IT services and infrastructure can properly resist and recover from failures due to error, deliberate attack or disaster	PO6 AI7 DS4 DS5 DS12 DS13 ME2
ITG22 - Ensure minimum business impact in the event of an IT service disruption or change	PO6 AI6 DS4 DS12
ITG23 - Make sure that IT services are available as required	DS3 DS4 DS8 DS13
ITG24 - Improve IT's cost-efficiency and its contribution to business profitability	PO5 DS6
ITG26 - Maintain the integrity of information and processing infrastructure	AI6 DS5
ITG27 - Ensure IT compliance with laws, regulations and contracts	DS11 ME2 ME3 ME4

Table IV lists the IT processes of which maturity levels are to be measured for year 2005. Similar analyses are done to the data of year 2006 and 2007. Table IV shows the recapitulation of IT processes for year 2005, 2006 and 2007.

As mentioned earlier in the discussion of methodology, we need to use AA's maturity level data of the company's ITIL processes to obtain the maturity levels of the COBIT processes already identified. It is important to note that there are some COBIT processes that are not implemented fully by any ITIL processes, but only partially (only some of the COBIT processes' control objectives). In this

study, we treat such partial control implementations as full implementation. We can do so because this study is not concerned with the precision of the maturity level, but with the changes of the maturity level over time. As long as the maturity levels for the periods are calculated consistently there should be no problem.

TABLE IV  
LIST OF COBIT'S IT PROCESSES OF WHICH MATURITY LEVELS ARE TO BE MEASURED FOR YEAR 2005, 2006 DAN 2007, RESPECTIVELY

Process	2005	2006	2007
PO1 Define a strategic IT plan	V	V	V
PO2 Define the information architecture	V	V	V
PO3 Determine technological direction	V	V	
PO4 Define the IT processes, organisation and relationships	V	V	V
PO5 Manage the IT investment	V	V	V
PO6 Communicate management aims and direction	V	V	V
PO7 Manage IT human resources	V	V	V
PO8 Manage quality	V	V	V
PO9 Assess and manage IT risks			
PO10 Manage projects	V	V	V
AI1 Identify automated solutions		V	
AI2 Acquire and maintain application software	V	V	
AI3 Acquire and maintain technology infrastructure	V	V	V
AI4 Enable operation and use	V	V	
AI5 Procure IT resources	V	V	
AI6 Manage changes	V	V	V
AI7 Install and accredit solutions and changes	V	V	V
DS1 Define and manage service levels	V	V	V
DS2 Manage third-party services	V	V	V
DS3 Manage performance and capacity	V	V	
DS4 Ensure continuous service	V	V	V
DS5 Ensure systems security	V	V	V
DS6 Identify and allocate costs	V	V	V
DS7 Educate and train users	V	V	
DS8 Manage service desk and incidents	V	V	
DS9 Manage the configuration			
DS10 Manage problems	V	V	
DS11 Manage data	V	V	V
DS12 Manage the physical environment	V	V	V
DS13 Manage operations	V	V	V
ME1 Monitor and evaluate IT performance	V	V	V
ME2 Monitor and evaluate internal control	V	V	V
ME3 Ensure compliance with external requirements	V	V	V
ME4 Provide IT governance	V	V	V

Taking the ITIL maturity level data of the company for year 2005, 2006, dan 2007, we obtained the 'radar charts' of the company's COBIT process maturity levels. Fig. 1, 2, and 3 show the charts for the periods of 2005, 2006, and 2007, respectively.

In order to compare between the IT governance maturity levels and the company's productivity indices, the single value maturity level for a year period is computed as the average maturity level across the processes within the year.

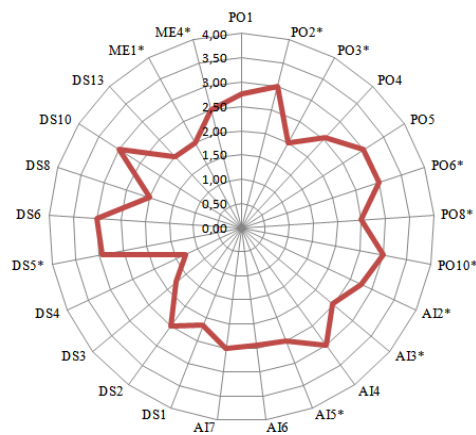


Fig. 1. The company's COBIT IT processes maturity levels for year 2005. Asteric marks indicate processes that are not implemented fully by ITIL processes.

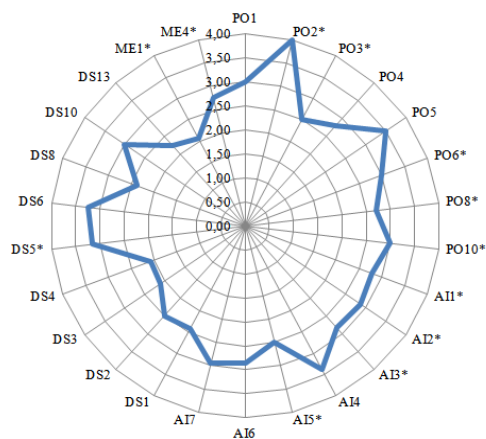


Fig. 2. The company's COBIT IT processes maturity levels for year 2006. Asteric marks indicate processes that are not implemented fully by ITIL processes.

