

Internal Auditor Involvement in Developing Information System to Support Good Corporate Governance

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Abstract

The rationale of initiating pre-implementation auditing is more cost-effective to correct weaknesses in the control framework during the design/development and installation process than after implementation, when large quantities resources have been expended and strong commitment to the entity under design has been generated. But some organization chose to wait until the system is finalized and is in full operation, before they begin to evaluate the system. This decision is based on two primary issues (Babachicos, 1995). First, does the audit staff have technical capability to analyse the automated application, and secondly, can they maintain their professional independence. This research adds one variable that is perception about benefit of auditor involvement in the system development process (Durant, 1991; Oliphant, 2001; Landsittel, 1991; Shaver (1987)). The study result support variable technical capability and perception about benefit of auditor involvement. Issue about professional independence do not supported by this research.

Keywords: Internal auditor, information system, perception of involvement benefit

1. Introduction

Implementation of *Good Corporate Governance* should be supported by good information system management because transparency needs qualified information which only be resulted from qualified information system. Meanwhile good information system management should be started from good information system design.

Auditor involvement in developing information system is based on above concept and also because early detection of error is a cost-effective action (Durant, 1991). Any corrections before implementing the system are much cheaper compared with correction after implementing the system. The earlier error detection will make the correction cost cheaper. On the other hand, the later error detection will make the correction cost becomes more expensive including system recovery cost, failure on used resources, or cost caused by resulted risk, such as data error, data lost, unauthorized access, fictitious transaction, etc. Downstream effect of incapable design and implementation is very expensive.

System development project is famous of its risk such as cost consumption and time-beyond planning, implemented system does not fulfill user requirement, and information technology based

system needs complex *control framework*. Therefore auditor involvement since system development stage is expected to minimize those risks above.

However, there was conflict between auditors about whether auditor needs to be involved as team member in developing information system. The contra party argued that auditor independence will be disturbed if the auditor should be responsible for system evaluation where he/she involves in the system development (Weber, 1999). Therefore the contra party said that auditor would only be involved in evaluation on developed system (ex-post review).

Weber (1999) summarized auditor involvement area in information system review which consisted of 3 types : (1) *Concurrent Audit*: Auditor becomes information system development team member. They help team in increasing developed information system quality (Gallegos, 1988), (2) *Postimplementation Audit* : Auditor conducts evaluation on implemented information system specifically for each certain application system implementation and gives suggestion or modification when necessary, (3) *General Audit* : Auditor conduct general evaluation on information system in order to determine scope substantive examination that is necessary in financial report audit.

External auditor tends to conduct general audit rather than *concurrent* or *post implementation audit*. But the client also might ask for external auditor service so the auditor gets involve with system development because this involvement will decrease general audit cost or because the client needs auditor suggestion on the system development project. In the meanwhile, internal auditor tends to be involved in *concurrent* or *post implementation audit*.

Cerullo and Cerullo (1999) collected empirical data of 200 companies from Fortune 500 Company in the area of client/server system development project and found that 77% companies included their internal auditors in developing system. From that percentage, 9,5% companies included their internal auditors as system development team, 50,8% companies included their internal auditors as consultants for system development team, and 39,7% companies included their internal auditor as *independent appraiser*.

Shaver (1987) tried to find factors that influenced auditor involvement scope in developing information system. He found the influence factors was user expectancy, perception of system development project team for auditor involvement benefit, auditor expert, and authorization that was given to auditor by professional organization.

Maher and Aker (2002) examined perception of *Chief Executive Officers* (CEO) and internal auditor in America about independence problem when auditor gets involve with system development process. This research found that CEO paid more attention to independence problem caused by internal auditor involvement in developing information system than the auditor itself.

Phenomenon of internal auditor involvement in developing information system had encouraged researchers to collect empirical evidence about internal auditor involvement practice and the influencing factors in Indonesia.

2. Problem Statement

The previous background formulated two problem statements for this paper as follows:

1. What internal auditor involvement scope in developing information system?
2. Does internal auditor involvement scope in developing information system is influenced by perception of internal auditor involvement benefit in developing information system, perception of internal auditor independence problem if gets involve with information system development, and internal auditor skill in information technology?

