

**THE IMPACT OF ERP SYSTEM ON THE AUDIT PROCESS**

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<b>Title of Thesis</b> THE IMPACT OF ERP SYSTEM ON THE AUDIT PROCESS	
<b>Abstract:</b> Organizations implement Enterprise Resource Planning (ERP) Systems in order to address the problems pose by disparate applications within functional areas and to achieve competitive advantages. ERP systems typically provide elegant technological solutions for organizations information needs through radical changes in information processing orientation. Due to the robust nature of these applications and the changes associated with the implementation, auditors may need to adjust the audit processes and procedures when auditing in such an environment.  The aim of this research is to investigate the impact of ERP systems and the audit process in an organization. The focus is to identify whether changes exist when auditing an ERP implementing company compared to a non-ERP implementing company and if such changes are beneficial to auditors. The research is conducted using a survey questionnaire. The sample consists of 365 auditors working in various organizations. Altogether, 100 responses were received (response rate of 27.4%).  The result indicates that ERP systems have had a significant impact on audit processes. Auditors spent more time on control testing when auditing an ERP implementing company. In addition, the result showed that auditing ERP implementing company lead to decreased substantive testing. Finally, the auditors felt that ERP systems did not provide them with efficient access to information and timely audit trail.	
<b>Keywords:</b> Enterprise Resource Planning, Information Technology, Information System Auditor, Auditing, Audit Process	

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1	RESEARCH BACKGROUND.....	1
1.2	RESEARCH OBJECTIVES.....	3
1.3	EMPIRICAL METHOD .....	3
1.4	STRUCTURE OF THE THESIS .....	4
<b>2</b>	<b>AUDIT PROCESS IN AN ORGANIZATION.....</b>	<b>5</b>
2.1	DEMAND FOR AUDITING.....	5
2.2	AUDIT PROCESS .....	8
2.2.1	<i>Plan and Design of audit approach.....</i>	<i>9</i>
2.2.1.1	<i>Team Mobilization.....</i>	<i>9</i>
2.2.1.2	<i>Client’s Information Gathering.....</i>	<i>9</i>
2.2.1.3	<i>Risk Assessment .....</i>	<i>10</i>
2.2.2	<i>Internal Control System .....</i>	<i>11</i>
2.2.3	<i>Test of control.....</i>	<i>12</i>
2.2.3.1	<i>Substantive Tests .....</i>	<i>13</i>
2.2.4	<i>Analytical Procedures .....</i>	<i>13</i>
2.2.4.1	<i>Detailed Test of Transactions.....</i>	<i>13</i>
2.2.4.2	<i>Detailed Test of Balances .....</i>	<i>13</i>
2.2.5	<i>Audit Report.....</i>	<i>14</i>
2.3	CHAPTER SUMMARY.....	14
<b>3</b>	<b>ERP SYSTEMS IN ORGANIZATION.....</b>	<b>16</b>
3.1	ERP SYSTEMS .....	16
3.2	ERP SYSTEMS ARCHITECTURE .....	18
3.2.1	<i>Software components of ERP System.....</i>	<i>19</i>
3.3	ERP SYSTEM LIFE CYCLE .....	21
3.3.1	<i>Pre-implementation Phase.....</i>	<i>21</i>
3.3.1.1	<i>Audit Implications .....</i>	<i>21</i>
3.3.2	<i>Implementation Phase .....</i>	<i>22</i>
3.3.2.1	<i>Audit implications .....</i>	<i>23</i>
3.3.3	<i>Post-implementation phase.....</i>	<i>23</i>
3.3.3.1	<i>Audit Implications .....</i>	<i>24</i>
3.4	CHAPTER SUMMARY.....	24
<b>4</b>	<b>ERP SYSTEM AND AUDIT PROCESS.....</b>	<b>26</b>
4.1	IMPACT OF ERP SYSTEM ON AUDIT PROCESS.....	26
4.2	PREVIOUS RESEARCH .....	27
4.2.1	<i>Booth, Matolcsy &amp; Wieder (2000).....</i>	<i>27</i>
4.2.2	<i>Bierstaker, Burnaby and Thibodeau (2001).....</i>	<i>28</i>
4.2.3	<i>Yang and Guan (2004).....</i>	<i>30</i>
4.2.4	<i>Sia et al (2002).....</i>	<i>31</i>

4.2.5	<i>Sally Wright and Arnold M. Wright (2002)</i> .....	32
4.2.6	<i>Hunton, J. E Wright A. M and Wright S (2004)</i> .....	33
4.2.7	<i>Spathis and Constantinides (2004)</i> .....	35
4.2.8	<i>Bae and Ashcroft (2004)</i> .....	37
4.2.9	<i>Brazel, J.F (2005)</i> .....	37
4.2.10	<i>Brown and Nasuti (2005)</i> .....	39
4.2.11	<i>Debreceeny R.S et al (2005)</i> .....	39
4.2.12	<i>Sutton S.G (2006)</i> .....	40
4.3	ANALYSIS OF THE PREVIOUS RESEARCH .....	41
4.4	CHAPTER SUMMARY .....	43
<b>5</b>	<b>RESEARCH METHODOLOGY .....</b>	<b>45</b>
5.1	RESEARCH OBJECTIVES .....	45
5.2	HYPOTHESES AND RESEARCH QUESTIONS .....	46
5.3	SAMPLE .....	53
5.4	SURVEY .....	54
5.5	CHAPTER SUMMARY.....	55
<b>6</b>	<b>EMPIRICAL RESULT .....</b>	<b>57</b>
6.1	THE RESPONSE RATE.....	57
6.2	DESCRIPTIVE STATISTICS .....	58
6.3	FINDING ON HYPOTHESIS 1 .....	60
6.4	RELIABILITY ANALYSIS .....	64
6.5	FINDINGS ON HYPOTHESIS 2 .....	65
6.6	FINDINGS ON HYPOTHESES 3 .....	68
6.7	FINDINGS ON HYPOTHESIS 4 .....	70
6.8	EVALUATION OF THE EMPIRICAL RESULTS.....	73
6.9	VALIDITY, RELIABILITY, AND GENERALIZIBILITY .....	76
6.10	CHAPTER SUMMARY.....	77
<b>7</b>	<b>CONCLUSION.....</b>	<b>78</b>
7.1	ANALYSIS OF THE CONTRIBUTION .....	78
7.2	SUGGESTIONS FOR FURTHER RESEARCH .....	79
	<b>REFERENCE.....</b>	<b>81</b>

## APPENDIX

Appendix 1. Questionnaire.....	86
Appendix 2. Result from Single Sample T-test on Questions 2 to Questions 14.....	89
Appendix 3. Result from Independent Sample T-test on Question 2 to Question 6.....	92
Appendix 4. Result from Independent Sample T-test on Q7, Q8, Q10, Q11.....	94
Appendix 5. Result from Independent Sample T-test on Question 9.....	96
Appendix 6. Result from Independent Sample T-test on Q12, Q13, Q14.....	97
Appendix 7. Tables and chart representing responses on Question 3.....	99
Appendix 8. Tables and chart representing responses on Question 4.....	100
Appendix 9. Tables and chart representing responses on Question 5.....	101
Appendix 10. Tables and chart representing responses on Question 6.....	102
Appendix 11. Tables and chart representing responses on Question 8.....	103
Appendix 12. Tables and chart representing responses on Question 10.....	104
Appendix 13. Tables and chart representing responses on Question 11.....	105
Appendix 14. Tables and chart representing responses on Question 13.....	106
Appendix 15. Tables and chart representing responses on Question 15.....	107
Appendix 16. Cronbachs Alpha Tables.....	109

## LIST OF FIGURES

Figure 1. Relationship between accounting and auditing.....	7
Figure 2. Four Phases of a financial statement audit.....	8
Figure 3. Anatomy of an ERP system.....	17
Figure 4. ERP System modules.....	20
Figure 5. The Theory-testing Survey research process.....	46
Figure 6. The Proposed Research model.....	47
Figure 7. Respondent Audit Experience.....	59
Figure 8. IS Audit Experience.....	60
Figure 9. Auditors will experience change in traditional audit processes and procedures.....	62
Figure 10. Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company.....	66
Figure 11. Auditing an ERP implementing company leads to less substantive testing compared to non-ERP implementing company.....	70
Figure 12. When auditing an ERP implementing company less time is spent by auditors to trace audit trail.....	71

**LIST OF TABLES**

Table 6.1. Breakdown of the questionnaire survey statistics.....57  
Table 6.2. Auditors will experience changes in traditional audit processes and procedure .....61  
Table 6.3. Cronbach’s Alpha table for hypothesis 1 .....65  
Table 6.4. Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company.....66  
Table 6.5. Auditing an ERP implementing company leads to less substantive testing compare to non-ERP implementing company.....69  
Table 6.6. When auditing an ERP implementing company less time is spent by auditors to trace audit trail.....71

# **1 Introduction**

This chapter will be an initial discussion about this thesis, research background, the research objective as well as the structure of this research thesis. Based on this initial discussion the actual theoretical background will be presented.

## **1.1 Research background**

Recent changes in the business environment namely deregulation, privatization, globalization and consequently increased competition, have increased the need for companies to search for new ways to survive and succeed (Spathis and Constantinides 2004). Innovative information technology offers the required tools for companies to respond effectively and efficiently to these changes. The Enterprise Resource Planning (ERP) systems provide an example of such information technology infrastructure Nicolaou, (1999). Enterprise resource planning (ERP) systems are defined as information systems packages that integrate information and information based processes within and across functional areas in an organization (Kumar and Hillegersberg 2000).

ERP systems facilitate horizontal and vertical integration of business processes across an organization via a synchronized suite of software applications (Hunton et al 2004). These ERP systems if successfully implemented, can enable companies to better manage supply chains, perform business re-engineering and re-organize their accounting processes along with different other functions (Hebermann and Scheer 2000). In addition, (Spathis & Constantinides 2004) observed that ERP systems are currently becoming a necessary tool for companies to remain competitive in this new business environment rather than constituting a new strategic move. However, ERP systems are usually accompanied with changes in business processes in companies. According to Hunton et al (2001), ERP systems bring about changes in internal control, business process, and segregation of duties. Typically, organizations may need to re-engineer business processes and make essential changes for successful implementation of ERP systems. Such changes brought about by ERP systems affect the ways auditors perform their duties Helms (1999).

Wright and Wright (2002) observed that auditors are faced with the daunting task of auditing in an ERP environment where internal control systems seem compromised. Further, Girard and Farmer (1999) noted that ERP systems implementation at many corporations has led to increased audit-related risk due to automated interdependencies among business processes, and integrated relational database. As technological developments continue, auditors may need to expand their technological knowledge and skills in order to perform effectively and efficiently in audit functions Kinney (2001). According to a survey done by Baganoff and Vandrzyk (2000), many auditors suggested that academic accounting and MIS departments needed to merge to be able to produce the job candidate that can face the current challenges.

Few researchers have investigated the impact of ERP system on auditing and audit process. Bierstaker, Burnaby and Thibodeau (2001) studied the impact of information technology on the audit process. Although the paper did not specify whether ERP systems implementation had a positive or negative effect on audit process however, the study revealed that technology had a dramatic impact on virtually every phase of the audit process. They proposed that auditors who make use of new technology would be rewarded with tremendous gains in audit efficiency and effectiveness. Wright and Wright (2002) were more specific when they noted that ERP implementation increased the potential for control weakness and resulting financial statement errors, leading to increased audit risk. They argued that the design of ERP systems suggested that controls might be compromised through business-process reengineering or ERP customization and this could jeopardize the auditor's assessment.

Regarding the many different viewpoints to this topic, ERP systems seem to bring about changes and auditors need to adjust to cope with the ever-changing trend brought about by its implementation. This is because ERP implementations offer seamless integration of business processes across functional areas of organization, which are not usually consistent with the processes offered by the legacy systems. Auditors are faced with the situation of relying on internal control processes, which are arguably weakened by ERP systems. Panel on Audit Effectiveness (POE 2000,171) states that 'auditors must expand

their technological knowledge and skills, devise more effective audit approaches by taking advantages of technology and design different types of audit test to respond to new business processes'. Zhao, Yen and Chang (2004) noted that ERP systems would influence information systems audit practice and that these changes pose serious threats to the economic viability of auditing. The paper concluded that auditors needed to change their mindset and embrace a continuous reporting environment while acquiring the requisite technical skills and knowledge of subject matter to meet the demand of this environment.

Finally, it is important to understand how this ERP environment is affecting auditors work and responsibility. What makes this topic interesting is because several researchers are quick to point out the need for auditors to adapt to changes brought about with ERP evolution, yet understanding how these changes affect auditors have not been adequately investigated. While some papers viewed ERP systems as increasing audit related risk, other studies noted that ERP systems could assist auditors in audit processes. Furthermore, it is essential to understand how these changes in audit process can improve the work of the auditors or otherwise. This means that truly there is a need to look and analyze the impact between ERP systems and audit processes.

## **1.2 Research objectives**

This paper aims to study the extent which ERP systems have affected the audit process in an organization. The emphasis is to investigate whether there are changes in audit process in an ERP implementing company and if such changes are of assistance to auditors.

## **1.3 Empirical method**

The empirical method of this study will be conducted using a survey questionnaire targeted towards auditors that have audited an ERP implementing company and a non-ERP implementing company. The objective of the empirical research is to study the validity of hypotheses regarding the impact of ERP system on audit process.

## **1.4 Structure of the thesis**

This thesis is divided into seven chapters. The first chapter covers the introduction and research background, the objectives of the study, the methods and the structure of the thesis.

Chapter two, will review briefly auditing and audit process, relevant audit test utilized by auditors including substantive test, test of balances. This will help to present a clear understanding of audit approach and steps performed by auditors in audit engagements.

Chapter three discusses enterprises resource planning (ERP) systems, their characteristics life cycle and architecture. The will present a detailed understanding of ERP systems and how it implementation affect processes in the organization.

Chapter four will review previous academic research carried out in the field of ERP systems and auditing. This is aimed at providing understanding of research area regarding current issues and unanswered questions.

Chapter five introduces the empirical part of this thesis. The objective and the research hypotheses of the thesis are discussed and reviewed. The chapter will also present the survey overall structure.

Chapter six presents the result of the empirical part with descriptive statistics. Thereafter the results are analyzed with statistical test to confirm the validity of the hypotheses. Finally, chapter seven will present the finding in details. A conclusion will be presented and some suggestions for future research will be provided.

## **2 Audit Process in an organization**

The objective of this chapter is to introduce auditing and audit process in an organization. Firstly, a definition of auditing will be given. Thereafter, the role of auditors in audit process and the requirement for an effective audit will be presented. In addition, major content of this chapter are based on the textbook 'Auditing and Assurance Services: An Integrated Approach' Arens, Elder and Beasley (2006).

### **2.1 Demand for Auditing**

The American Accounting Association's Committee on Basic Auditing Concepts defined auditing as:

a systematic process of objectively obtaining and evaluating evidence regarding assertions about economic actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the result to interested users. (ASOBAC, 1972:18)

A definition by Arens et al, (2006:4) describes auditing as the accumulation and evaluation of evidence about information to determine and report on the degree of correspondence between the information and established criteria. According to Watt and Zimmerman (1983), demand for auditing arose from the need to bridge the asymmetric information gap existing between the providers and users of accounting information. Ricchiute D.N (1989:8) pointed out that demand for auditing was necessary due to external users reluctance to rely upon internally generated financial information. With globalization and increased competition pushing businesses, there was need to ensure the reliability of information. Arens et al (2006:7) suggested that auditing reduced information risk. In addition, they identified four factors that necessitated the demand for audit:

- § Remoteness of Information: With globalization and cross-boarder businesses, there was a need to establish a reliable framework enabling information provided by others to be relied upon by various stakeholders.
- § Biases and Motive of the Providers: There was a need to ensure that information provided are unbiased and reflected the true picture. This could only be achieved

through an independent examiner that could ascertain the reliability of such information.

