

Assessing the impact of the National Defense Comptroller Cloud Information System (NDCCIS): An internal control achievement perspective

楊志豪 · 李昕恩

Abstract

By conducting a questionnaire survey in national defense comptroller sectors, the comprehensive framework herein was tested by structural equation modeling (SEM) to examine the internal control achievement of the National Defense Comptroller Cloud Information System (NDCCIS), and to determine how it influenced the net benefit. Information quality plays a key role in enhancing the internal control achievements under the National Defense Comptroller Cloud Information System; the positive influence of the impact of the achievements first affects the direct benefits and subsequently, the indirect benefits. The proposed framework enables the Ministry of National Defense (MND) to enhance the internal control efficiency by intensifying the information

quality of the National Defense Comptroller Cloud Information System and establishing the comprehensive internal control system through the Committee of Sponsoring Organizations' (COSO) framework which promotes the net benefit of an organization.

Keywords : National Defense Comptroller Cloud Information System (NDCCIS); Information System Success model; Internal Control Achievement (ICA)

摘 要

本篇以國軍主財雲端資訊系統為研究標的，透過問卷調查瞭解國軍官兵對雲端資訊系統的使用認知，並運用結構方程模型（SEM）檢測雲端系統之「內部控制達成度」及探討其與「組織效益」間之關聯性。研究結果顯示，

「資訊品質」提升有助於內部控制達成度，而內部控制達成度愈高，不僅能為組織帶來財務面等直接效益，更強化組織內部人員學習成長等間接效益。本研究之貢獻，期能提供雲端資訊系統後續精進作為參考方向；除藉由強化雲端資訊系統資訊品質以增進內部控制效率，亦可運用COSO架構建立更加全面的內部控制系統，俾利增進組織整體績效。

關鍵字：國軍主財雲端資訊系統(NDCCIS)、資訊系統成功模式、內部控制達成度

1. Introduction

With the recent cloud computing and management of large amounts of data in the handling of public affairs, there has been a significant increase in the government sector's use of cloud computing services, such as the National Defense Comptroller Cloud Information System (NDCCIS), to assist defense, financial and budget spending activities. Rikhardsson & Dull (2016) indicate that the advantage of information technology lies in ensuring the quality of decision information, as well as in the assurance of compliance with regulations. Under the national policy and laws environment, the national defense comptroller cloud information system as an Enterprise Resource Planning (ERP) system for conducting defense affairs and reasonable resources allocation, is expected to support military sector specific operation processes, while simultaneously enhancing the quality of the internal control mechanism.

The Committee of Sponsoring Organizations' (COSO) 2013 report which defines internal

control includes the plans, methods, policies, and procedures used to contribute to achieving the core mission of the organization. The major objective of internal control is to provide reasonable assurance regarding the effectiveness and efficiency of operations and the reliability of financial reporting. The evaluation concept is divided into five control components: the control environment, risk assessment, control activities, information and communication, and monitoring, in order to achieve internal control objectives. Chang, Yen, Chang & Jan (2014) indicate that information system control features may positively impact the effectiveness of internal controls over financially relevant reporting.

In Taiwan, the Ministry of National Defense has implemented the Comptroller Information Strategy since 2013, by introducing a cloud computing infrastructure and outsourcing the system consultant to fulfill the integration of information planning. In 2014, the modules implemented by the National Defense Comptroller Cloud Information system consisted of three main modules: Budget, Accounting, and Annual accounts. In order to maximize the NDCCIS investment performance, an effective measuring system and information quality help an organization achieve internal control benefits, maintain precise daily transaction records, and produce accurate financial information. The success of the National Defense Comptroller Bureau lies in its ability to effectively manage and monitor the NDCCIS in order to realize expected benefits. To improve the overall national defense comptroller operation processes, it is necessary to understand the relationships among system and

information quality under the NDCCIS, internal control achievement, and organization performance.

This study employs the Updated DeLone and McLean's IS success model (2003) to develop a conceptual framework for investigating how the NDCCIS system and information quality are linked to internal control achievement, and how this in turn influences the performance of the organization. National defense comptroller officers using the NDCCIS were selected from among the questionnaire respondents who were asked to conduct structure equation model (SEM) analysis. The following section offers a brief discussion on the relevant literature. Later sections examine the methodology and offer an empirical analysis. The study ends with the main conclusion and implications for decision managers.

2. Literature Review

This study proposes an evaluation model for the National Defense Comptroller Cloud Information System; it is based on Updated DeLone and McLean's IS success model and offers an assessment of internal control achievement attained through an examination of the relevant literature.

