Determinants for Effective Application of Software in Computer Assisted Auditing Techniques (CAATs)

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EXECUTIVE SUMMARY

Title
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Background
In light of its increasing importance to the stability of financial markets, significant effort has been made in recent years to improve the effectiveness of auditing profession. To cope with the developments in information technology and to meet the increasing demands of users of accounting information, effort is being made to improve and expand auditing techniques. Since the primary responsibility of professionals in public accounting firms involve information-intensive activities such as gathering, organizing, processing, evaluating, and presenting data, the use of IT is likely to improve the productivity of accounting professionals. Hence, examining the determinant factors for effective application of IT in the audit process by public accounting firms and investigating the ways of enhancing productivity is of considerable interest to academic inquiries like this.

Research Problem
A number of studies have been conducted in areas related to the application of software for the audit of automated accounting information systems. Some researchers concluded that only few auditors use audit software for CAATs and despite the expanding role of e-commerce in the economy and much of the traditional audit trail is disappearing, auditors made less effort to incorporate state of the art audit software in the audit process.

- Given information technology’s potential and public expectation for quality of audit process, why aren’t more auditors using IT?
- What are the determinants for effective application of Information Technology (IT) for computer assisted auditing techniques and tools (CAATs)?

Purpose
The purposes of this study are to get an over all picture of the general objectives and awareness of auditors for the adoption of CAATs and the current level of involvement of auditors in the application of CAATs in the audit process, which software and techniques they use and the possible causes for non use
or less efficient use of CAATs. Once the determinant factors are identified, their implications for audit firms and to employees in the auditing profession are also discussed.

**Significance of the Study**

The first thing to take corrective action for a problem is identifying the cause why it happened. I believe that increasing the efficiency and effectiveness of auditors in the use of audit software for audit process could be enhanced if determinant factors for this are identified. Furthermore, studies of this type could help software developers on how audit software could be improved to better suit for auditing process, if the cause for the inefficiency and/or avoidance of using the software is identified.

**Method**

The process for gathering the empirical data is conducted in to two phases. First detailed questionnaire is designed and distributed to selected respondents in four companies and then based on the analysis made on this data, interviews were conducted to get the answer for those questions evolved later. This data is then analyzed by using tools like SPSS, summated rating (or Likert) scale and spreadsheet which are mainly descriptive statistics and analysis methods.

**Conclusion**

The auditing profession certainly has firm integration with IT and it seems that firms under this survey and their employees aware of this and are trying to integrate relevant computer assisted auditing techniques (CAATs) in the audit process. The survey result indicated that both management and employees believe that, effective applications of CAATs in the audit process have high potential for enhancing work efficiency and effectiveness. Besides, audit firms seem less constrained by the major hurdles for effective adoption of IT in their operational process.

However, the pace of change by audit firms in adopting the relevant CAATs for auditing and be abreast of technology seem slow due to lack of awareness and less commitment to address change and develop appropriate strategies and plans in order to adapt the operation of the firm in line with the change in technology, business operation environment and the increasing public demand and expectation for timely audited financial information. Employees seem lacking adequate knowledge and relevant practical experience to utilize the full potentials of the existing CAATs. Technical complexities of the software and less involvement of users while new technology is adopted are also found to be other determinant factors.

The findings of this research have some practical implications for future auditors. It is inevitable that the application of CAATs for auditing will be even more relevant in the future than now as business increasingly use electronic data processing techniques to process their accounting systems which in turn signal the end of traditional auditing approach. Effective application of CAATs in such computerized accounting information system will help auditors to perform quality audit timely that can meet public demand and expectation. For this auditors need to keep abreast with current issues and looks at available CAATs tools and improve their conceptual abilities in defining the techniques and enhancing their imaginative skill to implement CAATs.

**Key Words**

Accounting information system (AIS), auditing, audit process, continuous auditing, Information technology (IT), IT adoption, e-commerce economy, audit software, efficiency and effectiveness.
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Zeleke Belay T.
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ABBREVIATIONS AND DEFINITION OF TERMINOLOGIES

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<tr>
<td>AIS</td>
<td>Accounting Information System</td>
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<tr>
<td>CAATs</td>
<td>Computer Assisted Auditing Techniques</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>Electronic Commerce</td>
</tr>
<tr>
<td>EDI</td>
<td>Electronic Data Interchange</td>
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<tr>
<td>EDP</td>
<td>Electronic Data Processing</td>
</tr>
<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
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Wi-Fi: Short for wireless fidelity technology. This is another name for IEEE 802.11b. It is a trade term promulgated by the Wireless Ethernet Compatibility Alliance (WECA). "Wi-Fi" is used in place of 802.11b.  
http://www.cms.syr.edu/connecting/wireless/glossary.html

Sarbanes-Oxley Act of 2002: It is considered to be the most significant change to federal securities laws in the United States. It came in the wake of a series of corporate financial scandals, including those affecting Enron, Arthur Andersen, and WorldCom. Among the major provisions of the act are: criminal and civil penalties for securities violations, auditor independence / certification of internal audit work by external auditors and increased disclosure regarding executive compensation, insider trading and financial statements.  
http://www.techlistings.net/xlist/tech/bizsoft/compliance
I. INTRODUCTION AND PRELIMINARY CONSIDERATIONS

1. Introduction

The purpose of this chapter is to give an overview of this master thesis. First background of the research and the motivation for the study are described. Second, relevant literatures that lead to the problem definition for the research are reviewed. Moreover, the purposes of the study and scope and limitations of the study are explained in the fourth and fifth part respectively. In the sixth part, significances of the study are discussed. The outlines of the thesis and expected audiences are also introduced to the reader in the final part of this section.

2. Background and the Motivation for the Study

To audit means to examine and to assure. The nature of auditing differs according to the subject under examination. But in general, audits are examinations performed to assess and evaluate an activity or object such as whether the internal controls implemented into the accounting information system (AIS) are working as prescribed by management or whether the information processing function needs improvement (Porter et al, 2000). Audits that may be performed within a typical firm are operational, compliance, system development, internal control, financial and fraud audits. But, in this paper when I say audit, it is to mean financial audit performed by external and independent public auditors.

In light of its increasing importance to the stability of financial markets, significant effort has been made in recent years to improve the effectiveness of the auditing profession (Stuart et al, 2001). Both the internal and external auditing professions are continually striving to improve and expand their techniques and be able to cope with the developments in information technology and increasing demands by users of accounting information. As the methods for processing of accounting information have changed, auditors have been forced to change their approach to auditing since accounting and auditing are closely related professions.

Since the primary responsibility of professionals in public accounting firms involves information-intensive activities (Auditing Concepts Committee [ACC] 1972) such as gathering, organizing, processing, evaluating, and presenting data, the use of IT is likely to improve the productivity of accounting professionals (Pinsonneault and Rivard 1998). Hence, examining the determinant factors for effective application of IT in audit process by public accounting firms and enhancing productivity is of considerable interest to academic inquiries. Moreover, my previous studies for accountancy and auditing professions together with my work experiences as an external auditor in various industries, motivates me to know more about the subject matter in detail which I assume that very useful for my future career development in IT auditing. To the best of my knowledge, this study represents the first investigation of the determinant factors for effective application of CAATs in the audit process.

3. Problem Definition

The next generation of auditors will have to rely more and more on advanced analytical techniques and methods to conduct effective audits. As an increased number of business organizations engage in electronic commerce and as much of the traditional audit trail is disappearing, it becomes critical for auditors to understand the fundamentals of doing business electronically and develop new audit techniques for such environment. This means that the application of information technology for audit processes will be indispensable in the foreseeable future.
A number of researchers have been conducting extensive study in the areas of the application of such software for the audit of automated accounting information systems. A research which was conducted in Finland by Toiviainen (1991) concluded that only few auditors use audit software for CAATs. A survey conducted by Braun et al, 2003, also states that, despite the expanding role of e-commerce in the economy and much of the traditional audit trail is disappearing, auditors have made less effort to incorporate state of the art audit software in the audit process.

Given information technology’s potential and public expectations for quality of audit process, why aren’t more auditors using IT?

In the earlier periods, many practitioners had been assuming that extensive knowledge of computer systems and programming is necessary to understand and implement these sophisticated tools and these tools were assumed to be expensive to acquire. As a result, it was believed that CAATs are only for large and resource rich firms. Consequently, still small and modest sized auditing firms are not fully engaged in the use of such tools (Brozina et al 2004). This means that, while many larger audit firms have used data extraction and analysis software tools to increase audit efficiencies and effectiveness, smaller firms will remain the most vulnerable to expensive and less effective traditional audit process.

With its potential to provide more effective and efficient audits, auditors should have been rushing to use IT for audit process. However, as indicated above, auditors are still not using it to any great extent. The other possible reason for this may be because of people resistance for new technology. When new technologies are adopted by any type of company to increase the effectiveness, efficiency, or capacity of a given firm, human elements must also be a key consideration. Most of the time people react to change and developers and adopters of technologies ignore human elements at great risk. But, the benefits of new audit technologies to increase audit efficiencies will not be realized simply from the availability of the new technologies for audit process. Rather, any audit efficiencies will occur when auditors actively reduce or eliminate some procedures that were performed during the past. Yet, it is found that, the difficult task facing managers of audit technology is persuading auditors to adopt a technology that introduces a new approach to auditing (Fischer et al., 1993). One possible reason for this resistance may be the fear of the potential costs of adopting new technology like work displacement, negative reaction from future-shocked officials and excessive dependence on foreign suppliers of hardware, software, training and maintenance as Boritz (1989) explained. This means that, to adopt new information technology for the improvement of work efficiency and effectiveness, appropriate managerial infrastructure must exist in the firm.

An article issued by Humphries (1995) also explained that, companies frequently fail to consider or budget for the most important factor that determine the successful use of new technology; the education of the people who will be managing, operating, maintaining and using of the new technologies. For example to apply CAATs during audit process in an environment of Electronic Data Interchange (EDI), auditors should be familiar with EDI systems and possess, fundamental information system skills and should understand how businesses integrate various EDI systems and their plans for further growths. To achieve this, auditors must continually update themselves to the use of technology to stay on course and to remain competitive within the profession.

The degree of technological penetration could also depend on the availability and accessibility of computing resources to the right users of the information technology for the enhancement of work efficiency and effectiveness. For example as per the survey conducted by Boritz (1989), some audit supervisors were observed failing to provide the necessary computing resources to carry out the CAATs during audit process like micro computers to the right users of audit software.

From these entire findings one can raise some important questions about the application of software in CAATs.
Why it is that so few auditors use information technology given its potential and public expectations for quality audit process?
Is it because audit software is too difficult to use or auditors do lack the required skills to use software and computers for audit process?
What are the determinant factors for effective application of Information Technology (IT) for computer assisted auditing techniques and tools (CAATTs)?

4. Purposes of the Study

The purposes of this study are to get an overall picture on the general objectives and awareness of auditors for the adoption of CAATs in the audit process, the current level of involvement of auditors in the application of CAATs and which software and techniques they use in the audit process and the possible causes for non use and/or less efficient use of CAATs. Once the determinant factors for effective application of CAATs in the audit process are identified their implication for audit firms and to employees in the auditing profession are discussed.

5. Scope and Limitation of the Study

As discussed in the background section of this paper, audit could be operational, compliance, system development, internal control, financial and fraud audits. This master thesis is primarily focuses on and tries to investigate the determinant factors for effective application of CAATs that are used by external and independent public auditors for the execution of financial audit. It should also be noted that due to resource limitation, time and money, the empirical study does not include small firms and sole practitioners. The study is confined to only in those four branch offices of the big four audit firms, Ernest & Young, KPMG, Deloitte & Touch and Price Water House Cooper, working in Karlskrona.

As explained in the earlier sections of this paper, the purpose of this study is to assess the determinant factors for effective application of computer assisted auditing techniques (CAATs) in the audit process. Based on the imperial analysis I made in the branch offices of the four big audit firms, I arrived on those research findings presented under Section 2 of Chapter Five.

However due to resource constraint and lack of access to the respondents at head office level, I did the study at the branch offices of those big firms. Moreover, depending on the region where they are working, branch offices could differ in their client base and type which could in turn determine the type of IT audit approach they follow and the type and number of staff they recruit. For example, it was difficult for me to find respondents in all organizational levels due to small number of employees working in each firm. As a result researches of this type could have been more appropriate if it were done at the head office level of those firms in Sweden so that it will be possible to include respondents in the survey from all branches of those firms which have different staff with range of expertise and variety of client composition that could make the research findings and the conclusions more comprehensive. Therefore, the research findings and the implications stated are applicable only to those branch offices which were included in the survey.

Moreover, due to constraints related to resource (time and cost) small audit firms and sole practitioners were not included in the survey. As a result, I could not see the determinant factors for effective application of CAATs from the perspective of small firms and sole practitioners as compared to medium and big size firms. The research findings and the conclusions may differ if respondents were included from all types of audit firms which differ in size classified as the big four, medium size, small firms and sole practitioners.

While I have been conducting the interview, it was peak time for auditors work, as a result, in two of the firms I could not find a person at managerial level whom I can interview. Due to this, I made the interview
with two auditors in the remaining two audit firms only. Had it been that I was capable to conduct the interview in the rest firms too, it might have been possible to find additional determinant factors.

6. Significance of the Study

The first thing to take corrective action for a problem is identifying the cause why it happened. This is because, once the cause for a given problem is identified it will be easy to design remedies. I believe that increasing the efficiency and effectiveness of auditors in the use of audit software for audit process could be enhanced if determinants for this are identified properly. For example, if lack of adequate training of the user is found to be the major cause for inefficient application of software or the cause for avoidance of using audit software, it will be an indicative on how to design and deliver effective user trainings, etc.

Moreover studies of this type will help software developers on how audit software could be improved to better suit for auditing process, if the cause for the inefficiency or avoidance of using the software is found to be due to the ineffectiveness of the software itself.

7. Overviews of the Chapters and Expected Audiences

The main body of this thesis consists of six chapters. The first chapter describes the research methods employed for the gathering of the empirical data and for the making of the detailed analysis on the road to answer the research problem. The second chapter introduces basic literatures to readers related to theoretical descriptions about auditing and the application of IT in each audit process. In chapter three, the theoretical framework and relevant prior studies related to the causes of resistance for technology adoption are presented. This includes, the determinants for technology adoption in enhancing work efficiency and effectiveness, perceived difficulty and technical complexity, adoption experiences, suppliers’ commitment and the need of specialist assistance, perceived benefit, compatibility, enhanced value, cost-effectiveness, data security and viruses, the human element in technology adoption and finally managing resistance in technology adoption.

In chapter four, I present the empirical data gathered and the analysis made. In the last chapter, research findings and their implication for audit firms and to employees in the auditing profession are discussed. Finally in the same chapter, related areas for future research are covered.

The intended audiences for this paper are persons with some general knowledge of accounting and auditing. An attempt is made to describe the fundamental concepts to the reader. However because of the scope of the study it is impossible to cover all areas needed in this regard. Therefore, to understand fully this thesis, it is advisable to have some general knowledge of accounting and auditing.
II. CHAPTER ONE

RESEARCH DESIGN AND METHODS FOR EMPIRICAL DATA COLLECTION & ANALYSIS

1. Chapter Overview

In this chapter, the research methods employed to gather the empirical data and for the making of the detailed analysis on the road to answer the research problem are described in brief. In general, to maintain compatibility among the purpose, the research questions, research site selection, reviewing relevant literatures and theories and choosing the appropriate methods for data collection and analysis, the research design framework illustrated by Robinson (2002) is employed, as depicted below in Figure 1.1.

![Framework for research design](image)

**Figure 1.1:** Framework for research design

2. Choice of Companies and Respondents for the Survey

2.1. Selecting the Companies for the Survey

As mentioned below under section 3, the empirical data collection method followed is survey method with the aid of detailed questionnaire and interviews. For this four suitable companies were selected. These are the branch offices of the big four audit firms, Ernst & Young, KPMG, Deloitte & Touch and Price Water House Cooper, which all of them are operating in Karlskrona. I decided to collect the data from these firms, because I believed that, the determinant factors for effective application of audit software may vary among different audit firms. As a result, I thought that, the data collected across these companies will help me to get detailed and diversified information that could help me to see the various factors for the effective application of audit software from the perspective of different audit firms. I exclude sole practitioners and small audit firms from my study because, I expect that such firms may not use audit software for CAATs because of financial constraint to acquire and other related hurdles.