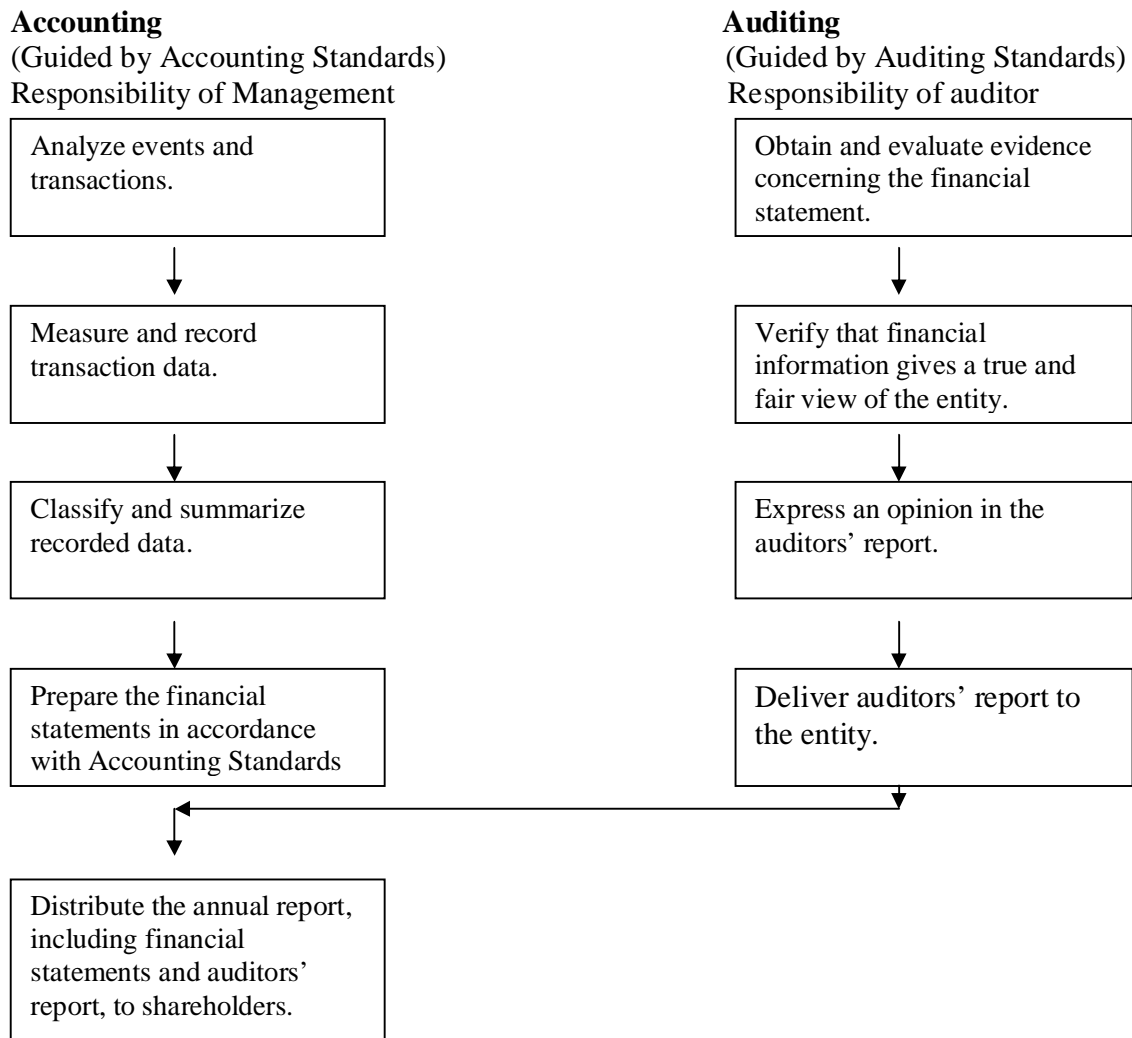
§ Voluminous Data: As organizations grow, the volume of transactions increases tremendously. These large data can create errors and irregularities when preparing financial statement. Consequently, it was important for an independent examination of such information to ensure that information provided conform to set standards.

§ Complex Exchange Transactions: As transaction became complex in an organization and hence difficult to record properly, it was necessary to set standards and mechanism to ensure compliance of such recording standards.

Hermanson et al (1976:4) also identified that four conditions in the business environment created demand for independent audit. These conditions were ‘conflict of interest’, ‘consequences’, ‘complexities’, and ‘remoteness’. Auditing helped minimize bias by acting as a monitor of financial information reported by management. Hermanson et al (1976) concluded that while auditing does not alter the primary communication process between subject matter and users of financial statements, it added a secondary communication process between auditors and users.

There are significant differences between the accounting process by which financial statements are prepared and the process of auditing these statements. According to Cosserat (2000:14), accounting process involves identifying, measuring, recording, classifying and summarizing events and transactions that affect the entity. The outcome of this process is the preparation and distribution of financial statements in accordance with accounting standards and regulatory requirements. Conversely, the audit of financial statements involves obtaining and evaluating evidence on management’s financial statement assertions. Cosserat (2000:23) concluded that rather than creating new information, auditing adds credibility to the financial statements prepared by a company’s management.

## FINANCIAL REPORTING



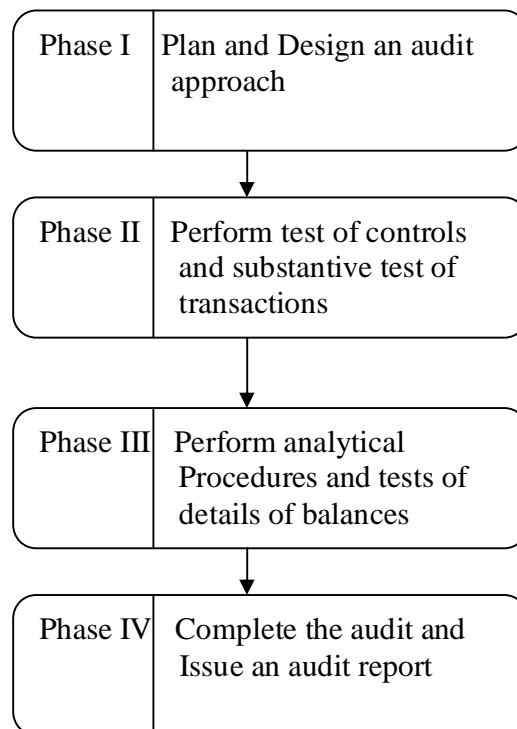
*Figure 1*

*Relationship between accounting and auditing*

*Source: Cosserat ( 2000)*

## 2.2 Audit Process

According to Arens et al, (2006:150) ‘an audit process refers to a well-defined methodology for organizing an audit to ensure that the evidence gathered is both sufficient and competent and that all appropriate audit objectives are both specified and met’ (refer to figure 2). Although every audit project is unique, the audit process is similar for most engagements.



*Figure 2*

*Four phases of a financial statement audit*

*Source: Arens et al (2006:151)*

## **2.2.1 Plan and Design of audit approach**

The first step in an audit is to develop an audit plan. In order to conduct an audit effectively and efficiently, the work needs to be properly planned and controlled. An audit plan includes team mobilization, client's information gathering, risk assessment and audit program preparation.

### ***2.2.1.1 Team Mobilization***

This involves selecting an engagement team and communicating to the members. Usually, the engagement team comprises of partners who will sign the audit report, other staff auditors who will conduct necessary audit work and any required specialist depending on the nature of the engagement. Team mobilization is a crucial step because it equips the audit team with the skills and quality required for the audit engagement. It is important to mobilize and set up pre-planning meeting in order to communicate all engagement matters, level of involvement and roles and responsibilities to each member of the team.

### ***2.2.1.2 Client's Information Gathering***

This step involves gathering information about the business and operation of the organization. There is usually a cooperation and collaboration between the client and the audit team. The auditor typically performs preliminary analytical procedures to understand the client's business and assess the client business risk. Through this process, auditors try to understand business objectives, legal obligations and system structure. The audit team should understand the system procedures and control mechanisms embedded in those procedures. The Sarbanes-Oxley Act in the US requires that management certify it has designed disclosure controls and procedures to ensure that material information about business risk is made known to them. Based on information about controls identified from the meeting with client and the understanding of system structures and processes, all internal controls are updated, assessed and documented. The quality of the audit team is valuable in performing this step.

### 2.2.1.3 Risk Assessment

Audit risk refers to the level of uncertainty in performing audit engagement. Risk identified in the previous step is analyzed and evaluated. An effective auditor recognizes that risk exist and deals with such risk in an appropriate manner. Auditor's ability to deal with these risks properly is critical to achieving a high-quality audit. Arens et al, (2006:241) identified four risks in audit risk model.

$$\text{Planned Detection Risk} = \frac{\text{Acceptable Audit Risk}}{\text{Inherent Risk} * \text{Control Risk}}$$

#### § Planned detection risk

This refers to a measure of risk that audit evidence will fail to detect misstatement exceeding a tolerable amount. The auditor need to accumulate audit evidence until the level of misstatement risk is reduced to planned detection risk level. For example, if the planned detection risk is 0.05, then audit-testing needs to be expanded until audit evidence obtained supports the assessment that there is only five percent misstatement risk left.

#### § Acceptable audit risk

This is the likelihood that auditor will unintentionally render inappropriate opinion on the client's financial statement. According to Arens et al, (2006:243) acceptable audit risk is a measure of how willing the auditor is to accept that the financial statements may be materially misstated after the audit is completed and an unqualified opinion has been issued.

#### § Inherent risk

Arens et al, (2006:241) described inherent risk as the probability that there exist material misstatements in financial statements. If an auditor concludes that there is a high likelihood of misstatement, error, and fraud then the auditor would conclude that inherent risk is high. Usually, some accounts like liquid assets such as cash and marketable securities are more susceptible to theft and therefore are more inherently risky, than non-

liquid assets like Coal or raw material. The auditor needs to consider all risk before establishing the probability of inherent risk.

#### § Control risk

According to Arens et al, (2006:241) control risk refers to the probability that a client's internal control will not prevent or detect errors or misstatement exceeding a tolerable amount. In general, after establishing inherent risks, controls should be capable of detecting and preventing such risk. The more effective the internal controls, the lower the risk factor that could be assigned to control risk. The auditor will assess the existing controls to identify whether they can be relied upon. Currently, auditors of public companies in the United States will generally rely on control because of the requirement of Sarbanes-Oxley Act.

### **2.2.2 Internal Control System**

One of the most widely accepted concepts in the theory and practice of auditing is the clients system of internal control for safeguarding assets and records and generating reliable financial information. According to Committee of Sponsoring Organization of the Treadway Commission (COSO):

Internal control is broadly defined as a process, effected by an entity's board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives in the following categories:

- § Effectiveness and efficiency of operations.
- § Reliability of financial reporting.
- § Compliance with applicable laws and regulations. (COSO 1992, 1)

The definition of internal control system reveals that it is not fundamentally different from management control, which has an essential component of control such as planning, organizing, staffing and directing (Chambers et al, 1987).

According to Fadzil et al (2005), reviewing and evaluating the adequacy and effectiveness of an organizations internal control system and the quality of performance

in carrying out assigned responsibilities is representative of several primary core activities of audit work. In addition, Arens et al (2006:242) suggested that auditors must assess the control risk by considering both the design and operation of controls to evaluate whether they will likely be effective in meeting transaction-related objectives. Auditors must ascertain that internal control measures are kept in operation. According to Hermanson R.H et al (1976:122) the auditor's review of internal control is made to determine whether such controls are capable of reducing to a minimum the possibilities of error and defalcation, and whether the prescribed controls are currently operating effectively. Yang and Guan (2004) observed that in conducting the study and evaluation of the internal accounting control system, the auditor would need to do the following:

- § undertake a preliminary review of the system (obtain a general understanding of the flow of transactions and assess the control environment)
- § complete the system review (obtain a detailed understanding of the prescribed general and application controls and document)
- § conduct compliance tests
- § evaluate the results

### **2.2.3 Test of control**

One of the requirements of an external auditor is to test the effectiveness of the internal controls in order to assess the control risk. Consequently, the auditor must always test the extent to which established procedures and controls are functioning as intended. These tests are usually referred to as test of controls and they determine the extent to which the auditor relies on the internal control system. Yang and Guan (2004) defined test of control as the procedures directed toward either the effectiveness of the design or operation of a control. According to Hermanson et al (1976:121), auditors use test of control work to determine whether the internal control system generates reliable and accurate data and may therefore be relied upon. The scope of tests should be sufficiently thorough to allow the auditor draw conclusion as to whether controls have operated effectively in a consistent manner.

### ***2.2.3.1 Substantive Tests***

Substantive tests consist of tests of details and analytical procedures and are auditing procedures intended to verify the correctness of transaction amounts. These tests satisfy the transactions accuracy. According to Bailey and Jensen (1977), substantive test leads to a decision on the acceptability of a client's representation; a client's book value is either acceptable or unacceptable depending on whether it falls inside or outside a chosen confidence interval. Furthermore, the Auditing Guideline on Audit Evidence describes substantive tests as those tests of transactions and balances, and other procedures such as an analytical review, which provide audit evidence as to the completeness, accuracy and validity of information contained in the accounting records or in the financial statements. The extent of substantive testing is dependent on the result of tests of controls, because the extent of substantive tests depends on the assessed level of control risk.

### **2.2.4 Analytical Procedures**

This approach is used to ensure that overall account balances and other data in the financial statement are stated reasonably. Usually auditors develop expectations of each account balance and set an acceptable threshold. In addition, they compare these thresholds with the actual values. Usually a significant difference in value will lead to detailed examination of supporting documents, extending analytical procedures and performing a comprehensive substantive test.

#### ***2.2.4.1 Detailed Test of Transactions***

The objective of detailed test of transaction also known as substantive testing of transaction is to determine whether transaction-related audit objectives have been satisfied in each accounting transaction. Usually, auditors make professional judgement regarding the extent of test. It can vary from a sample size to all transaction depending on the level of assurance the auditor wishes to obtain.

#### ***2.2.4.2 Detailed Test of Balances***

The objective of detailed test of transaction also known as substantive testing of balances is to determine whether balance-related audit objectives have been satisfied in each

accounting balance. They are usually performed after the balance sheet date to gather sufficient competent evidence as a reasonable basis for expressing an opinion on the financial statement. The extent of test usually depends on the result of test of control, analytical procedures and detailed test of transaction relating to each account.

### **2.2.5 Audit Report**

This is the final stage of the audit engagement process. The result of steps mentioned above are assessed, summarized and reported. Usually each members of the audit team reports their work to the senior auditor. Consequently, the auditor in-charge should perform the final review to ensure that audit task are diligently performed and sufficient evidence gathered. The chief examiner should make sure that critical issues from the executive process have been resolved and adjusted in the financial statement. Based on the accumulation of audit evidences and audit finding, the auditor can issue an opinion, which can be either qualified or unqualified. The audit report expresses the auditor's opinion on the financial statements results from evidence examined. When the audit report is ready, usually auditors arrange clearance meeting with the client.

## **2.3 Chapter Summary**

Auditing is a systematic process of objectively obtaining and evaluating evidence regarding assertions about economics actions and events to ascertain the degree of correspondence between those assertions and established criteria and communicating the results to interested users. Users of financial information's are usually concerned with the possibility of biased, misleading and irrelevant, or incomplete information. As information communicated becomes more complex, users of information find it more difficult to obtain direct assurance as to the quality of the information received. The role of auditing is to breach this gap by attesting to correctness and reliability of financial information. Furthermore, in performing these tasks, auditors will need to perform some audit processes. This requires auditors to perform audit test to ascertain the effectiveness of internal control systems with the organization.