3. Benefit of Research

The research benefits are as follows:

1. To give description to companies about benefit of internal auditor involvement in developing information system.

2. To encourage internal auditors so they will improve their knowledge and skill in information system area because auditors have important role in developing information system conceptually.

4. Literature Study and Hypothesis Formulation

4.1. Information System Life Cycle

Information system life cycle consists of 2 stages (Whitten, 1999) which are *System development* and *system operation and support*. At first stage, information system is being designed, then enters operating stage of system implementation, and being maintained in order to operate refers to the goal. Afterwards, this cycle might be back to the development stage (first stage) whenever is necessary and so on.

Eventhough system development stage is different according to applied methodology, but basically information system development consists of 5 stages (Whitten, 1999 ; Oliphant, 2001; Maher, 2002) which are:

- a. Planning Stage, which consists of problem/opportunity análisis activity that encourages information system development, required strategic information system identification, system reengineering process management, feasibility study, risk analysis, and required system identification.
- b. Design Stage, which consists of organization structure design activity and responsibility distribution for new system, database design, process design and data flow, interface design, physical design (hardware and software), and procedure design.
- c. Development Stage, which consists of acquisition activity and software development, and also acquisition and hardware and network development.
- d. Testing Stage, which is stage to test developed system reliability.
- e. Implementation Stage, which is conversión stage from old system to new system.

4.2. Information System Development

A formal process called system development methodology is necessary in order to make efficient and effective information system development. System development methodology is a formal process which defines a group of activity, method, practice, and automated tools that is being used to build information system. Methodology aims to minimize error risk in system development. There is no a certain type that can be used in all condition or all companies. The relevant methodology depends on goal and priority in certain condition. However, all used methodologies are basically one of or combination (hybrid) of these methods: (1) *Model-Driven Methodology*, (2) *Rapid Application Development*, (3) *Commercial Off-the-Shelf Package Software* (Whitten, 1999).

4.3. Internal Auditor Involvement in Developing Information System

Internal auditing function has two main goals which are (1) to support management in achieving productivity improvement (*auditing economy, efficiency, and effectiveness*), (2) to give input to management for effective and efficient infrastructure development (either new or improvement). Based on the goal, then it is clear that internal auditor has task to evaluate and give suggestion therefore the developed information system can support companies in achieving it goal, which means system can fulfill user requirement and business requirement, becomes strong internal control aspect, and time accurate system development project and resources.

Logically, early auditor involvement since information system development stage can increase developed system reliability, therefore system implementation will achieve target with minimum error. The earlier the error is detected, the cost will be lower (*cost effectiveness*).

Auditor involvement type in information system development was classified by Weber (1999) into 3 types, which were: *Concurrent Audit*, *Postimplementation Audit*, *General Audit*.

4.4. Hypotesis Formulation

4.4.1. Perception of Internal Auditor Involvement Benefit

Acknowledgement of *cost-effectiveness* benefit by involving internal auditor in information system development will determine internal auditor assign scope. This internal auditor involvement is basically based on the concept that early detection on *deficiencies* will allow *cost-effective* correction compared with if the detection occurs at the advance system development stage or implementation stage (Durant, 1991). Oliphant (2001) stated that internal auditor needs to be involved in information system development as internal control aspect is commonly not being calculated by system developer or system user. Landsittel (1991) also stated the same opinion. While Babachicos (1995) stated that actually internal auditor has specific capability that is not always owned by system development team. That specific capability is internal control analysis skill and strong foundation about manual processing scope from a system that will be automates. Shaver (1987) also found that the higher the perception or acknowledgement of internal auditor involvement benefit in information system development, the higher the possibility of involving internal auditor as information system development team.

H1: perception of internal auditor involvement benefit has positive influence on internal auditor involvement in information system development.

