Innovation of Fraud Deterrence System in the Organization using Forensic Accounting and Data Mining Techniques

Pornchai Naruedomkul, Chulalongkorn University, Thailand
Pannipa Rodwanna, Chulalongkorn University, Thailand

INTRODUCTION

It is undeniable that corporate fraud is one of the critical issues for the businesses around the world including Thailand. The 2010 Association of Certified Fraud Examiners (ACFE) Report stated that the loss due to fraudulent activities in the businesses was about 5-7% of the annual revenues in the U.S.A. (Table 1). The amount of loss due to occupational fraud and abuse did not decrease after the enacted of Sarbanes-Oxley Act and Statement of Auditing Standard (SAS) No.99 in 2002.

![Table 1: Estimated loss due to occupational fraud and abuse in U.S.A.](Image)

In Thailand, KPMG Forensic conducted the fraud survey in 2005 and 2007 and it appeared that fraud risk was a major concern for businesses in Thailand [15]. The estimated financial loss in case of fraud detected in Thailand from 2005 to 2007 is shown in Table 2. While the percentage of fraud less than a million baht (Thailand currency) has come down, fraud above a million baht has gone up. The survey also indicated that the fraud issues found in Thailand are also found in other countries [15].

![Table 2: Estimated financial losses in cases of fraud detected in Thailand](Image)

After Enron and WorldCom collapsed, many organizations had established the policy and regulations to detect the internal fraud e.g. Sarbanes-Oxley Act, Statement of Auditing Standard (SAS) No.99 and International Standards on Auditing No. 240. The Securities and Exchange Act 1992 of Thailand clearly defines that if the auditor finds any false supporting documents and/or incorrect recording in the accounts of a listed company, the auditor shall disclose the effects on the financial statement in the audit report.

These regulations are used to detect the frauds which have already occurred in the business resulting in the loss or damage. It would be beneficial to the business if there was a system in place where fraud can be detected early so that it can be prevented or loss can be minimized as much as possible.

Deterrence is the best way to prevent fraud before it happens which should reduce the loss or damage to the organization [31] [33]. To develop this system, it is important to understand the behavioral factors influencing a fraudster [26].

RESEARCH OBJECTIVE

This research identifies the risk factors causing the fraudulent activities in the organization. A risk model to identify potential fraud and a fraud deterrence system are developed in the paper.

LITERATURE REVIEW

FRAUD DEFINITION

Fraud can be defined in many ways. Reference [12] defined fraud as “Fraud (false pretense) involves intentional and material misrepresentation of one or more material facts with the intent of taking of property from a victim. The misrepresentation must be more than mere sales hyperbole.”

Albrecht (2003) defined fraud as “a representation about a material fact which is false and intentionally or recklessly so, which is believed and acted upon by the victim, to the victim’s damage” [cited in 27].

Oxford, dictionary of law (2003) defined fraud as “a false representation by means of a statement or conduct made knowingly or recklessly in order to gain a material advantage. If the fraud results in injury to the deceived party, he may claim damages for the tort of deceit. A contract obtained by fraud is voidable on the grounds of fraudulent misrepresentation” [17].

American heritage dictionary (second college edition) defined fraud as “a deception deliberately practiced in order to secure unfair or unlawful gain” [cited in 14].

Black’s law dictionary describes fraud as “the intentional use of deceit, a trick or some dishonest means to deprive another of his/her/its money, property or a legal right” [cited in 18].
Criminal Code of Thailand, B.E. 2499 (1956) as amended until the Criminal Code (No.17), B.E. 2547 (2003), chapter 1, section 1 defined fraud as "To commit an act dishonestly means to do an act in order to procure, for himself or the other person, any advantage to which he is not entitled by law" [10].

For this research, the definition of fraud from Criminal Code, B.E. 2499 (1956) as amended until the Criminal Code (No.17), B.E. 2547 (2003) will be used to measure the behavior or act causing fraudulent.

**FRAUD CLASSIFICATION**

The type of fraud which is relevant to accountants and auditors is "occupational fraud" which is classified into the following categories [5]:

1. **Employee fraud/Asset misappropriation**
   Employee fraud/Asset misappropriation is the most common type of fraud. It involves theft or misuse of an organization’s assets such as skimming revenues, stealing inventory, and payroll fraud. Asset misappropriation can be divided between cash schemes and non-cash schemes. Cash schemes involve the theft of money or other assets in the company.