2.2. Selecting Respondents from Chosen Companies for the Survey

As per my initial interview with contact persons and as I understood from the web pages of these firms, staffs in a given audit firm are classified as partner, senior manger, junior manger, senior auditor, junior
auditor, consultants (tax and financial) and accounting technicians or accountants. These titles are assigned to each staff based on their academic background, experience and work efficiency and effectiveness. Depending on the type of responsibility they have, the IT techniques and tools they use for work could also vary in the same firm. As the type of techniques and tools used by each staff vary, the factors for effective application of CAATs could also vary for each staff type. As a result, to address the major determinant factors for effective application of CAATs in the audit process at all responsibility levels, effort was made to include as much respondents as possible from each type of staff in all firms.

3. Methods for Data Collection

In this study, I conducted the empirical data collection process in two phases in order to get more detailed information on the application of software for CAATs. First detailed questionnaire is designed and distributed to selected respondents and second based on the analysis made on this data, interviews were conducted to get the answer for those questions evolved later.

3.1. The Questionnaire and Analysis of Response Rates

To gather the relevant data for the analysis, a detailed questionnaire was designed and distributed to those selected respondents. As explained in chapter four the detailed survey questionnaire is structured in a way that can help me to gather the required empirical data for the identification of:

- The general objective of firms and awareness of both management and employees for the adoption of CAATs in the audit process.
- The current level of involvement of those firms in the application of CAATs for the audit process.
- Understanding the beliefs of both management and employees as to the determinant factors for efficient and effective application of CAATs for auditing and,
- Understanding the firms’ likely future involvement in the application of IT for auditing in terms of the areas in which it is likely to be used.

Questionnaires were distributed to a responsible person in each firm in person and collected back once respondents completed and forwarded it to same person.

The average number of employees who are working at various levels in each of the four branches is approximately ten. As a result, I distributed forty questionnaires. Among those respondents, twenty three completed the survey questionnaire properly and forwarded it to me, which is 57% response rate and it is possible to say that it is acceptable, since more than half of the requested respondents have forwarded their response. But, the question of what constitutes an acceptable response rate cannot be answered easily because many researchers do not agree on a standard for a minimum response rate (Frankfort-Nachmias and David, 1996). But I tried my best to maximize the response rate by sending e-mails and contacting them physically while they were filling the questionnaire. Among those questions included in the questionnaire, question number 16 and 28 were least answered by respondents as a result, these questions were fully omitted from the analysis. I have also received three questionnaires which are incomplete and carelessly completed and I realized that these were respondents who are novice for the profession. As a result, I deliberately disregard them from my analysis, because including their less thoughtful and incomplete response would rather be misleading. Details of the respondents who answered the questionnaire properly are shown under Table 4.2. As indicated in this table, it is possible to say that the feedback collected could represent the view of the population since the response was collected from respondents who have diversified experience, educational level, different responsibilities and rank and age categories. Consequently, I believe that the non-response rate has less effect on non-response bias.
3.2. Interviews

Interviews were also conducted with auditors (see the basic questions asked during the interview under Appendix C). For this, auditors were selected from two audit firms who are senior auditors and willing for the interview. For those auditors whom I could not interview, I send them the interview question by e-mail of which two auditors send me their feedback (Appendix C). The purpose of this interview at this stage was to get answer for those questions that evolved during making a detailed analysis of the data gathered in the first stage by the questionnaire and to get answer for those questions which were not replied properly in the questionnaire.

4. Analysis Methods

Both quantitative and qualitative data analysis methods are put in to use in this study. First, the data collected using the questionnaire is analyzed by using quantitative tools like SPSS, spreadsheet and Summated Rating (or Likert) Scale. These tools are descriptive statistics and analysis methods which are used for describing and analyzing the data collected using the questionnaire. The objective of the study at this stage is to get an over all picture of which software the auditors use and to identify possible causes to less use and/or for non use of software, the problems that auditors are encountering to apply audit software for audit process and to identify the causes for this. Second, to analyze the additional data collected by using the interview, qualitative method of analysis is employed.

All the outputs of the descriptive statistics used for the analysis are portrayed in each of the respective analysis part. I decided to include all the charts and tables in the body of the analysis instead of putting them as an appendix because, I thought that integrating them into the portion of the text that are discussing them will be helpful for easily referencing, analyzing and understanding of the whole work for the reader. Detailed explanations about the of data analysis methods employed in this thesis are described below.

4.1. The Summated Rating (or Likert) Scale

To identify the determinant factors for effective application of CAATs, a number of possible factors for this were developed from several literatures (as shown in the questionnaire) and then respondents were asked to gauge these factors. Respondents guess the relevance of a given factor for a problem defined based on their attitude which could in turn depend on the experience and background of the respondents. However, as Robson (2002) explained it is very difficult to asses something like attitude towards a given variable by means of a single question or statement. For such situations, he suggests the summated rating (or Likert) scale approach to be employed. I adhered this method for the most of data collection and analysis made in this thesis. This is because, this method is (Robson,2002);

- Looks interesting for the respondents and people often enjoy completing a scale of this kind
- Minimizes the problems of respondents in not to be prepared to cooperate in filling questionnaires that appears boring and,
- It is easy to develop and apply for the analysis.

The data analyzed in such a way was also tested using the T-test method of SPSS but finally it leads me to the conclusion reached with the analysis made following the Summated Rating (or Likert) Scale. As a result with the consultation of my advisor, for the sake of data presentation clarity and simplicity, finally I decided to adhere the Summated Rating (or Likert) Scale.

4.2. Cluster Analysis

Cluster analysis classifies a set of observations into two or more mutually exclusive groups based on combinations of interval variables. According to Stockburger (___), the purpose of cluster analysis is to discover a system of organizing observations, usually people, into groups where members of the groups
share properties in common. It is cognitively easier for people to predict behavior or properties of people or objects based on group membership, all of whom share similar properties. It is generally cognitively difficult to deal with individuals and predict behavior or properties based on observations of other behaviors or properties.

In this study, with the aid of SPSS, Hierarchical Cluster Analysis is produced to identify relatively homogeneous groups of respondents based on the variables defined and the results of the application of the clustering technique are best described using a dendogram or binary tree. Homogeneous respondents are represented as nodes in the dendogram and the branches illustrate when the cluster method joins subgroups containing that object. The length of the branch indicates the distance between the subgroups when they are joined.

Using SPSS box plots are generated to display outliers, extreme values and variability in the medians of each cluster of respondents defined by those factor variables. This method of data presentation is very useful in deciding whether outliers and extreme values could be omitted or otherwise finding the reason why or threading them differently from the rest of the population.

4.3. Spread Sheet

Spreadsheet is also used to portray some statistical information in the form of tables and charts. This is because I found that, spreadsheet is a powerful program and easy for organizing and analyzing data in easily understandable way.

5. Validity and Reliability

According to Robson (2002) validity is concerned with whether the findings are really about what they appear to be about. The study had a clear analytical stance and was largely designed like any other study of this kind. As explained earlier, the empirical data was collected by using a well developed questionnaire and by getting as many respondents as possible to answer it, and well organized interview was conducted. Consequently, I believe that the data gathered could show me the representative picture of how certain examined variables affected each other in a chosen setting. The data collected in such a way is also believed to be “the truth” at the time when the respondents answered the questionnaires and the interview. Accordingly, I suppose that the findings reported are based on valid data and consistent analysis.

As defined by Frankfort-Nachmias & Nachmias (1996, pp 170) reliability refers to “the extents to which a measuring instrument contains variable errors, that is, errors, that appear inconsistently from observation to observation during any one measurement attempt or what they vary each time a given unit is measured by the same instrument”. Unreliability of a given data or information could have various causes among which participant error and observer error are the major one which in turn may depend on whether concepts in the questionnaire and during interview are clear to respondents. To minimize such problems, I put in much effort to avoid questions that could be interpreted differently since such question will damage the reliability and validity of the research. Questionnaires were designed in a way that can be understood easily by respondents with appropriate measuring scale. Moreover, before the questionnaire was distributed to respondents, it was critically reviewed by my advisor and expressions that do not give sense and confusing terminologies were removed before hand. Reliability is also determined by how accurate I put together, arrange and code the data. To avoid mistakes in putting together, arranging, coding the data and feeding the data to the SPSS program, I got tremendous advice of my advisor and other experienced teacher in the area. As a result, to the best of my knowledge all the data included for the analysis is valid and reliable to arrive on those findings.
III.CHAPTER TWO

THE IMPACT OF INFORMATION TECHNOLOGY (IT) ON THE AUDIT PROCESS

1. Automation of Accounting Information System (AIS) and Its Impact on the Audit Process

Integration of IT into the accounting information system (AIS) is forcing auditors to change their approach to auditing.

In the earlier times entities had been recording and processing financial transactions manually. Manual systems are those in which source documents are posted by hand to sales, cash receipts, and other types of journals. The totals from the journals are then hand-posted to the general ledger. Financial reports are then manually prepared from the general ledger (Watne et al 1990). In such system, it had been easy for the auditor to observe visually the entire accounting process and determine whether proper procedures are being followed.

Then entities started to apply mechanical systems that utilize data processing equipment such as bookkeeping machines that can post transactions to subsidiary ledgers for example and unit record equipment which process punched cards. With such system, the auditing process becomes slightly more complex since the basic arithmetic operations of posting debits and credits are under machine control (Watne et al 1990).

But now a day, due to the continued change in the application of IT for the handling of financial transactions, auditors are expected to conduct the audit process in an environment where there is no audit trail. For example, in recent years we reached to a new concept called as electronic commerce. It is the application of information technology for the handling of financial transactions in a “paperless” electronic environment. Consequently, reliance on computer networks increases and entities must design and implement control systems that can adequately manage risk, particularly in areas such as data security and integrity and vulnerability to viruses (Arens et al 2000). In such types of AIS, involvement of auditors simultaneously with or shortly after the disclosure of the information as opposed to auditing them after the fact is becoming important. But here the challenge for auditors is on how to make the audit without having audit trail on a continuous basis.

2. The New Challenges for Auditing Profession

In the last few years because of the intensification of terrorism in the world, now a day auditors are expected to apply an audit process that can assure the public that the AIS adopted by companies is capable of counteracting terrorism. For example, the AIS for this purpose is using banking systems to trace the flow of funds across international borders. The other example is, auditors are expected to assure that, the AIS adopted by entities are using security measures to control cyber terrorism and installing new internal controls to help detect money laundering and illegal fund transfers( Strand et al 2005).

Moreover, the increasing expectation of the public considering audit service as deterrent and preventive tool for continuing occurrence of accounting scandals, frauds and illegal financial operations that caused the passage of the Sarbanes Oxley Act of 2002 and the use of Wi-fi technology to perform accounting tasks,
have also put pressure for the expansion of auditing practice to include a variety of new assurance services and the nature of the audit process to be changed (Strand et al 2005).

3. Information Technology and Its Application for Audit Process

3.1. The Audit Process in Automated Accounting Information System (AIS)

Auditing can generally be defined as,

“… the accumulation and evaluation of evidence about information to determine and report on the degree of correspondence between the information and established criteria (Strand et al 2005, pp18).

An accountant who specializes in auditing computerized accounting information system is referred as information technology (IT) auditor (Strand et al 2005).

The objective of traditional financial audit has been attesting the stakeholders that the management of the entity has designed and implemented management control system that can safeguard the assets, maintain data integrity and improve operational effectiveness. On the other hand IT audit involves evaluating the computer’s role in achieving control objectives and proving that data and information are reliable, confidential, secure and available as needed.

As illustrated in Figure 2.2, the IT audit function encompasses all the components of a computer based AIS: people, procedures, hardware, data communications, software, and data bases (Strand et al 2005). These components are a system of interacting elements that auditors should examine to forward their opinion on the effectiveness of the management control system implemented by management in safeguarding assets, maintain data integrity and improving operational effectiveness.

![Figure 2.2: The six components of a computer based AIS examined in IT audit](image_url)

As illustrated in Figure 2.3, the steps that generally take place in IT auditing are almost similar to those performed in any traditional financial audit process. What is the difference is that the auditor’s examination in this case concerns a computer based accounting information system (AIS). Therefore, in automated AIS the IT auditor is expected to examine the six components of computer based AIS following the audit processes shown in Figure2. 3 and give opinion about the management control system to stakeholders.
In the past, since AIS was not highly automated, auditors have been auditing around the computer. However, the continuous automation of the accounting information system has brought new auditing problems for the auditors that result from the use of electronics for data processing, the internal storage of data and procedures, the ease of changing internally stored data and procedures without the knowledge of the auditor, and the disappearance of the audit trail (Watne 1990). To counteract these problems auditors have started to shift to new auditing approaches, audit through and with the computer in examining the effectiveness of the computer-based controls as described below.

3.1. Auditing around the computer

Auditing around the computer involves reconciling the source documents associated with input transactions to the output results while treating the computer application process as a “black box.” However, the significance of this approach has diminished as data exists only in electronic form and the sophistication of accounting information systems and computers eventually reached the point where auditors could no longer audit around the system because of an online data entry, elimination or reduction of printouts and real time file updating. These developments forced auditors to treat the computer as target of the audit and “Audit through it” (Watne, 1990).

3.1.2. Auditing through the computer

Auditing through the computer requires that the auditor submit data to the computer for processing. The results are then analyzed for the processing reliability and accuracy of the computer program.

According to Arens et al (2000), there are three strategies for testing computer programs by auditing through the computer to ensure that the programs accomplish their goals and that the data are input and processed accurately as stated in the following section.
3.1.2.1. Test data approach

Test data approach involves processing the auditor’s test data using the client’s computer system and the client’s application program to determine whether the computer-performed controls correctly process the test data. Since the auditor designs the test data, the auditor is able to identify which test items should be accepted or rejected by the client’s system. The auditor compares the output generated by the system from the test data to the auditor’s expected output to assess the effectiveness of the application program’s internal controls. *Figure 2.4* illustrates the use of test data approach.

An alternative to auditors developing a set of test data is to use software programs called test data generators (Strand et al, 2005).

3.1.2.2. Parallel Simulation

With parallel simulation, the auditor uses live input data rather than test data, in a program actually written or controlled by the auditor, as the process is depicted under *Figure 2.5*. Software commonly used by the auditor to perform parallel simulation testing is generalized software (GAS).

In order for this method to be effective, an auditor must thoroughly understand the audited organization’s computer system and know how to predict the results. The latter is necessary to intelligently compare system and know how to predict the result (Strand et al, 2005).
3.1.2.3 Embedded Audit Module Approach

When using the embedded audit module approach an auditor inserts an audit module in the client’s application system to capture transactions with characteristics that are of specific interest to the auditor to achieve continuous auditing.

Continuous auditing can be defined as “a comprehensive electronic audit process that enables auditors to provide some degree of assurance on continuous information simultaneously with, or shortly after the disclosure of the information” (Rezace et al 2002). This approach helps the auditor to identify all unusual transactions for evaluation and follow up of discrepancies continuously on an exception report.

Continuous auditing may help to curb reported abuses by enabling detection of problems as they occur rather than at the end of a reporting period. However, in order to be able to execute continuous auditing, it seems clear that auditors will not only have to increase their conceptual abilities in defining the techniques that are the foundation of the continuous auditing process but also their technical skills in implementing these techniques (Braun and Harlod, 2003).

3.1.3. Auditing With the Computer

When auditing with the computer, the computer becomes a tool to assist in various audit processes. For example the auditor can use the computer to recalculate depreciation, to compare the contents in two or several files, to examine the data in the files and to perform different kinds of analysis and tests.

3.2. Stages of Information Technology Adoption for Audit Process

These increased trends in the automation of the AIS, the increasing expectation of the public, the continuous change of the way how business is being made coupled with the authoritative auditing guidance issued by
auditing standard setting bodies, strongly suggest the need for increased use of technology in the audit process (Strand et al 2005).