4.4.2. Perception of Internal Auditor Independence

Pro-contra in regards with independence problem that happens when auditor involves in system development process might become reason for not involving internal auditor. *Information System Auditing Guideline, Document G17*, title "Effect of Nonaudit Role on the IS Auditor's Independence" that had been published by *Information Systems Audit and Control Association (ISACA)* stated the possibility of independence and internal auditor objectivity problems either *in fact* or *in appearance*, so it needs assign strategy. In practice, this independence problem tends to encourage internal auditor to get *ex-post audit assignment* rather than *concurrent* or *pre-implementation audit* (Maher & Akers, 2002).

H2: perception of internal auditor independence problem has negative influence on internal auditor involvement in developing information system.

4.4.3. Internal Auditor Skill on Information Technology

Internal auditor involvement in developing information system aims to make developed system fulfill the goal of *asset safeguarding*, data integrity, effectivity and efficiency. This matter needs intersection between two discipline which are auditing and information technology. Without sufficient skill for those disciplines, then auditor involvement maybe will not give meaningful contribution. In other word, involving internal auditor requires auditor skill improvement in information technology area. Shaver (1987) found that internal auditor skill in information technology area relates with its involvement with information system development process. This result supports Babachicos (1995) that the decision to include internal auditor in developing information system is based on two major issues which are (1) does internal auditor have technical skill and (2) does internal auditor can maintain his/her independence.

H3: level of information technology coverage by internal auditor has positive influence on his/her involvement in developing information system.

5. Research Methods

5.1. Population and Sample

The research object consists of manager that has authorization to approve or create or lead information system development project team, head of internal audit division, and head of system/information technology/EDP (Electronic Data Processing) in Semarang city, Indonesia. The company criteria are (1) had applied or is applying information technology based information system, whether it is being developed by the company itself or not, (2) has internal audit function and information technology division. The sample consisted of 30 respondents from 10 companies, from total 150 questionnaires that had been distributed to 50 companies.

5.2. Operational Definition and Variable Measurement

5.2.1. The Role of Internal Auditor in Developing Information System

Cerullo (1999) and Weber (1999) classified the role of internal auditor in reviewing information system to 2 types, which are (1) role in the information system development process and (2) role of conducting post-implementation audit which is system audit after being developed. The first role can be classified again into 3 types, which are (1) as a system development team member, (2) as a consultant for system development team, (3) as a *reviewer* or *independent appraiser* that conduct *pre-implementation*.

5.2.2. Involvement of Internal Auditor in Developing Information System

Internal auditor involvement is measured at each system development stage which is planning, designing, improving, testing, implementing, operating and maintaining, with 1-5 scale (never until intensive).

5.2.3. Perception of Internal Auditor Benefit in Developing Information System

Variable of internal auditor benefit perception was developed based on Watsong and Earl (1983) paper that internal auditor involvement was necessary therefore system development became more *cost-effective* compared with involving with *post-implementation audit* only, as it (1) keep system development project refers to the budget, (2) fulfill time target, (3) system fulfill user needs, (3) system has sufficient internal control aspect. Those aspects then being developed into 7 question items with 1-5 scale (strongly disagree until strongly agree). The higher the score, the higher the perception of internal auditor involvement benefit.

5.2.4. Perception of Internal Auditor Independence

There were 5 questions used to measure this variable that related to perception of independence for each auditor role type in developing information system. The 1-5 scale answer was used. It showed the higher the score, the higher the perception that internal auditor involvement will disturb his/her independence.

5.2.5. Internal Auditor Skill Related to Information Technology

Auditor skill was measured by respondent perception such as manager, internal auditor, and information technology division, for their internal auditor information technology skills. Majoring information technology was measured at each information technology component, consisted of (Whitten, 1999): (1) process which consists of process logical design and application program-making using program language, (2) data which consists of data logic design and database physical floatation, (3) hardware, (4) network, and (5) security and control systems. Semakin tinggi skor berarti semakin tinggi penguasaan teknologi informasi oleh auditor.

5.3. Type and Source of Data

This paper used primary data which consisted of respondents answers based on research questionnaires. The instrument was tested by Product Moment Pearson for its validity and by Alpha Cronbach coefficient method for its reliability. The test results showed that the instrument was valid and reliable.