2. **Corruption**
   Corruption occurs when fraudsters wrongfully use their influence in a business transaction in order to procur[e some benefits for themselves or for other people, contrary to their duty to their employer or the rights of another such as accepting kickbacks or engaging in conflicts of interest.

3. **Fraudulent statements**
   Fraudulent statement generally involves falsification of an organization’s financial statements such as overstating revenues and understating liabilities or expenses.

**FRAUD TRIANGLE**

Fraud triangle (Figure 1) was introduced by Donald R. Cressey in 1950 [29] describing the reasons why fraud is committed.

1. **Pressure**
   Pressure (incentive or motivation) refers to something that motivates people to be a fraudster. It may come from financial stress, gambling or other factors from personal life style. However, it is not necessary that people who are poor will be a fraudster; there is also a possibility for a wealthy person or top management of the company to commit fraud as well.

2. **Rationalization**
   Most of the fraudsters do not have a criminal record [5]. Actually white collar crime has a personal code of ethics. "It is not uncommon for a fraudster to be religious" [29]. They steal the money or assets from the company and think that they will pay it back. Unfortunately, they never return the funds; hence, a fraud is committed.

3. **Opportunity**
   The management of the firm understands the weaknesses in the internal controls of the company are and some managers are willing to use them to execute a fraud.
   Fraud is likely to occur in a situation where there are three factors combined; pressure, opportunity and rationalization [7]. Therefore, preventing fraud from occurring while putting in place the control mechanism to deter it can reduce the potential losses.

**RISK FACTORS AND RED FLAGS INDICATORS**

The top management of the firm should be alert to any warning signs that might indicate that fraud is taking place; these warning signs may be [1] [2] [3] [4] [5] [6] [9]:

- Living beyond means
- Financial difficulties
- Control issues, unwillingness to share duties
- Unusually close association with vendor/customer
- Wheeler-dealer attitude
- Divorce/family problems
- Irritability, suspiciousness, or defensiveness
- Addiction problems
- Refusal to take vacations
- Past employment-related problems
- Complained about inadequate pay
- Excessive pressure from within organization
- Past legal problems
- Instability in life circumstances
- Excessive family/peer pressure for success
- Complained about lack of authority

**FORENSIC ACCOUNTING DEFENITION**

Bolga and Linquist (1995) defined forensic accounting as “the application of financial skills and an investigative mentality to unresolved issues, conducted within the context of the rules of evidence” [cited in 11].

Webster’s dictionary defined forensic accounting as “belonging to, used in or suitable to court, of judicature or to public discussions, debate and ultimately dispute resolutions.” It is also defined as “an accounting analysis that is suitable to the court which will from the basis for
discussion, debate and ultimately dispute resolution” [cited in 23].

ROLE OF FORENSIC ACCOUNTANT

“The forensic accountants apply special knowledge in accounting, auditing, finance, quantitative methods, certain areas of law, research and investigative skills to collect, analyze, and evaluate evidential matter and to interpret and communication findings” [12]. A forensic accountant can be called “Sherlock Holmes” [12].

Joseph T. Wells, Chair of the Association of Certified Fraud Examiners states that an auditor cannot uncover all the frauds in the firm by performing an audit [16]. Hence, the forensic accountant is required to uncover fraud in the organization [25]. The survey conducted by Kessler International nationwide also revealed that 39 percent of organizations surveyed need forensic accountants [23].

FORENSIC INVESTIGATION

If there is any signal for fraudulent activities in the organization, a forensic accountant should conduct an investigation that includes the following steps:

1. Collect the evidence

A forensic accountant should collect as much evidence as possible. Some evidence is stored in the database of the company. However, some evidence may be stored with external sources e.g. government, bank etc. A forensic accountant should try to collect all information to support the case [12].

2. Interview and interrogate

Forensic accountant should conduct an interview and interrogation as necessary to gather all information required to be the evidence.

DATA MINING TECHNIQUE

Data mining is a technique with an objective to mine large amount of data to discover previously unknown, action oriented, hidden trends, patterns and complex relationships. Discovery, predictive modeling and deviation analysis are three major activities of data mining techniques [24].