While the effectiveness of the audit has received considerable attention, auditors are constantly under pressure to make the audit as efficient as possible. To cope with these constraints, audit profession must review the audit process and seek additional methods to increase efficiency without compromising the effectiveness of the audit.

These continuous challenges have caused auditors the need to learn new techniques for auditing. A likely path that auditors could use to bridge the gap between the current technological skills of an auditor and the skills that would be needed in the audit of highly automated accounting information system in a continuous audit process is to increase the usage and understanding of the effective application of software in Computer Assisted Auditing Techniques and Tools (CAATTs).

According to Tiittanen (1995), there are four stages in the development of the utilization of information technology as summarized under Table 1. The development should begin from stage one to stage four. At stage one firms use only few standard off-the-shelf software: word processing and spreadsheets. At stage two firms also use some databases, E-mail and graphs. At stage three firms use several different external and internal databases, audit software and company models. At stage four firms also use experts systems, decision support systems and special audit software for continuous audit. Many small firms are still at the first stage when it comes to utilizing IT. Big audit firms are either at the second or at the third stage. Table 2.1 illustrates the different ways of utilizing IT in the audit process (Tiittanen, 1995).

<table>
<thead>
<tr>
<th>STAGE</th>
<th>EDP Software</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Word processing, Spread sheets</td>
<td>Documentation, auditors’ report, Financial analysis and calculations</td>
</tr>
<tr>
<td>II</td>
<td>Graphs, External data bases, Electronic Mail</td>
<td>Audit Planning, Comparison of financial Information, Company analysis</td>
</tr>
<tr>
<td>III</td>
<td>Company models, Audit databases, EDP audit software</td>
<td>Testing of information systems, Database inquires</td>
</tr>
<tr>
<td>IV</td>
<td>Expert systems, decision support Systems, Special software for continuous audit</td>
<td>Expert analysis for finding out Important tasks for audit</td>
</tr>
</tbody>
</table>

**Table 2.1:** The four stages in the development of utilization of IT

### 3.3. Computer Assisted Audit Tools and Techniques (CAATTs)

As broadly defined by Harold (2003), Computer-assisted audit tools and techniques (CAATTs) include any use of technology to assist in the completion of an audit. This definition would include automated working papers and traditional word processing applications as CAATTs. CAATTs can also be described as the tools and techniques used to examine directly the internal logic of an application as well as the tools and techniques used to draw indirectly inferences upon an application's logic by examining the data processed by the application (Braun and Harold, 2003).

A variety of software is available to the auditors to apply in the audit process of which the most common are discussed below (Strand et al, 2005).
3.3.1. General Use Software

General use audit software includes programs like word processing programs, spreadsheet software, and database management systems. Word processing increase the efficiency of the auditors by using built in spell checks, mail-merge features, confirmation letter writing, etc. Spreadsheet allows auditors to make complex calculations automatically like interest and depreciation, change one number and updates, perform analytical procedures such as computing ratios, and other managerial functions. The auditor can also use database management systems (DBMS) to manipulate large sets of data in a fairly simple way.

A valuable tool in a DBMS for retrieving and manipulating data is structured query language (SQL) which the auditor can use to select records matching specified criteria, deleting records from a file based on established criteria, generating customized reports based on all or subset of data and rearranging file records in sequential order.

3.3.2. Generalized Audit Software (GAS)

The most frequently used of all of the CAATTs, GAS allow for data extraction and analysis. The key reasons for the widespread use of GAS include its relative simplicity of use requiring little specialized information systems knowledge and its adaptability to a variety of environments and users. Although auditors often have some degree of difficulty in preparing the data for first use, the design of effective audit procedures after this initial set-up facilitates the achievement of greater coverage than could be possible with traditional types of procedures. This coverage is achieved through queries that allow the auditor to analyze data and extract information from the client's database. In addition, several audit operations such as sampling are supported by the software (Braun and Davis, 2003).

Large audit firms have developed some of this software in house; many other programs are available from various software suppliers. GAS programs are capable of doing mathematical computations, cross footings, categorizing, summarizing merging files, sorting records, statically sampling, and printing of reports and the auditor can tailor them to specific tasks.

Two most popular GAS package use by auditors are Audit Command Language (ACL) and Interactive Data Extraction and Analysis (IDEA) that allow the auditor to examine a company’s data in a variety of formats.

3.3.3. Automated Work Paper Software

This software can handle accounts for many organizations in a flexible manner and has features of generated trial balances, adjusting entries, consolidations, and analytical procedures.

These features of the software allow the auditor to generate unadjusted trial balance, make adjusted journal entries, automatically generating adjusted trial balance, automates footings, reconciliation to schedules, making consolidation of accounts, publish financial reports and compute financial statement ratios and measurements such as current ratios, the working capital, the inventory turnover rate, and the price earning ratio.

3.4. Potential Benefits of CAATs at Individual User, Business Process and Work Group Levels

In general, adoption of IT for audit process has potential benefits of enhancing work efficiency and effectiveness by reducing the time for working paper preparation, presentation of electronic information facilitates timely and in required form for the decision-making process of audit professionals, support for audit decisions since information could be obtained from knowledge-sharing databases and improving
decision making quality by providing groupware facilitates for collaborative decision making (Banker et al, 2002).

Moreover, automation of audit tasks and use of specialized audit software could substituted IT for labor and change the structure of audit teams (Gogan et al. 1995) and since an audit team is composed of professionals at different ranks (such as managers, seniors, and juniors) with different job responsibilities (Carmichael and Willingham 1989), IT adoption may benefit audit professionals at different ranks in different ways (Banker et al, 2002).

3.4.1. IT Impact on Junior Auditor

The primary tasks that junior auditors perform are assigned audit procedures and preparation of working papers. Most of these tasks are relatively repetitive and involve substantial calculations and referencing across different accounts. Computer applications can automate such structured tasks and substantially reduce the processing time (Abbe and King 1988). In addition, the reduction in monotone work allows individuals to concentrate on more complex tasks and enhance their individual performance (Millman and Hartwick 1987). The research result of Banker et al, (2002) also indicates that the principal benefits to a junior auditor from the IT changes are the savings in effort and the reduction in errors afforded by the electronic preparation of working papers.

3.4.2. IT Impact on Senior Auditor

As the middle-level member of an audit team, a senior auditor assists in audit plan development, organization of audit activities, and supervision and review of the work of junior auditors. The firm's audit software organized all required audit procedures in a common list and cross-referenced them to items in the working papers. Since electronic presentation of information facilitates user's information acquisition (Jones et al. 1993), a senior auditor could benefit from the convenient information gathering.

3.4.3. IT Impact on Audit Managers

According to Banker et al, (2002) as supervisors and reviewers, audit managers do not benefit directly from the audit automation process, except for the convenience of computer-based presentation of information. Since the firm's audit software organizes all audit evidence collected by juniors and seniors in an electronic format, audit managers are likely to be more effective when reviewing such data.

With the help of IT, managers can easily search for information from various local and international databases regarding companies, industries, and regulations relevant to a certain client to help them perform analytical review (Cohen et al. 2000).

3.4.4. IT Impact at the Business Process Level

A current trend is to create a paperless office environment that replaces paper documents with electronic documents so that information can be accessed easily and with much less effort. It is reported that, paperless office could improve work efficiency and reduce operating costs (Hunton, 1994). Moreover, it also reported that firms can create a client database to store all related audit files for each client and then the documents in the database can be easily retrieved by a search function or with associated links. Consequently, auditors in the same team can share audit files and significantly reduce the coordination effort of the senior auditors (Salamasick et al. 1995). This could also allow audit senior for quick reference and modification from previous audit plans and reports for the client and, consequently, work hours for a client can be reduced significantly.
3.4.5. IT Impact at the Work Group Level

A professional service firm stands to benefit substantially from the knowledge-sharing applications and network applications that enable real-time information circulation can also facilitate communications efficiency in a public accounting firm and the use of telecommunication applications had led to a decrease in operating costs such as postage and travel expenses (Zarowin 1994).

3.4.6. Task-Technology Fit

Banker et al, (2002) suggests that the new IT program matches audit profession tasks in three aspects. First, the new IT provides data to support audit decision making. The audit software organizes the audit evidence for audit judgments and the databases provide relevant supplemental information. Second the audit software automates the preparation of working papers and the notes applications facilitate communication between the professionals and the clients. Third, the new IT program fits the business needs. It also facilitates knowledge sharing and supply of up-to-date information that supports the professional requirements of the information-intensive public accounting industry.

3.5. The Importance of CAATTs in each Audit Phases

According to Arens et al (1999) the audit process in general could be divided in to four phases as illustrated under Figure 2.6: Plan and design an audit approach, Test controls and transactions, Perform analytical procedures and test details of balances, Complete the audit and issue an audit report. In each phase the application of CAATTs has the potential to minimize the cost of accumulating sufficient and competent audit evidence to meet the auditor’s professional responsibility.

The auditor’s usually begin with the decision of client selection. To minimize the audit risk, set the appropriate audit fee and to develop appropriate audit plan, the auditor need to have adequate background information about the prospective client as shown in Phase one of Figure 2.6. The auditor can access such information easily and effectively with the help of searching several external date bases. He can also use e-mail to get in touch with the previous auditor to find out the reason for the change of audit assignment (Tiittanen, 1995). The auditor can also use word processing to make documents and to store the information collected.

With the help of software that has a knowledge base, like decision support systems, it is also possible to estimate the inherent risk when planning the audit tasks. Moreover, as shown in figure 6, the auditor may also use expert systems to decide what to examine and the depth of examination for example CAPEX (Canadian Audit Programming Expert system) or an automated dynamic audit program tailoring (ADAPT), (Tiittanen, 1995).

During Phase two an auditor performs tests of transactions. The extent to which he tests controls depends on the assessed level of control risk. In this stage the auditor may use statistical and generalized audit software for the choice of sample size and for the undertaking of cost efficient transaction tests (Tiittanen, 1995).

During Phase three the auditor performs analytical procedures and tests details of balances. For this the auditor can use spread sheets and financial analysis software for analytical review. The major benefit of computerized analytical procedures is the ease of updating the calculations when adjusting entries to the client’s statements are made Arens et al (1999) and if there are several adjusting entries to the client’s records, the analytical procedures calculations can be quickly revised.
At stage four, the auditor completes the audit process and has to review contingent liabilities and subsequent events, evaluate results and issue an audit report. In this stage it is important for the auditor to be sensitive to information concerning material errors that could have effect on the going concern of the client which in turn may cause the auditor to change the opinion given initially. To make such kind of decisions, auditors may use expert models.
For instance, as shown on Figure 2.7, GCX model (Going concern expert) proposes an overall structure for knowledge needed, four possible reasoning processes (recognition of problems, casual reasoning evaluation of problems and a process for judgments and casual reasoning, evaluation of problems and a process for judgments) and casual reasoning that is based on the knowledge of actual client related events (Tiittanen, 1995).

3.6. The Trends in the Application of CAATs for Audit Process

From the above discussion, it is clear, then, that auditors can gain substantial benefits in terms of efficiency and effectiveness by "converting" to audit software. It is not enough, however, simply to go out and buy an appropriate package; an effective support and implementation plan must also be developed to ensure that the software is used properly. And this is not a task that should be put off until another day: in a number of industries the traditional paper audit trail is disappearing as the use of electronic data interchange (EDI) and digital image processing grows. When these are fully integrated into accounting information systems (AIS), all transactions are conducted by computer, with no paper evidence to inspect after the fact. Increasingly, auditors will be required to use computer-based techniques to audit complex computer transactions and controls. The use of CAATs will no longer be an option, but a necessity.
1. Introduction

There is a growing awareness around the world that while information technology offers some exciting possibilities and prospects, there are dangers as well. An increasing number of people are concerning themselves with the ethical and social questions raised by the introduction of new technology which in turn is causing resistance for technology adoption for the enhancement of work efficiency and effectiveness. Some of these factors and related prior researches are presented in this chapter.

2. The Determinants for Technology Adoption in Enhancing Work Efficiency and Effectiveness

Despite its potential in enhancing work efficiency and effectiveness companies are not always rushing to implement new IT in their operational processes. Different researchers have forwarded various reasons for the hurdles of effective application of IT. For example as per the research result of Enderwick et al (2000) the cognitive process, which determine an attitude towards technology adoption in a given company was found to be affected by six beliefs: perceived difficulty; adoption experiences; suppliers' commitment; perceived benefits; compatibility; and enhanced value. Rogers and Sheehy (1994) also explained that even though the appropriate hardware and software have been available for years, most auditors have failed to take advantage of them for audit process because of a number of hurdles that include: technical complexity, an absence of demonstrated cost-effectiveness, and client concerns about data security and viruses. Moreover, when new technologies are adopted to increase work efficiency and effectiveness, or capacity of the enterprise, human nature is also a key consideration since mostly people react to change negatively (Myers, 1997). All these and related articles are summarized in the following sections.

2.1. Perceived Difficulty and Technical Complexity

According to Enderwick et al (2000) "Perceived difficulty" is defined as the degree to which the perceived application of foreign technology is free of efforts. The lower the perceived difficulty, the lower is the level of perceived risk and the higher is the probability of a successful adoption.

In the past, technical issues, such as the complexity of the audit software itself, together with problems in accessing client data, persuaded many auditors that the use of audit software required extensive training and experience. It was expensive to train an auditor to use audit software, and to train data processing staff to perform audit functions. Frequently, there were not enough audit software applications available to allow an auditor to specialize; consequently, retraining was often necessary (Rogers and Sheehy, 1994).

In their survey Manson et al, (1997) found that one of the major problems facing audit firms introducing audit automation was lack of familiarity and understanding of IT by senior staff, partners or from top since there are some older partners who will not use the PC at all but only have their secretary read their e-mail regularly, and print it out for them to read. On the other hand, they also found that, junior staffs are readily embraced the new technology and willingly explored the ways in which it could be used in the audit process. Paradoxically, therefore, junior staff may develop greater knowledge and awareness of the potential of IT than the partners in the firm. One of the surprising (and hence unintended) consequences according to
Manson et al, (1997) is that partners then develop strategies to constrain the behavior of their junior staff, for example prohibiting the use of IT outside defined parameters.

2.2. Adoption Experiences

Previous experiences with the technology provide an excellent opportunity for the adopting firm to collect and important information regarding the technology and provide the needed personnel for similar future engagement (Enderwick et al (2000). Moreover, the adopter is in a better position to evaluate the needs and requirements of the technology more accurately and can develop an understanding of the level of support required from the suppliers of the technology.

2.3. Suppliers’ Commitment and the Need of Specialist Assistance

The adoption of new technology carries a high risk and this is particularly so where foreign parties are involved (Enderwick et al, 2000). The level of perceived commitment from suppliers can help reduce this perceived risk through the transmission of adequate information from the suppliers to the adopters. Resource commitment by suppliers can also affect the recipient's ability to absorb the technology (Enderwick et al, 2000). In certain circumstances, the supplying firm may impose some restrictions on the conditions through which the transferred technology is to be used. In doing so, the supplier could strengthen its position to control the technology. However, these restrictions could decrease perceived usefulness of the technology as some operations adjustments may be required which, in turn, lead the adopter to create a negative perception on the level of supplier's commitment. Moreover, according to Rogers and Sheehy (1994) the complexity of both the audit software and the operating environment created extensive reliance on technical specialists. This resulted in additional costs and reduced effectiveness because of miscommunication, scarcity of time and lack of audit client knowledge on the part of the specialist. All too often, the audit test results were delivered late or failed to conform with the auditor's requirements, either because the requirements were not communicated properly, or because the auditor changed them after gaining additional knowledge of the client.

Obtaining data of audit significance was also a more technically challenging process in the earlier times as per the finding of Rogers and Sheehy (1994). It was difficult to transfer data from one computer system to another, and it was almost impossible to transfer data from a large mainframe to the early microcomputer systems. Many inexperienced auditors were forced to abandon what appeared to be promising audit software applications because of the complications involved in getting the information to where it was required. Auditors were not encouraged to carry out the detailed analysis and planning necessary to integrate audit software fully into the audit process. Time and budget pressures, combined with the need for additional, unplanned, expert technical assistance and, possibly, additional access to the client's computer resources, made the application of CAATTs impractical.