Organizations develop system of internal control in order to assure management that assets are secured and that management policy is been followed. Consequently, auditors rely heavily on the internal control system. The auditor in performing an audit will need to evaluate the reliability and accuracy of the system of internal control. This is usually done by performing some audit test of transaction or control. The auditor uses knowledge gained from strategic systems understanding of the clients business and industry to assess client business risk. As the global economy, the business organizations operating within it, and organizations' business strategies becomes increasingly complex and interdependent, auditors faces a daunting task of forming an opinion about the validity of firms financial statement. According to Cosserat (2000), auditors roles are gradually been redefined by widening it scope with respect to detection of fraud and errors. Cosserat (2000) concluded that auditors should place more weight on knowledge about clients business and control risks.

### **3 ERP systems in organization**

This chapter will present an introduction of Enterprise Resource Planning (ERP) systems its characteristic, architecture as well as the life cycle. The relationship between ERP systems and audit will also be presented.

#### **3.1 ERP systems**

ERP systems are commercial software packages that enable the integration of transactions-oriented data and business processes through out an organization (Markus et al 2000). According to Hunton, Wright and Wright (2004), ERP systems facilitate horizontal and vertical integration of business processes across an organization via a synchronized suite of software applications (see figure 3). Usually each of department in an organization typically has its own computer system optimized for the particular ways that the department does its work. However, ERP systems combines them all together into a single, integrated software program that runs on a single database so that the various departments can more easily share information and communicate with each other. ERP systems not only encompass traditional transaction processing but also elements of management support systems and knowledge management (Davenport 2000). ERP systems offer unique advantages to companies adopting them, by improving the decision making process via the provision of appropriate and timely information (Hunton et al 2004). Most companies want to standardize processes and learn the best practices embedded in ERP systems to ensure quality and predictability in their global business interest by reducing cycle times from order to delivery (Ross J.W, 1999).

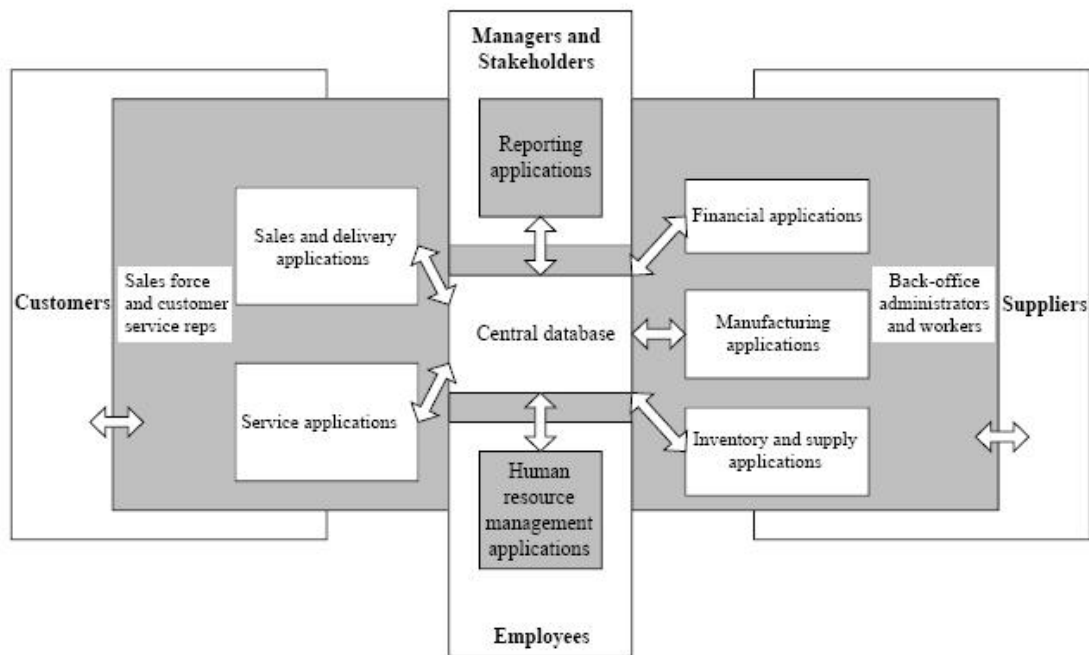


Figure 3

*Anatomy of an ERP system*

*Source Davenport (1998)*

According to Parr and Shanks (2000), ERP systems have two important features: firstly, it facilitates a causal connection between a visual model of business processes and the software implementation of those processes, and secondly, it ensures a level of integration, data integrity and security, which is not easily achievable with multiple software platforms. ERP systems can provide an organization with competitive advantage through improved business performance by integrating supply-chain management, receiving inventory management, customer orders management, production planning and management, shipping, accounting, human resource management and all other activities that take place in the modern business (Hitt et al 2002, Kalling, 2003). O, Leary (2000) noted the following characteristics of ERP systems:

- § ERP systems are packaged software designed for a client server environment whether traditional or web-based.
- § ERP systems integrate the majority of a business's processes

- § ERP systems process a large majority of an organization's transaction.
- § ERP systems use enterprise-wide database that typically store each piece of data once.
- § In some cases, ERP systems allow an integration of transaction processing and planning activities.

### **3.2 ERP Systems Architecture**

ERP systems integrate the data of formerly disparate application across functional areas of an organization. The idea is to centralize data and computation so that data can be entered once in a clean form, and then can be used by each department in the organization and even by external supply chain partners with confidence that the information is correct. This integration implies that data once entered in any of the functional modules is made available to every other module that needs this data. In order to achieve this level of data consolidation, ERP systems integrate data hitherto scattered throughout divisions, departments and workgroups into a centralize database instance. A database is an integrated aggregation of data usually organized to reflect logical or functional relationship among data element. It refers to a collection of information organized in such a way that a computer program can quickly select desired pieces of data. ERP systems typically run on a single database instance with multiple software modules providing the various business functions of an organization. ERP system use closed system on dedicated servers (client server architecture) to assess organizational data.

According to Debreceeny et al (2005) ERP systems typically employ a three-layer model: a data management layer which employs a single or federated relational database management system, an application layer which comprises of integrated application modules and analytical tools and a presentation layer which enables end-users to interact with the system. When ERP systems are tied to external system to facilitate e-commerce applications, they must be integrated across organizations. This is usually achieved through message services. The SAP R/3 approach aims at enterprise integration using a single database without boundaries between ERP's. However, message services are still

needed to integrate autonomous ERP systems. One of the key features of any ERP system is that it is built around a central integrated database encompassing all of the company's operational data. The major ERP software packages convert in-house database usually department-specific into an interfaced conglomeration of database tables integrated more tightly.

### **3.2.1 Software components of ERP System**

The software components of ERP system are sub-divided into modules (see figure 4). It is usually seen as the ERP product and several generic modules sold by ERP vendors. SAP is a clear market leader in ERP deployment. Gelinas et al, (2005:57) identified the core modules of SAP R/3 as listed below:

- § Sales & Distribution: This contains the functions related to the sale of goods to customers and includes recording customers order, shipping of good to customer, and billing the customer. They are inter-connected to the Material Management module to check the availability of inventory and record the issue of goods, the Financial Accounting module to record the sales and the Controlling module for profitability analysis.
- § Material Management: This contains the function related to acquisition of goods from vendors and management of goods in the warehouse. This module prepares and records a purchase order, receives goods from vendors and record the vendors invoice.
- § Financial Accounting: This contains the function related to business events from other modules such as Sales & Distribution and Material Management. This module records transactions into the general ledger accounts, external account statements, the balance sheet, profit and loss statement and statement of cash flows. This module also includes account receivables and account payable functions.
- § Human Resources: This contains the function related to the recruitment, management and administration of personnel, payroll processing and personnel

training and travel. The HR module is also used to maintain data related to training and work benefits.

§ Quality Management: This contains the function related to product inspections, material certifications and quality controls.

§ Project Management: This contains the function related to research and development, construction, marketing projects, cost settlement and project phases.

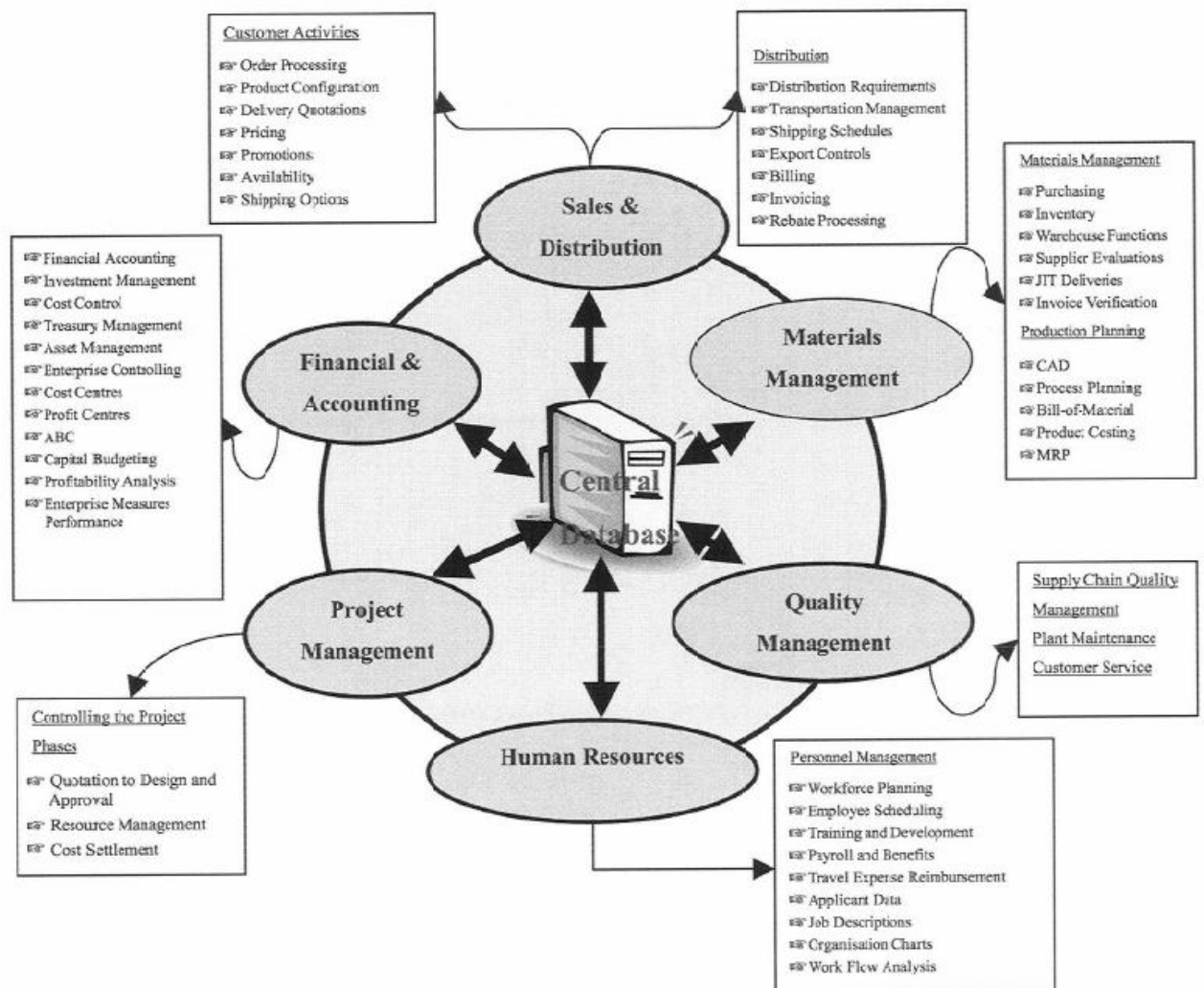


Figure 4  
ERP System Modules  
(Shehab E.M et al 2004)

### **3.3 ERP system life Cycle**

For the purpose of this chapter, we have categories ERP system life cycle into three phases: the pre-implementation phase, the implementation phase and the post implementation phase.

#### **3.3.1 Pre-implementation Phase**

According to Ross (1999), the objective of pre-implementation phase is to identify the ERP package most appropriate for the organization and the technological infrastructure needed for it. A decision and analysis need to be made to understand gaps and weaknesses of the existing system and the objectives of the new system. Usually, a committee is set up to conduct feasibility study, to identify and select the ERP solution, streamline integration framework and assess the cost implication of such a project. Typically, organizations will have disparate applications scattered across functional areas with each department or workgroup having specific legacy systems and application where information and data about that department are recorded. Information flow within various departments are generally minimal and in most cases non-existing due to application differences. Consequently, each department usually has separate database and where information about its processes and operations are usually managed and stored.

##### ***3.3.1.1 Audit Implications***

Auditing at this stage is normally done using various database-auditing tools. Normally, auditors spend a lot of time gathering data and working with various departmental managers. According to Orman (2004), auditing normal database systems usually involves gathering historical information about database activities. In a database audit the primary concerns of the auditor is usually data integrity. Auditors need to understand authentication and authorization issues involved in each department. It is important to establish whether audit information can be added, changed or deleted without detection. Auditors usually concentrate and audit targeted database activities. After gathering required information, auditors archive audit records that are of interest and perform audit trail of such information. In order to ensure effective internal control measures within the database, auditors need to audit user activities. Auditing user activities provides auditors

with assurance that policies, procedures and safeguards enacted by management are working as intended. Auditing user activities can be achieved through continuous data auditing. According to Orman (2004), continuous data auditing is the process of monitoring, recording, analyzing and reporting database activity on a periodic basis. This process is critical because it can capture violation or unauthorized access to database. In addition, database servers include non-trigger audit agents, which capture all relevant activity within the database. These non-trigger audit agents according to Orman (2004) gather information through two means:

- § Database transaction log: Each database maintains a database transaction log through the normal course of its operation, which gathers data modifications and other activity.
- § Database built-in event notification mechanism: Obtains additional information, such as permission changes and data viewing activities.

### **3.3.2 Implementation Phase**

This is the main phase of the life cycle of ERP project. According to Vemuri and Palvia (2006) during this phase, organizational processes are re-designed to work with the ERP system. Organization may need to re-engineer business process, change policies and procedures depending on whether it is implementing a big-bang deployment, a phased rollout or customizing the ERP system with existing in-house applications. In many cases, implementation is done in parallel with the existing system in order to minimize the interruption with ongoing operation. The ERP system is implemented, end-users trained and acceptance testing conducted. Vemuri and Palvia (2006) noted that implementation phase typically requires a lot of testing and troubleshooting to ensure that the change over and installation issues are promptly addressed. The implementation enables users to be acquainted with the technological infrastructure and system requirements. According to Olson (2004:77), the vital difference between pre-implementation phase and implementation phase is that disparate systems are consolidated into a total integrated solution and data is stored in a central database system. ERP implementation enables real-time information flow and facilitates end-to-

end business processes, including sales and customer service, purchasing, inventory management, logistics, human resources and accounting. Information can be accessed via a central database and data can flow free across departmental boundaries.

### ***3.3.2.1 Audit implications***

ERP systems facilitate integration of business processes across an organization. Such integration potentially creates substantial concerns about system security, database security and audit risk due to business process interdependency (Girard and Farmer 1999, Hunton et al 2004). Consequently, during the implementation phase, auditors need to evaluate the system and business processes to ensure that security and system controls are not compromised. This audit procedure helps the Client to ensure compliance to the standards, system design and configuration. Since ERP systems utilize a central database system and provide real time access to information, a security flaw in one department can potentially jeopardize the entire system in the organization (Orman 2004). It is advisable to include an experienced auditor as part of the implementation team to ensure that control measures are incorporated in the system to guarantee data integrity. Although, ERP products come with adequate and arguably formidable security mechanism, however, organizations need to take appropriate control measures with regard to who has access to information at any given time and who can change, delete and update information.

### **3.3.3 Post-implementation phase**

The post-implementation phase is normally the longest phase of the ERP life cycle and can last several years. It consists of the period after ERP implementation. This phase is characterized with reviews, support and system modifications. Usually a post-implementation analysis is performed to measure the effectiveness of the ERP solution in meeting its goals and objectives. During this phase, support centers are established to develop user-training tools and support ongoing operations. In addition, technological changes and vendor upgrades are monitored and implemented. A system audit may be periodically performed to determine whether the system meets users need.

