A Study on Performance Evaluation for Security Test Laboratory

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Abstract

The Security products play a key role in ensuring confidentiality, integrity and availability of industry-related products. However, all the companies do not have enough time, expenses and space, so that it is difficult for them to purchase and use expensive facilities and equipment for quality verification or test certification on performance and functionality of security products developed. Accordingly, every country has been carrying out policies to build and promote a joint utilization system of advanced quality verification facilities and equipment for security products with public institutions as the center. In addition, public institutions have designed and conducted relevant projects with the goal of improving safety and reliability of security products developed, reducing the cost of production and so on.

To enhance the value of these projects more and more, therefore, there is a need to objectively measure and analyze direct/indirect performance of projects carried out at an appropriate time. For projects carried out with public institutions as the center, however, it is difficult to analyze performance of the projects due to public purposes. Therefore, this paper studied performance analysis on the security test support project. In detail, the business flow of security product development activities was analyzed to measure performance of the facility and equipment project for quality verification of security products. In addition, multidimensional performance analysis was carried out empirically by applying it to a theoretical measurement model. It is expected that this performance analysis study could be utilized as a basic methodology for performance analysis of other public projects.

Keywords: *Security Test, Security Support, Performance Evaluation*

1. Introduction

Importance of personal and corporate information management is on the rise day by day as the knowledge information age is changed into the knowledge or information based systems every day in the 21st century [6]. In addition, the change is accelerating further due to development of communication methods such as Internet, and there are good effects to utilizing information and adverse effects trying to make ill use of them at the same time. Most companies continue to introduce physical and logical solutions for utilizing information safely against external attacks [2, 3]. Logical solutions use anti-virus products etc., and physical solutions use equipment such as firewall and server etc.

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Utilization of costly advanced facilities and equipment for quality verification of security products is an important factor of improving technical development competitiveness. However, it is inefficient that every individual company builds such facilities and equipment to test security products. Therefore, every country has carried out projects to build facilities and equipment for quality verification of security products with public institutions as the center and to provide them to companies without cost [4, 5].

Companies participated in the projects obtain not only direct results such as reduction of product's development periods and improvement of quality levels, but also indirect ones such as the raising awareness of corporate members for quality and the revenue growth by enhancing product's competitiveness.

To spread economic benefits for more participating companies and product families, there is a need to objectively measure and analyze direct/indirect performance on the project carried out and to draw improvement schemes for lack.

Therefore, this paper would like to carry out an empirical verification work by designing a model to specifically draw performance and utilizing objective data such as surveys and financial statements for participating companies.

2. Precedent Studies

2.1. DETER Testlab

The 'DETER (cyber-DEfense Technology Experimental Research) Lab Test Bed' was designed in 2003 for the purpose of experimenting cyber security technologies such as DDoS and worm, which are difficult to experiment on the Internet, and it is operated by the USC ISI (Information Sciences Institute), UCB (University of California, Berkeley) and Sparta (defense industry) etc. It has the ISI cluster composed of 76 nodes and the UCB cluster composed of 34 nodes as core equipment.

2.2. NVLAP (National Voluntary Laboratory Accreditation Program)

The 'Laboratory accreditation' means that accreditation is conducted whether the corresponding laboratory holds qualification (calibration) enough to scientifically carry out relevant research. The NVLAP is a program that some departments of the NIST (National Institute of Standards and Technology) objectively judges whether the laboratory requested holds qualification and issues accreditation. It is a program that verifies whether the corresponding company possesses research capability to produce products or services in the verification process for whether products or services of the company has the use suitability and the purchase safety.

2.3. NSTB Testbed

The NSTB Testbed is operated by the Idaho National Laboratory (INL) and the Sandia National Laboratory. It was established by the INL in 1949, and started the study about the nuclear power. It operates the National SCADA Test Bed program for ensuring safe, stable and efficient distribution of electricity. It is supported by the Department of Energy, and has main purposes of raising awareness about the SCADA system's security, evaluating vulnerability, developing methods to reduce risks, developing related standards and model cases, and developing new security evaluation tools. 63 projects including the Nuclear Safety etc. are completed or in progress so far.