2.1 Updated Delone & Mclean IS success model

The Delone and Mclean IS success model was first introduced in 1992; it presents: an integrated evaluation concept related to successful implementation of an information system. The model of interrelationships between six major IS categories of success variables include system quality, information quality, IS use, user satisfaction, individual impact, and organizational impact, respectively. Most importantly, it provides a scheme for categorizing the multitude of IS success measures which have been documented in the research literature (Wang and Liao, 2008)

In order to provide a multidimensional evaluation framework for information systems, the updated model of IS success incorporates a "service quality" measure as a new dimension in the IS success model (as shown in Figure 1). At the same time, "net benefits" constitutes the most important success measures as the organization determines objectives and develops the key performance infrastructure. In fact, how to measure "net benefits" is challenging and cannot be analyzed without "system quality" and "information quality" measurements (DeLone and McLean, 2003).

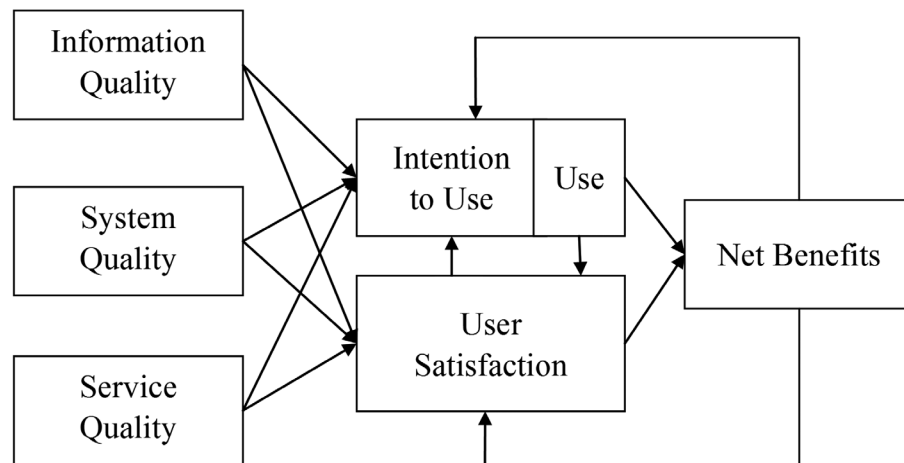


Figure 1. Updated D&M IS success model (DeLone and McLean, 2003)

Existing studies have confirmed the feasibility of using an updated Delone and Mclean model in many areas, including e-Government systems (Wang and Liao, 2008), an industrial information system (Roky and Al Meriouh, 2015) and a mobile banking system (Tam and Oliveira, 2016). Following the same conceptualization infrastructure, this study is conducted in order to understand the impact of the system quality and information quality of the National Defense Comptroller Cloud Information System (NDCCIS) with an emphasis on the military sector. The impact of the system quality and information quality of the NDCCIS was assessed by viewing the net benefits from two perspectives, namely, the direct and indirect effects, as follows.

System quality (SQ) represents the performance of the National Defense Comptroller Cloud Information System, including the degree of user friendliness, ease of use, and response time (Urbach, Nils and Benjamin Muller, 2012; Roky and Al Meriouh, 2015). Information Quality (IQ) is defined as the quality of the National Defense Comptroller Cloud Information System output, including how precise, reliable, up-to-date, and

useful the information is, and the relevance of this information in decision making (Tam and Oliveira, 2016; Stefanovic et al., 2016). The net benefits of the National Defense Comptroller Cloud Information System is defined as the extent to which the National Defense Comptroller Cloud Information System contributes to the success of information transferred from comptroller officers to the military sector.

Tsai et al. (2012) applied the DeLone and Mclean model to measure ERP performance and combined the balanced scorecard (BSC) concept as the indicators of net benefits. Wu and Chen (2014) evaluated the effectiveness of a firm's performance via innovation diffusion theory and BSC. Jain (2016) utilized four dimensions of the BSC in measuring ERP values and clarified its financial and non-financial characteristics. Additionally, Shen, Chen and Wang (2016) proposed a model combining BSC and multi-criteria decision-making to evaluate the performance of high-tech companies. This study also utilizes the BSC technique as a method for evaluating the net benefits dimension of the National Defense Comptroller Cloud Information System; benefits

included both direct effects (financial and customer benefits) and indirect effects (internal business processes and learning and growth).