2.4. Perceived Benefit

``Perceived benefit" is the adopter's belief of the likelihood that the technology can improve the economic benefits of the organization and/or of the person (Enderwick et al, 2000). Benefits may come from productivity enhancement, quality improvement, cost reduction, gain in market share, new market development improvement in job performance and the associated intrinsic and extrinsic rewards.

IT is sometimes perceived as having a moral or ethical dimension because of its capacity to affect workers' lives. In particular, the introduction of IT may be associated with redundancy and deskilling of workers. For example the research conducted by Tolsby (2000) demonstrated that, the implementation of IT system within the Norwegian Army affected the way the employees perceived their flexibility and personal involvement in their work and the introduction of IT system was perceived by some of the employees
deskilling of the employees, to a more task-oriented approach to their work, and to increased employees' interdependence instead of increasing employees' work engagement. It is in this sense that the introduction of audit automation may affect legitimating structures in audit firms. If audit firms were seen to be using a technology that resulted in a reduction in employment levels and a lowering of the skills expected of audit staff, this might have consequences for the perception of the audit firm as a constituent of a profession that depends for its existence on having a high moral standing. Manson et al. (2005) discovered that audit automation was having an impact on the work of secretarial and clerical staff since a number of tasks undertaken previously by secretarial and clerical staff was now carried out by audit staff. These may cause the appropriate technology not to be adopted effectively by the personnel who are expected to use it.

2.4. Compatibility

International technology developed by overseas companies under a foreign environment may not be compatible with the facilities of the adopting firm (Enderwick et al. 2000). The more a foreign technology is perceived to be compatible with existing technology, the higher is confidence of mastering the new technology and the more positive the attitude that can be derived. For example, according to Kasparek (1987) accountancy firms that are involved in multinational operations have faced problems of implementing computer-assisted audit techniques and tools (CAATs) in overseas companies due to lack of versatile audit software for all types of hardware used by their clients. Such incompatibility often reduces the anticipated economic benefits from the adoption of new technology; thereby creating a negative attitude towards adopting the technology.

2.5. Enhanced Value

In addition to the benefits derived directly from the technology itself, there could be some other forms of benefit relating indirectly to the adoption of the technology such as the generation or enhancement of a quality image or a novelty perception from adopting the technology (Enderwick et al. 2000). Such benefits can generate extra value as perceived from the consumer's point of view. Hence, the attitude towards adopting the technology may not only be related to the firm's utilization point of view, but also incorporate the firm's perception of the extra (enhanced) value carried by the new technology to the consumers.

2.6. Cost-Effectiveness

When auditors first started using audit software, the available tools were expensive and inefficient by today's standards (Rogers and Sheehy, 1994). Auditors had to learn to develop, test, and process programs using complex programming languages. Moreover, the cost of developing, testing, debugging and actually applications using the first generation of audit software tools was typically prohibitive. Similarly, installing the software on clients' computers was difficult, time-consuming and expensive (Rogers and Sheehy, 1994). It has also resulted in conflicts in the use of resources and a lack of confidentiality for the auditor's data. For both of these approaches, it was often necessary to purchase, or develop and maintain, several versions of software, to run applications in different client environments. Very few applications could provide sufficient benefits to justify these high costs.

To justify investment on IT, managers need to understand the potential benefits resulting from the investment. Although there is a general perception that IT investments by public accounting firms can improve firms’ productivity (Lee and Arentzoff 1991), the impact of IT on firm performance is not directly observable. Public accounting firms need to understand how the technology can transform their work and whether such transformation will ultimately lead to productivity gain.
2.7. Data Security and Viruses

Whether intending to use their own or their clients' computers, many auditors have been prevented from using audit software because of client concerns over the security of confidential or sensitive data. Clients have also been concerned about auditors introducing viruses into their computers (Rogers and Sheehy, 1994) which may also be one reason for slow adoption of IT for audit process.

2.8. The Human Element in Technology Adoption

When new technologies are adopted to increase the effectiveness, efficiency, or capacity of an enterprise, human nature is also a key consideration. People react to change in highly predictable ways (Myers, 1997). Effectiveness in gaining acceptance of new technology is largely determined by an organization's ability to identify sources of resistance and effectively addressing of human element would seem to be an obvious requirement, given that people will ultimately be using the technology. Since adopter perceptions are the key to widespread adoption of the technologies made available by developers, effective approaches to technology transfer rely on influencing those perceptions. According to Myers, (1997), this can be accomplished by intentionally building four characteristics into a technology package: benefit, clarity, accessibility, and wholeness.

**Benefit:** In general, acceptance and use of a new technology will be directly correlated with perceptions of net benefit by those who use it. Benefit to an organization is not the same as benefit to users, however. For a technology is to be effectively transferred to the user, and it must provide benefit at both the organization and the user levels.

**Clarity:** People become frustrated when they are required to use an unfamiliar technology, one that they do not understand, or one whose use is unduly difficult or cumbersome. If they experience difficulty, on the other hand, frustration is compounded and may result in rejection of the technology.

**Accessibility:** If information or artifacts are more available for one technology than they are for another, busy people will tend to choose the technology whose adoption requires the least time, effort, and other resources. Thus, all other things being equal, that which is most available will be preferred.

**Wholeness:** Since creation is much more difficult, time consuming, and frustrating than adaptation, a technology package that includes extensive libraries, templates, or examples will be preferred over one that contains minimal supporting materials. If a given technology could not satisfy most of these human element requirements it will cause people to resist it. According to Myers Jr, (1997), from the human elements point of view, the sources of resistance for new technology adoption are resulted from:

**Professional:** Our work represents an emotional investment as well as a physical and intellectual one, and it is to be expected that anything perceived to threaten professional accomplishment will be viewed with some level of uncertainty, suspicion, and distrust. Resistance will surely follow where the meaning that people derive from their jobs is threatened.

**Personal:** When threatened, the instinctive reaction of humans is to protect them selves. When technical change is introduced to an organization, particularly where trust between management levels is low, the immediate reaction of many people will be to perceive any change as threatening.

**Social:** Because humans are social by nature and relationships are so much a part of each individual, a threat to a relationship will be perceived much the same way as a threat to the self. Relationships are often altered when new technologies are introduced. People may find that they will no longer be working with good
friends or trusted associates. They may have a new manager or a co-worker who is unknown to them or, worse yet, one whom they do not like or respect.

It is also suggest that audit automation which is imposed by senior management in part to strengthen control over subordinates will cause resent, and may offer some resistance to, its implementation. Fore example the ability of audit managers and partners to have continuous access to audit staff gives an impression of increased control and surveillance. But, in their research, Manson et al, (1997), found that some audit staff, notably audit seniors in the field, resented the greater control and surveillance brought about through audit automation. This means that, people will feel threatened in any of these situations, and they will resist the new technology.

Cultural: When fundamental rules are violated, strong emotions are triggered, and it is often difficult for people to explain why they are angry, worried, or disturbed. When cultural norms are challenged, highly emotional resistance can be expected.

3. Managing Resistance in Technology Adoption

To realize the potential benefits of technology while avoiding the remaining pitfalls, auditors require a strategy for integrating audit software into their work. Myers, (1997) stated that, strategies that play an important role in effective planning and monitoring of resistance are to involve the people who will be affected by change in the planning process and to establish an environment in which it is safe for them to surface resistance. Because they are the ones who know their jobs and their personal and social situations better than anyone else, it is important to tap into their knowledge, experience, and reactions to the changes that will be made. Moreover, according to Rogers and Sheehy (1994), an effective strategy to adopt technology includes: commitment from senior management, use of an "office champion" to help introduce the software, appropriate staff training and an emphasis on audit planning.

The attitudes and opinions communicated by senior management send a powerful message through any organization. For audit software to be successfully introduced there must be a significant and visible commitment from senior audit management (for example, the senior audit partner). In voicing its support for the initiative, management should acknowledge issues such as:

- The target use for audit software and the expected time frame for achieving it.
- How the technical specialist and the auditor will use the audit software and interrelate to ensure that it is used in an efficient and effective manner.
- Development of new audit test plans that encourage the use of audit software.
- Establishment of procedures to measure the direct costs and benefits from the use of the software.
- Development of efficient methods for accessing and, where necessary, downloading client data.

They should also emphasize the fact that there is a learning curve; auditors should not judge the software solely on the first applications. Just as an office should have support from senior management, it should also have a local "champion", a user who is interested in seeing the software successfully introduced. This person's enthusiasm, knowledge and effort will often serve as a catalyst for other staff to begin using the software. Of course, to use audit software effectively, all auditors must be adequately trained. Thus, the implementation plan should identify training needs and how they will be addressed. Audit manuals designed for on-the-job use are an important element of the training. Not only should the manual describe, in technical terms, how the software actually works, but it should also show how it can be most efficiently and effectively used. It should clearly identify the responsibilities of auditors and technical support staff, and indicate when and how technical support is to be requested and provided. Finally, it should formally communicate firm policies for data security and retention.
V. CHAPTER FOUR

EMPIRICAL ANALYSIS

1. Introduction

As indicated in the introduction part, the purpose of this research is to assess the determinant factors for effective application of computer assisted auditing techniques (CAATs) in the audit process. To achieve this purpose, two procedures were followed in gathering the required empirical data from the branch offices of the four big audit firms, Earnest & Young, Deloitte, KPMG and Price Water House Cooper, which are operating in Karlskrona, Sweden.

Initially, a detailed questionnaire was designed and distributed to auditors who are working in those audit firms (Refer the questionnaires for this purpose under Appendix B). The detailed survey questionnaire was structured in a way that can help to gather the required empirical data for the identification of:

- The general objective of firms and awareness of both management and employees for the adoption of CAATs in the audit process.
- The current level of involvement of those firms in the application of CAATs for the audit process. This includes the firms’ current usage of CAATs, the type of CAATs being used, investment on manpower development for efficient and effective utilization of CAATs, investment on the acquisition and/or development of CAATs and the audit areas where CAATs are being used by those firms.
- Understanding the beliefs of both management and employees as to the determinant factors for efficient and effective application of CAATs for auditing. This includes the identification of technical or related problems encountered by staffs during the application of CAATs, human elements, management commitment in managing those issues and other related factors and,
- Understanding the firms’ likely future involvement in the application of IT for auditing in terms of the areas in which it is likely to be used.

As per the interview I made and as I understand from the web pages of these firms, staffs in a given audit firm are classified as partner, senior manager, junior manager, senior auditor, junior auditor, consultants (tax and finical) and accounting technicians and/or accountants. These titles are assigned to each staffs based on their academic background, experience and work efficiency and effectiveness. Depending on the type of responsibility they have, the IT techniques and tools they use for work could also vary in the same firm. As the type of techniques and tools used by each staff vary, the factors for effective application of CAATs could also vary for each staff type. As a result to address the major determinant factors for effective application of CAATs in the audit process at all responsibility levels, effort was made to include as much respondents as possible from each type of staff.

The average number of employees who are working at various levels in each of the four branches is approximately ten. As a result, I distributed forty questionnaires. Of those auditors, twenty three completed the survey questionnaire properly and forwarded it to me, which is 57% response rate. I have also received three questionnaires which are incomplete and carelessly completed, as a result, I deliberately disregard them from my analysis. Details of the respondents contacted are shown under Table 4.2.

Secondly, interviews were also conducted with two auditors selected from two audit firms who were willing for the interview (See the basic questions asked during the interview under Appendix C). For those respondents whom I could not interview, I also send the interview question by e-mail and two auditors forwarded me their opinion (Appendix D). As discussed in chapter one, the purpose of the interview at this
stage is just to get answer for those questions evolved during the analysis of the data collected using the questionnaire.

<table>
<thead>
<tr>
<th>Title</th>
<th>Number</th>
<th>Age range</th>
<th>Average auditing experience in years</th>
<th>Educational level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partner</td>
<td>3</td>
<td>36 to 60</td>
<td>25</td>
<td>2 Bachelors, Gymnasium</td>
</tr>
<tr>
<td>Senior Manager</td>
<td>2</td>
<td>41 to 50</td>
<td>11</td>
<td>Bachelors</td>
</tr>
<tr>
<td>Junior Manager</td>
<td>2</td>
<td>31 to 35</td>
<td>10</td>
<td>Master and Bachelor</td>
</tr>
<tr>
<td>Senior Auditor</td>
<td>5</td>
<td>26 to 40</td>
<td>6</td>
<td>4 Bachelor, Gymnasium</td>
</tr>
<tr>
<td>Junior Auditor</td>
<td>4</td>
<td>20 to 30</td>
<td>3</td>
<td>2 Bachelor, 2 Master,</td>
</tr>
<tr>
<td>Expert</td>
<td>2</td>
<td>31 to 45</td>
<td>10.5</td>
<td>2 Bachelor</td>
</tr>
<tr>
<td>Accountant</td>
<td>5</td>
<td>20 to 55</td>
<td>2</td>
<td>3 Gymnasium, Bachelor, Master</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 4.2: Details about the status of respondents*

The empirical data gathered in both ways, i.e., the questionnaire and interview, and the analysis made on this data is presented in the following sections.

### 2. Objectives of Firms and Awareness of both Management and Employees in Adopting CAATs

As stated in the literature review, in *Chapter Two*, the principal reason for a firm for adopting computer assisted auditing techniques (CAATs) is to enhance the efficiency and effectiveness of the audit process and broaden the client base. This reason is closely followed by a desire to keep abreast of technological change and the desire to keep abreast or a head of competitors.

In connection with this, respondents were asked how much their firm is utilizing IT for audit process and 91% of the respondents replied that, IT is utilized “Very much” in their firm during the audit process. As shown under *Table 4.3*, 43% of the respondents believe that IT techniques and special software is “a natural tool for work”. From this it is possible to say that auditors seemed to perceive the potential benefits associated with adopting IT for audit process.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturb the actual work</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>A tool for work</td>
<td>5</td>
<td>22%</td>
</tr>
<tr>
<td>Natural tool for work</td>
<td>10</td>
<td>43%</td>
</tr>
<tr>
<td>Unavoidable part of work</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>A tool that helps at work</td>
<td>2</td>
<td>9%</td>
</tr>
<tr>
<td>Incomplete answer</td>
<td>6</td>
<td>26%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>23</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Table 4.3: Respondents belief as to the application of CAATs in their work*

Moreover auditors were asked to respond to five statements which are supposed to be the purposes of adopting CAATs for audit process. They were requested to rate their opinion regarding those statements using a four point scale, ranging from 1 to 4, where a response rate of 1 indicated total agreement and 4 indicated total disagreement. By using Hierarchical Cluster Analysis, attempt was made to identify relatively homogeneous groups of respondents based on the variables defined (i.e., for the possible purposes of
adopting CAATs in the audit process). The result of the cluster analysis of respondents with these five variables are illustrated by using dendrogram shown under Figure 4.8. Group of respondents are represented as nodes in the dendrogram and the branches illustrate when the cluster method joins subgroups containing that respondent. The length of the branch indicates the distance between the subgroups when they are joined. The dendrogram shown under Figure 4.8 clearly differentiates two groups of respondents who have homogeneous opinion for the variables they were asked to gauge.

To see the variability among clusters, outlier and extreme respondents and to investigate the reason for such "runt" responses, a stem-and-leaf plot (see Chart 4.1) are used to display each of the groups of respondents defined by those factor variables. High variability among clusters of respondents is observed for variables shown under Chart 4.1, number iii. Three respondents do believe that, CAATs have less potential to increase audit quality, this is may be because of their low awareness what CAATs are all about since none of them were found to be not attending any training or formal education about CAATs. I identified that the extreme respondent represented by case number * 19 of chart # ii is a partner who has experiences of 38 years but with only secondary educational level (gymnasium) and without any IT training. He is mainly responsible for those tasks that do not require sophisticated audit software utilization like client contact, planning, team leading and final audit. It could be due to this background that the opinion given by him is that CAATs does not increase audit quality. This finding clearly supports the inference arrived earlier that the awareness and the knowledge level that users have had immense impact on the adoption of CAATs.