FRAUD DETERRENCE SYSTEM IN THE ORGANIZATION USING FORENSIC ACCOUNTING AND DATA MINING TECHNIQUES APPROACH

The regulations enacted after Enron and WorldCom collapsed were the fraud detection in the financial statement. Therefore, the concept of fraud deterrence using data mining and forensic accounting is explored. It will be developed as a tool to deter fraud in the organization. The system to be developed will be a product innovation according to taxonomy of innovation [8] and a knowledge intensive business services (KIBS) [21].

CONCEPTUAL FRAMEWORK

This research attempts to develop the fraud deterrence system for the organization. To develop such system, it is necessary to understand the risk factors influencing a fraudster to commit the fraud. The conceptual framework for this research is shown in Figure 2.

In phase 1, from the background and literature review which consist of fraud auditing, forensic accounting, data mining technique, risk management and regulations related to fraudulent, the conceptual framework was built as shown in Figure 2.

In phase 2, qualitative research was conducted with the 30 non-listed companies in Bangkok and quantitative research was conducted with the samples of 565 companies from the total listed-companies in the Stock Exchange of Market in Thailand and 500 non-listed companies in Bangkok. The differences of fraud risk factors between these two types of companies were compared.

Samples of qualitative were selected using snowball method and in depth interviews were carried out. The samples for quantitative research were selected using Krejcie and Morgan method and simple random sampling technique and the questionnaire was provided to all sample companies [22].

In phase 3, attitude and behavior survey was conducted to collect the information from the participants. The samples were selected using Krejcie and Morgan method and simple random sampling technique and the questionnaire was again provided to all samples to complete. The findings of fraud risk factors from quantitative research and attitude and behavior survey were used to determine the important rules for fraud risk behaviors using association rule.

In phase 4, the fraud deterrence model was developed based on the important rule findings in phase 3.

In phase 5, system for fraud deterrence was developed based on fraud deterrence model in phase 4. The fraud deterrence system should perform the risk assessment based on risk management – principles and guidelines of International Standard (ISO 31000) [13] and rank the company as per the examples below:

\[A = \text{Fraud free} \]
\[B = \text{Minor fraud found} \]
\[C = \text{Major fraud found} \]

The work flow process of fraud deterrence system is shown in Figure 3.

The company should conduct attitude and behavior survey from all staff in the organization and input the collected information into the fraud deterrence system. The system will assess the risk potential by mapping the individual employee information with the fraud risk behaviors and measure the fraud potential based on the risk measurable set up in the system. The next step is the validation of the evaluation process. For those who are validated by the system, the validation report will be prepared. Those who are not validated by the system, reasons for not validating will be reported. The forensic accountant has to investigate those who are not validated by the fraud deterrence system and issue on investigation report.
In phase 6, the validation will be conducted to assess the efficiency, the practicality and reliability of the program and identify areas for further improvement.

FRAUD DETERRENCE MODEL

Identification of the risk factors causing fraudulent activities in the organization in Thailand was carried out using a quantitative research which represented the attitude of the participants in the survey. However, it cannot be concluded that a person displaying such characteristics will commit fraud. Hence, the association rule is more appropriate to be used to find out the important rules for fraud potential to occur in association with each fraud risk factor [19] [20] [28] [30] [32].

POTENTIAL FRAUD RISK BEHAVIORS

Apriori algorithm in association rule is selected to find out the potential fraud rules. The samples of 14 strong rules to be used in fraud deterrence model are shown in Table 3.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Fraud risk behaviors</th>
<th>Probability to occur fraud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeler-dealer attitude</td>
<td>Living beyond means and financial difficulties</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Living beyond means, financial difficulties and past legal problems</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Living beyond means and past legal problems</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Past legal problem and refusal to take vacations</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Financial difficulties and refusal to take vacations</td>
<td>0.87</td>
</tr>
<tr>
<td>Financial difficulties</td>
<td>Living beyond means, wheeler-dealer attitude and past legal problems</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>Remove money from coworkers, wheeler-dealer attitude and past legal problems</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>Remove money from coworkers and wheeler-dealer attitude</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Living beyond means and past legal problems</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Remove money from coworkers and past legal problem</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>Wheeler-dealer attitude and past legal problems</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>Past legal problems and refusal to take vacations</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>Living beyond means and wheeler-dealer attitude</td>
<td>0.89</td>
</tr>
<tr>
<td>Living beyond means</td>
<td>Financial difficulties, wheeler-dealer attitude and past legal problem</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Table 3: 14 best rules for fraud deterrence model

From table 3, it seems that “wheeler-dealer attitude”, “financial difficulties” and “living beyond means” are the three key risk factors for a person to potentially commit fraud. However, most people do not want to be a fraudster unless they are in a difficult situation where they are under a lot of pressure and there seems to be no solution for them. For a person to commit fraud, there are usually more than one risk factor involved. For example, an individual who overspends more than he could earn may not commit a fraud. An individual who overspends and has financial difficulty has 98% chances to commit fraud. Nonetheless, fraud can be committed if there is an opportunity and rationalization.