Kaplan and Norton (2005) introduced the balanced scorecard in 1992, which included financial and non-financial measures for estimating the state of an organization. The four constructs of the BSC are financial measures, customer perspectives, internal business processes, and learning and growth. In this case, financial measures specify whether the implementation of the National Defense Comptroller Cloud Information System contributes to the lower maintenance cost of facilities and speeds up budget allocations for the military. Customer perspective comprises the degree of satisfaction within other departments regarding financial activities, including reliability of the system, budget allocation period, and work efficiency of employees. Internal business process perspectives indicate the ability to solve problems in activity processes and interactions with peers in other departments. In addition, it includes the extent to which attempts are made to simplify work procedures. Lastly, learning and growth highlight the aims and measures which determine the progress of the organization and patterns of employee growth. This perspective typically includes the extent to which employees understand their job, the employees' sense of accomplishment, and their on-going ability to learn the details of information systems. In order to identify the effects the performance of the National Defense Comptroller Cloud Information System has on financial and non-financial benefits, this study classifies net benefits into direct effects (DE) (including financial

measures and customer perspectives) and indirect effects (IE) (internal business processes and learning and growth perspectives) through the characteristics of four measurement dimensions.

2.2 Internal Control Achievement

Facing the rapid evolution of technology, large numbers of organizations from small and medium firms to large enterprises all rely on information systems to strengthen their effectiveness and ability to compete. New business models lead to regulatory restrictions and strict surveillance which require organizations to adopt comprehensive internal control systems which align operational processes in this changeable environment. This has also been the case with government and military-related organizations. The Ministry of National Defense implemented the National Defense Comptroller Cloud Information System in order to improve work efficiency and develop a knowledge management platform for comptroller officers. They also aimed to fit the internal control elements into it in an effort to prevent the violation of regulations during operational procedures, and to enhance financial reporting quality, achieve expected financial goals, and improve overall operational processes.

Chang et al. (2014) stated that internal controls related to information systems must be considered as the popularity of information technology applications continues to increase. The Committee of Sponsoring Organizations (COSO) of the Treadway Commission defined internal controls as "a process, affected by an entity's board, management, and other personnel, designed to provide reasonable assurance regarding the

achievement of objectives such as effectiveness and efficiency of operation, reliability of financial reporting, and compliance with regulation" and issued an updated internal control framework in response to significant advances in technology and increasingly complex operating environments (COSO, 2013).

According to United States Government Accountability Office (GAO, 2014), the five components of internal control developed by COSO must be effectively designed, implemented, and operate in an integrated manner for an internal control system to be effective. The framework includes five components of internal control:

- (1) **Control Environment** - for the Ministry of National Defense, the control environment is the foundation of the internal control system, and provides the discipline and structure to help an organization achieve its objectives.
- (2) **Risk Assessment** - Evaluates the risks while the organization seeks to achieve its objectives. This assessment provides the basis for developing appropriate risk responses.
- (3) **Control Activities** - Through policies and procedures, the actions of management are established to achieve objectives and respond to risks in the internal control system, including the organization's information system, such as the NDCCIS.
- (4) **Information and Communication** - The quality of information supporting the internal control system, as well as effective information and communication, are vital for an organization to achieve its objectives
- (5) **Monitoring** - Internal control monitoring

oversees the quality of performance over time and promptly resolves the findings of audits and other reviews.

Internal control provides many benefits to the organization and to management. By effectively integrating internal controls with an information system, the organization will promote operational effectiveness. Stoel and Muhanna (2011) suggest that internal controls related to information systems are commonly referred to as information system (IS) controls; these comprise controls (i.e. policies and procedures) over the organization's IS infrastructure and systems. They consist of general controls and application controls; the former ensures that the organization has a stable and well managed control environment which enhances the effect of application controls, whereas the latter prevents and corrects related errors and fraud during the processing of transactions. The computerization of business transactions in particular leads to the digitization of audit evidence, resulting in difficulties when attempting to follow audit trails (Chang et al., 2014).

The COSO framework impacts firms' existing controls within each of the framework's five components, as well as IS-specific controls within the firm. In addition, the new technology-focused principle may cause firms to reevaluate their IS-related controls, such as those related to cybersecurity and cloud computing transactions. In terms of information systems, effective internal controls primarily help firms to achieve their expected financial goals, maintain precise records of daily transactions, and produce accurate financial statements.

In conclusion, this study expects to determine

the relationships among system and information quality under the NDCCIS, internal control achievement, and organizational performance aimed at improving the overall national defense comptroller operation processes.