The variability among the median scales for variable, CAATs makes audit test faster, occurs because of two respondents who disagree with this purpose of CAATs. The cause for this seems, most likely due to their less competitiveness in IT as they were found to be totally not attending any sort of training for IT and CAATs. Variability is also observed among the median scales ranked by respondents for variable that CAATs are effective tool for special audit. As shown in Figure 4.8, most respondents (83% of the total respondents) fall under Cluster 1 who strongly believe that adoption of CAATs could make audit test faster and an effective tool for special audit as indicated by a median scale of one for both variables represented by plot # iii & iv of Chart 4.1 and it is only four respondents (17%) who fairly believe on these convictions (the median scale is 2.5 for both variables). Consequently, it is possible to say that most respondents highly believe that adopting CAATs could have the advantage to make audit test faster and for the handling of
special audits. Effort was made to identify the reason why the four respondents fairly believe on these convictions. But, the only common character which I observed vividly is that, none of them has attended any training related to the application of CAATs and have less exposure for general IT training as compared to the category of respondents under the category of cluster one which might be one possible reason for such belief. It is possible to say that the extremes represented by case number *15 and *16 of plot # iv & iii have still the same effect on the conclusion arrived since the median scale for these variables too is two.

For the remaining variables, as shown under Chart 4.1., # i, &v, it seems most respondents do agree that, adopting CAATs in the audit process could help to increase audit efficiency and effectiveness by handling many transactions which will in turn bring cost minimization as the median scale for both clusters in each plot is indicated at and below 1.5 scale.

**Chart 4.1.** Stem-and-leaf plots to display the variability of respondents’ opinion among clusters (for the definitions of outliers, extreme values and for other related terms please refer the note under Chart no. 4.4.)

Related to this, respondents were also asked to give their opinion on how they could explain the attitude of both management and employees in their firm towards the application of specifically Computer Assisted Auditing Techniques and Tools (CAATTs) in the audit process. As shown under Chart 4.2 and 4.3, the survey result indicates that most respondents think, both management and employee believe that adopting CATTs for audit process has “high potential for enhancing work efficiency and effectiveness”.

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Eight respondents also forwarded their opinions that, unlike employees, management believe that employees must continually update themselves for the use of technology so as to stay on course and to remain competitive within the profession (see Chart 4.2). This opinion is in line with the opinion given by nine respondents who states that, employees fear the adoption of new technology because they believe that they lack the required educational background and useful experience for managing, operating, maintaining and using of the new technologies (see Chart 4.3). This means that even if respondents do believe that IT in general could have high potential for enhancing audit efficiency and effectiveness, they displayed a lower confidence in their technical abilities in using the CAAT applications specifically. From this it is possible to say that to increase the confidence, efficiency and effectiveness of employees in adopting CAATs continues professional development and training in relation to CAATs is mandatory in addition to the general IT training and education that most employees are doing.

**Chart 4.2.** Summary of the survey result on respondents' opinion as to the attitude of management towards the adoption of CAATs

**Chart 4.3.** Summary of the survey result on respondents' opinion as to employees attitude towards the adoption of CAATs in the audit process

From Chart 4.2 and 4.3, it is also possible to infer that, respondents do not believe that management has the fear of the potential costs of adopting new technology like work displacement, excessive dependence on foreign suppliers for hardware, software, training and maintenance and employees have no fear of the
potential disadvantages of adopting new technology related to work displacement. This could have positive contribution for more adoption of effective CAATs by firms in the future.

3. Current Level of Firms’ Involvement in CAATs Application for Auditing

To provide an insight into the views of the state regarding the application of CAATs for audit process by those firms, effort was made to gather empirical data that could help me to identify how often it is that those firms are applying CAATs, the type and for which sort of audit work it is applied in the process. The empirical data and the detailed analysis made in this regard are shown in the following sections.

3.1. The Type of IT Techniques and Tools being Used and the Areas Where Applied in the Audit Process

Respondents were asked to state the name of the software they used and for which type of audit task they are applying it and the summary of the survey result is presented under Table 4.4.

<table>
<thead>
<tr>
<th>Name of Software</th>
<th>Its Current Application in the Audit Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS/2</td>
<td>Audit planning and Computations</td>
</tr>
<tr>
<td>Hogia Art</td>
<td>Tax Computation and Accounting/Book keeping</td>
</tr>
<tr>
<td>Hogia Audit</td>
<td>Annual Report, Audit Documentation</td>
</tr>
<tr>
<td>Microsoft Office</td>
<td>Calculation, Letters Writing and Short reports</td>
</tr>
<tr>
<td>Microsoft Outlook</td>
<td>E-mail and Calendar</td>
</tr>
<tr>
<td>Lotus Notes</td>
<td>E-mail, database, communication, calculation and Knowledge sharing</td>
</tr>
<tr>
<td>AWS</td>
<td>Audit Planning, Documentation and Communication</td>
</tr>
<tr>
<td>ALL</td>
<td>Data Analysis</td>
</tr>
<tr>
<td>Mychent</td>
<td>Audit Planning</td>
</tr>
<tr>
<td>SPCS</td>
<td>Audit Planning and Computations</td>
</tr>
<tr>
<td>STCS</td>
<td>Tax Computation</td>
</tr>
<tr>
<td>XOR Compact</td>
<td>Accounting</td>
</tr>
<tr>
<td>Excel</td>
<td>Spread sheet calculation</td>
</tr>
<tr>
<td>EY AWS</td>
<td>Audit Documentation</td>
</tr>
<tr>
<td>Briljant</td>
<td>Book Keeping</td>
</tr>
<tr>
<td>Kapell</td>
<td>Annual Audit Report</td>
</tr>
<tr>
<td>Notes</td>
<td>Audit Planning</td>
</tr>
<tr>
<td>Norstedts</td>
<td>Tax Calculation</td>
</tr>
</tbody>
</table>

Table 4.4: Summary of survey result about the most commonly used software in the audit processes across the four firms and their respective application in the audit process as stated by the respondents.

From Table 4.4, it is possible to infer that, the stated software are commonly applied for the simplification of monotonous tasks (like calculation of tax, depreciation, pension, investment etc.), facilitating communication (like e-mail), audit planning, documentation, accounting and secretarial works. None of the respondents stated any software, techniques and/or tools which are being applied, for more advanced, efficient and effective auditing techniques which could be more relevant in an automated accounting information system environment like test data approach, parallel simulation, embedded audit module approach etc., as discussed under Section 3.1.2., of the literature review.
<table>
<thead>
<tr>
<th>Audit Tasks</th>
<th>Number of Respondents</th>
<th>how often they are using CAATs</th>
<th>Average Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seldom</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>E-Mail</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Audit report</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Tax</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Audit planning</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Automated Audit working paper</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Audit memos</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Reporting</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Electronic Spreadsheet (Excel)</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Communication with other members in audit team</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Depreciation calculations</td>
<td>0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Word processing</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Financial analysis</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Audit minutes</td>
<td>1</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Communication with clients</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Spreadsheets Templates</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Data transport</td>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Text templates</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Graphics</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Pension computation</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Make lists</td>
<td>2</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Interest expense/income computation</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Risk analysis</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Test with the help of lists</td>
<td>3</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Databases</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Investment calculations</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Test of inventory</td>
<td>7</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Test of account receivables</td>
<td>8</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Test of account payables</td>
<td>8</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Knowledge sharing</td>
<td>9</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Samples selection and analyzing software</td>
<td>9</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Planning software</td>
<td>10</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Test of Information systems</td>
<td>11</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Test data generators software</td>
<td>15</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Data extraction and analysis software</td>
<td>16</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Continuous auditing/Embedded Audit Module software</td>
<td>17</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Decision Support Systems</td>
<td>17</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Statistical Software</td>
<td>15</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Expert Systems</td>
<td>16</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Parallel Simulation audit software</td>
<td>18</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

**Table 4.5:** Summary of survey result that show the number of respondents to identify for which tasks and type of IT tools, techniques and/or software do firms are using and the level of utilization as per their opinion.

This response is in line with the feedback they gave while they were asked to respond by rating a serious of statements regarding CAATs application in each audit process using a four point scale ranging from 1 to 4.
where a response of 4 indicated high utilization and a response of 1 indicated very infrequent utilization of the stated CAATs for each tasks in the audit process. The statements asked were the basic tasks of the audit process that could be *around, through or with the computer* in an accounting information system which could be either manual or automated. The summary of the survey result is presented under *Table 4.5*.

If we take a look at the summary of the survey result presented in *Table 4.5*, it is possible to infer the following basic points:

- Respondents use CAATs mostly for those standardized auditing tasks and other tasks which are more relevant for less automated accounting information systems or for an audit process where the traditional audit trail is available.
- However, those audit techniques like parallel simulation, data extraction and analysis techniques, continuous auditing, test of information systems, decision support systems and expert systems which are highly efficient and effective for highly automated accounting information system like in an e-commerce economy are less utilized or not used totally.

However, with the expanding role of e-commerce economy and much of the traditional audit trail is disappearing which in turn will cause for the diminished likelihood of the traditional “*audit around the computer*” approaches will undermine the efficiency and effectiveness of firms. Moreover, if audit firms continue to adhere only those traditional audit techniques, it will be very difficult for them to meet public expectations. This is because, as Braun and Davis (2003) explained, economic forces at work in capital markets appear to be signaling the demand for more timely assurance on financial information reported annually, quarterly, and throughout the year. As a result, auditors who are prepared for these changes may be empowered to take advantage of new audit and assurance opportunities resulting from the ability to provide more effectively distributing the workload throughout the year. However, as per this survey result shown under *Table 4.5*, CAATs like generalized audit software that facilitates data extraction and analysis which are relevant for “*auditing through the computer*,” approaches that can effectively illuminate the “black box” of computer application processing are the least utilized software.

With its potential to provide more effective and efficient audits, auditors should have been rushing to use IT for audit process. However, as explained above auditors are still not applying CAATs for more efficient and effective auditing tasks. According to this survey, the IT tools and techniques being used by these firms, indicated under *Table 4.4 and 4.5*, it seems that these firms are under *Stage II* and to some extent *Stage III* of technology adoption stages as explained under *Table 2.1. of Section 3.2.*., which are mostly applicable for manual and less automated accounting information system environment.

Given the high potential of IT as an efficient and effective auditing tool in highly automated accounting information system of the e-commerce economy, why are these firms still slow to adopt more relevant auditing techniques like parallel simulation, data extraction and analysis techniques, continuous auditing, test of information systems, decision support systems and expert systems?

### 3.2. Assessing the Determinant Factors for the Adoption of CAATs by Firms in General

To assess the determinant factors for the adoption of CAATs by firms, respondents were asked to rate a serious of statements regarding the possible influencing factors for the adoption of CAATs (the variables considered) by firms for audit process using a four point scale ranging from 1 to 4, where a response rate of 4 indicated “*High disagreement*” and a response rate of 1 indicated “*High Agreement*”. The summary of the survey result is analyzed by using Hierarchical Cluster Analysis to identify relatively homogeneous groups of respondents based on the variables defined. The result of the cluster analysis on the seven variables is portrayed by using dendogram shown under *Figure 4.9* and stem-and-leaf plots (*Chart 4.4*) are used to display each clusters of respondents defined by these variables.
The dendogram shown under Figure 4.9 ideally illustrates clear grouping of three differentiate clusters of respondents who have homogeneous opinion towards the specified variables. Out of the total 23 respondents 39%, 43%, and 18% of them fall under the category of cluster 1, 2 and 3 respectively. To see the variability of median scales among these clusters and to conclude about to which direction their opinion is skewed, all those clusters are depicted by using Stem-and-leaf plots (Chart 4.4) for each of the seven variables considered for the study.

High variability among clusters of respondents for each variable has occurred for all those Stem-and-leaf plots, except for the variable represented by Chart # iii of Chart 4.4. This means that respondents mainly believe that the use of software is highly influenced by the skill that the users have (the median scale is 2).

As indicated by Chart i, 39%, respondents (cluster 1) strongly believe that acquisition cost of the software could have higher impact to adopt CAATs by firms. Most of these respondents are found to be senior staffs (see Appendix E) who could have high involvement in the management of operation in the firm including resource planning which in turn could have high awareness about the acquisition cost of audit software in the prevailing market. Besides, partners and accountants (18%, under cluster 3) fairly agree that cost could have impact as indicated by their median scale of 2.5. On the other hand respondents under the category of cluster 2 (43%) and most of whom are junior staffs (Appendix E) disagree that, for the adoption of CAATs, acquisition cost could not be a major factor (the median scale for these category of respondents is 3). One possible reason for junior staffs to forward such opinion could be because of their less involvement in the management of the resources of the firm that could make them less informed about the acquisition cost of audit software and other required resources related to CAATs adoption in the market. Therefore, according to the feedback given by senior staffs, partners and accountants, it is possible to say that acquisition cost could have impact to adopt CAATs in the audit process.

Respondents under the category of Cluster 1 & 2 (82%) and who are entirely junior and senior staffs agree that the size of client has impact on the adoption of CAATs but those respondents who are partners and accountants (Cluster 3,18%) disagree with this opinion (see Chart ii and Appendix E). Therefore the
majority of respondents and who are the actual users of CAATs believe that, the size of client could influence the adoption of CAATs.

Senior and junior staffs (Cluster 1 & 2, 82% of the respondents) agree that auditors are less aware of about the usefulness of CAATs. On the other hand partners and accountants (18%) disagree with this view (see Chart iv and Appendix E). This variation in opinion among staffs could be due to less understanding of what CAATs can do as there is great variation in IT knowledge and academic qualification among these groups of respondents. For example, there is one deviant (outlier) respondent (o13) who strongly believes that, auditors are aware of everything about CAATs. But this respondent doesn’t attend any IT related course except the training for word processing application (See case number 13 under Appendix F). But as per the opinion given by the majority of respondents, it can be said that, under the current situation auditors do have low awareness as to the usefulness of CAATs which in turn could influence its adoption.

Some variations in response are also observed among the clusters of respondents as to the impact of personal attitude of the users towards CAATs adoption (Chart 4.4, under v). To identify the possible cause for these variations in opinion, I checked other related variables like age, experience, educational level, auditors’ responsibility in the firm and the training they attend for all respondents in each clusters (Appendix E & F). The summary of the result indicates that respondents for this variable do have diversified category of age, experience, educational level, responsibility assignment and trainings. However, it is vague to identify some possible common causes for the variation of opinion by respondents for each cluster. But it is possible to say that personal attitude of the users could have impact for the adoption of CAATs by firms since the median scale for all clusters are at and below 2.5 (see Chart # v).

**Chart 4.4:** Stem-and-leaf plots to display the variability of respondents’ opinion among clusters

![Stem-and-leaf plots](image-url)
Lack of training on how to use CAATs on the other hand does not seem a major influencing factor to adopt IT in the audit process as the median scale for the 61% of the respondents are 2.5 and above (Chart vi). The major respondents for these opinion are junior staffs, partners and accountants. However, out of these respondents, it is only two respondents who attend the training for the application of CAATs (see the case summary for Cluster 2 & 3, under Appendix E and F). In contrast, senior staffs and some accountants (Cluster 1, 39%) fairly believe that, lack of training could be influencing factor for the adoption of CAATs. As I understand from the interview and from the e-mail of two respondents (Appendix C & D), the opinion given by these groups of respondents seems more valid than the former two groups of respondents. As shown under Appendix D, two interviewees believe that, because of “lack of time”, most employees do not attend “enough training” related to the application of CAATs. Besides, as explained under Section 4 and as illustrated by Chart 4.6, the belief of the 61% respondents seems less acceptable.