### ***3.3.3.1 Audit Implications***

The audit implication of post-implementation phase is that auditors have timely access to data via a centralized database system with integrates information throughout functions and departments. This would reduce the time spent in retrieving data across departments and help eliminate redundant data files. However, a number of internal control risks are introduced. According to Arens et al (2005), there are risks associated with multiple users, including individual from various department updating data files, and access control risks. Wright and Wright (2002), Girard and Farmer, (1999) also observed increase in control risk with ERP systems resulting from integration and automated interdependencies. Auditing in this environment involves utilizing different computer assisted audit tools and audit software programs. Most ERP systems typically have embedded audit modules (EAM). EAM are programs written and compiled within an application to perform audit procedures while an application is in operation and may be run only when activated or on a routine basis. EAM enables auditors to monitor and analyze transactions at various levels of the application. It has the ability to identify all unusual transactions for auditor's evaluation. This is done in form of exception reporting. Exception reporting is the selection and highlighting of data that are in some way different or critical. Using exception reporting auditors can extract data from the audit file to another file using specified criteria. According to Bodnar and Hopwood (2001), if the system is equipped with mechanisms to reject certain transactions that fall outside predefined specifications, then the ongoing reporting of exception transactions allow the system to continually monitor itself. EAM usually requires auditor's expertise during system design and may require high-level time and resource to build and maintain.

## **3.4 Chapter Summary**

ERP systems are increasingly becoming strategic solutions to remain competitive in the global business environment. This current business trend has led to adoption of ERP systems by most companies with a view of achieving seemingly enormous benefits. ERP systems are packaged business software solutions that allow organizations to automate and integrate the majority or all of its business processes, share common data and practice across the enterprise and access information in a real-time environment. Such

ERP implementations are accompanied with changes in business processes in functional areas. Furthermore, the ERP systems arguably promise radical sustainable advantages through its set of business application modules. Usually, companies adopt ERP systems with a view to achieve seemingly enormous advantages. Such ERP implementations are accompanied with changes in business processes in functional areas. According to Hunton et al (2001), the ERP systems bring about changes in “internal control”, “business process”, and “segregation of duties”. ERP system can influence the assessment and conduct of the auditor through business interruption, process interdependency, network security, database security, application security and overall internal control. ERP systems come in different modules that can fit into functional areas of an organization. ERP vendors promise that these modules represent “best practice” solution for organizational functional areas. ERP implementation in an organization can be viewed from three phase, which consists of pre-implementation phase, implementation phase, and post-implementation phase. The major unique feature of ERP systems is the ability to utilize integrated relational database and communicate data in a cross-functional organization.

## **4 ERP SYSTEM AND AUDIT PROCESS**

The objective of this chapter is to examine the impact of ERP system on auditing. First, a relationship and implication of ERP systems and audit process is offered and then a review of scientific papers in this area is presented.

### **4.1 Impact of ERP system on audit process**

Information technology is playing a key role in virtually every phase of global business environment. Auditors are faced with the enormous challenge of working and keeping up-to-date with such sophisticated technologies. ERP systems are one of such state of the art technologies deployed by various organizations to achieve a strategic advantage in the competitive market. ERP systems create seamless integration of information among cross-functional areas through automation of business processes. This differs from the traditional information flow in an organization where data is usually stored and isolated in a departmental structure. ERP systems offer real-time access to information via a synchronized suite of modules and arguably creating an asymmetric gap between the accounting profession and traditional audit process by removing traditional control mechanism, which auditors rely on. With such level of integration, the audit profession is faced with the need to provide increased guidance for audits conducted in an ERP environment. Auditors are faced with the enormous challenge of auditing in an IT environment where processes are integrated and control mechanism difficult to understand. Consequently, auditors rely on various audit related tools and software applications to access information in the system.

According to Wright & Wright (2002), Hunton et al (2004), auditors need to be aware of increased audit risk involved with ERP systems. Bae and Ashcroft, (2004) went further to state that ERP implementation is usually associated with elimination of traditional controls without adequate replacement. Auditors traditionally rely on these control mechanisms for effective and efficient audit assessment. It is imperative for the auditor to understand the ERP environment for quality audit assessment. Covaleski (2000) pointed out that accountants need to be mentally creative to understand and communicate the value added by ERP systems and the technological knowledge needed to implement it.

As global business environment continues to move towards technological alignment, auditors need to be proactive and technology savvy to audit in such sophisticated environment.

## **4.2 Previous Research**

The review of related literature surprisingly revealed that there has not been much published research on ERP environment and audit. Hunton et al (2001) and Debrececy et al (2005) also noted this little academic research on the audit implications of ERP systems. However, some relevant and related research papers have been identified and analyzed for the literature. The literature review consists of two parts. The first part of the literature review takes a general picture of Information technology audit and the second part reviews ERP systems audit.

### **4.2.1 Booth, Matolcsy & Wieder (2000)**

Booth, Matolcsy & Wieder (2000) study was one of the first papers to examine information system impact on accounting role. The paper investigated the degree of information system integration and the impact of ERP systems on the adoption of new accounting practices. They examined the benefits derived and the adoption or non-adoption of new accounting practice such as ABC, EVA, balanced scorecard, etc. The research was conducted using a questionnaire targeted to samples of organization with and without ERP systems. The survey was mailed to CFOs as they were better positioned to provide informed responses to the range of issues covered in the survey. The response rate to the survey was 74 firms, which represented 9.25% validity of the initial target group.

They found that most ERP users believed they are achieving high levels of information integration. The findings indicated a very high level of satisfaction with ERP systems for transaction processing for all three areas of accounting: finance, financial accounting and management accounting. In addition, the study revealed that the use of ERP systems appears to have only a small effect on the use of new management accounting practice.

The finding showed no support that having an ERP system will sufficiently lead to greater use of new accounting practice.

Booth, Matolcsy & Wieder's (2000) study clearly revealed that introduction of ERP systems need not lead to new accounting practice. This finding was noteworthy because it demonstrated the fact that the use of elegant technology did not alter accounting processes. This finding was consistent with Lilly, R.S (1977) who concluded that computers have not in any significant way changed or established accounting theory as it relates to the type of data to be collected or the manner in which such data should be organized for reporting purpose. Rather Lilly (1997) observed that computers have substantially changed the method by which that theory is put into practice.

#### **4.2.2 Bierstaker, Burnaby and Thibodeau (2001)**

Among other papers that examined audit processes, this paper stands out because it was the first paper to examine the impact of technology on audit process. Bierstaker, Burnaby and Thibodeau (2001) in their paper '*the impact of Information technology on the audit process: an assessment of the state of the art and implications for the future*' investigated the current impact of technology on the audit process, and the future implications of technological trends for the auditing profession. The researchers examined how technology has influenced audit planning, testing and documentations. They interviewed information technology professionals from three large international accounting firms. The focus of the interviews was to learn which audit technologies were currently being utilized and to investigate auditors future plans for technological applications. Furthermore, one of the authors attended a training session of one of the largest international accounting firms. The firms that participated in the study represented four of the five largest accounting firms in the world at that time. These firms had considerable resources to draw upon with regard to the development and implementation of new audit technology.

They found significant changes in every phase of the audit process. Their study indicated that Enterprise-wide computing platforms offered powerful auditing and internal control evaluation tools. ERP packages such as SAP R/3 modules come equipped with a variety of advanced control features including logging capabilities, security tools, the ability to compare actual performance in an area to preset goals, and the capacity to completely trace individual transactions from beginning to end. This they observed led international accounting firms to adopt the process auditing approach that relies on increased analysis of business strategy, risks and control testing and decreased substantive testing. In addition, the study revealed that as auditing software becomes integrated into the audit process, auditors would have more time to address the complex issues that their clients face in the global marketplace. They found that the focus of audit is shifting from manual detection to technology-based prevention. The study also observed that ERP systems had built-in reports and analysis capable of identifying areas of concern where unusual relationships exist. The ability to include internal control checks into advanced systems aided management and auditors in preventing errors and irregularities. They concluded that as new enterprise wide systems are introduced, auditors would provide a larger range of services to their clients. Auditors will be free from mundane parts of audit, and can utilize their time in helping clients develop good business plans, assess business risks and measure performance as part of the financial statement audit.

Bierstaker, Burnaby and Thibodeau (2001) revealed a relationship between Information Technology (IT) and audit process. They clearly identified significant changes in every phase of audit process as new technological trend emerged. This was consistent with Yang and Guan (2004) who noted that although the overall audit objectives are not different for a computerized system, but that the methods and procedures that auditors use when conducting Information system audits are different. Bierstaker et al (2001) found that auditors benefited from the introduction of Enterprise wide application through timely information reporting and that advancements in technology would improve the efficiency and effectiveness of future audit. However, a key relationship between ERP systems and audit processes could not be adequately established because the researchers studied audit processes from a wider perspective. This paper is unique

because it demonstrated that a relationship existed between audit process and information technology and hence created the need for further research by limiting the technology to ERP systems.

#### **4.2.3 Yang and Guan (2004)**

This study is interesting and important because it showed the effect of IT on audit profession and standards. Yang and Guan (2004) in their paper '*the evolution of IT auditing and Internal control standards in financial statement audits: the case of the United States*' investigated the evolution of United States IT auditing and internal control standards in financial statement audits and discussed their significance for the auditing profession. The study focused on discussion of the IT standards issued by the American Institute of Certified Public Accountants (AICPA) and the Information System Audit and Control Association (ISACA). The paper utilized an exploratory approach by studying different IT audit standards issued by the AICPA and ISACA and how these standards affect auditing and internal control. The paper tried to examine relevant accounting standards and how these standards shape auditor's assessment and responsibility.

Yang and Guan (2004) concluded that with the wide spread of computers in data processing; auditors would have to deal with conducting audits in IT environment. Furthermore, the paper argued that although the overall audit objectives are not different for a computerized system, however, the methods and procedures that the auditor uses in conducting the audit are different. They noted that standards are emerging to bridge the gap of technological advances. Furthermore, the paper observed that rapid escalation of technology would lead to more pronouncements and guidelines to aid auditors in conducting examination of financial statements in an IT environment.

Yang and Guan (2004) established that IT auditing and internal control had a symmetric relationship and that standard were established to be consistent with conducting audit. As new technologies emerge, more standard are pronounced to ensure internal control integrity. The study showed the need for auditors to change the methods and procedures

when auditing in an IT environment. Furthermore, this study revealed the need for auditors to be adequately equipped when auditing an IT environment. This study significantly highlighted the need for changes in the auditing profession with respect to IT advances and how audit standards tries to bring these changes. Although, this paper is limited for its inability to offer support whether the changes assisted auditors in audit processes or created more challenges however, the study provided support that new technologies had the capability to change procedures utilized in the traditional audit processes.

#### **4.2.4 *Sia et al (2002)***

Sia et al (2002) investigated the impact of ERP implementation on organizational control. They examined how different forces reacted with ERP implementation and explored the implication for traditional power distribution in organization. They wanted to determine whether the implementation of ERP system tightened management control or created greater control relaxation. The research used a single case study of a restructured hospital in Singapore and the survey was conducted using a questionnaire survey of 260 users. In addition, an interview section of approximately 27 hours with 23 people was also administered to compliment the questionnaire survey. The study focused on direct users of ERP in day-to-day operation of the hospital.

Sia et al (2002) found that although ERP system can facilitate both “empowerment” and “panoptic control” management has consciously resisted empowerment by working to re-institute the power lost through the ERP implementation. The finding revealed that users were quick to discover the panoptic control with ERP systems and it clearly affected their perceptive of the system. Furthermore, the study concluded that ERP had a likelihood of perpetuating management power.

This paper is relevant because it established that ERP systems had the capacity to bolster control measures needed in an integrated system. However, the paper is limited because

its inability to analyze how the control embedded in the ERP system can improve the system of internal control.

#### **4.2.5 *Sally Wright and Arnold M. Wright (2002)***

This paper is vital because it was among the first papers to examine the risks associated with ERP systems. Sally Wright and Arnold M. Wright (2002) investigated the unique risk associated with the implementation and operation of ERP systems. The study focused on examining ERP risks by applications, and how such risks affects planning and conducting of assurance engagement and reliability of complex computer systems. Wright and Wright (2002) asked the following questions:

- § What risks are most common in an ERP setting?
- § Do risks differ by ERP application?
- § Do risks differ by ERP vendor across applications?
- § How are ERP systems tested as a basis for providing system-reliability assurance?

They conducted a semi-structured interview study with 30 experienced information system auditors from 3 of the big 5 firms who specialized in assessing risks for ERP systems. The average number of years of experience of the participants in ERP implementations was 4.70 (range 1 to 15). The sample represented individuals with broad experience across ERP packages; 86.4 percent have worked with SAP; 59.1 percent with Oracle; 58.1 percent with PeopleSoft; and 40.9 percent with JD Edwards. Moreover, participant work experience indicated that 68.2 percent had a background in Accounting and Auditing, 81.8 percent in Information Systems/Computer science, and 13.6 percent in another area.

On the first research question, they found that lack of end-user involvement exposed the firm to significant risk of unintentional errors and inefficiencies. They noted that due to fixed deadlines, there is usually inadequate time to train end-users and this lead to high error rates that could eventually affect financial statement. This often resulted to erroneous reporting. Regarding how the risks differed by applications, they found that

supply-chain, payroll and financial modules exhibited greater control risks and that the risks varied according to the vendors. The respondents reported major system differences with regard to access and encryption controls. This finding suggested significant variations in risk exposure for various modules. Finally, on examining how information systems auditors test the effectiveness of an ERP systems and security, Sally Wright and Arnold M. Wright (2002) found a predominant use of process audit techniques rather than conducting audit of the output. The result indicated that the implementation process of ERP systems had an important impact on system reliability. They concluded that access controls and security protocols were correlated to the ERP risks and hence financial statement error and business risk may be increased if access is not adequately considered during ERP implementation.

Wright and Wright (2002) research found that control risk could potentially increase with the implementation of ERP systems and that these risks varied according to ERP vendors. This result was also consistent with Girard and Farmer (1999) who also noted that ERP systems implementation at many corporations increased audit-related risk due to “automated interdependencies” among business processes, and “integrated relational database”. Although Wright and Wright (2002) could not establish whether the risk was because of ERP access control configuration, however, the research further signified that ERP systems could have a causal relationship with audit risk.

#### ***4.2.6 Hunton, J. E Wright A. M and Wright S (2004)***

Built on the studies of Wright and Wright (2002), this paper tried to examine financial auditor’s ability to recognize the risks created by ERP systems with auditing in an organization with such IT infrastructure. Hunton, Wright and Wright (2004) in their paper ‘*Are financial auditors overconfident in their ability to assess risks associated with ERP systems*’ investigated the extent to which financial auditors recognize heightened risks associated with an enterprise resource planning (ERP) system as compared to a non-ERP (legacy) system, in the presence of a control weakness over access privileges. In addition, they examined the propensity of financial auditors to consult with information

technology (IT) audit specialist within their firm when assessing ERP and non-ERP system risks during the planning stage of an audit.

The survey involved two types of systems and two types of auditors where the system type was randomized across participants. They conducted a survey at four Continuing Professional Education (CPE) sessions involving a broad spectrum of auditors with varied financial and IT auditing background. The participants consisted of one hundred and sixty five auditors from four of the then big five CPA firms. The IT audit specialist consisted of 82 participant while the financial audit where 83 participant. Furthermore, thirty-eight percent of the IT audit specialist held Computer Information Systems Auditor (CISA) certificates while none of the financial auditors did. In addition, the IT audit specialists had vast majority of their overall auditing experience (92.68 percent) directly related to assessing computer system controls, as compared to a significantly smaller percentage (18.67 percent) for the financial auditors. They embedded a security weakness into a case where one scenario was a tightly coupled ERP system environment and the other a non-ERP system environment consisting of independent business process with manual control.