3. Conceptual Model and Hypothesis (Research Design and Method)

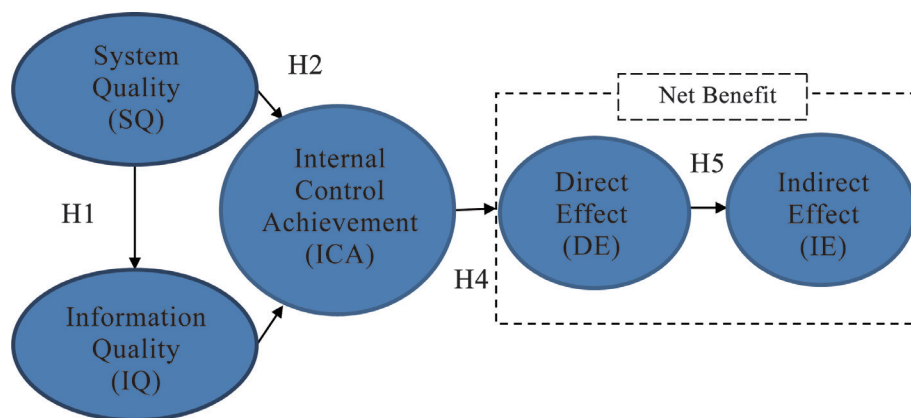


Figure 2. Conceptual model

3.2 Hypothesis

Stefanovic et al. (2016) indicate that for employees, a useful system will both support the employees working with it and allow them to actively learn about it. When the National Defense Comptroller Cloud Information System is easy to use and is able to respond quickly, comptroller officers may tend to utilize the system frequently rather than finding fault with the information, thereby promoting its knowledge or information quality. Hence, this study hypothesizes the following:

Hypothesis 1: System Quality (SQ) will positively affect Information Quality (IQ).

Chang et al. (2014) indicate that the IS control

3.1 Conceptual Model

In this study, the performance of the National Defense Comptroller Cloud Information System was analyzed following the updated Delone and Mclean model. In addition, internal control achievement is discussed. Based on a review of the literature, the conceptual model was designed, as presented in Figure 2.

taken as the internal control core for information systems consists of general and application controls. Application controls include input, processing, and output control based on the flow of data processing. When the system is easy to use and reacts precisely, users will pay more attention to using it effectively and make specific recommendations for system improvement. The inputs will help operational processes go smoothly and motivate a series of valid internal controls. To sum up, the study hypothesizes the following:

Hypothesis 2: System Quality (SQ) will positively affect Internal Control Achievement (ICA).

In light of the application controls for information systems which focus on the accuracy,

completeness, validity, and authorization of the data captured, entered in the system, processed, stored, transmitted to other systems, and reported, according to Chang et al. (2014), information quality is obviously the fundamental component of internal control. The information quality can provide precise, up-to-date, sufficient, and reliable information to users and decision makers (Afiah and Azwari, 2015). Furthermore, information quality is able to help internal auditors assess risk and identify accounting transactions; thus, this study hypothesizes the following:

Hypothesis 3: Information Quality (IQ) will positively affect Internal Control Achievement (ICA).

Lawson, Muriel and Sanders (2017) state that effective internal control can help organizations achieve their expected financial goals, maintain daily transaction records, and output accurate financial statements. Thus, for the National Defense Comptroller Cloud Information System, internal control helps the financial sector to not only keep daily transactions as a means of recording and controlling the overall budget but also shortens the budget allocation period. In conclusion, effective internal controls will result in direct net benefits (financial measures and customer perspectives). We offer the following hypothesis:

Hypothesis 4: Internal Control Achievement (ICA) will positively affect Direct Effects (DE) of net benefit.

According to Tsai, et al. (2012), this study classifies the financial and customer perspectives derived from BSC into direct effects of net benefits; this includes work efficiency and the budget allocation period for financial personnel and other

employees. It is anticipated that people will gain a sense of accomplishment and be motivated to learn about information systems, solve work-related problems, and interact with other sectors proactively. Thus, the study hypothesized that the indirect effects comprised of internal processes and personal learning and growth perspectives are influenced by direct effects.

Hypothesis 5: Direct Effects (DE) will positively affect Indirect Effects (IE) among overall net benefit.

4. Data analysis and findings

The data analysis was carried out using a structural equation modeling (SEM) with SPSS Amos to examine the model fit for each construct and to test the hypotheses in the conceptual model.