The usefulness of the audit software to be adopted could also be another influencing factor as the median scale given by 57% of respondents (most of whom are senior staffs, partners and accountants) is 2 and 1 (See Cluster 1 & 3, under Chart vii). On the other hand most junior and few other types of staffs do not agree with this idea. But as discussed under Section 4, the opinion forwarded by the former respondents seems valid. On the other hand it seems difficult to infer meaningful conclusion from the responses represented by extreme cases represented by *4 * 8 * 22 and * 23 consequently I prefer to disregard them from the analysis.
As per these analyses, it is possible to deduce that, most respondents believe, adoption of CAATs as a tool for auditing is highly influenced by the size of the firm, and the skill, awareness of the auditor as to the usefulness of CAATs. This means that, the higher the level of awareness, familiarity with and understanding of CAATs will be able auditors to increase the adoption of more sophisticated auditing software and techniques. These inferences are in line with the discussion made on those data presented under Chart 4.2 and 4.3 and related general literatures. On the other hand acquisition cost for audit software and other required resources, the required training and personal attitude of the user towards CAATs could also have influencing factor to some extent,

But as shown under Chart 4.2 and as discussed under Section 2 earlier, respondents do not believe that management has the fear of the potential costs of adopting new technology. During the interview I tried to pin point the reason for these contradictory views and one of the interviewee forward me his opinion in such a way that;

“In my opinion, I do not think that software acquisition and other related costs could be a major problem for our firm.”

I asked him again what he thinks the impact of cost for the adoption of IT for audit process from the perspective of sole practitioners, small and medium sized audit firms and he replied me that;

“I agreed that small firms could have resources constraint for software acquisition and provision of relevant trainings for their employees.”

From these discussions it can be said that, cost for audit software and computer facility acquisition and the cost for the provision of trainings may not be a major determinant factor form the perspective of the firms under the survey since they are the branches of the resourceful and leading audit firms, but it could still be a decisive factor for sole practitioners, small and medium size firms which needs further analysis actually.

The two interviewees were also asked why their firms are slow in adopting more efficient and effective IT tools and their conviction seems that, to adopt relevant IT by firms, management must be aware of what type of technology exist in the market continuously and staffs need to have the knowledge, the experience and the interest to implement it. Besides, the other two respondents mailed me (Appendix D, # 1) an opinion that supports the opinion given by these two interviewees as mentioned below;

“Our firm is in front regarding CAATs however implementation of these systems tends to take a long time, due to some resistance among senior auditors”.

But once a firm adopts a given software as a tool for auditing, is it always possible to say that staffs can use it efficiently and exploit its maximum potential benefit and achieve the expected effectiveness in the audit process? If not what could be the possible determinant factor for this? These issues are addressed in the following sections.

4. Assessing the Factors for Effective Application of CAATs by Users in the Audit Process

Auditors were asked to give their opinion how far all the potential benefits of those audit software adopted by their respective firm currently are being utilized to the maximum possible for the improvement of work efficiency and effectiveness. Out of the total respondents, 57% of them believe that most potential benefit of those audit software are not yet used efficiently and effectively. To identify the possible causes for this, they were asked to choose one or more opinions among those factors that could be the possible reasons in their
situation or to forward other factors if their opinion is different. The summary of this survey result is presented under Chart 4.5.

![Chart 4.5: Summary of the respondents who commented for the possible causes for under capacity utilization of currently used software by each firms](image)

**Chart 4.5:** Summary of the respondents who commented for the possible causes for under capacity utilization of currently used software by each firms

As shown under Chart 4.5, most respondents believe that, the most causes for under utilization of audit software are due to lack of the required back ground knowledge and lack of relevant practical experience to utilize the full potential of the software efficiently and effectively which is in line with their comment which says that effective utilization of CAATs is influenced by the staffs’ interest to learn on how to use them as presented under Table 4.6. This means that as more auditors achieve a higher level of understanding of and familiarity with CAATs, their efficiency in the utilization of IT for audit process may increase and improve the effectiveness of the audit. Moreover, eight and seven respondents do believe that effective application of CAATs is also influenced by its technical complexity and the provision of computing resources by management respectively. As shown in question number 28 of the questionnaire, respondents were asked to rate the technical complexity of the software that they are using. But none of them could fill it, in stead three respondents forward their comment that the software they use has technical problems. As a result, I asked again during the interviews to tell me exactly what sort of problem they face while they use software and one of the interviewee told me that the software what he is using for receivables aging analysis and audit planning has difficult langue to understand. The other one has also told me that, it is not always easy to design inputs for the software from client financial statements and get the required analysis report. But this kind of problem could also arise because of lack of training and experience in using the software. For example, two auditors mentioned that (Appendix D), even if their firm is in the forefront regarding the adoption of CAATs, they believe that because of lack of adequate training, they could not use it to the maximum possible.

These respondents also think that;

“Learning by doing” which I understand as “on the job training” and “on going updates regarding legislations och audit standards” could be a possible solution to solve such problems (Appendix D).

Therefore it can be said that, if these problems do exist as explained by interviewees, employees together with management should have been capable of solving it. But as the interviewees explained, management does not believe that these are major problems as a result does not budget time to find solution for such problems.
### Table 4.6: Summary of survey result that show the number of respondents for rating the possible determinant factors for effective application of a specific CAATs in the audit process by staffs

<table>
<thead>
<tr>
<th>Possible Determinant Factors for the Effective Utilization of a specific type of CAATs</th>
<th>Number of Respondents for Rating the Factors</th>
<th>Agree</th>
<th>Disagree</th>
<th>Average Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other factor(s)</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Staffs’ interest to learn on how to use CAATs</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Attitude of the staff towards CAATs</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Client resistance or Cooperativeness</td>
<td>5</td>
<td>10</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Usefulness of the software</td>
<td>4</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Availability of support/Guidance from the supplier</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Lack of training (in house &amp; external)</td>
<td>1</td>
<td>3</td>
<td>11</td>
<td>7</td>
</tr>
</tbody>
</table>

On the other hand, as per Chart 4.5, it seems that compatibility of the software with the firms existing computing facility and requirement for specialist assistance are not the major problem of the software that they are using in their firm currently. This argument seems valid as compared to their response they gave as, suppliers of audit software (both internal and external) commitment to provide specialist assistance has less impact for the application of CAATs in their firm as presented under Table 4.6. They said this, may be because they believe that they have access for training (both in house and external) that their firm is arranging for (Table 4.6).

Moreover, as shown in Table 4.6, respondents agree that the usefulness (with 2.22 rank) of the software and the attitude of staff towards it could determine to apply CAATs effectively. To some extent they also agree that (see the average rank is 2.217), client resistance or cooperativeness for the application of the CAATs during the audit process could determine for its effective application on the other hand as shown in Table 4.10, it is only one respondent who believe that clients believe that, CAATs could affect their AIS which seems contradictory opinions. Moreover, from the analysis made it is possible to understand that all the firms have not yet started to apply those sophisticated CAATs in their client AIS, as a result, I found this odd to explain. During the interview I tried to identify what is special for those respondents to say that clients could resist the application of those advanced CAATs in their AIS for the audit process and I asked them to explain me what type of problem that could cause clients not to be cooperative or resist for the application of CAATs, if it is going to be applied for that matter. And the interviewees explained me their expectation in that, some clients may believe that implementation of CAATs in their AIS could cause system corruption, hinders processing speed of the AIS and introducing viruses. According to the theory stated by Braun and Davies (2003) such conviction seems valid but still if these problems could happen it is possible to minimize or even eliminate such risks. For example, integrated test facility could cause corruption of clients file. However if the auditor has the required level of expertise, it is possible to design the audit modules into the system and to ensure that test transactions do not affect the actual data (Braun and Davies, 2003). More over, Braun and Davies (2003) stated that embedded audit modules could affect the processing speed of the information system but it is possible to eliminate such problems by turning on and off the module at intervals and for this the auditor need to have relevant programming skill to design and install appropriate module. The e-mail response given by the two respondents coincide with these literatures as stated below;

“We do not feel that clients resist the application of CAATs during the audit process. This is because, before the implementation of the CAATs, a test run over a year was performed. Consequently, this eliminates most of the start up problems” (Refer Appendix D, # 5).
Therefore, as per the literatures and the respondents opinion mentioned above, it can be said that, resistance or lack of cooperativeness of clients could not be taken as a major determinant factor for effective application of CAATs.

### Variables for self evaluation for using IT

<table>
<thead>
<tr>
<th>Variables for self evaluation for using IT</th>
<th>No. of respondents*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Can use IT efficiently and effectively</td>
<td>16</td>
</tr>
<tr>
<td>Sometimes I ask for assistance from colleagues</td>
<td>13</td>
</tr>
<tr>
<td>I use IT with the help of manuals &amp; senior staffs</td>
<td>0</td>
</tr>
<tr>
<td>I can not use IT efficiently &amp; effectively</td>
<td>0</td>
</tr>
</tbody>
</table>

### Possible causes for poor performance

<table>
<thead>
<tr>
<th>Possible causes for poor performance</th>
<th>No. of respondents*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of experience</td>
<td>13</td>
</tr>
<tr>
<td>Absence of clear manual on how to use the IT tool</td>
<td>0</td>
</tr>
<tr>
<td>Difficulty of the software</td>
<td>2</td>
</tr>
<tr>
<td>Lack of training</td>
<td>9</td>
</tr>
<tr>
<td>Less interest to use IT</td>
<td>0</td>
</tr>
</tbody>
</table>

*One respondent can choose more than one factors.

**Table 4.7:** The number of respondents who evaluate their IT competency and the reason chosen for poor performance

Respondents were also asked to evaluate themselves on how efficient and effective they are in the use of IT tools for their work and the summary of the survey is presented under **Table 4.7**. As shown in **Table 4.7**, most respondents (16) believe that they can use IT efficiently and effectively and some of them believe that they can use IT efficiently but sometimes they also ask assistance from colleague. On the other hand those respondents who believe that they depend on colleague assistance for IT utilization believe that, the cause for this is basically due to lack of experience followed by lack of training. Although respondents believe that they do not lack training in their firm, see **Table 4.6**, they displayed a lower confidence in their technical abilities in using the application of IT, **Table 3.9** and expressed *high desire to increase their skills* through increased specific CAATs utilization training, **Table 4.8**.

### Respondents reason for the training

<table>
<thead>
<tr>
<th>Respondents reason for the training</th>
<th>Number of respondents for rating</th>
<th>Average Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low 1</td>
<td>2</td>
</tr>
<tr>
<td>Desire to improve own skill</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>The firm developed EDP system</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Clients’ EDP system have developed</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Demands from client’s tasks</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Superior suggestion</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 4.8:** Summary of respondents rating for taking part in training or attending IT courses.
This is because, most of the courses and trainings attended by them are just to develop general IT skill for the utilization of those common applications like word process, statistical software, accounting information systems, etc as the survey result indicated shown under Chart 4.6 and Appendix F. From the total respondents, it is only two of them who have got the chance to attend courses or trainings on how to use CAATs. However, unrelated or general IT courses or trainings may not increase individual’s ability to use a specific CAAT tools efficiently and effectively in the audit process.

For example, the Swedish National Audit Office Proceeding (1998) indicated that, the changing in technology requires the IT auditors to keep abreast with current issues and looks at available CAATs tools. This means that, to provide assurance about individual’s ability to the efficient utilization of CAATs and to increase the individual’s effectiveness in doing the audit effectively, the auditor’s knowledge need to be updated continually as new CAATs are adopted or developed otherwise general IT training may not be useful for the effective application of the specific CAATs in the audit process. I found this the least considered idea in the firms under this study as I understand from the response gathered of which the feedback given by two respondents are stated as follow;

Respondents agree that almost all auditors did not participate in any type of trainings related to the application of CAATs and most of them were mainly involved in general IT trainings and they believe that the major reason for this is due to “lack of time” (Refer Appendix C & D, # 4).

Moreover as indicated under Chart 4.7, it seems that, most respondents tried to improve their general IT skill by self education which means that attending fewer task oriented trainings in the firms. However, it is believed that training which cannot be used directly is often of no use. It is also difficult to train auditors in advance due to differences in systems, and change is taking place all the time. “Just in time” training appears to be a suitable model: take the opportunity when the need arises in a project (The Swedish National Audit Office Proceeding, 1998). This means that if certain software for CAAT becomes predominant among the auditees, specialist training can be recommended. As I understand from the interview discussion, employees do not have the problem of getting the training they need. But the problem seems that due lack of proper identification of the type of training required and planning for it.

To sum up, this analysis suggest that, appropriate training for effective application of CAATs is lacking in firms and it seems that it is needed and desired by auditors. But to increase training extra cost need to be
incurred in the expectation of enhancing work efficiency and effectiveness in the long term which in turn means that effectiveness of the audit should provide benefits that outweigh the extra cost.

![Chart 4.7: The methods that respondents attend IT training](image)

Respondents were also asked to rate statements related to the possible factors that need to be considered while new CAATs is adopted or developed by the firm using a four point scale ranging from 1 to 4, where a response of 4 indicated “a lot” and a response of 1 indicated “not at all”. The summary of the survey result is presented under Table 4.9. As shown in this table, while new system is adopted and/or developed, it seems that employees were not consulted at all and their responsibility is not defined very well but training is arranged fairly. However, for successful application of a given software, involvement of prospective users during acquisition and/or designing of software has grate role for its effective application. This is mainly relevant to address users’ problem during system specification and finally avoid resistance and increase users’ effectiveness during its implementation.

<table>
<thead>
<tr>
<th>Number of respondents on those possible factors that need to be considered when new software is acquired/developed by management</th>
<th>Not at all</th>
<th>A lot</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consult employees about their preference, specification, etc</td>
<td>10</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Each user's responsibility is defined clearly</td>
<td>4</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Technical support staffs &amp; manuals are arranged</td>
<td>-</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Arrange training to users</td>
<td>-</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 4.9: Summary of respondents rating for taking part in training or attending IT courses.

The other major problem, as one of the interviewee explained me, is that some audit software has a lot of jargons which could be very difficult to understand by novice auditors and to apply those advanced auditing techniques it will take too long time to extract and process the data files for the audit unless the auditor is brave enough and well experienced. The other interviewee in the other firm explained me that, audit software in their firm is mostly adopted from the head office, as a result, new staffs usually face problem until they become familiar with it. This means that the learning time for effective application of audit software for junior auditors will be long. In general both of interviewees believe that management does not give much attention for such problems considering them as minor one but practically it usually affects the performance of the auditor when performance is judge against the time budget for the audit process. They believe that the best solution for this kind of problem could be increasing the technical competence and understanding of the auditor by providing on the job training and for this management should make budget
while new software is acquired and less experienced auditors are employed. Moreover, involvement of employees during software acquisition and development could also be helpful to have software that could be used by auditors effectively and efficiently.

5. Likely Future Involvement

Respondents were asked to choose one or more opinions among those factors which are believed to be the major determinants for continuous technology adoption in a firm as summarized under Table 4.10. As shown under Table 4.10, most respondents believe that both employees and management believe that adopting of CAATs by the audit firms could generate extra value (enhanced value) as perceived from customers’ point of view. It is few respondents who believe that management and employees have no clear view of the perceived values of adopting CAATs. Therefore it can be said that the adopters’ belief of the likelihood that CAATs can improve the economic benefits of the firm is also high.

<table>
<thead>
<tr>
<th>Respondents opinion on management, employees and clients attitude towards adopting CAATs</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees do believe that adoption of new technology has enhanced value</td>
<td>20</td>
</tr>
<tr>
<td>Management believe that adoption of CAATs has enhanced value</td>
<td>15</td>
</tr>
<tr>
<td>Employees have no clear view of the perceived value of CAATs</td>
<td>4</td>
</tr>
<tr>
<td>Management has no clear view of the perceived value of CAATs</td>
<td>2</td>
</tr>
<tr>
<td>Management do not believe that adoption of CAATs has enhanced value</td>
<td>1</td>
</tr>
<tr>
<td>Clients believe that CAATs could affect security of system</td>
<td>1</td>
</tr>
<tr>
<td>Employees do not believe that adoption of new technology has enhanced value</td>
<td>0</td>
</tr>
<tr>
<td>Clients believe that CAATs could introduce viruses to their system</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4.10: Summary of respondents’ opinion on those major determinant factors for continuous adoption of CAATs

Moreover, except one respondent, all respondents have not chosen the opinion that clients will be concerned with the application of CATTs in their system because of loss of security and system breakdown. This opinion seems somewhat contradictory as compared to their opinion shown under Table 4.6, which could be interpreted as resistance and less cooperativeness of client will not be major factor for the adoption of CAATs (but as per Table 4.6 their opinion is ranked 2.21. This means that client resistance and cooperativeness could still have impact for the adoption of CAATs). But as per the opinion summarized under Table 4.10, and as per the conclusion arrived from the discussion made under Section 4, the application of CATTs like embedded audit module software and parallel simulation in the client Accounting Information System will not be constrained highly due to clients’ resistance in the future.