The result suggested that financial auditors might not be fully aware of the greater risk exposure associated with ERP systems, as compared to non-ERP system environment when security controls are relatively weak. The paper found that although IT audit specialist assessed significant higher levels of network, database and application security risks with ERP systems, as compared to the non-ERP systems, the financial auditors recorded similar security risk assessment in both environments. This finding suggested that the participating financial auditors were unaware of the pervasive nature of security risks in an integrated database environment. The result also revealed that financial auditors did not indicate a greater need to consult with IT specialist in the ERP, as compared to the non-ERP system environment, and that they had high confidence in their ability to assess risk in both computing environment. This finding suggested that financial auditors are overconfident in their ability to assess IT-related risks in an ERP computing environment. However, Hunton, Wright & Wright (2004) suggested that

economic pressure on audit fee could also contribute to the financial auditors seeming reluctance to consult with IT audit specialist. Further, a non-economic reason that financial auditors might be hesitant to consult with IT audit specialists is that they might not perceive a link between ERP system risks and the likelihood of material financial misstatement or fraud.

This study was significant because it further established a risk exposure associated with ERP systems. Furthermore, this research bolstered the initial study by Wright and Wright (2002) on the relationship between ERP systems and audit risk. However, this study was inconclusive in determining auditor's ability to risk.

#### ***4.2.7 Spathis and Constantinides (2004)***

Spathis and Constantinides (2004) investigated the impact of ERP system with emphasis on their accounting processes. They examined the depth of changes and impact ERP systems had on accounting processes. The researchers attempted to investigate the extent to which ERP system helped companies focusing attention on changes in accounting practices. In addition, they were interested in the best way forward in future ERP application. The study was conducted through a survey and all questionnaires were returned completed (26.5 percent). The survey was collected from 26 companies in Greece that had implemented ERP system. Half of the respondents worked in the industry and 31 percent in commerce while the balance was in services and other types of organizations. The majority of the companies (65.4 percent) were independent, while a substantial proportion (19.2 and 11.5 percent) were parent and associate companies respectively. All the managers of companies used in the questionnaire affirmed operating financial and management accounting modules of the ERP system. They first examined different accounting processes and calculated the percentage changes brought about by ERP systems.

The result indicated that financial accounting and management accounting had the highest changes. They investigated the accounting practice in the post ERP period and

found that the only notable changes in accounting methods and practices resulting from adoption of the ERP systems relate to the increased use of “internal audit function”, “non financial performance indicators” and “profitability analyses by business segment and by products. Their result found that the adoption of ERP systems enabled a number of companies to introduce financial ratio analysis, the production of budgets, profit centers, absorption costing and profitability analysis per customer. These changes also stem from the availability of real-time data and integrated application. Furthermore, managers were asked to rate the actual benefits achieved via the introduction of ERP systems on a seven-point Likert scale. Their result suggested that the most highly rated perceived benefits achieved through ERP systems related to “increased flexibility in information generation”, “increased integration of accounts applications” and improved quality of reports- financial statements. They concluded that the integration of applications, the production of real-time information and particularly information for decision making clearly affect business processes and particularly the accounting practices of ERP adopters. In addition, additional benefits were achieved through time reductions for accounts closure and preparation of financial statements. This lead to improved decision-making process, increased use of financial ratios and improved internal audit functions.

Spathis and Constantinides (2004) established a correlation between accounting and ERP systems. Furthermore, they observed notable changes in internal audit functions and identified that ERP implementation showed a corresponding rise in internal audit function usage. This arguably may be because of access to real-time information created by ERP systems. However, the research was too limited to draw a positive correlation between the two variables. Although Spathis and Constantinides (2004) were not able to ascertain a causal relationship, they study streamed the need for further research. In other to establish the impact of ERP on auditing, further research need to be done to limit the variable to auditing and ERP system.

#### **4.2.8 Bae and Ashcroft (2004)**

Bae & Ashcroft (2004) in their paper '*Implementation of ERP Systems: accounting and auditing implications*' primarily discussed information technology implications based on the SAP system. They wanted to analyze major technological and accounting issues involved in the implementation of SAP and ERP systems focusing on information integrity and audit issues. This paper used an exploratory approach by studying SAP's ERP software and how different modules within the software provides audit related control and information security. They focused on SAP's R/3 package and how these product shapes auditor's assessment and responsibility.

Bae and Ashcroft (2004) found that auditors needed a proper understanding of ERP systems in order to perform audit of a client that used such data processing systems. The paper observed that since auditors are obligated to evaluate component of internal control of a client business, then auditors needed to have a thorough understanding of the client's ERP systems. Furthermore, they observed that ERP systems if not properly implemented could increase the audit related risks and jeopardize internal controls. Bae & Ashcroft also recognized that implementation of ERP systems brought changes in audit approach. However, the paper could not establish what the changes were and how the auditors will adapt to such changes. It is of important concern to identify how ERP implementation affects the internal control system. In addition, the paper did not address whether changes brought by ERP systems influenced the audit procedures. In addition, there is need for researchers to investigate the changes accompanying ERP implementation to determine whether such changes are correlated with audit procedures.

#### **4.2.9 Brazel, J.F (2005)**

The purpose of the study was to develop, assess and provide uses for a measure of perceived enterprise resource planning (ERP) systems expertise for financial statement auditors. The study also tried to investigate whether auditor's perceptions of their own ERP systems expertise influenced their behavioral control and in turn audit behavior.

The study was conducted through a questionnaire survey with 73 practicing audit seniors from four international and two national public accounting firms. The participating firms were located in US and each participant had an average of 3.68 years of auditing experience. They used five items to measure perceived auditor ERP system expertise and each participant recorded their responds on eight-point scales.

The researcher found that there exists significant correlations between perceived ERP systems expertise and auditors control. An assessment of the measure showed that it possesses a high level of reliability, construct and validity. In addition, the result suggested that auditor's perceptions of ERP systems expertise are not simply a by-product of general audit experience. The study found no correlation between ERP system expertise and general audit experience. Since the measure had the propensity to dichotomize auditors into distinct groups perceiving either low or high ERP systems, expertise for experimental research, Brazel J.F (2005) concluded that it might not be prudent to assume that auditor perceptions of ERP systems expertise automatically increase in conjunction with the length of their audit careers. It may be preferable to assign a less experienced auditor with an ERP background to an ERP systems audit environment than a more senior auditor who may lack this domain of expertise.

The significance of this study was that it demonstrated a correlation between perceived ERP system expertise and auditor control. Although Wright and Wright (2002) concluded that ERP system could have a causal relationship with audit risk, no previous research had investigated how ERP system expertise could affect auditor's judgement. In addition, Brazel J.F (2005) found a zero correlation between ERP system expertise and general audit experience hence creating the need for further understanding how experienced auditors can effectively audit in an ERP driven organization. This study further revealed the need for significance alignment between ERP system and audit.

#### ***4.2.10 Brown and Nasuti (2005)***

Brown and Nasuti (2005) examined the ERP system, its framework and compliance with the Sarbanes- Oxley (SOX) requirement. They wanted to identify how ERP systems facilitated SOX compliance and auditors assessment.

Brown and Nasuti (2005) utilized a review of extensive literature with a view to understanding four major compliance areas. They integrated recently published works and on going themes that lead to implementation of SOX. They used the private sector of United State business as a benchmark of what was expected with SOX compliance. The paper observed that ERP systems had competencies necessary to support and implement SOX. Although variables in technology, process and personnel could threaten effective implementation, however, ERP system if adequately implemented and run by qualified personnel has a high priority in execution of SOX.

Brown & Nasuti (2005) found that SOX had impact in the IT administration of an organization. SOX enabled companies to make representation related to the disclosure of internal controls, procedures, and assurance from fraud. Furthermore, SOX compliance will enable an auditors make decision on the efficiency of internal control. However, the paper did not establish how ERP systems could enhance such compliance. It only established that ERP systems had the capacity to implement SOX requirement.

#### ***4.2.11 Debreceeny R.S et al (2005)***

Debreceeny et al (2005) investigated the capacity of ERP systems designed for medium to large enterprises to host Embedded Audit Modules (EAMs) for substantive testing and monitoring of control processes. In addition, they examined the feasibility of implementing EAMs within the enterprise. The research was conducted using six ERP solution providers: Frontstep, Scala, Industrial and Financial Solutions, Intentia, Oracle and SAP. The research method consisted of a three-staged approach. First, they selected

set of ERP systems that enterprises of varying size were likely to adopt. Second, they designed a set of test EAM alerts to examine each ERP solution's ability to provide for Embedded Audit Modules (EAMs) for substantive testing. Third, they conducted interviews with representatives of each ERP system provider to give the researchers practical insight into key implementation issues in the adoption of EAMs.

The finding indicated variation in support for EAMs in ERP systems. While some ERP applications provided some user friendly tools to implement EAMs, other ERP solutions did not provide any functionality for EAMs explicitly within the package. The finding showed that implementation required an extensive auditing, business process, and technical knowledge and that an auditor may need to rely on the client's technical staff to implement the EAM.

This study explored the configuration of ERP systems and revealed that ERP systems were accompanied with various audit related functions. Furthermore, it found that each ERP system provider had functionalities affecting auditor's assessment. However, one cannot be sure whether various audit functionalities affected the audit process.

#### **4.2.12 Sutton S.G (2006)**

Sutton S.U (2006) in their paper '*Enterprise systems and the re-shaping of accounting systems: a call for research*' investigated the growth of enterprise system in accounting and the impact it has had across various discipline of accounting. The study utilized an exploratory approach examined how enterprise system affect accounting. The paper examined financial accounting, auditing and assurance, managerial accounting and accounting systems to understand how enterprise systems introduction has affected these areas of accounting.

The paper found that enterprise systems have substantially changed financial accounting processes. They observed that financial accounting process was faster and timely for decision makers. Sutton noted that with the implementation of ERP systems, the

challenges of financial accounting are now other issues surrounding the timely delivery of information as opposed to the processes for assimilating and refining report. The study concluded that as enterprise systems evolve, the reality of continuous reporting would become more likely.

Regarding the impact of enterprise systems on managerial accounting the paper noted that the role of managerial accountants as the generators of cost report is diminishing in value. They argued that management accountants now add value in their ability to sift through huge data warehouse of information and understand patterns and changes that effect strategic goal and operational efficiency.

Regarding the impact of enterprise system on auditing, Sutton found that enterprise systems have brought changes in audit and assurance and that auditors are adapting very poorly to these changes. The paper noted that in order for auditors to provide assurance over information, auditors need to be dynamic and technological enhanced. Furthermore, the paper observed that the introduction of enterprise systems has made systems reliability assessment an inevitable part of the audit. The study found that although ERP systems (SAP R/3) demonstrated the capability to monitor business process controls, however, they do not address bigger conceptual issues of monitoring metrics and how monitoring should be optimally completed.

### **4.3 Analysis of the previous research**

Information technology evolution have affected the accounting and auditing process in organizations. Sutton S.G (2006), Yang and Guan (2004), Biersktaker, Burnaby and Thibodean (2001) all agreed that auditors require a different method and procedure for auditing in a technology driven environment. Yang and Guan (2004) observed that rapid escalation of technology made it necessary for more pronouncement and guideline to assist auditors. In addition, Bierstaker et al (2001) also found that auditing approach changed in every phase of audit process as new technologies emerged. The paper

concluded that as new technologies emerge, audit focus would shift from manual detection to technology-based prevention.

Several research papers were covered to understand and reveal the effect of ERP system on accounting and audit processes in the organization. Sia et al (2002) found that ERP systems enhanced empowerment and panoptic control in an organization. The study revealed that through ERP integration, employees felt empowered largely from the ability to access information promptly. Booth et al (2000) also found that ERP system lead to improvements in several areas of accounting. The paper also revealed that ERP system did not lead to new accounting practice and this finding was consistent with Jancura & Lilly (1997) paper which concluded that Information technology solutions did not lead to changes in accounting theory, rather an a change in method. Spathis and Constantinides (2004) went further to establish that ERP implementation increased financial analysis streaming from availability of real-time information. The paper concluded that although ERP systems did not come with significant changes, however, ERP systems provided timely information leading to improved decision-making and increased use of financial ratios. Spathis and Constantinides also supported the notion that ERP systems improved audit functions in an organization. They concluded that a positive correlation existed with internal audit functions and ERP systems. Their study found that internal audit functions were improved with introduction of ERP systems.

Many researchers have suggested that ERP systems increase audit related risk in an organization. According to Wright & Wright (2002), Hunton et al (2004), control risk increased with ERP implementation. They observed that these risks varied with ERP vendors. Wright & Wright observed that access controls are not adequately considered during ERP implementation. Girard & Farmer (1999) in their study observed a similar conclusion and argued that ERP systems increased audit-related risks due to automated interdependencies and integrated relational database. Further, Bae and Ashcroft (2004) in their study also observed that implementation of ERP system brought a change in audit approach and increased risk. The study also suggested that auditors needed to understand ERP systems to perform an effective audit engagement. Bae and Ashcroft (2004)

concluded that if ERP systems are not properly implemented, they could potentially increase audit related risks and compromise internal control systems. In addition, Brazel J.F (2005) in his paper found a similar trend and concluded that ERP systems expertise and general audit experience were not correlated. Brazel J.F (2005) study also revealed that auditors needed expertise knowledge of the system to audit in an ERP environment.

Although certain studies found that ERP systems created audit risks by compromising internal control system, however, some researcher suggested that ERP systems could enhance audit processes. Brown and Nasuti (2005) in their paper of *What ERP system can tell us about Sarbanes-Oxley* suggested that ERP systems had the competence and control mechanism necessary to support SOX implementation. The study found that tightly coupled ERP systems did not require additional functionality to implement the level of internal control required by SOX. The paper suggested that auditors could benefit in an ERP environment than in a typically non-ERP organization. Also, Berstaker, Burnaby and Thibodeau (2001) observed a similar trend in their paper and suggested that as auditing software's becomes integrated into audit process, auditors would have more time to address the complex issues their clients face in the global market. In addition, Debreceeny R.S et al (2005) also found that ERP systems had support mechanism for Embedded Audit Modules (EAMs). EAMs could assist auditors in accessing and auditing in a sophisticated information system platform. However, the study observed that such support varied with ERP vendors and that while some vendor provided EAMs functionalities and user-friendly tools, other vendors had minimal tools and functions to implement EAMs. Debreceeny R.S et al (2005) suggested that auditors required extensive auditing and technical knowledge to utilize EAMs. Sutton S.G (2006) also noted that ERP systems demonstrated the capacity to monitor controls and assist auditors however; the paper was also quick to point out that such functionalities had shortcomings.

#### **4.4 Chapter Summary**

This chapter presented a review of previous research conducted on the impact and effect of ERP system on audit and accounting processes. Several researchers all agree that ERP implementations are accompanied with changes in business processes in functional areas.

According to Hunton et al (2001), the ERP system has brought about changes in “internal control”, “business process”, and “segregation of duties”. ERP system can influence the assessment and conduct of the auditor through business interruption, process interdependency, network security, database security, application security and overall internal control (Hunton et al 2004). The review of scientific paper showed that the effect of ERP systems on audit has not been adequately studied by many researchers. Bierstaker et al (2001) studied the impact of IT on the audit process and concluded that every aspect of audit process was affected by technology. According to Zhao et al (2004), traditional audits are threatened by the development of robust and sophisticated information technology systems. Furthermore, Spathis & Constantinides (2004), Booth et al (2000) all examined the impact of ERP system on accounting processes and concluded that causal relationship existed with slight variations in functional areas.

Wright and Wright (2000), Girard and Farmer (1999), Bae and Ashcroft (2004) all found that ERP system lead to heightened audit related risks. They found that ERP implementation compromised internal control system and hence made auditors vulnerable in auditing processes. However, some other researchers suggested that ERP systems could assist auditors by promptly and timely data. Debreceeny R.S et al (2005), Yang and Guan (2004) observed that ERP systems had the capabilities to assist auditors in audit processes if technological savvy auditors are used. In addition, they also found that ERP system would be beneficial when auditors understand the infrastructure and system configurations.

