Influence of physical and network security on company efficiency using SEM

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Abstract. A computer network is a system consisting of two or more computers that are interconnected and designed to share resources, communicate, and access information. Nowadays, IT security plays an important role in a company. The purpose of this study is to get an overview of the performance of IT security and network security to improve the efficiency of company. Implementing IT security and network security, however, poses major challenges to many organizations. To ensure IT and network security, the article applies SEM method to analyze its influence in performance efficiency. The research results show that physical security is more influential on enterprise efficiency than network security. The outcome of the article is expected to deliver reference for companies to apply appropriate physical and network security.

1 Introduction
The use of computer networks has become essential tool in changing daily life and the way companies carry out their business processes. However, recent computer attacks have attracted attention around the world. Due to all transformation, computer security issues especially related to the use of Internet have not received serious attention since last decade. According to a survey conducted by Ware (2002) in CSO research report, the average company only allocates 7% to 8% of the information technology budgets for securing IS assets [1-2].

The components needed for network security are summarized as network perimeter, internal network, human factor. The network perimeter consists of a static packet filter, firewall, IDS (Intrusion Detection System), VPN (Virtual Private Network). Some of the internal network technologies are personal firewall, anti-virus software, operating system hardening, configuration hardening, and audit.

In the previous studies, the effect of the security of transacting on the success of e-commerce business shows that the higher security level contributes higher success rates of the penetration of digital use in the marketplace [3]. The human factors such as: employee Engagement and ability [4] are among the It is expected that the benefits gained from this study is for IT professionals to measure the effectiveness of physical and network security to increase efficiency in IT companies’ factors. Thus, in this paper, we present our study on the influence of Physical and Network Security on Company Efficiency.

2 Research Model & Methodology
The research model in this study is shown the Figure 1 and in Table 1. It is a Structural equation modeling (SEM) [5][6][7]. The samples were surveyed from 200 respondents of IT professionals in Jakarta greater area. The correspondent’s roles are including IT Manager, Data Security Staff, Network.
Administrator, System Administrator, Computer Network Security Consultant. Five Likert scales are used in the surveys in the study. The data analysis was conducted using AMOS.

![Diagram of the research model]

**Figure 1.** Research Model.

**Table 1.** The Development of the Theory-Based Model.

| CONSTRUCT          | INDICATOR                                      |
|--------------------|------------------------------------------------|
| (X) Physical Security | X1 = Physical Control                           |
|                    | X2 = Technique Control                          |
| (X) Network Security | X3 = Network Perimeter                          |
|                    | X4 = Network Internal                            |
|                    | X5 = Human Factor                                |
| (Y) Company Efficiency | Y1 = Financial/Potential Loss                 |
|                    | Y2 = Property Intellectual                      |
|                    | Y3 = Good Relationship                           |
|                    | Y4 = Company Image                               |

### 3 Results & Analysis

#### 3.1 Descriptive analysis

The respondent’s demography in this study are shown in Table 2, Table 3, Table 4,
3.2 Validity & Reliability Test

The value of $P$ on each indicator is below the value of 0.05, this indicates that the indicator is valid. Thus, it can be concluded that the indicator variable used is valid. Meanwhile, because of the overall fit model, each construct can be evaluated separately by looking at the significance of the loading indicator and assessing the reliability of the construct and the extracted variance. An estimate of the reliability and variance measurements of each construct is required to assess whether these indicators adequately illustrate the constructs. The reliability test is calculated in Figure 2 and Figure 3.

### Table 2. Age of Respondents

| Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|---------|---------------|--------------------|
| Valid > 50 years | 2 | 2.0 | 2.0 |
| 41 – 50 years | 8 | 8.0 | 10.0 |
| 31 – 40 years | 32 | 32.0 | 42.0 |
| 20 – 30 years | 58 | 58.0 | 100.0 |
| Total | 100 | 100.0 | 100.0 |

### Table 3. Working Experiences of Respondents

| Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|---------|---------------|--------------------|
| Valid > 3 years | 40 | 40.0 | 40.0 |
| 2 – 3 years | 32 | 32.0 | 72.0 |
| 1 – 2 years | 22 | 22.0 | 94.0 |
| < 1 years | 6 | 6.0 | 100.0 |
| Total | 100 | 100.0 | 100.0 |

Validity & Reliability Test

The value of $P$ on each indicator is below the value of 0.05, this indicates that the indicator is valid. Thus, it can be concluded that the indicator variable used is valid. Meanwhile, because of the overall fit model, each construct can be evaluated separately by looking at the significance of the loading indicator and assessing the reliability of the construct and the extracted variance. An estimate of the reliability and variance measurements of each construct is required to assess whether these indicators adequately illustrate the constructs. The reliability test is calculated in Figure 2 and Figure 3.