Moreover two respondents said that, “We believe the existing platform will evolve” while they were asked what they think about the likely future application of CAATs as a tool for the audit process in the future (Refer Appendix C & D, #3).

E-commerce is a completely new way of doing business transactions electronically which has challenged the auditing profession. The absence of the possibility of document-based verification and traceability will have a deceive effect not only just on the business process but also on the way the audit is performed. Respondents believe in that, (see Chart 4.2 and 4.3), both management and employee believe that adopting CATTs for audit process has high potential for enhancing work efficiency and effectiveness, considering IT as source of enhanced value, may be as per the expected, less resistance from client side in the application of CAATs in their AIS during the audit process (as per Table 4.10) and the continuously increasing demand &
expectation of the public from auditors as early warning of management scandals & inefficiencies in a given organization could most likely invite auditors to adopt increasingly sophisticated IT tools that can address adequately the changing business environment, i.e., e-commerce economy and the constantly increasing desire for timely and reliable audited financial statement by interested users. However, adopting of increasingly sophisticated technology for auditing will still require suitably trained auditors and management in firms need to keep abreast with current issues and looks at available CAAT tools in the market.

VI.CHAPTER FIVE

CONCLUSIONS

1. Chapter Overview

In the previous chapters the related literature review and the empirical analysis were presented. Based on these, the main results of this study are presented in the following order in this Chapter:

- The first part of this chapter presents concluding remarks that summarize the results of the study,
• Second discussion is made on the implications of the main finding to the audit firms where the survey was made and to individual employees who are progressing in the profession,
• Finally, based on the results and limitation of this study, related topics for possible future research are also suggested.

2. Research Findings

The auditing profession certainly has firm integration with IT and it seems that firms and their employees under this survey aware of this and are trying to integrate relevant computer assisted auditing techniques (CAATs) in the audit process. The survey result indicated that both management and employees believe that, effective applications of CAATs in the audit process have high potential for enhancing work efficiency and effectiveness.

The survey result also indicated that management has no the fear of the potential costs of adopting new technology related to work displacement, excessive dependence on foreign suppliers for software and hardware and provision of training. It is also found that employees have no the fear of the potential disadvantages of adopting new technology related to work displacement.

From these findings, it is possible to conclude that, audit firms seem less constrained by the major hurdles for effective adoption of IT in their operational process. However, the pace of change by audit firms in adopting the relevant CAATs for auditing and be abreast of technology seem slow. It is found that, the most commonly applied CAATs by these firms are those software which are useful to perform standardized audit tasks and for other tasks in the audit process which are more relevant for less automated accounting information systems or for an audit process where the traditional audit trail is available. For example, among those highly utilized CAATs, tools and techniques for the simplification of monotonous tasks (like calculation of depreciation, tax, investment and pension), facilitating communication (like e-mail), software useful for standardized works (such as audit planning, documentation and accounting) and for secretarial works are the most utilized. On the other hand, most effective CAATs such as continuous auditing, parallel simulation, data extraction and analysis, test of information systems, decision support systems and expert systems that could have been more effective for the handling of both electronic audit trails and paper based audit trails are less utilized.

Moreover, it is seems that the potential benefits of those software which are already adopted by firms are not yet used effectively and efficiently to the maximum possible.

The determinant factors for slow pace of change by firms in adopting the relevant CAATs so as to remain abreast of technology and for underutilization of the existing software by employees are found to be due to the factors mentioned below.

It seems that management lacks the awareness and the commitment in addressing change and develops appropriate strategies and plans so as to adapt the operation of the firm in line with the change in technology, business operation environment and the increasing public demand and expectation for timely audited financial information.

Employees were also found to be lacking adequate knowledge and relevant practical experience to utilize the full potentials of the existing CAATs. They also have the fear for the application of CAATs since they believe that they lack the required educational background and useful experience for managing, operating, maintaining and using of the new technologies. Although, respondents believe that they do not lack training in their firm, they displayed a lower confidence in their technical abilities in using the application of CAATs, and expressed high desire to improve their skills through specific trainings for effective utilization of CAATs. The courses and trainings attended by them were just to develop general IT skills for the utilization
of these common applications like word process, statistical software and accounting software. Most respondents tried to improve their general IT skill by self education which means that attending fewer task oriented trainings in the firms. It is only two respondents who attend trainings on how to use CAATs, most of the respondents attend unrelated IT trainings that may not increase individuals’ ability on how to use a specific CAATs tools efficiently and effectively in the audit process.

Most respondents also believe that, adoption of CAATs as a tool for auditing is also highly influenced by personal attitude, the skill and awareness of the auditor as to the usefulness of CAATs. This means that, the higher the level of awareness, familiarity with and understanding of CAATs will be able auditors to increase their effectiveness for the adoption and application of more sophisticated auditing software and techniques.

It is found that effective application of CAATs is also influenced by the technical complexity of the software and the provision of computing resources by management. On the other hand, it seems that compatibility of the software with the firms existing computing facility and requirement for specialist assistance are not the major problem of the software that they are using in their firm currently and the commitment of suppliers of the audit software (both internal and external) to provide specialist assistance have less impact for the application of CAATs in their firm. This may be because these firms have appropriate computer hardware and software for audit use. Besides, they believe that they have access for training (both in house and external) that their firm is arranging which actually is found to be less task specific and as a result that has not been used directly.

It is also found that, while new system is adopted and/or developed, it seems that employees are not consulted at all and their responsibility is not defined very well. However, for successful application of a given software, involvement of prospective users during acquisition and/or designing of a given software has great role for its effective application. This is mainly relevant to address users’ problem during system specification and finally avoid resistance during its implementation.

Respondents also believe that application and implementation of CAATs could be constrained by the size of the firm that determine in committing resources for the acquisition and trainings which they assume that it has less impact from their firm perspective.

To some extent, respondents believe that, resistance or cooperativeness of client for the application of the CAATs during the audit process will also determine for its effective application.

Some audit software which are being used for receivables and payables analysis and audit planning software are also found to be difficult to use by beginners because of a lot of jargons which are very difficult to understand by novice auditors and taking of too long time to extract and process the data files for the audit unless the auditor is brave enough and well experienced. Employees believe that management does not give much attention to solve such problems considering them as minor problems. They believe that the best solution for this kind of problem could be increasing the technical competence and understanding capacity of the auditor by providing on the job training and for this management should make budget while new software is acquired and less experienced auditors are employed. Moreover, involvement of employees during software acquisition and development could also help to have software that could be used by auditors effectively.

3. Implications for Audit Firms and to Employees in the Auditing Profession

The findings of this research have some practical implications for future auditors. The existence of business transaction data in non electronic form is becoming increasingly scarce as companies make use of e-commerce due to the changing technology. The absence of the possibility of document-based verification and traceability will have a deceptive effect not only just on the business process but also on the way the audit
is performed which in turn caused for declining of the application of auditing “around”, that consider the computer as “black box”. Moreover, the constantly increasing desire for timely and reliable audited financial statement by interested users together with considering auditors as problem detector as they occur rather than at the end of the fiscal year could urge them to adopt more effective and efficient auditing techniques. The possible mechanism to meet these demanding and changing factors will be adopting Continuous Auditing that could help to curb reported abuses by enabling detection of problems as they occur rather than at the end of a reporting period and at the same time meet the timely audited financial information requirement of users. One way of achieving continues auditing is by using specialized IT auditing tools like CAATs. These types of audit tools could help auditors not only just to audit the data that supports the financial statements but also to audit the systems that capture and summarize the data. According to Walker (1991), future auditors are expected to report on the deficiencies of the existing IT-based systems and assure that management has implemented appropriate new systems that can manage inherent risk and maintain strategic advantages in the market place. Moreover regulators are calling for audit opinions on management control systems.

However, from the survey and the analysis made, it seems that auditors lack the required knowledge and experience for effective execution of CAATs. One reason for this is that the training provided to employees seems general IT utilization that cannot be used directly for the application of CAATs. But effective execution of CAATs needs auditors’ to keep abreast with current issues and looks at available CAATs tools. This means, to implement CAATs effectively, it is mandatory for auditors to improve their conceptual abilities in defining the techniques that are the foundation for continuous auditing process and the technical and imaginative skill to implement CAATs. As Walker (1991) pointed out, training and education of IT in a given audit firm should enable auditors to identify and understand the systems that produce the data under audit, particularly their objectives and the risks they are intended to manage and it should also enables them to use IT efficiently and effectively once they understand it.

As discussed earlier, it seems that employees are aware of the importance of appropriate training and education for effective application of CAATs that they lack and it seems that it is desired by them. But to increase training extra cost need to be incurred in the expectation of enhancing work efficiency and effectiveness in the long term which in turn means that effectiveness of the audit should provide benefits that outweigh the extra cost.

Moreover it is advisable if firms could look critically at their employees training needs and link investment in training and education directly to the achievement of their business goals. This is because employees training and development in the work place is becoming increasingly important aspects of working life and as Humphries (1995) explained, those companies that pursue a deliberate course to understand the potential fears of their people and deliver appropriate training programmes are in a far stronger position to reap the fruits of their investment.

On the other hand, employees in the audit profession should also dedicate some time to keep themselves abreast with technological development in connection with CAATs and the trainings that they enquire from their firms as a continues professional development should also be in line with this objective instead of general IT skill development. Moreover they should also make effort and have the motivation to gain practical experience with the best audit software products available now. This is because, as the more the auditors achieve a higher level of understanding of and familiarity with common CAATs, their efficiency in the utilization of IT for audit process could also increase which in turn improve the effectiveness of the audit process too.

To sum up, it is inevitable that the application of CAATs for auditing will be even more relevant in the future than now as business increasingly use electronic data processing techniques to process their accounting systems which in turn signal the end of traditional auditing approach. Effective application of
CAATs in such computerized accounting information system will help auditors to perform quality audit timely that can meet public demand and expectation. CAATs are also very useful to minimize the cost of making audit by minimizing the number of staff and the time required for a given audit assignment as a result it will be possible to provide audit service to clients at reasonable fee which in turn will improve the competitiveness of the auditor. But to materialize this, firms need to have clear strategic plan on how to adopt new technology for auditing and should always be well acquainted about the emerging technological change and its impact on their clients’ data processing system as well as their own audit procedures. Firms should also have clear and appropriate strategy on how to acquire the required resources (the software and the required computer facilities and the man power). It will not only be advisable to involve employees but it could also be necessary for firms to go further and involve their clients too while new system is acquired and developed so that it will be possible to address their fears towards CAATs too.

4. Related Areas for Future Research

The findings and the limitations of this study suggest that some possibilities for further research in this area that could add new knowledge and awareness in the profession as presented below.

First, since this study was done at the branch offices of those firms, researches of this type could be done at the head office level of those firms in Sweden and prove that whether the situation is similar. If not, why?

Moreover, small audit firms and sole practitioners could also be included in the survey and similar study can be made so that it will be possible to see the determinant factors for effective application of CAATs from the perspective of medium firms, small firms and sole practitioners too.

Third, study could be done by taking specific problem areas encountered by auditors during the application of particular audit software and examining the causes for those problems so that it will be possible to propose solution(s) for the improvement of the software considered.

The other potential researchable topics include the use of computer assisted audit techniques, audit strategies for advanced IT environments, the evaluation of inherent and control risk, and the design and the use of computerized working paper files.

Finally, further study could also be conducted in identifying what type of user support best suits for audit firms and how the policies for recruitment and training of employees in a firm could be designed or improved for the effective application of CAATs.

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VIII. APPENDIXES

Appendix A: The Covering Letter
Bifogat finns Du ett frågeformulär, som vi ber Dig fylla i och returnera i bifogade svarskruvert. Dina svar kommer att hjälpa Zeleke Belay att i sin magisteruppsats försöka förklara orsaker till varför användningen av vissa datorstödda revisionstekniker kan tänkas variera mellan olika potentiella användare. Hans uppsats har rubriken:

*Determinants for effective applications of softwares in computer assisted auditing techniques (CAATs)*


Tack på förhand.

Lars Svensson  
Universitetslektor

Zeleke Belay  
Aukt. revisor

---

**Appendix B: The Detailed Questionnaire**

**QUESTIONNAIRE**

1. Age
2. Gender:  □ Male  □ Female

3. Audit experience (in years) ______________________

4. Have you taken or are you taking the examination of professional competence test (revisorsexamen) to be Approved public accountants (godkända revisorer) or authorized public accountants (auktoriserade revisor) to be qualified and carry out statutory audits?
   □ Yes  □ No

   4.1. If No, what do you think the reason for this? Is it because;

   □ Your employer does not sponsor you  □ Your employer does not allow you study/exam leave
   □ You think that it is not useful  □ You are not interested to take it
   □ Any other reason ______________________________________________________________

5. Which of the following basic education have you already completed?
   □ Secondary education (Gymnasium)
   □ Bachelor degree, (kandidatexamen)
   □ Master degree (magisterexamen)
   □ Other _______________________________

5.1. Studies that the education included (Refer your answer at 5 above)
   □ Use of main frame computer  □ Use of micro computer
   □ Word processing  □ Electronic spread sheets
   □ Decision support systems  □ Accounting information systems
   □ Statistics software  □ Computer assisted auditing techniques
   □ No studies in Electronic data processing  □ Any other IT and Information system related courses _____________________________
   __________________________________________________________________________

6. Are you currently attending any basic education?  □ Yes  □ No

6.1. If your answer in # 6 is YES, do you think that it will help to enhance your IT utilization knowledge?
   □ Yes  □ No

7. Have you improved your Electronic Data Processing or the use of IT skills after completing your formal studies in,

   □ Employer’s training  □ Professional Associations’ courses
   □ Universities/Colleges courses  □ Self education

   □ As part of studies for continuous professional development scheme  □ No further studies

   □ Through other meanness like __________________________________________________________
8. The reason for taking part in training and benefits from it (Please choose as much as you can)

Rate the benefit you get

<table>
<thead>
<tr>
<th>Low</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desire to improve own skills</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Clients’ Electronic data processing (EDP) have developed</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>The firm EDP system has developed</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Superior suggestion</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Demands from client’s tasks</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>Other reason</td>
<td>____________________________________________________________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. What is your rank or position in your firm?

□ Partner □ Senior Auditor □ Consultant (strategic, tax, etc...)
□ Senior Manager □ Junior Auditor □ Accounting technician and/or Clerk
□ Junior Manager □ Other ________________________________

10. Are your tasks mainly (you may have more than one answer)

□ Planning □ Test internal control □ Final audit
□ Audit financial report □ Reporting □ Special Tasks
□ Client contacts □ Expert tasks □ Leading audit team
□ Managing □ Other ________________________________

11. Does your firm or you use Information Technology (IT) for work?

□ Yes □ No

11.1. If your answer in # 11 is YES, how much do you utilize it?

□ Very much □ Much □ Sometimes □ Other ________________________________

11.2. If your answer in #11 is NO, what do you think the reason for this could be?

□ High cost of acquisition from suppliers or developing internally
□ Lack of awareness of management as to the importance of IT for work efficiency & effectiveness
□ Lack of employees’ willingness to accept new technology
□ Other factors ________________________________

12. How do you explain the attitude of management in your firm towards the application of Computer Assisted Auditing Techniques and tools (CAATTs)? (Please choose as much answer as you can)

□ As compared to the availability of the new technology, it is possible to say that the firm does not adopt new technology as much as it could introduce as a new approach for work efficiency and effectiveness
□ Management has the fear of the potential costs of adopting new technology like work displacement, excessive dependence on foreign suppliers of hardware, software, training and maintenance
□ Management believe that IT has great potential for improvement of work efficiency and effectiveness
□ Management fail to budget for the education of the people who will be managing, operating, maintaining and using of the new technologies

□ Management believe that employees must continually update themselves to the use of technology to stay on course and to remain competitive within the profession.