It can be concluded from these previous studies that ERP systems affect the way auditors carry out auditing. Although the papers vary in the changes brought about by ERP systems, all the papers and researchers agree that ERP implementation bring about change that can affect the auditor in the conduct of audit engagement. Consequently, there is need to further study ERP system impact on audit process for proper understanding.

## **5 RESEARCH METHODOLOGY**

This chapter introduces the research methodology part of the thesis. A discussion of survey questionnaire will be given and different elements of the empirical part of the research will be presented. Section 5.2 presents the hypothesis of the thesis. Section 5.3 describes the sample and data collection method utilized in the study. Section 5.4 describes the survey questionnaire.

### **5.1 Research Objectives**

This research has the objective of examining the impact of ERP system on the auditing. It tries to understand how changes brought by elegant technological design can influence audit process. In a study of this nature that aims to contribute to the general body of knowledge in a particular area of interest, it is essential to follow a process framework that will demonstrate in-depth clarity and explicitness in reporting information.

The empirical part of this study is based on Forza (2002) conceptual model (see figure 5). It includes a number of related sub-processes: the process of translating the theoretical domain into the empirical domain, the design of hypotheses, the process of collecting data for hypotheses testing, the data analysis process and the process of interpreting the result. However, pilot test would not be utilized in this study, due to time constraint and the nature of the study. The research hypotheses have been formulated using the process framework outlined in the model and it would be tested using data collected from a survey questionnaire.

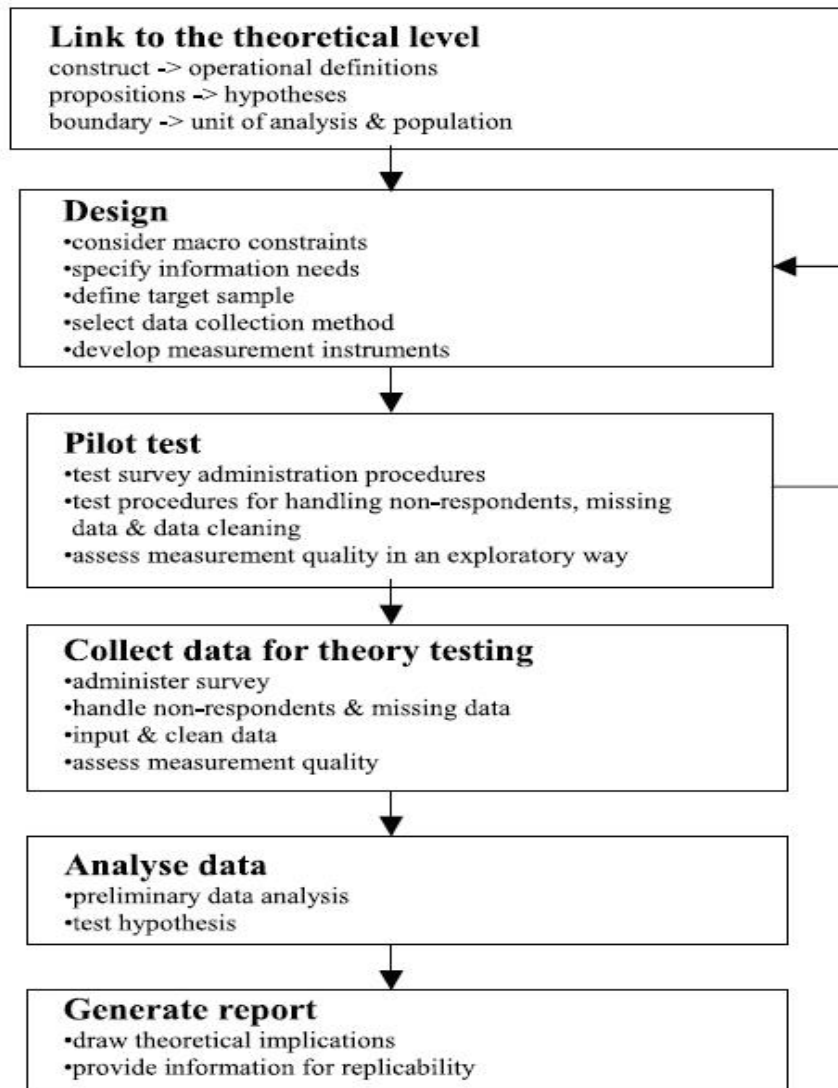


Figure 5  
 The Theory-testing Survey research process  
 (Adapted from Forza .C 2002)

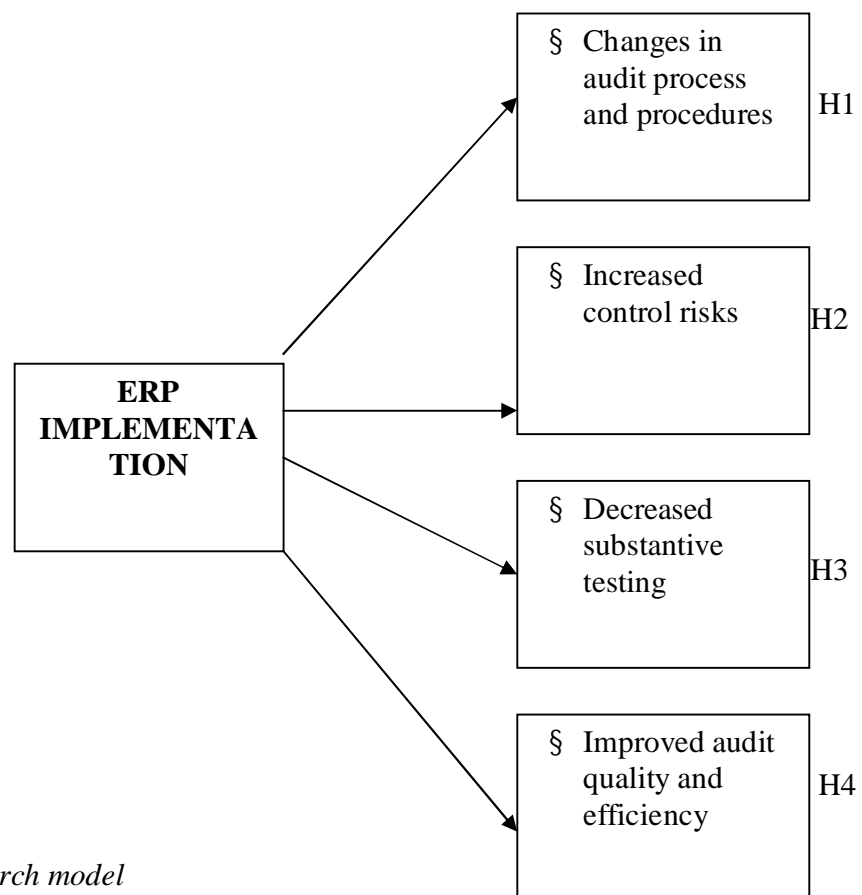
## 5.2 Hypotheses and Research questions

Based on the research objectives, the hypotheses for the empirical part will be developed. This study tries to examine the impact of ERP systems on the audit process by investigating how auditors conduct audit in an ERP environment as opposed to non-ERP environment.

The study examines the following research questions:

- How does ERP implementation affect audit process?
- Does ERP implementation lead to changes in audit process?
- Does ERP implementation influence control risks in auditing?
- What benefits are derived from auditing an ERP organization?

In addition, with the hypotheses, the data collection questions used in the survey questionnaire are also presented. Figure 6 illustrates the research model and shows the relationship between the hypotheses presented later in this chapter.



*Figure 6*  
*The proposed Research model*  
*(Source: Author)*

Paper by Booth et al, (2000) identified only minor effects with ERP implementation and accounting. Most of the benefits according to Booth et al (2000) were in transaction processing and ad hoc decision support. While Booth et al observed that high level of integration lead to satisfaction in several areas of accounting, however, the paper did not

observe any change in accounting practices. In addition, Lilly (1997) also found that introduction of new Information technology solutions did not have any significant effect in accounting procedure. However, Sutton (2006) observed that enterprise system had significant effect on accounting and that accountants and auditors are generally adapting poorly to these changes and as such trend to overlook the changes. This trend was also noticed by Hunton et al (2004) in the paper *Are financial auditors overconfident in their ability to assess risks associated with ERP system*. Hunton et al (2004) noted that financial auditors did not recognize higher security risk in ERP environment and did not indicate a greater need to consult with IT audit specialist. Hunton et al concluded that financial auditors did not notice changes in an ERP environment and as such, financial auditors may be overconfident in their ability to assess ERP system risks.

On the other hand, Yang and Guan (2004) Bierstaker, Burnaby and Thibodean (2001) Sutton (2006), all demonstrated that auditors required a different method and procedure in conducting an audit in an ERP environment. Bierstaker et al (2001) noticed significant changes in every phase of the audit process. The paper observed that enterprise-wide computing platforms provided auditing capabilities and efficient internal control tools. Bierstaker et al went further to suggest that auditors could provide larger range of services to their clients with the introduction of ERP system. In addition, Yang and Guan (2004) observed that although the overall audit objective does not change in an enterprise environment, however, the methods and procedures that auditors use would differ.

This paper tries to investigate how the deployment of ERP systems affects the traditional audit process. Booth et al (2000), Granlund and Malmi (2002) found only minor changes in accounting practice. They observed that ERP systems did not change accounting procedures. However, Bierstaker et al (2001) Sutton (2006) observed that ERP systems lead to changes in various stages of audit process.

To answer if ERP systems have influenced or changed audit process in organization a hypothesis 1 was formulated.

***Hypothesis 1:** Auditors will experience changes in audit procedures and processes after ERP implementation.*

In order to measure whether auditors will experience changes in audit process and procedures after ERP implementation, the following questions were asked:

- 1) Auditors will experience changes in traditional audit process and procedures when auditing in an ERP organization.
- 2) Auditors will require a different approach and audit tool when auditing an ERP system ( suggested e.g., by Yang and Guan 2004)
- 3) IS auditors are essential as part of the audit team when auditing an ERP organization (suggested e.g., by Brazel 2005).
- 4) The auditing tool used to audit an ERP system differs from the tool used in a non-ERP audit.
- 5) More time is spent understanding the system and business process in an ERP system as opposed to non-ERP system (suggested e.g., by Bierstaker et al 2001).

Respondents are asked to indicate their level of agreement with the statement on a five-point likert scale. However, for each statement it is also possible to select 'No Opinion' (0) meaning that the respondent did not have opinion regarding that statement. A mean value greater than three will provide support that auditors 'experience changes in audit process and procedure when auditing in an ERP implementing company. In addition, it will be further assumed that the higher the mean value, the more significant the change.

Previous research has identified audit risk posed by ERP implementation. Information System Audit and Control Association (ISACA) suggested that audit risks arise to some extent due to the integrated program logic and business process functions inherent in ERP software products. Girard and Farmer (1999), Wright and Wright (2000), Bae and Ashcroft (2004) all argued that ERP systems could potentially increase audit related risk in an organization due to automated interdependencies and integrated relational database. In addition, Gibbs and Keating (1995) discussed the impact of reengineering on controls

and they argued that control environments have been disrupted and shifted because of downsizing, flattening and decentralization trends in business. They went further to state that many of the controls on which auditors traditionally rely on, such as separation of duty, authorization tend to work at cross-purpose to reengineering goals. Bae and Ashcroft (2004) in their paper *Implementation of ERP systems: Accounting and Auditing implications* also observed that during ERP implementation, traditional controls are usually eliminated without replacing them with new effective control measures. This they argued was because data is shared across the modules of an ERP system hence some traditional control activities are no longer needed for reconciling or adjusting entries. They argued that auditors required immense adaptation and understanding to operate successfully in an ERP environment.

To answer if ERP systems have increased control risk in an audit engagement, hypotheses 2 is formulated.

***Hypotheses 2: Auditors will experience increased control risk after ERP implementation.***

In order to measure the impact of control risk in an ERP system audit, the following questions were asked:

- 1) Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company. (suggested e.g., by Hunton et al 2004)
- 2) Auditors spend more time in test of control when auditing an ERP implementing company compared to a non-ERP implementing company.
- 3) Auditors are aware that a problem in one business process will lead to problems in a related business processes ( suggested e.g., by Wright and Wright 2002)
- 4) During ERP implementation project IS auditor should be part of the implementation team to address control and infrastructure integrity in the company.

In order to test hypothesis 2 respondents are asked to indicate their level of agreement to the questions on a five-point likert scale. There was also an option of 'No opinion' to reduce the problem of forced choice that is typical of likert scale measurement. A mean value will be calculated and analyzed.

Bierstaker et al (2001) in their paper '*The impact of Information technology on the audit process: an assessment of the state of the art and implication of the future*' argued that ERP implementation will lead to decreased substantive testing. The paper observed that enterprise-wide computing platform provided powerful auditing and internal control evaluation tools that aided auditors. In addition, the paper noted that in response to these new control features, auditors have adopted the process auditing approach, which relies on increased analysis of business strategy, risk, control-testing and decreased substantive testing. The paper went further to suggest that with the integration of business processes across functional areas of a company through ERP implementation, the need for rigorous substantive testing when conducting audit would diminish.

To answer if ERP implementation has lead to decreased substantive testing, hypothesis 3 is formulated.

***Hypotheses 3: Auditors will experience decreased substantive testing after ERP implementation***

In order to measure the changes in substantive testing in ERP systems audit the respondents were asked this question 'Auditing in an ERP implementing company leads to less substantive testing compared to non-ERP implementing company'. The respondents were asked to rate the question on a five-point likert scale. A mean value of above three would provide support for decreased substantive testing in an ERP implementing company. It was also assumed that the higher the mean value the more significant the decrease.

Studies by Granlund and Malmi 2002, Spathis and Constantinides 2003, all suggested that ERP systems provide more real-time data and report. These studies demonstrated that ERP systems provided general benefits in terms of increased transaction processing efficiency, more accessible information of a higher quality and greater support for ad-hoc reporting. In addition, Bae and Ashcroft (2004) suggested that ERP systems created a tremendous change by switching to continuous real-time reporting compared to issuing financial statements annually, quarterly or monthly. Using real-time data access, researchers argued auditors could improve efficiency when auditing in an ERP environment. Bae and Ashcroft (2004) went further to demonstrate that ERP systems (SAP R/3) offered tracing capabilities that can seamlessly follow a transaction throughout the system and that this improved business control. Furthermore, the view by Bae and Ashcroft (2004) was also noted by Debreceny et al (2005) when they observed that ERP systems had support mechanisms and functionalities for EAMs. The paper argued that real-time data and report could potentially assist auditors when auditing in an ERP environment while also noting that innovative auditing techniques, advanced consulting and technological skills where required. In addition, Brown and Nasuti (2005) in their paper of *What ERP system can tell us about Sarbanes –Oxley* also argued that ERP system had the competencies and technological capabilities necessary to support SOX implementation.

To answer if ERP systems have improved audit quality by providing real-time information, hypotheses 4 was formulated.

***Hypotheses 4: ERP systems will improve audit quality and efficiency by providing real-time information.***

In order to evaluate the impact of ERP system on audit quality and efficiency, the following questions were asked:

- 1) When auditing an ERP implementing company less time is spent by auditors to trace audit trail (suggested by e.g., Bierstaker et al 2001).

- 2) When auditing an ERP implementing company less time is spent to assess and retrieve information.
- 3) ERP systems have functionalities that can enhance auditing and audit processes (suggested e.g., Debreceeny et al 2005).

As in the case of the other hypothesis, the respondents are asked to indicate the level of agreement with the statement on a five point likert scale. Furthermore, an option of 'No opinion' was also included. It was assumed that a mean value greater than three would provide support for the hypothesis and that the higher the mean value, the more significant the improvement.