**Reliability**

Number of Standart Loading:
- Physical Security Construct $= 0.943 + 0.966 = 1.909$
- Network Security Construct $= 0.982 + 0.906 = 2.888$
- Enterprise Efficiency Construct $= 0.724 + 0.955 + 0.944 + 0.969 = 3.592$

Measurement Error:
- Measurement Error $= 1 - (\text{Standard Loading})^2$
  - Physical Security Construct $= 0.11 + 0.067 = 0.177$
  - Network Security Construct $= 0.179 + 0.036 + 0.004 = 0.219$
  - Enterprise Efficiency Construct $= 0.061 + 0.109 + 0.088 + 0.476 = 0.734$

Reliability of Physical Security Construct $= \frac{1.909^2}{1.909^2 + 0.177} = 0.954$

Reliability of Network Security Construct $= \frac{2.886^2}{2.886^2 + 0.219} = 0.974$

Reliability of Enterprise Efficiency Construct $= \frac{3.592^2}{3.592^2 + 0.734} = 0.946$

**Figure 2.** Output 1 Model Calculation from AMOS Program
Table 4. Job Roles of Respondents

| Role                  | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------------|-----------|---------|---------------|--------------------|
| System Administrator  | 19        | 19.0    | 19.0          | 19.0               |
| Staff                 | 41        | 41.0    | 60.0          |                    |
| Consultant            | 20        | 20.0    | 80.0          |                    |
| Network Administrator | 12        | 12.0    | 92.0          |                    |
| Information Technology Manager | 8 | 8.0 | 100.0 |                |
| Total                 | 100       | 100.00  | 100.0         |                    |

3.3 Model Results

The results of the model calculation generated from the AMOS program show the calculation in Figure 2 and Figure 3. The Cut-Off Value indicating that the model tested has goodness of fit is good, so H<sub>0</sub> is accepted. This means that there is no difference between the population covariance matrix of a factor estimated by the sample covariance matrix. The proposed model has a good of fit, since there is no difference between the population covariance matrix of a factor estimated by the sample covariance matrix. Table 5 shows the detail of goodness of fit index.

Table 5. Goodness of Fit Index

| Goodness          | Cut-Off Value | Model Result | Information            |
|-------------------|---------------|--------------|------------------------|
| Chi - Square      | 30.175        | Expected Small Value |                      |
| Probability       | ≥ 0.05        | 0.179        | Good                   |
| RMSEA             | ≤ 0.08        | 0.051        | Good                   |
| CMIN/DF           | ≤ 2           | 1.257        | Good                   |
| TLI               | ≥ 0.90        | 0.996        | Good                   |
| CFI               | ≥ 0.95        | 0.995        | Good                   |

The hypothesis is physical security and network security affect the efficiency of the company. Our decision criteria are if Probability> 0.05 then H<sub>0</sub> is accepted while If Probability <0.05 then H<sub>0</sub> is rejected. From the results, for Physical Security is 0.044 < 0.05 which means physical security significantly affects the efficiency of the company. Meanwhile, Network Security is 0.432 > 0.05 which means network security does not affect the efficiency of the company significantly. The value of Squared Multiple Correlations for company efficiency is 0.987 which means that the Company Efficiency.
variable described by Physical Security variable (X1) and Network Security (X2) is 98.7% while the rest of 1.3% is explained by other variables not covered in this research. The final model is shown in Equation (1). Meanwhile, Table 6 and Table 7 show the direct effect and indirect effect respectively. This research can be used for private companies as well as Government companies Structural module for calculating the effect of physical security and network security on company efficiency.

\[ Y = 0.732X_1 + 0.263X_2 \]  

Table 6 Direct Effect

| Physical Security | Network Security | Efficiency Company |
|-------------------|------------------|--------------------|
| Efficiency Company | 0.732 | 0.263 | 0.000 |
| Image | 0.000 | 0.000 | 0.000 |
| Relationship | 0.000 | 0.000 | 0.944 |
| Property | 0.000 | 0.000 | 0.724 |
| Finance | 0.000 | 0.000 | 0.955 |
| Perimeter | 0.000 | 0.906 | 0.000 |
| Network | 0.000 | 0.982 | 0.000 |
| Human | 0.000 | 0.998 | 0.000 |
| Physical | 0.966 | 0.000 | 0.000 |
| Technique | 0.943 | 0.000 | 0.000 |

Table 7 Indirect Effect

| Physical Security | Network Security | Efficiency Company |
|-------------------|------------------|--------------------|
| Efficiency Company | 0.000 | 0.000 | 0.000 |
| Image | 0.710 | 0.255 | 0.000 |
| Relationship | 0.691 | 0.248 | 0.000 |
| Property | 0.699 | 0.251 | 0.000 |
| Finance | 0.530 | 0.190 | 0.000 |
| Perimeter | 0.000 | 0.000 | 0.000 |
| Network | 0.000 | 0.000 | 0.000 |
| Human | 0.000 | 0.000 | 0.000 |
| Physical | 0.000 | 0.000 | 0.000 |
| Technique | 0.000 | 0.000 | 0.000 |

4 Conclusion

From the results of data processing is known that physical security is more influential on company efficiency than network security, without physical security, then network security does not have much effect on the efficiency of the company. Indicators to measure: Network Security is the perimeter of networks, internal networks, and human factors. Physical security is a control technique and physical control. The company's efficiency is financial/potential loss, intellectual property, good relationships, and corporate image.

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