□ Other opinion _____________________________________________________________

13. How do you explain the general attitude of employees or staffs in your firm towards the adoption of Computer Assisted Auditing Techniques and tools (CAATTs)? *(Please choose as much as you can)*

□ As compared to the availability of the new technology, it is possible to say that the firm does not adopt new technology as much as it could introduce as a new approach for work efficiency and effectiveness

□ Employees have the fear of the potential disadvantages of adopting new technology like work displacement, training and maintenance

□ Employees believe that IT has great potential for improvement of work efficiency and effectiveness

□ Employees fear the adoption of new technology because they believe that they lack the required educational background useful for managing, operating, maintaining and using of the new technologies

□ Employees believe that continually updating oneself to the use of technology to stay on course and to remain competitive within the profession is vital.

□ Other opinion _____________________________________________________________

14. How do you feel about the utilization of IT techniques and special software for your work in your firm?

□ Disturb the actual work

□ A tool for work

□ A natural tool for work

□ Unavoidable part of work

□ A tool that helps at work

□ Other opinion _____________________________________________________________

15. For which tasks do you use IT tools, techniques and/or software and how often? *(Please choose as many answers as you can)*

<table>
<thead>
<tr>
<th>Task</th>
<th>Rate how often you are using it.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seldom</td>
</tr>
<tr>
<td>Audit planning</td>
<td>□</td>
</tr>
<tr>
<td>Financial analysis</td>
<td>□</td>
</tr>
<tr>
<td>Automated Audit working paper</td>
<td>□</td>
</tr>
</tbody>
</table>
Audit minutes □ □ □ □
Parallel Simulation audit software □ □ □ □
Test data generators software □ □ □ □
Data extraction and analysis software □ □ □ □
Continuous auditing/Embedded Audit Module software □ □ □ □
Audit memos □ □ □ □
Audit report □ □ □ □
Test of Information systems □ □ □ □
Samples selection and analyzing software □ □ □ □
Depreciation calculations □ □ □ □
Pension computation □ □ □ □
Tax □ □ □ □
Interest expense/income computation □ □ □ □
Investment calculations □ □ □ □
Test of account receivables □ □ □ □
Test of account payables □ □ □ □
Test of inventory □ □ □ □
Communication with other members in audit team □ □ □ □
Communication with clients □ □ □ □
Risk analysis □ □ □ □
Data transport □ □ □ □
Make lists □ □ □ □
Test with the help of lists □ □ □ □
Reporting □ □ □ □
Graphics □ □ □ □
Knowledge sharing □ □ □ □
Word processing □ □ □ □
Text templates □ □ □ □
Electronic Spreadsheet (Excel) □ □ □ □
Spreadsheets Templates □ □ □ □
E-Mail □ □ □ □
Decision Support Systems □ □ □ □
Expert Systems □ □ □ □
Statistical Software □ □ □ □
Databases □ □ □ □
Planning software □ □ □ □

Could you please state if you are using IT for other purposes too ____________________________________________

16. Could you please state the name(s) of Software used by your firm?

<table>
<thead>
<tr>
<th>Name of Software</th>
<th>Its use or application</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. ______________________________</td>
<td>_________________________</td>
</tr>
<tr>
<td>ii. ______________________________</td>
<td>_________________________</td>
</tr>
<tr>
<td>iii. ______________________________</td>
<td>_________________________</td>
</tr>
<tr>
<td>iv. ______________________________</td>
<td>_________________________</td>
</tr>
</tbody>
</table>

16.1. How do you rate the usefulness or effectiveness of those software you stated above under # 18?

<p>| i. ______________________________ | ii. ______________________________ |</p>
<table>
<thead>
<tr>
<th>(Please choose as much answer as you can)</th>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Easy to use</td>
<td>☐ ☐ ☐ ☐</td>
<td>Easy to use</td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
</tr>
<tr>
<td>Sufficient instructions</td>
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<td>Sufficient instructions</td>
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<td>Clear structure</td>
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<td>Clear Printouts</td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
</tr>
<tr>
<td>Enough functions</td>
<td>☐ ☐ ☐ ☐</td>
<td>Enough functions</td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
</tr>
<tr>
<td>Over all good</td>
<td>☐ ☐ ☐ ☐</td>
<td>Over all good</td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
</tr>
<tr>
<td>Less satisfactory</td>
<td>☐ ☐ ☐ ☐</td>
<td>Less satisfactory</td>
<td>☐ ☐ ☐ ☐</td>
<td></td>
</tr>
</tbody>
</table>

If you think that the software is “less satisfactory”, could you please state the reason for this?

iii. _________________________

iv. _________________________

(Please choose as much answer as you can)

<table>
<thead>
<tr>
<th>Low</th>
<th>High</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Easy to use</td>
<td>☐ ☐ ☐ ☐</td>
<td>Easy to use</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Sufficient instructions</td>
<td>☐ ☐ ☐ ☐</td>
<td>Sufficient instructions</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Sufficient input</td>
<td>☐ ☐ ☐ ☐</td>
<td>Sufficient input</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Clear structure</td>
<td>☐ ☐ ☐ ☐</td>
<td>Clear structure</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Clear Printouts</td>
<td>☐ ☐ ☐ ☐</td>
<td>Clear Printouts</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Enough functions</td>
<td>☐ ☐ ☐ ☐</td>
<td>Enough functions</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Over all good</td>
<td>☐ ☐ ☐ ☐</td>
<td>Over all good</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Less satisfactory</td>
<td>☐ ☐ ☐ ☐</td>
<td>Less satisfactory</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
</tbody>
</table>

If you think that the software is “less satisfactory”, could you please state the reason for this?

________________________________________

17. Do you think that all the potential benefits of those software used by your firm are utilized to the maximum possible for the improvement of work efficiency and effectiveness?

☐ Yes ☐ No ☐ Other opinion________________________________________

17.1. If your answer in #17 is NO, what do you think that the reason for this could be?

(Please choose as much answer as you can)

☐ Staffs lack all the required knowledge to utilize all the potential of the software

☐ Management don’t provide all the required computing resources (e.g. Lap top, time, training etc) to users

☐ Most audit software are too difficulty & has technical complexity to use and need advanced skill

☐ Most staffs lack the experience to use them efficiently and effectively

☐ The software has Compatibility problem with the facilities of the your firm
18. How do you explain in general the attitude of management, employees and clients towards the adoption of new technology or CAATTs in the firm? (Please choose as much answer as you can)

- Management has no clear view as to the “Perceived benefit” of adopting CAATTs (i.e., productivity enhancement, quality improvement, cost reduction, new market development improvement in job performance and the associated intrinsic and extrinsic rewards)

- Employees have no clear view as to the “Perceived benefit” of adopting CAATTs

- Management believe that adoption of new technology has “Enhanced Value” that relate to indirect benefits such as the generation or enhancement of a quality image or a novelty perception from adopting the technology

- Management do not believe that adoption of new technology has “Enhanced Value”

- Employees do believe that adoption of new technology has “Enhanced Value”

- Employees do not believe that adoption of new technology has “Enhanced Value”

- Use of CAATTs by auditors concerns Client over the security of confidential or sensitive data

- Clients are concerned about the use of CAATTs by auditors can introduce viruses into their computers

Other or additional opinion

19. What factor(s) do you think that people or you could consider when they or you are invited to use new technology for your work? (Please choose as much answer as you can)

- The expected benefit that the new technology could provide both to the organization and the user levels

- You will become frustrated when you are required to use unfamiliar technology expecting that it could be too difficult to understand and cumbersome

- You believe that adoption of new technology requires time, effort, and other resources.

- People could consider New IT as a threat for professional accomplishment

- People could feel that Adoption of new technology could have social impact

- Other opinion to state
20. How do you evaluate your efficiency and effectiveness in the use of software or use of general IT tools for your work? *(Please choose as much answer as you can)*

☐ Can use efficiently and effectively by my self

☐ Sometimes asks for assistance of Colleagues or the software supplier

☐ I usually use it with the help of manuals or senior staffs

☐ I am not efficient and effective in the use of software or IT tools for my work

☐ Other opinion_______________________________

20.1. If yours answer in # 20 is other than the first choice (i.e., can use efficiently & effectively), what do you think the reason for this? *(Please choose as much answer as you can)*

☐ Lack of experience

☐ Absence of clear manual

☐ Difficulty of the software

☐ Lack of training on how to use the software

☐ Less interested to use it

☐ Other reason________________________________________

21. What do you think that the use of software (or the use of computer assisted auditing techniques and tools- CAATTs) is influenced by? And how do you rate your opinion? *(Please choose as much as you can)*

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of acquisition</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The size of audit client</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lack of skill on how to use it</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Low awareness as to its usefulness</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Lack of training on how to use IT for work</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The usefulness of the software</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Personal Attitude of the user</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other factors, could you please state the reason for this?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

22. What do you think that more wide spread utilization of Computer Assisted Auditing Techniques and Tools *(CAATTs)* is hindered by? *(Please choose as much answer as you can)*

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude of staffs towards CAATTs</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Client resistance or cooperativeness</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Usefulness of the software</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Availability of support / guidance from the supplier</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Availability of in-house or Suppliers training</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Staffs’ interest to learn on how to use CAATTs</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Other factors (if you have)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. Do you think that Computer Assisted Auditing Techniques and Tools *(CAATTs)* can be useful in, *(Please choose as much answer as you can)*

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize cost of audit</td>
<td></td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
24. Is the use of software affected by your superior’s utilization skills, attitudes and so on related to;  
(Please choose as much answer as you can)  

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

- Lack of CAATTs utilization skills
- Does not know how to utilize CAATTs
- Have/has Negative attitude towards CAATTs
- Can utilize CAATTs efficiently and effectively
- Senior staffs lack the motivation to involve in IT training & updating their knowledge in the area

Other idea to express

25. Is the use of software affected by your subordinates’ utilization skills, attitudes and so on related to;  
(Please choose as much answer as you can)  

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

- Lack of CAATTs utilization skills
- Does not know how to utilize CAATTs
- Have/has Negative attitude
- Can utilize CAATTs efficiently and effectively
- Subordinate staffs lack the motivation to involve in IT training & updating their knowledge in the area

Other idea to express

26. Does your firm usually acquire software from;  
[ ] External software suppliers  [ ] Develop internally  [ ] Both from internal & external  
[ ] Other means

27. While your firm is acquiring or developing new software to be used by employees,  
(Please choose as much answer as you can)  

<table>
<thead>
<tr>
<th>Not at all</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

- Consults employees about preference, specification, etc of the new technology
- Management usually arrange training to users of the new IT
- The responsibilities of each users of the IT is defined and
Technical support staffs and manuals are arranged

Other opinion

28. If you have used any audit software so far, could you please rate its competitiveness using the following measures?

<table>
<thead>
<tr>
<th>Agree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
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</tr>
<tr>
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<td>☐</td>
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</tr>
</tbody>
</table>

If you think that the software is “less satisfactory”, could you please state the reason for this?

___________________________________________________________________________________

29. What kind of software or CAATTs would you like your firm to use in the future?

______________________________________________________________________________________

30. Other comments or opinions ____________________________________________________________

Thank you very much for answering!

Appendix C: Interview Questions

1. Given the high potential of IT as an efficient and effective auditing tool in highly automated accounting information system of the e-commerce economy, why do you think that your firm is still slow to adopt more relevant auditing techniques like parallel simulation, data extraction and analysis techniques, continuous auditing, test of information systems, decision support systems and expert systems?
2. From my initial survey result, some respondents forward their general comment that some audit softwares have problems to use. Can you tell me exactly what type of problems you encounter in using those softwares?

2.1. Did management and employees try to solve those problems?

2.2. If not why?

2.3. In what way you think that the software needs improvement?

3. What do you think that the likely future application of Computer Assisted Auditing Techniques (CAATs) by your firm as a tool for audit process could be?

3.1. Do you think that the firm will budget more for this?

3.2. If so in which type of CAATs you think that the firm will invest more?

4. From the survey I made, I understand that, almost all respondents did not participate in any type of trainings related to the application of CAATs. Rather most respondents were mostly involved in general IT application trainings.

4.1. What do you think that the reason for this could be?

4.2. Do you think that it would be possible to improve the training?

5. What do you think that the basic reason that could cause clients to resist or not to be cooperative for the application of CAATs during the audit process if it is going to be applied?

Appendix D: Feed back received by E-mail for the Interview questions stated under Appendix C.

The questions designed for interview were also sent to some auditors by e-mails for feedback among which the e-mail response I got from two auditors is included here below.
Hello Zeleke

Here are some clarifications regarding your questions:

1. Our firm is in front regarding CAATs however implementation of these systems tends to take a long time, due to some resistance among senior auditors.

2. Not enough training.
   2.1 Learning by doing.
   2.2 –
   2.3 Ongoing updates regarding legislations och audit standards.

3. We believe the existing platform will be evolved.
   3.1 Yes
   3.2 See above

4.1 Lack of time.
   4.2 Yes

5. We don’t feel that clients resist the application of CAAT’s during the audit process.
Before the implementation of the CAAT’s test runs for over a year was performed. This eliminated most of the startup problems.

Good luck with your thesis
Andreas Hansson and Jonny Olsson
Öhrlings PricewaterhouseCoopers
Stortorget 2
371 34 Karlskrona
Direkt telefon 0455 - 554 49
Mobiltelefon 0709 - 29 53 36
Fax 0455 - 554 41
Direkt fax 0455 - 32 02 49
e-post andreas.hansson@se.pwc.com

Appendix E: Summary of Respondents based on their Age, Gender & their educational Level

<table>
<thead>
<tr>
<th>Ward Method</th>
<th>Case Number</th>
<th>Age</th>
<th>Gender</th>
<th>Experience</th>
<th>Current Educational Level</th>
<th>Rank of the employee in the firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>1</td>
<td>1</td>
<td>Female</td>
<td>2.00</td>
<td>Secondary education (Gymnasium)</td>
<td>Accounting</td>
</tr>
<tr>
<td>Cluster</td>
<td>N</td>
<td>Income</td>
<td>Age Range</td>
<td>Gender</td>
<td>Education</td>
<td>Occupation</td>
</tr>
<tr>
<td>---------</td>
<td>---</td>
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<td>-----------</td>
<td>--------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>2,00</td>
<td>26 to 30</td>
<td>Male</td>
<td>Bachelor degree (magisterexamen)</td>
<td>Junior Auditor</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>12,00</td>
<td>36 to 40</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Senior Manager</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>11,00</td>
<td>26 to 30</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Consultant</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1,00</td>
<td>36 to 40</td>
<td>Female</td>
<td>Secondary education (Gymnasium)</td>
<td>Accounting</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>2,00</td>
<td>36 to 40</td>
<td>Female</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Senior Auditor</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>7,00</td>
<td>31 to 35</td>
<td>Female</td>
<td>Master degree (magisterexamen)</td>
<td>Senior Auditor</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1,00</td>
<td>26 to 30</td>
<td>Female</td>
<td>Master degree (magisterexamen)</td>
<td>Senior Auditor</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>10,00</td>
<td>36 to 40</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Senior Manager</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Cluster</th>
<th>N</th>
<th>Income</th>
<th>Age Range</th>
<th>Gender</th>
<th>Education</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9</td>
<td>2,00</td>
<td>20 to 25</td>
<td>Male</td>
<td>Bachelor degree (magisterexamen)</td>
<td>Accounting</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>12,00</td>
<td>36 to 40</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Partner</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>11,00</td>
<td>26 to 30</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Junior Manager</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>9,00</td>
<td>31 to 35</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Junior Manager</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>10,00</td>
<td>20 to 25</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Consultant</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>3,00</td>
<td>26 to 30</td>
<td>Male</td>
<td>Bachelor degree (kandidatexamen)</td>
<td>Junior Auditor</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>10,00</td>
<td>31 to 35</td>
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