SUMMARY OF FRAUD DETERRENCE SYSTEM

This model will be used to develop a fraud deterrence system - a tool to predict a potential fraud in the organization. However, it is not easy for staff in the company to fill in the form and admit that they are prone to commit fraud in the organization.

Therefore, forensic accountant is needed to conduct a further investigation on staff who are indicated by the system that they may potentially commit fraud i.e. staff who responded that they have 0% or less than 10% of fraud risk behaviors.

Forensic accountant will use the personal financial information filled in by staff to check against those questions in the attitude and behavior form. A forensic accountant will also check the financial information of that staff with National Credit Bureau Co.,Ltd. to ensure the accuracy and reliability of the information especially if the staff is at the management level to prevent the white collar crime cases. If needed, forensic accountant may check staff records via Office of the National Anti-Corruption Commission and/or Crime Suppression Division, Royal Thai Police.

Human Resources Department should check the records of the staff with their former companies by sampling two to three sources to ensure that the persons do not have bad records regarding legal or performance issues with the previous employers and forward them to the forensic accountant to be used as supporting evidences.

The purpose of the fraud deterrence system is to alert or provide an early warning to the owner of the businesses to be aware of the potential fraud. It is a tool to indicate potential frauds in the organization, but it cannot confirm that an individual will be a fraudster. Further investigation should be done by forensic accountant as mentioned to validate the case. If a fraudster has a motivation to commit fraud, without an opportunity, fraud cannot be committed. Therefore, risk management should also be developed and implemented in the firm to deter the fraud activities apart from the fraud deterrence system.

CONCLUSION

The risk factors causing fraudulent activities in the organization in Thailand are identified from the qualitative and quantitative researches. The association rule is used to capture the fraud risk behaviors of each risk factor. The significant rules which state the high probability to occur fraud activities are selected to be used as fraud deterrence model.

The fraud deterrence system will be developed and implemented using the fraud deterrence model as criteria to measure potential frauds in the organization. The forensic accountant will further investigate to ensure the correctness of potential frauds.

Fraud deterrence system using forensic accounting and data mining techniques will be a tool to assist the owner of businesses to prevent the fraudulent activities by identifying the potential frauds in the organization in a timely manner. It will also be an instrument to minimize the loss from fraudulent activities and improve the savings.

LIMITATION OF RESEARCH

This research does not cover specific business risk for each type of business. Samples of fraud risk factors research were selected from Bangkok only. It might be better
to use the samples from different demographics to identify fraud risk factors.

ACKNOWLEDGEMENT

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REFERENCES

Figure 2: Conceptual framework for fraud deterrence system in the organization

1. Risk factors research

- Risk Factors:
  - Living beyond means
  - Financial difficulties
  - Control issues, unwillingness to share duties
  - Unusually close association with vendor/customer
  - Wheeler-dealer attitude
  - Divorce/family problems
  - Irritability, suspiciousness, or defensiveness
  - Addiction problems
  - Refusal to take vacations
  - Past employment-related problems
  - Complained about inadequate pay
  - Excessive pressure from within organization
  - Past legal problems
  - Instability in life circumstances
  - Excessive family/peer pressure for success
  - Complained about lack of authority

Reduce fraud risk factors and fraud triangles

2. Financial information and attitude & behavior surveys

- Important rules for fraud potential for each risk factor (data mining)

3. System development

- Develop fraud deterrence model
- Develop fraud deterrence system

Corporate Governance

Fraud Triangle
- Pressure
- Opportunity
- Rationalization

Fraud Committed
- Asset Misappropriations
- Corruption
- Fraudulent Statement

Add

If it cannot reduce risk factors and fraud triangles

Risk factors finding from research

Figure 3: Work flow process for fraud deterrence system

- Start
- Collect attitude and behavior survey and records
- Risk assessment process
- Evaluation validation process
- Investigation report
- Investigation (Forensic accountant)
- Reasons for not validating
- Validation report
- Validate