### **5.3 Sample**

A sample refers to a subset of the population. A population is the entire set of data from which a sample is selected and about which the researcher wished to draw conclusion. Usually, the elements of a sample are selected intentionally as a representation of the population being studied. According to Forza .C (2002) 'sampling is the process of selecting a sufficient number of element from the population so that by studying the sample, and understanding the properties or the characteristics of the sample subjects, the researcher will be able to generalize the properties or characteristics to the population elements'. Sampling is utilized to overcome the difficulty of collecting data from the entire population which can be impossible or extremely tasking at its best in terms of time and resource. However, poor sample design can constrain and limit the application of appropriate statistical techniques and results generalization. Randomness and sample size are important factors to consider in ensuring that the sample can represent the population and that the sample size will be statistically useful. According to Forza (2002), sampling can be grouped into probabilistic and non-probabilistic sampling. In probabilistic sampling, the population element has some known probability of being selected differently than non-probabilistic sampling.

For this research, the target sample was auditors who had audited an ERP system organization and a non-ERP system organization or had been part of an audit team that audited an ERP system and a non-ERP system organization.

#### **5.4 Survey**

The empirical research is conducted using a web-administered questionnaire. The questionnaire was developed using Real Time Analyzer (RTA) software tool in [www.webropol.com](http://www.webropol.com). This method of internet and e-mail questionnaire was used to make it more convenient for the sample. The auditors in the sample are contacted with a personalized e-mail in which a link to the questionnaire is provided.

The questionnaire consists of 14 multiple-choice questions and one open-ended question written in English language and it made up of four parts. The first part of the questionnaire (question 1) asks about the background of the auditors. This information was considered important to determine whether the respondent had the required audit experience needed to represent the target population in this study.

The second part of the questionnaire consists of five questions, which are used to validate hypotheses 1 concerning changes in audit process and procedures after ERP implementation. The respondents were asked about how ERP systems influenced auditing. The main purpose was to determine if there were changes in audit process and how auditors adjusted to such changes. Questions 2 will study whether there were changes in traditional audit processes and procedure in a ERP implementing company while question 3 were aiming to study whether the implementation of ERP systems lead to new audit approach. Questions 4 and 5 will examine whether auditors required new knowledge and skills to audit in an ERP implementing company compared to a non-ERP implementing company and whether ERP implementation lead to use of advanced auditing techniques and tools.

The third part of the questionnaire consists of five questions, which are used to validate hypotheses 2 and 3. The respondents were asked to express their opinions about the

predetermined statements. The main purpose was to determine how ERP system implementation influenced auditing with regard to control risks as well as substantive testing. Questions 7 and 8 will examine whether auditors spent more time in assessing control risk and related test in an ERP implementing company as opposed to a non-ERP implementing company. The answer from this question might help determine whether ERP implementations lead to increased assess control risk in the organization. As regard hypotheses 3, question 9 will be used in the analysis to validate the hypotheses as suggested by Bierstaker et al (2001) that process-auditing approach will lead to increased analysis of business risk, control testing and decreased substantive testing. Additionally, questions 10 and 11 will examine how auditors perceived integrated business processes and controls within an ERP implementing company. This result was considered important because it will highlight whether there was the need for increased control risk.

The fourth and final part of the questionnaire consists of three questions. The objective was to determine whether ERP implementation improved auditing. This was necessary to validate hypotheses 4 relating to audit quality and efficiency due to ERP implementation. Questions 12 and 13 will examine whether real-time data and information availability in an ERP structure assisted auditors when performing an audit engagement. In addition, question 14 will aim to determine whether ERP functions could support and enhance audit process and approach as suggested by many researchers. Finally, question 15 was included to get background information of the respondent regard their IS audit experience. This information was considered relevant to enable an analysis of the survey between IS auditors and non-IS auditors with regard to audit processes.

## **5.5 Chapter Summary**

This chapter presented the empirical part of the thesis, which examines the impact of ERP systems on the audit process. It presented the research model and process framework used in conducting this research. The method of research, the survey questionnaire and sample analysis were also present in this chapter.

Four hypotheses were formulated in order to determine how each factor is linked with ERP implementation and audit process. The first hypotheses will examine the changes on audit process. The second hypotheses will examine the control risks associated with ERP implementation while the third hypotheses will examine the impact of ERP implementation on substantive testing. Finally, the fourth hypotheses will study the impact of ERP system on audit efficiency and quality. The sample of the study was discussed and specific research questions used in the questionnaire presented. Questionnaire survey consisting of 15 questions was sent to respondents.

## 6 Empirical Result

This chapter will present the empirical result acquired through the questionnaire survey. Section 6.1 presents the response rate and factors that might have affected it. Section 6.2 presents the results of the questionnaire survey descriptive statistics while sections 6.3 to 6.6 presents the validity and finding of the hypothesis formulated in chapter 6 using statistical tests.

### 6.1 The response rate

The survey questionnaire was sent to 400 auditors during the third week of February 2007. A reminder was also sent one week after the initial mail. In total 365 emails reached the respondents and in 35 cases the email bounced back due to invalid email address. Further, 27 out-of-office responses were received due to vacation or other personal reasons. All together, 100 responses were received within two weeks of which 71 were usable for the analysis. This response rate represented 27.3% (100 of 365), while the response rate usable for the statistics was 19.5%. The usable response rate was low because 29% of the respondent indicated in the first question of the questionnaire that they have not audited both an ERP implementing company and a non-ERP implementing company and this was a key requirement in completing the remaining questionnaire.

Table 6.1: Breakdown of the questionnaire survey statistics

QUESTIONNAIRE	COUNT	PERCENTAGE
Total Number of Questionnaire Sent Out	400	100
Total Number of Questionnaire received by respondents	365	91.2
Total Number of Questionnaire filled out by respondents	100	27.4
Total Number of Responses usable for the study	71	19.5

In addition to the responses received through Webropol software, an email message from 6 respondents was received indicating that they could not participate in the survey

because they have not audited an ERP implementing company and as such felt no need to participate. Also, Webropol indicated that 33 respondents viewed the questionnaire, but have not responded. There are several reasons why the questionnaire was not filled by the respondents. The probable reasons might be the following:

- § The auditors did not have time to fill the questionnaire especially as some auditors were still auditing company's annual report.( several respondents sent email indicating that the timing was wrong)
- § Many of the auditors did not have experience in both an ERP implementing company and a non-ERP implementing company.
- § Some of the emails might have been considered as spam by company and hence refused.
- § The respondents were not able fully understand the questionnaire due to language differences. (One respondent actually wrote back explaining this).
- § The auditor's database was not up-to-date as such contained email addresses of retired auditors. (Several respondents actually wrote explaining that they could not participate in the survey because they have retired).

Altogether, the response rate can be considered satisfactory as 35.7% of the respondent answered the questionnaire either by filling-in the questionnaire or by sending a reply email.

## **6.2 Descriptive statistics**

Regarding the background information of the respondents, the survey provided limited information. This was because the questionnaire was targeted at auditors at various companies and background information like companies, gender and length of services was not considered relevant. The underlying factor was to reach-out to auditors with audit experience in ERP and non-ERP environment. In addition, it was discovered that significant proportion of the auditors did not have ERP experience. Some actually sent an email expressing this fact. This may be partly because most businesses are still using their existing in-house system and are not in a hurry to replace them with costly ERP

systems. Although the questionnaire was evenly distributed between higher-level auditors and lower-level auditors, however, it was not possible to see which respondent had participated in the survey. Further, this information was not considered important for this study.

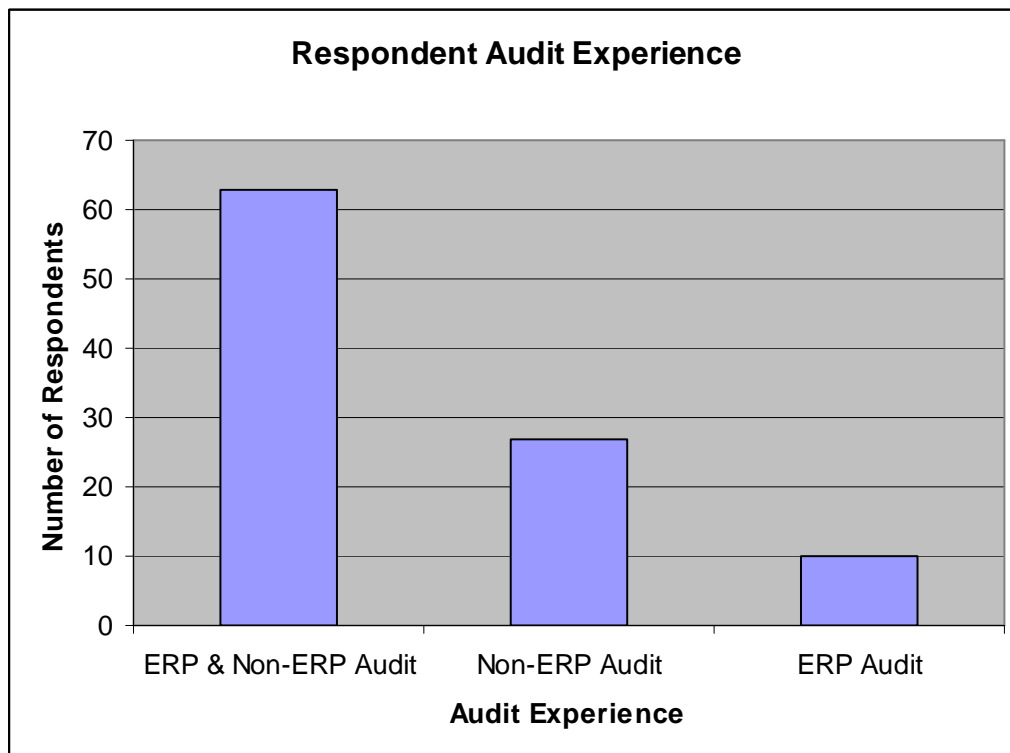


Figure 7: Respondents audit experience

In addition the question 15 in the questionnaire requested the respondents to indicate the length of service as an IS auditor in the event that they were one. This revealed that only 16 respondents were actually IS auditors. Furthermore, the information collected also showed that the respondents were randomly distributed in Information System audit experience. While the highest IS auditor had 30 years of IS audit experience, the lowest had only 2 years IS audit experience.

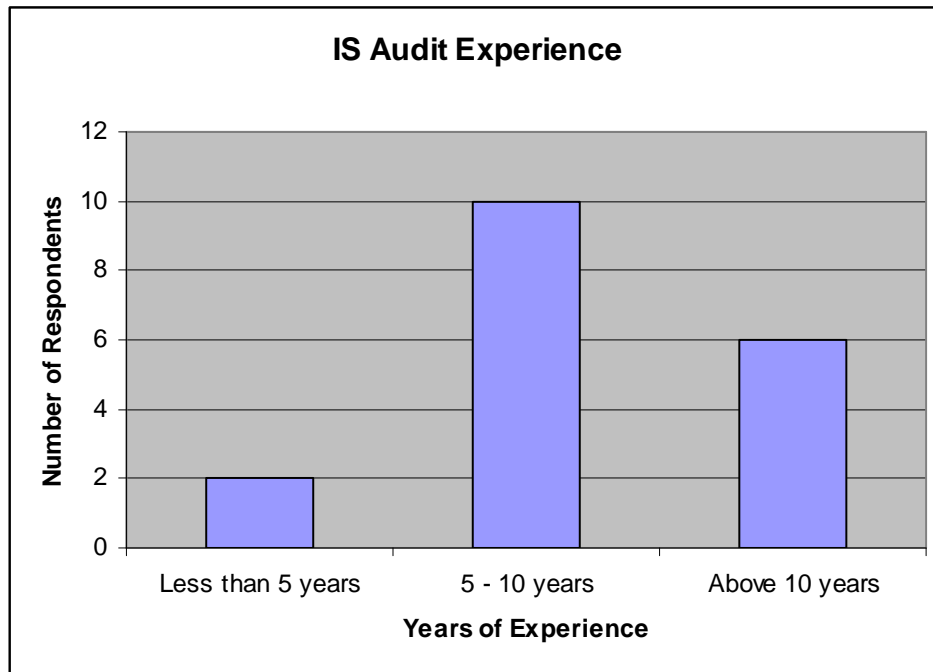


Figure 8 IS Audit Experience

### 6.3 Finding on hypothesis 1

In order to investigate the impact of ERP system on audit process, four hypotheses were formulated in chapter 5. The first hypothesis was:

***Hypothesis 1:*** Auditors will experience changes in audit processes and procedures after ERP implementation.

To ascertain whether auditors will experience changes in audit procedures and processes after ERP implementation, the respondents were asked four sets of questions. The first question was 'when auditing in an ERP environment, auditors will experience changes in traditional audit processes and procedures'. As can see in table 6.1 59.2 percent or 42 respondents somewhat agreed that auditors will experience changes and 11.3 percent totally agreed. However, a total 18.3 percent or 13 respondent somewhat disagreed. The

overall result indicates that more than half of the respondent felt that auditors would experience changes, while a less significant proportion of respondent or 18.6 percent did not believe in any change in traditional audit process. Altogether, the respondents suggested that there are significant changes in traditional audit process when auditing an ERP implementing company. On the average, the question had a mean value of 3.61, which shows that majority respondents believed that ERP environment brought changes in audit processes and procedures. This result provided a moderate support for the hypothesis 1. Further, the group of Non IS Auditors had a mean value of 3.64 while IS Auditors had a mean value of 3.50 and an Independent samples t-test was conducted in order to find out if there were significant difference in the mean value between the groups. However, the t-test did not reveal any significant difference between the two groups (refer to Appendix 3).

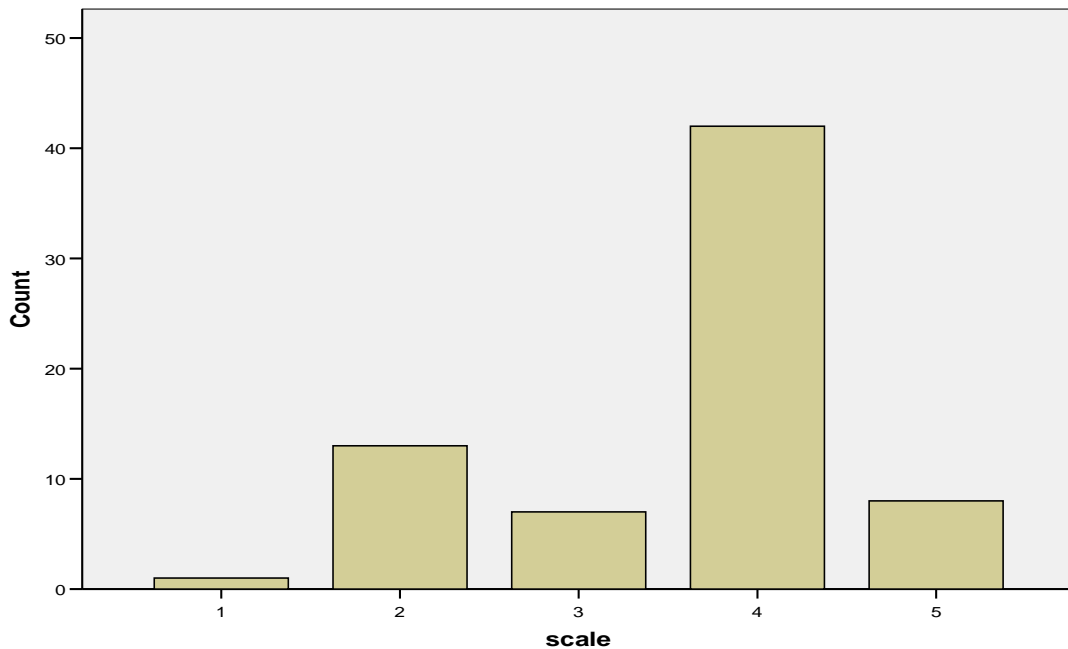
In addition, a single sample t test was used to test if the sample mean is significantly different from a hypothesized population mean. This statistics measure compared the sample mean with the hypothesized mean to get an estimate of the probability that the sample mean is different by chance or random occurrence. Since the statement was rated on a five-point likert scale, a hypothesized mean value of 3 was used for the t-test. The result indicated a p-value of less than 0.000. (refer to Appendix 2). This shows a very significant difference between the two mean variables and result further provides support to hypothesis 1.