4.1 Samples and data collection

This study used a questionnaire survey to collect data during 2017. The respondents were either top managers or personnel of comptroller departments. Of the 284 questionnaires mailed, 217 usable responses were returned for a successful response rate of 76%. Of the 217 usable responses obtained, a large proportion of respondents were from comptroller agencies (39.63% of 217); approximately 75 were field officers (34.56% of 217) followed by lieutenants (23.97% of 217). Of the 217 samples, most individuals provide service in comptroller units (70.97% of 217) with job positions involved in general budgeting, accounting, auditing, statistics, cashier, and so on. The demographic characteristics of the sample population are shown in Table 1.

Table 1. The demographic composition (N=217)

Basic Information of Organization			Basic Information of Employee		
Services	Number	Percentage (%)	Gender	Number	Percentage (%)
Comptroller Agencies	86	39.63	Male	151	69.59
Army	47	21.66	Female	66	30.41
Navy	26	11.98	position	Number	Percentage (%)
Air Force	42	19.35	Field officers	75	34.56
Armed Forced Reserve	5	2.31	Lieutenants	52	23.97
Military Police	11	5.07	Petty officers	61	28.11
			Contract employee	29	13.36
Units Attribute	Number	Percentage (%)	Service age	Number	Percentage (%)
Comptroller	154	70.96	< 5	46	21.21
Financial	44	20.28	5 ~ <10	64	29.49
Billing	19	8.76	10 ~ <15	33	15.21
			15 ~ <20	42	19.35
Unit employees	Number	Percentage (%)	20 ~ <25	14	6.45
< 50	52	23.96	25 ~ <30	6	2.76
50 ~ <100	44	20.28	>30	12	5.53
100 ~ <500	31	14.28	Job content		
500 ~ <1,000	34	15.67	Comptroller agencies	Number	Percentage (%)
1,000 ~ <5,000	56	25.81	Supervisor	22	14.29
			Cashier	24	15.58
Financial employees	Number	Percentage (%)	Accounting/Auditing /Statics	28	18.18
< 5	80	36.87	General Budgets	43	27.92
5 ~ <10	44	20.27	Others	37	24.03
10 ~ <15	35	16.13	Financial Center	Number	Percentage (%)
>15	58	26.73	Supervisor	2	4.55
			Cashier	2	4.55
			Salary Payment	13	29.55
			Budget and Cost	10	22.73
			Others	17	38.62
			Billing Center	Number	Percentage (%)
			Supervisor	2	10.53
			General Budgets	4	21.05
			Final statement	4	21.05
			Inspect	7	36.84
			Others	2	10.53

4.2 Overall model fit

Table 2 shows the results of the overall model-fit. With a degree of freedom of 203, the estimated model yields a Chi-squared (χ^2) value of 445.9, and the corresponding ($\chi^2/\text{df} = 2.196$) is less than 3; in this study it was significant ($p < 0.001$), and noted by Kline (1998) as a good fit. Meanwhile, the Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI) and Adjusted Goodness of Fit Index (AGFI) were above the 0.80 level, set by Kline (1998) as indicating a good fit. The

Normed Fit Index (NFI) was above the 0.90 level, recommended by Bentler and Bonett (1980) for a good fit and the Root Mean Square Error of Approximation (RMSEA) was below the 0.08 level, recommended by Browne and Cudeck (1993) as the maximum allowable for a satisfactory model. To signify a good fit, the Standardized Root Mean Square Residual (SRMR) must be below the 0.08 level, as set by Hu and Bentler (1999). Overall, the GFI (0.854), AGFI (0.801), SRMR (0.0345), RMSEA (0.074), NFI (0.937) and CFI (0.964) attest to the validity of the measurement model.

Table 2. Fit Indices for Structural Equation Model

Fit Indices	χ^2	d. f.	$\chi^2/\text{d. f.}$	GFI	AGFI	SRMR	RMSEA	NFI	CFI
Output	445.9	203	2.196	0.854	0.801	0.035	0.074	0.937	0.964
Desire level	-	-	< 3.0	> 0.8	> 0.8	< 0.08	< 0.08	> 0.9	> 0.8

Notes : GFI= Goodness-of-Fit Index
NFI=Normed Fit Index
CFI=Comparative Fit Index

AGFI=Adjusted Goodness-of-Fit Index
SRMR= Standardized Root Mean Square Residual
RMSEA =Root Mean Square Error of Approximation

4.3 Reliability and confirmatory analysis

The measurement model included five factors: System quality (SQ), Information quality (IQ), Internal control achievement (ICA), Direct effect (DE), and Indirect effect (IE).