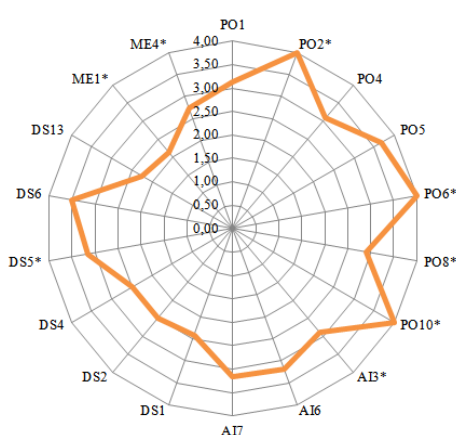


Fig. 3. The company's COBIT IT processes maturity levels for year 2007. Asteric marks indicate processes that are not implemented fully by ITIL processes.

Fig. 4 shows the company's increase in its IT Governance maturity levels over the years. As can be seen in Fig. 4, there had been a continuous

improvement of the company's IT governance maturity levels from year 2005 to 2007.

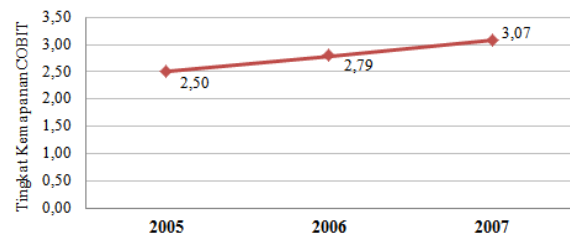


Fig. 4. The growth of the company's IT governance maturity level from 2005 to 2007.

## VII. BUSINESS PRODUCTIVITY

In order to compute the company's productivity indices, i.e., the PPE and TFP, we gather the needed data from the company's annual report. Table V summarizes the values of the productivity indices' components.

TABLE V  
THE PRODUCTIVITY INDICATORS' COMPONENTS AND THEIR VALUES  
FOR YEAR 2005-2007

Productivity Component	2005	2006	2007
Revenue	545.46	619.04	725.58
<i>IFO</i>	56.32	76.73	95.05
Total Assets	518.80	584.84	624.56
MP	958	974	971
<b><i>PPE: IFO/MP</i></b>	<b>58.79</b>	<b>78.78</b>	<b>97.89</b>
<i>ARE</i>	18.75%	11.63%	17.57%
<i>AAE</i>	-6.58%	10.88%	7.12%
<i>K</i>	0.19	0.19	0.19
<b><i>TFP:</i></b>	<b>20.00%</b>	<b>9.56%</b>	<b>16.22%</b>
$ARE - (AAE \times K)$			

Fig. 5 and 6 show the trajectories of the company's PPE and TFP, respectively, from year 2005 to 2007.

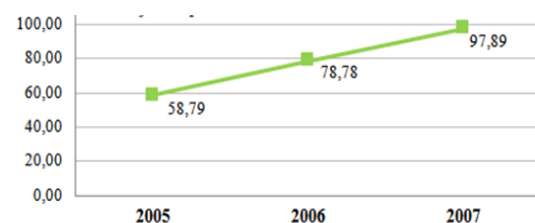


Fig. 5. The company's profit per employee for year 2005-2007.

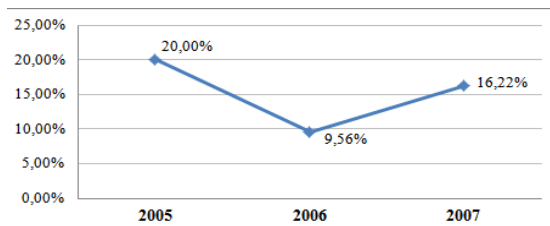


Fig. 6. The company's total factor productivity for year 2005-2007.

### VIII. CORRELATION SIGNIFICANCE

In order to determine whether there is a significant correlation between AA's IT governance maturity level and its productivity indicators, we compute the Spearman's rank correlation coefficient for each of the hypotheses stated in the discussion about methodology.

The Spearman's rank correlation coefficient,  $\rho$ , measures the strength of the correlation between two lists of rank order. The correlation coefficients are computed for the rank orders shown in Table VI.

TABLE VI  
RANK ORDERS USED IN THE SPEARMAN'S RANK CORRELATION COEFFICIENTS COMPUTATION

Year	Maturity level rank	PPE rank	TFP rank
2005	1	1	3
2006	2	2	1
2007	3	3	2

A very strong correlation, having  $\rho = 1.0$ , is found between the company's IT governance maturity level and its PPE. However, there is no correlation, with  $\rho = -0.5$ , between the maturity level and the company's TFP. In other words, hypothesis H1 is accepted, and hypothesis H2 is rejected.

### IX. CONCLUSION

There is an apparent correlation between the company's IT governance maturity level and the company's bottom line performance indicators such as revenue and profit. Taking a closer look at the business performance by using the amount of profit growth as the measure, however, no such correlation is found. The result of this single case study has demonstrated that one should not make a presumption that implementing, or let alone improving, IT governance will result in substantial business performance improvement.

However, our data reveals an interesting observation, despite the limited time span of our data. The data seems to suggest that there is a time delay

between the improvement of IT governance maturity level and the perceived benefit obtained from having more effective and less risk-prone IT solutions. In our case, the time delay could be in the order of one year. We could not validate this hypothesis as the data for year 2008 and onward are not usable due to the impact of the 2008 global financial crisis. Nonetheless, it may be enough to suggest that measuring the impact of implementing an IT governance mechanism on business performance within the same time period may result in a misleading conclusion, especially for IT governance mechanisms that take months or years to become an integral part of the organization's daily routine.

Needless to say, a company's productivity is affected by some other factors besides IT governance maturity level. There needs to be a method to limit the scope of the measurement only to parts of the business that rely on IT-based solutions. Much research needs to be done to explore the time delay effect in measuring the impact of IT governance. The amount of delay itself may be changing over time depending on a number of factors, including the organization's readiness to adopt the IT governance mechanisms, the level of organization's reliance on IT, and the level of competence of the IT staff members.

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