5.4. Data Analysis Method

The first research question was answered by using descriptive statistic about intensity of internal auditor role in developing information system. While the second research question about factors that influenced internal auditor involvement level in information system development process was tested using the following regression formula:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

Where :

- Y: intensity of internal auditor involvement in developing information system
- X1: perception of internal auditor benefit in developing information system
- X2: perception of internal auditor involvement effect on developing information system to independence
- X3: level of internal auditor skill related to information technology

6. Analysis

6.1. Descriptive Statistic

6.1.1. Internal Auditor Involvement in Developing Information System

Analysis of internal auditor role showed that internal auditor in a company does not only have one role. The research result showed that the biggest internal auditor role locates in *post-implementation audit* assignment on developed system (mean 3.60). As the lowest team member role, although the distribution was not much different, each of them was on the medium scale.

Table 1: Distribution of Internal Auditor Role in Developing Information System

	Pre-Implementation			Post Implementation
	Team Member	Consultant for Team	Independent Reviewer	
Mean	3.10	3.33	3.37	3.60

Source: processed primary data

If we see from internal auditor involvement at each information system development stages, the highest average was on the system test stage (3.20), then involvement at planning stage (4.03) and implementation stage (3.03). The lowest average was on the system development stage. The development stage was a technical stage where the system was physically developed, consisted of application program making, hardware installation, and network installation. In general, involvement average was in medium level (mean 2.82).

Table 2: Description of Internal Auditor Involvement Variable in Developing Information System Stage

	Min	Max	Mean	Dev.Stand.
Planning	1	5	3.04	0.85
Design	1	5	2.63	0.76
Development	1	5	2.51	0.91
Test	2	5	3.20	0.99
Implementation	2	5	3.02	0.92
Operation & Maintenance	1	4	2.66	0.92
Total	1.94	4.82	2.82	0.67

Source: processed primary data

If we see from the involvement level at each system development stage, the highest involvement was on system strategic requirement identification activity, then risk analysis activity, and problem analysis.

6.1.2. Perception of Internal Auditor Involvement Benefit

Perception average of internal auditor involvement benefit in developing information system showed high score (mean 3.97). It means that generally respondents have acknowledged positive benefit of internal auditor involvement.

The biggest benefit came from early system risk control aspect and control aspect which means that auditor involvement may guarantee that the system has sufficient control. This result proved that auditor role as controlling function was still dominant.

Table 3: Perception of Internal Auditor Involvement Benefit

Benefit	Mean
Avoid early risk	4.33
Budget control	3.93
Time control	3.67
User needs fulfillment	3.80
Control	4.20

Source: processed primary data

If we see from the perception of each respondent group, which was manager/company leader, internal auditor, and information technology division, all of them showed that the highest benefit perception was on the internal auditor group itself. It means that the internal auditor themselves thought that they need to be involved in developing information system in order to contribute on cost-effective system development project. Moreover, manager also had high perception about the benefit of internal auditor involvement benefit. The lowest perception came from information technology division. It might cause by information technology division perception who measured the contribution of internal auditor based on information technology/technical point of view.

Table 4: Perception of Involvement Benefit Based on Respondent Group

Respondent Group	Mean
Leader/Manager	4.05
Internal Auditor	4.11
Information Technology Division	3.75

Source: processed primary data

However, the test on those group perceptions showed no difference ($p 0.29$, $\alpha 5\%$) so it can be concluded that there was same perception trend between manager, internal auditor, and information

technology division about the benefit of internal auditor involvement in developing information system which showed high perception trend.

6.1.3. Perception of Internal Auditor Involvement Effect on Information System Development Related to Independence

Data description showed that in general respondent perception related to internal auditor independence problem caused by his/her low involvement in developing information system (mean 2.44). The test on respondent group consisted of manager, internal auditor, and information technology division also showed no difference in their perception ($p > 0.05$, $\alpha 5\%$).

6.1.4. Level of Internal Auditor Skill Related to Information Technology

Mastering information technology by internal auditor was measured by the perception of manager, internal auditor, and information technology division. The result showed that mastering information technology by internal auditor had average score (mean 2.79). When we observed auditor skill for each information technology component, we found that mastering security and control score was higher than other components, while the lowest score was on mastering program language.