Table 3 shows the reliability and validity analysis of variables, listed with composite reliability (CR), average variance extracted (AVE) and Cronbach Alpha values. The Cronbach Alpha values ranged from 0.924~0.971, indicating good consistency for the infrastructure of the questionnaire. All scales were within the accepted limits, and the composite reliability of all

factors exceeded the standard of 0.7 (Nunnally, 1978), signifying acceptable measurement. As recommended by Fornell and Larcker (1981), average variance extracted (AVE) above 0.5 has good convergent validity. This study suggests that the measurable variable of the model has an AVE between 0.652 and 0.809, so the model has good convergent validity. With regard to discriminant validity, the square root of the average variance extracted (AVE) should be larger than the correlations of inter-construct. Therefore, the measurement results display sufficiently strong discriminant validity to support testing the proposed model.

Table 3. The reliability and validity analysis of variables

Dimensions and Variables	Items	Cronbach's α	AVE	CR
Cloud information system quality				
Variable 1: System quality (SQ)	3	0.924	0.755	0.902
Variable 2: Information quality (IQ)	3	0.944	0.809	0.927
Internal control achievement (ICA)	5	0.971	0.805	0.954
Direct effect (DE)	6	0.957	0.679	0.927
Indirect effect (IE)	6	0.951	0.652	0.918

4.4 Correlation analysis

In this study, the correlation analysis of the

model is summarized in Table 4, which shows significant positive correlation between the variables.

Table 4. Construct correlations (N=217)

	System Quality	Information Quality	Internal Control Achievement	Direct Effects	Indirect Effects
System Quality	1				
Information Quality	0.960**	1			
Internal Control Achievement	0.639**	0.671**	1		
Direct Effects	0.779**	0.803**	0.705**	1	
Indirect Effects	0.735**	0.769**	0.755**	0.903**	1

Note : * p-value <0.05 , ** p-value <0.01

4.5 Hypotheses testing

This study used structural equation modeling to estimate the causal relationships between the different factors. Table 5 and Fig. 3 show the path coefficients of each dependent and independent variable within the nodes of the structural model. The findings support Hypothesis 1, relating the System Quality (SQ) of the NDCCIS to the Information Quality (IQ) ($\beta = 0.928$; $p = 0.000$). In addition, Hypothesis 3 shows that Information Quality (IQ) is positively related to the Internal

Control Achievement (ICA) ($\beta = 0.641$; $p = 0.000$). However, Hypothesis 2 is not supported, which implies that System Quality (SQ) is not a major factor effectively enhancing achievement of the internal control mechanism.

On the other hand, Hypothesis 4 indicated that the internal control achievement is positively related to the direct effects of net benefits, which is supported ($\beta = 0.319$; $p = 0.000$). Hypothesis 5 finds that direct effects are positively related to the indirect effects of net benefits ($\beta = 0.946$; $p = 0.000$). Meanwhile, the results suggest that

the system quality and information quality of the NDCCIS should be transferred and delivered through internal control achievement. Thus, internal control achievement is not only important for promoting the net benefits of the military sector,

but the system quality and information quality of the NDCCIS also rely on the internal control achievement to achieve objectives and steadily increase net benefits .

Table 5. Summary of hypotheses testing

Model estimates	Parameter Estimate	Standard Error	P-Value	Significant Level
H1 : SQ→IQ	0.928	0.056	0.000	***
H2 : SQ → ICA	0.161	0.141	0.256	
H3 : IQ→ICA	0.641	0.137	0.000	***
H4 : ICA→DE	0.319	0.056	0.000	***
H5 : DE →IE	0.946	0.050	0.000	***

Note:

1. SQ: System quality IQ: Information quality
ICA: Internal control achievement
DE: Direct effect IE: Indirect effect
2. * p-value <0.05 , ** p-value <0.01 ; *** p-value < 0.001