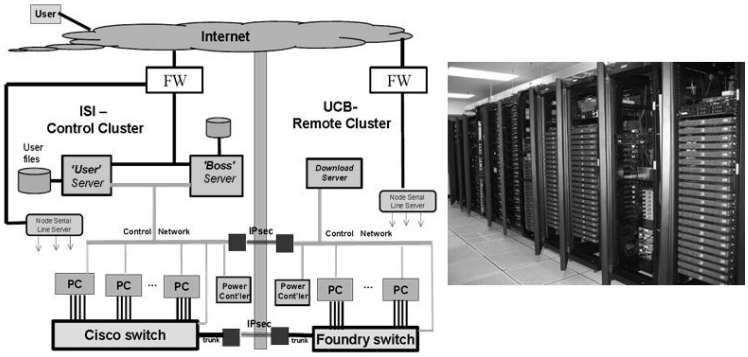

Figure 1. DETERlab Test Bed

3. Design of a Performance Measurement Model for the Security Test Support Project and Its Empirical Analysis

3.1. Design of the Performance Measurement Investigation

To measure performance for the security test support project, an investigation was carried out with objective financial data for 88 companies participating in the security test project supported by public institutions. Limiting to companies having participated in the project for a certain period of time rather than onetime participation, the investigation was carried out for companies that used for more than 8 days, participated in more than two times during the last 3 years.

3.2. Design of a Performance Measurement Model

For theoretical background to draw a logical relation diagram for designing a performance measurement model, the 'performance pyramid model' in Figure 2 is set as a basis [1].

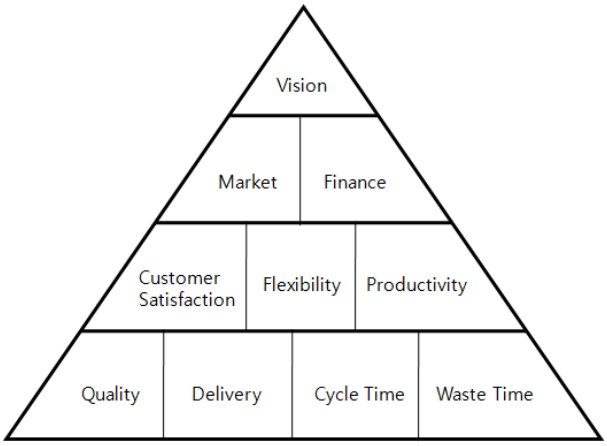

Figure 2. Performance Pyramid Model

Then, referring to the process flow (design, production, test, certification) developing/producing security products for each measurement item comprising of the 'performance pyramid model,' precedent studies and results of the expert meeting, a logical relation diagram was designed as Figure 3.

It would like to design a model to estimate absolute economic effects and relative comparison effects of companies participating in the security product quality verification support project for the participating companies. The correlation was analyzed to analyze logical relations between the performance measurement items until final economic effects occurred through the security product quality verification support project.

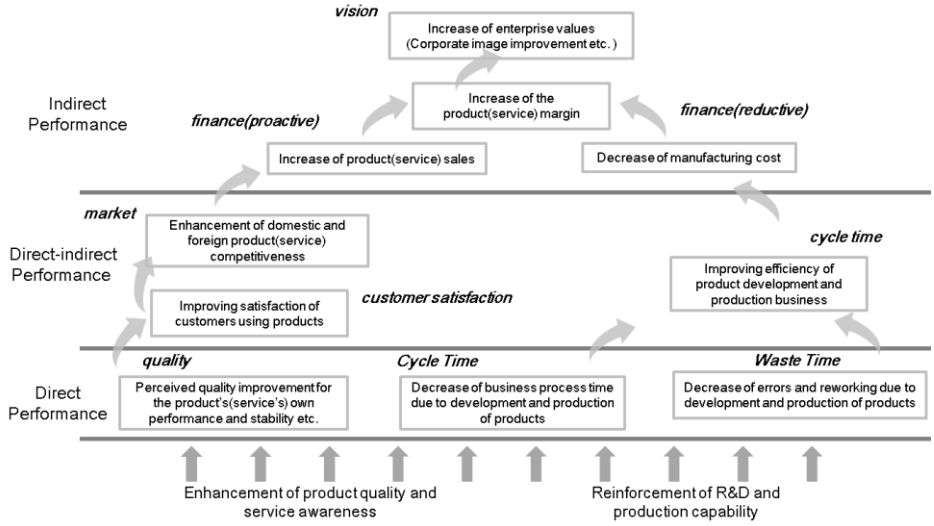

Figure 3. Performance Analysis Model for the Security Product Quality Verification Support Project