Table 5: Mastering Information Technology

Information Technology Component	Mean	Deviation Standard
Program Language	2.50	1.00
Design of data base logic	2.60	0.93
Physical database	2.90	1.02
Security & control	3.07	0.94
Hardware	2.80	0.88
Network	2.80	0.80
Process design	2.83	0.83
Total	2.79	0.77

Source: processed primary data

Test on each respondent group perception (manager, internal auditor, information technology division) also showed no difference ($p > 0.05$, $\alpha 5\%$).

6.2. Result of Hypotesis Test

Result of double regression test showed that the variable of internal auditor involvement benefit perception and the variable of internal auditor information technology skill had influence on the intensity of internal auditor involvement in developing information system, with the significant score 0.007 and 0.001 ($\alpha 5\%$). Perception of internal auditor involvement in developing information system effect on independence did not show influence on the intensity of internal auditor involvement in developing information system.

Table 6: Result of Double Regression Test

	Unstandardized Coefficient		Beta	t	Sig
	B	Std. Error			
Constant	- 0.543	0.799		- 0.680	0.503
Benefit	0.525	0.181	0.414	2.909	0.007
Mastering IT	0.460	0.124	0.527	3.705	0.001
Independence	- 0.321	0.445	- 0.135	- 0.721	0.477
F = 11.198 Sig = 0.000 Adj R ² = 0.413					

Source: processed primary data

6.3. Discussion

The research result provided empirical evidence that internal auditor involvement level in developing information system was influenced by organization perception (consisted of manager, internal auditor, and information technology/information system division) on internal auditor involvement benefit. The higher their perception on benefit or contribution provided by internal auditor on developing information system, the higher the auditor involvement level in developing information system. This result supports Shaver study (1987).

The biggest benefit for organization was that internal auditor involvement guaranteed the developed system will have sufficient security & control aspects. This was consistent with Oliphant (2001) study which stated that internal auditor should be involved in developing information system because internal control aspect rarely considered by developer or system user. The same result was also stated by Landsittel (1991). Moreover, Babachicos (1995) also stated that internal auditor had specific capability that was not always owned by system development team. The specific capability was that the skill of internal control analysis and strong foundation about manual processing scope of a to-be-automates system.

The second variable which influenced internal auditor involvement was mastering information technology by internal auditor. The higher the auditor internal master information technology, the higher the internal auditor tends to be involved in information system development. This result was consistent with Shaver (1987) study which found that internal auditor skill in the area of information technology area was related to his/her involvement in developing information system. This also supports Babachicos (1995) opinion that the decision to engage internal auditor in developing information system was based on the issue whether internal auditor has technical skill.

This result indicates that if perception of internal auditor involvement benefit can be increased, then assignment tendency to internal auditor to be more engaged in the information system development process will be increased, too. The effort to increase organization member perception related to this benefit is actually can be done if there is initiative from internal auditor. Manager and information technology division trusts will increase if internal auditor provides critical inputs related to information system development and convinces that bigger involvement in developing information system will be more *cost-effective*. In order to be able to give those critical inputs, the auditor should upgrade his/her information technology skill. This is supported by the research result in this paper that the higher internal auditor information technology skill, the higher the tendency of involving internal auditor in the information system development process.

7. Closing

7.1. Conclusion

This research result shows that:

- 1) Intensity of internal auditor involvement in developing information system was on middle level. The biggest role was on post-implementation audit. The engagement in system development process was lower.
- 2) Involvement of internal auditor in developing company information system development was influenced by organization member perception on the benefit of internal auditor involvement. The higher the perception of involvement benefit, the higher the involvement of internal auditor in information system development process.

7.2. Implication

Different business environment might cause different tendency of internal auditor involvement level in information system development process. As an example, the business environment in Indonesia will be different with the business environment in United Kingdom, where the information technology

application and auditor information technology skill are higher related to environment demand. Therefore the future research can be done by broadening research scope.

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