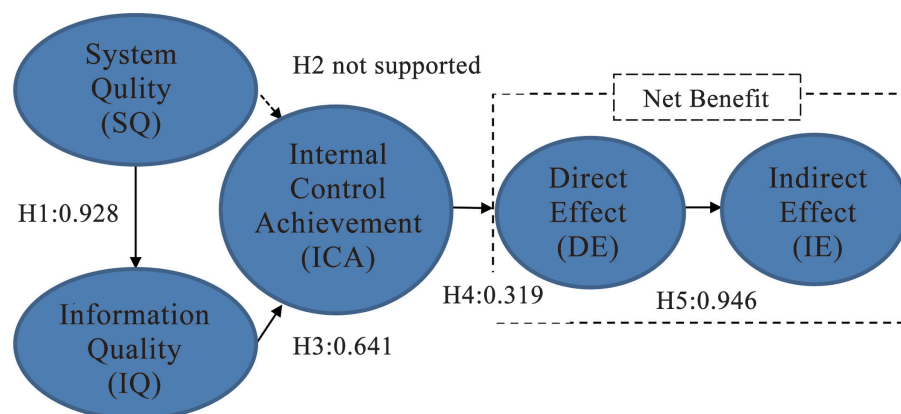


Figure 4. Results of the structural equation model

5. Discussion

This study analyzed the achievement of the internal control and realized how it influenced the net benefit for the military sector under the National Defense Comptroller Cloud Information System. In this study, the modified model for measuring the

internal control achievement within the National Defense Comptroller Cloud Information System environment based on the updated Delone and Mclean model has been empirically revalidated. The internal control achievement was derived from the COSO framework, and the balanced scorecard was used to evaluate the net benefit of the military sector divided into direct and indirect effects, respectively.

In our model, System Quality (SQ) was proven to have significant effect on Information Quality (IQ), but no significant effect on the Internal Control Achievement (ICA), which is contrary to existing theory and the hypothesis. Additionally, Information Quality (IQ) positively affected Internal Control Achievement (ICA); the latter also had a significant effect on Direct Effect (DE) composed of customer and financial dimensions. Ultimately, the Direct Effect (DE) increased the Indirect Effect (IE) within the net benefit. It means that IQ is one of the salient components used in measuring the achievement of internal control for the National Defense Comptroller Cloud Information System. Hence, whenever the IQ of the NDCCIS is higher, the ICA and net benefit are also higher. To strengthen the benefits of the National Defense Comptroller Cloud Information System (NDCCIS), management authority needs to develop Computer Assisted Auditing Tools and Techniques (CAATs) that effectively use cloud computing and big data advantages to conduct data analysis; the system and information quality should be ensured in order to perform meaningful analysis.

6. Conclusion and implication

This empirical study has sought to understand the relationships among system and information quality under the NDCCIS, internal control achievement to net benefit by using Structural Equation Modeling (SEM). A questionnaire survey was conducted in the national defense comptroller sectors, including Comptroller Agencies, Army, Navy, Air Force, Armed Forces Reserve, and

Military Police. According to the COSO framework, compliance is one of the objectives of internal control. In particular, the Ministry of National Defense authority emphasizes compliance with the law and regulations during the working process in order to achieve higher internal control. Generally, when compliance and internal audits interact, the result of internal control can be effective. Firstly, the law and regulations should be specific and upgraded at all times to adapt to the changeable environment. In addition, an internal audit is developed to oversee internal control defects via the scope of compliance, and provides some suggestions for improving the efficiency of internal control. With the comprehensive internal control system, the National Defense Comptroller Cloud Information System not only enhances the working efficiency but also achieves objectives and increases net benefit steadily.

By far, system and information quality serve as the most critical factors in implementation of the National Defense Comptroller Cloud Information System. Since there is assurance of system and information quality in the NDCCIS, it can more effectively promote the internal control mechanism operation. Consequently, the national defense comptroller database has been established to collect accurate data from defense resources and to successfully enhance the net benefits through internal control activities.

The primary contribution of the study is its benefit for academia and the military sector by analyzing internal control achievement under information systems. For academia, this study proves that information quality plays a vital role

for information systems to achieve internal control efficiency, which ultimately positively affects the net benefit. For the military, the finding supports the view that despite the information quality of the National Defense Comptroller Cloud Information System being important, management also fosters the comprehensive internal control system needed to obtain the expected organizational benefits.