3.3. Empirical Analysis for Performance of the Security Test Support Project

As a result of carrying out empirical analysis statistically for the performance analysis model of the security test support project passing through the precedent studies and the advance verification process, it had objective validity because a significant result was obtained between the performance measurement items. The reliability coefficient (Cronbach α) was measured as 0.934 (0.6 > α) for the overall performance analysis model, which was shown that it has very high explanation. And, as a result of carrying out a correlation analysis between direct performance measurement items and direct/indirect performance measurement items, between direct/indirect performance measurement items and indirect performance measurement items, it was calculated as significant levels (significant level was below 0.005.)

As shown in Table 1, it was investigated that companies using the security test support project acquired business performance of above "average (3.2, 5-point scale)" and 28.7% in general, and the direct performance (3.8) was measured relatively higher than the direct/indirect (3.5) and indirect (2.9) performance (corresponding with the result of precedent studies.) In detail, the "perceived quality improvement for the product's own performance and stability etc. (4.1 / 36.9%)", "enhancement of domestic and foreign product competitiveness (3.7/32.4%)", "decrease of errors and reworking due to developing and producing products improving satisfaction of customers using the products (3.6/31.8%)", and "decrease of business process time due to development and production of products (3.6/31.7%)" etc. were measured relatively higher than other performance items.

Table 1. Performance Level for Each Performance Measurement Item

Type	Performance measurement item	level (5-point)	type level (5-point)	Business improvement level (%)	Business improvement level for each performance type (%)
Direct	Perceived quality improvement for the product's own performance and stability etc.	4.1	3.8	36.6	33.4
	Decrease of business process time due to development and production of products	3.6		31.7	
	Decrease of errors and reworking due to development and production of products	3.6		31.8	
Direct-indirect	Improving efficiency of product development and production business	3.1	3.5	27.2	30.6
	Improving satisfaction of customers using products	3.6		32.2	
	Enhancement of domestic and foreign product competitiveness	3.7		32.4	
Indirect	Raising awareness of organization's members for importance of product's quality	3.4	2.8	29.4	24.4
	Reinforcement of organization's capability for development and production of products	2.8		23.6	
	Decrease of manufacturing cost	2.8		24.0	
	Increase of product sales	2.7		22.8	
	Increase of the product margin	2.6		22.6	
	Increase of enterprise values	2.8		24.2	
Average			3.2		28.2

The sales percentage of products using the security test support project is measured as about 32.3% for each corresponding company, and actual amount of sales contributed by the security products is 71,373 million won, which corresponds to 19.1% of the domestic security products' sales amount.

The increase percentage of operating profit by company for quantifying the performance measurement on the "increase of product sales" of companies using the security test support project is measured as 36.1%. And, the decrease percentage of personnel expenses compared to the selling and administrative expenses by company for quantifying the performance measurement on the "decrease of manufacturing costs" is measured as –4.78%.

Converting it into the amount, the increase amount of operating profit by using the security test support project is measured as 64,293 thousand won on average, and the decrease amount of personnel expenses compared to the selling and administrative expenses as 188,744 thousand won on average. In detail, considering the decrease amount of personnel expenses compared to the selling and administrative expenses in terms of the number of persons and period etc., it is analyzed that there is the reduction effect of 25,881,338 won.

4. Conclusion

Security products play a key role in ensuring confidentiality, integrity and availability of industry-related products. However, all the companies do not have enough time, expenses and space, so that it is difficult for them to purchase and use expensive facilities and equipment for quality verification or test certification on performance and functionality of security products developed. Accordingly, every country has been carrying out policies to build and promote a joint utilization system of advanced quality verification facilities and equipment for

security products with public institutions as the center. In addition, public institutions have designed and conducted relevant projects with the goal of improving safety and reliability of security products developed, reducing the cost of production and so on.

This study designed the performance analysis model for the security product quality verification project based on the related literature and the expert meeting. The designed performance analysis model measured direct/indirect performance using objective financial data with the survey for the participating companies above a certain level.

For the future study, it is going to carry out development of measurement variables for increasing applicability of objective financial data as well as an empirical analysis on the logical relation diagram of the performance model.

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