Reference

1. Afiah, Nunuy Nur, and Peny Cahaya Azwari. "The Effect of the Implementation of Government Internal Control System (GICS) on the Quality of Financial Reporting of the Local Government and its Impact on the Principles of Good Governance: A Research in District, City, and Provincial Government in South Sumatera." *Procedia-Social and Behavioral Sciences* 211 (2015): 811-818.
2. Bentler P. M., Bonett D. G. 1980. Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin* 88(3), 588-606.
3. Browne M.W., Cudeck R., Alternative ways of assessing model fit. In K. A. Bollen & JS Long (Eds). *Testing structural equation models*, Newbury Park, CA: Sage. 1993.
4. Chang, S. I., Yen, D. C., Chang, I. C., & Jan, D. (2014). Internal control framework for a compliant ERP system. *Information & Management*, 51(2), 187-205.
5. Chang, She-I., et al. "Internal control framework for a compliant ERP system." *Information & Management* 51.2 (2014): 187-205.
6. Committee of Sponsoring Organizations of the Treadway Commission (COSO). (2013). *Internal Control - Integrated Framework*. Durham, NC: COSO.
7. DeLone, William H., and Ephraim R. McLean. "Information systems success: The quest for the dependent variable." *Information systems research* 3.1 (1992): 60-95.
8. DeLone, William H., and Ephraim R. McLean. "The DeLone and McLean model of information systems success: a ten-year update." *Journal of management information systems* 19.4 (2003): 9-30.
9. Fornell, Claes, and David F. Larcker. "Evaluating structural equation models with unobservable variables and measurement error." *Journal of marketing research* (1981): 39-50.
10. Hu L. T., Bentler P. M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling* 6, 1-55.
11. Jain, Vikas. "Conceptualising ERP systems' value as a multidimensional formative construct." *International Journal of Business Information Systems* 21.4 (2016): 439-461.
12. Kaplan, Robert S., and David P. Norton. "The balanced scorecard: measures that drive performance." *Harvard business review* 83.7 (2005): 172.
13. Lawson, Bradley P., Leah Muriel, and Paula R. Sanders. "A survey on firms' implementation of COSO's 2013 Internal Control-Integrated Framework." *Research in Accounting Regulation* (2017).
14. Nunnally J., 1978. *Psychometric Theory*, New

- York: McGraw- Hill.
15. PricewaterhouseCoopers (Firme), and Miles EA Everson. Internal control: Integrated framework. Committee of Sponsoring Organizations of the Treadway Commission (2013).
 16. Rikhardsson, P., & Dull, R. (2016). An exploratory study of the adoption, application and impacts of continuous auditing technologies in small businesses. *International Journal of Accounting Information Systems*, 20, 26-37.
 17. Roky, Hanae, and Youssef Al Meriouh. "Evaluation by Users of an Industrial Information System (XPPS) Based on the DeLone and McLean Model for IS Success." *Procedia Economics and Finance* 26 (2015): 903-913.
 18. Shen, Yung-Chi, Pih-Shuw Chen, and Chun-Hsien Wang. "A study of enterprise resource planning (ERP) system performance measurement using the quantitative balanced scorecard approach." *Computers in Industry* 75 (2016): 127-139.
 19. Stefanovic, Darko, et al. "Assessing the success of e-government systems: An employee perspective." *Information & Management* 53.6 (2016): 717-726.
 20. Stoel, M. Dale, and Waleed A. Muhanna. "IT internal control weaknesses and firm performance: An organizational liability lens." *International Journal of Accounting Information Systems* 12.4 (2011): 280-304.
 21. Tam, Carlos, and Tiago Oliveira. "Understanding the impact of m-banking on individual performance: DeLone & McLean and TTF perspective." *Computers in Human Behavior* 61 (2016): 233-244.
 22. Tsai, Wen-Hsien, et al. "A comprehensive study of the relationship between enterprise resource planning selection criteria and enterprise resource planning system success." *Information & Management* 49.1 (2012): 36-46.
 23. Urbach, Nils, and Benjamin Muller. "The updated DeLone and McLean model of information systems success." *Information systems theory*. Springer New York, (2012): 1-18.
 24. Wang, Yi-Shun, and Yi-Wen Liao. "Assessing eGovernment systems success: A validation of the DeLone and McLean model of information systems success." *Government Information Quarterly* 25.4 (2008): 717-733.
 25. Wu, Long, and Jian-Liang Chen. "A stage-based diffusion of IT innovation and the BSC performance impact: A moderator of technology–organization–environment." *Technological Forecasting and Social Change* 88 (2014): 76-90.

楊志豪



現任國防大學財務管理學系中校副教授；國防管理學院會計系89年班、國防大學資源管理所碩士、國立中央大學企業管理所博士；曾任排長、教育行政官及會審官；榮獲國防大學106年優良教師。

李昕恩



現任空軍作戰指揮部上尉財務參謀官；國防大學財務管理學系102年班；國防大學財務管理所碩士；曾任統計官及預財官等職。