**Table 6.1 Auditors will experience changes in traditional audit processes and procedures**

**Q2**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	1	1.4	1.4	1.4
2	13	18.3	18.3	19.7
3	7	9.9	9.9	29.6
4	42	59.2	59.2	88.7
5	8	11.3	11.3	100.0
Total	71	100.0	100.0	

Mean 3.61  
Std. Deviation 0.963



***Figure 9 Auditors will experience change in traditional audit processes and procedures***

The second question regarding the first hypotheses was that “*auditing an ERP implementing company requires a different approach compared to auditing a non-ERP company*”. The auditing approach was considered a variable in determining the changes in audit processes. The question examined the approach used in an ERP implementing company compared to a non-ERP implementing company to determine whether there were differences. The result revealed that more than 70 percent of auditors believed that a different approach was inevitable in order to audit an ERP implementing company. This question had a mean value of 3.83 (refer to Appendix 8) which provided support to hypotheses 1. In addition, a single sample test showed a p-value of less than 0.000 (refer to Appendix 2) which indicated a significant difference between the two mean variables and adds validity to hypothesis 1. Further, the result of an independent samples t-test conducted to find out if there were significant differences in the mean value between Non IS Auditors and IS Auditors did not reveal any difference between the two groups (refer to Appendix 3).

The third question relating to hypotheses 1 was that “*IS auditors are essential part of the audit team when auditing an ERP implementing company*”. This question was aimed at determining whether auditing an ERP implementing company had effect on the composition of the audit team. The result showed that cumulatively close to 80 percent of respondents viewed IS Auditors as essential when auditing an ERP implementing company (see Appendix 9). Considering that IS auditors accounted for only 25.3 percent of the total respondents, therefore any form of bias from IS auditors was greatly reduced. In addition, the result of an Independent samples t-test between the group of Non IS Auditors and IS Auditors had a p-value of 0.5 (refer to Appendix 3) which did not reveal any significant difference between the groups. This question had a mean value of 4.13, which point out that auditors overwhelmingly agreed on IS auditors been part of the audit team in an ERP implementing company. This further provided support to hypothesis 1 with regard to changes in traditional audit process and procedures. A single sample t-test used to test the validity of the mean produced a p-value less than 0.000 (refer to Appendix 2) and this result added support to the finding and to hypothesis 1.

To ascertain whether auditor required a different or sophisticated tool when auditing an ERP implementing company, auditors were asked whether “*the auditing tool used to audit an ERP implementing company differed from the tool used in a non-ERP company*”. This was considered important in order to determine whether the degree of change was partly because of different auditing tool and software. Surprisingly, the finding revealed that auditors are closely divided on the question. Many respondents were not sure whether a different auditing tool was required and this lead to many responses been undecided. Furthermore, the question had a mean value of 3.22, (refer to Appendix 10) which can be interpreted that auditors are not quite sure whether auditing ERP implementing company required a different auditing tool. This result showed that if changes in audit process and procedures exist, that such changes could not be largely due to different auditing tools, because such a difference could be significantly established. Further, the result of an Independent samples t-test did not reveal any significant differences in the mean values between the groups of Non IS auditors and groups of IS auditors (refer to Appendix 3). This question did not provide any support to hypothesis 1

because it failed to find any significant difference between the auditing tool used in an ERP implementing company and the auditing tool used in a non-ERP implementing company.

The result of a single sample t-test was conducted on the question revealed a p-value of 0.066 (refer to Appendix 2). The p-value was above the confidence interval and as such, the difference between the question mean and the hypothesized mean could not be established. The result cast doubt on the validity of the mean value of question 5 and thus did not provide any support to hypothesis 1.

The fifth question relating to hypotheses 1 was that “*more time is spent understanding the system and business process in an ERP implementing company as opposed to a non-ERP implementing company*”. The degree of changes in audit processes and procedures was measured by the time spent in understanding the system and business processes in an ERP implementing company compared to a non-ERP implementing company. The result showed that over 70 percent of the respondents believed that more time is spent understanding the system and business processes in an ERP system audit. In addition, the mean value of the question was 3.80, (see Appendix 11) which also support the hypothesis. This result shows that understanding business processes was considered very important when auditing an ERP implementing company. Independent samples t-test was performed but no statistically significant difference was found between groups of IS Auditors and Non IS Auditors (refer to Appendix 3). A single sample t-test was used to test the mean validity derived from this question using a hypothesized mean value of 3 and the result produced a p-value of less than 0.000 (refer to Appendix 2). This result adds support to the finding and to hypothesis 1.

#### **6.4 Reliability Analysis**

In order to ensure the reliability of the variables used to measure the hypothesis 1, a cronbach’s alpha test was conducted to determine the coefficient of reliability. Cronbach’s alpha is not a statistical test but measures the reliability of a psychometric

instrument. It indicates the extent to which a set of test items can be treated as measuring a single latent variable. A cronbach's alpha value greater than 0.7 is commonly accepted (Pallant 2004). As can be seen in table 6.3, the result of the five questions used in hypothesis 1 produced an alpha value of 0.779, which is above the accepted value.

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.779	.780	5

**Table 6.3 Cronbach's Alpha table for hypothesis 1**

## 6.5 Findings on hypothesis 2

*Hypothesis 2: Auditors will experience increased control risk after ERP implementation*

In order to validate this hypothesis, respondents were asked four sets of questions. The first question and the seventh question in the questionnaire was that “*auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company*”. The degree of increase in control risk was measured by the time spent in assessing control risk in an ERP implementing company. As can be seen from table 6.4, 35.2 percent or 25 respondents somewhat agreed while 28.2 percent or 20 respondents totally agreed that auditors spent more time in assessing control risk in an ERP system. However, a little above 20 percent disagreed while 11 respondents representing 15.5 percent were undecided. This shows that more than 60 percent of the respondent agreed that control risk required more time in an ERP environment. In addition, the mean value for this question was 3.62, which therefore supports the hypothesis that auditors will experience increased control risk after ERP implementation. Further, IS Auditors had a mean value of 3.94 compared to Non IS Auditors mean value of 3.51. However, an Independent samples t-test conducted to find out if there were significant differences in the mean values between the two groups did not reveal any

significant differences (refer to Appendix 5). Also A single sample t-test was used to test the validity of the mean value calculated for this question using a 95% confidence interval and a hypothesized mean value of 3 and the result produced a p-value of less than 0.000 (refer to Appendix 2). This result further provides support to hypothesis 2.

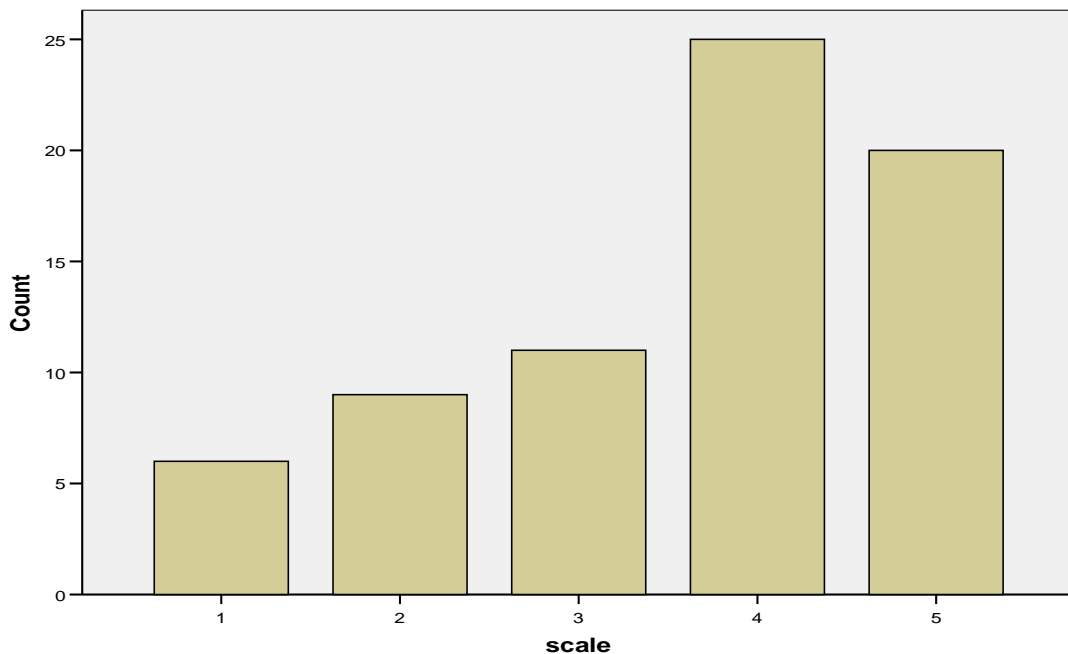
**Table 6.4 Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company**

**Q7**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	8.5	8.5	8.5
	2	9	12.7	12.7	21.1
	3	11	15.5	15.5	36.6
	4	25	35.2	35.2	71.8
	5	20	28.2	28.2	100.0
	Total	71	100.0	100.0	

Mean 3.62

Std. Deviation 1.258



**Figure 10 Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company**

The eighth question in the questionnaire and the second question for hypothesis 2 was that “*auditor spent more time in test of control when auditing an ERP implementing company*”. The result showed that more than 55.7 percent of auditors agreed that more time was spent in test of control when auditing an ERP implementing company. The question had a mean value of 3.45, which revealed that auditor’s opinion agrees slightly (refer to Appendix 12). In addition of the mean value of group of Non IS Auditors was 3.45 while that of IS Auditors was 3.44. Further, an independent samples t-test did not find any statistical significant difference between the two groups (refer to Appendix 4). This question added moderate validity to the hypothesis 2. In addition, a single sample t-test was used to test the mean validity at a 95% confidence interval. The result revealed a p-value of 0.005 (refer to Appendix 2) which added support to the hypothesis.

The tenth question in the questionnaire and the third question for hypothesis 2 was that “*when auditing an ERP implementing company you are aware that a problem in one business process will lead to a problem in a related business process*”. This was in order to validate the heightened control risk after ERP implementation. The result showed that approximately 77 percent agreed that a problem in one business process would potentially lead to a problem in a related business process in an ERP implementing company (refer to Appendix 13). In addition, the question had a mean value of 4.00, which provides good support to hypothesis 2. A single sample t-test was used to test the validity of the mean using a 95% confidence interval and a hypothesized mean value of 3. The result produced a p-value of less than 0.000 (refer to Appendix 2). This result adds support to the statement and to hypothesis 2. In order to determine whether a significant difference existed between Non IS Auditors and IS Auditors, an Independent samples t-test was conducted. The result however did not reveal any difference between the two groups (refer to Appendix 4).

The eleventh question in the questionnaire and the fourth question for hypothesis 2 was that “*during ERP implementation project the IS auditor should be part of the*

*implementation team to address control and infrastructure integrity in the company*". This was considered relevant to monitor auditors perception regarding assess control risk in an ERP implementing company. The result revealed that 72 percent of the respondents agreed that IS auditors are essential in ERP implementation team (refer to Appendix 14). This showed that respondents were greatly concerned about control issue in an ERP environment. The question had a mean value of 3.99, which indicates that auditors considered control risk as a critical issue in an ERP implementing company. This question also added validity to the second hypotheses since the question revealed that auditors were concerned about controls in an ERP implementing company and hence wanted adequate assess control measures at the ERP implementation phase. Furthermore, IS auditors had a mean value of 4.11, which was a little higher, compared to Non IS auditors mean value of 3.95. An Independent sample t-test was conducted in order to find out if there were significant differences in the mean value between the two groups. However, the t-test had a p-value of 0.589, which did not reveal any statistically significant differences between the two groups (refer to Appendix 4). In addition, a single sample t-test was used to test the validity of the questions mean using a 95% confidence interval and a hypothesized mean value of 3. The result produced a p-value of less than 0.000 (refer to Appendix 2). This result further added support to the statement and to hypothesis 2.

A cronbach,s alpha test was conducted to ensure the reliability of the variables used to measure hypothesis 2. The result produced an alpha value of 0.504 (refer to Appendix 16), which was not very high. However, when two variables (question 7 and question 8) where used, it resulted to a much higher alpha value of 0.860. This indicated that theses two variables had a greater reliability in comparison to other variable in the hypothesis.

## **6.6 Findings on hypotheses 3**

*Hypotheses 3: Auditors will experience decreased substantive testing after ERP implementation.*

In order to validate this hypothesis, question nine in the questionnaire asked the respondents whether “*auditing an ERP implementing company leads to less substantive testing compared to non-ERP implementing company*”. As can be seen in table 6.5, 36.6 percent or 26 respondents somewhat agree while 25.4 percent or 18 respondents totally agree. This shows that more than 60 percent of the respondents agree with the statement. However, 24.3 percent of the respondents were non-committal and only approximately 15 percent or 10 respondents disagreed. This finding provided support to hypothesis 3 that ERP implementation leads to less substantive testing. Further, the question had a mean value of 3.69, which tends to add support to hypothesis 3. In addition, the mean value of IS auditors in this question was 3.72 while that of Non IS auditors was 3.68. Independent sample t-test was conducted in order to find out if any significant difference in mean value existed in the two groups. However the t-test did not reveal any significant difference between the two groups (refer to Appendix 5).

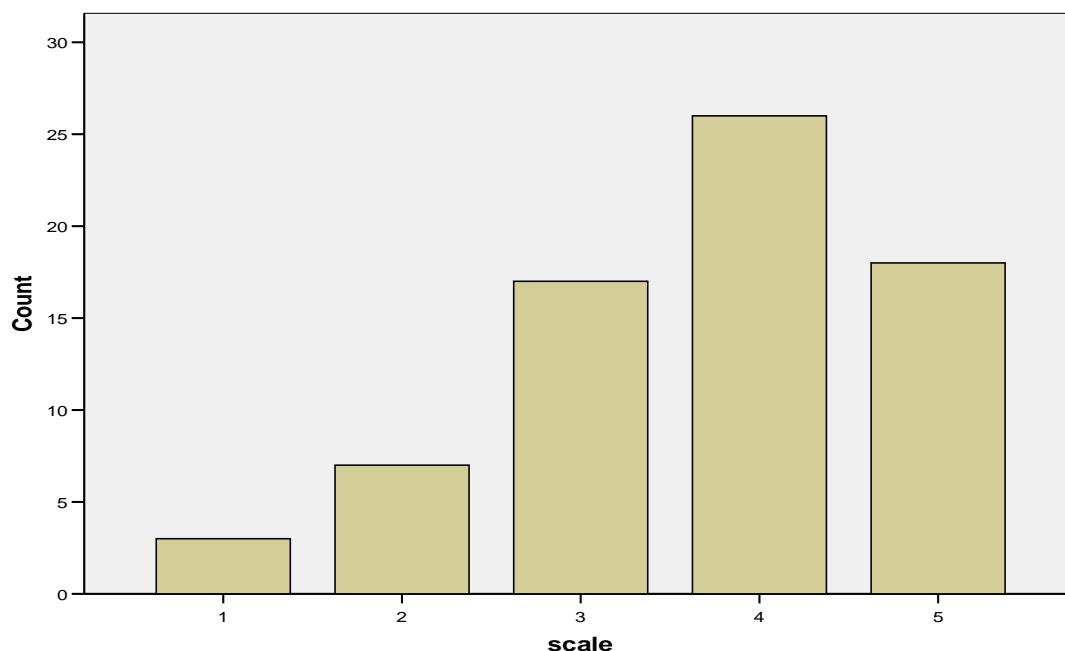
A single sample t-test was used to test the validity of the mean using a 95% confidence interval and a hypothesized mean value of 3 and the result revealed a p-value of less than 0.000 (refer to Appendix 2). This result adds support to the statement and to hypothesis 3.

**Table 6.5 Auditing an ERP implementing company leads to less substantive testing compared to non-ERP implementing company**

**Q9**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	3	4.2	4.2	4.2
2	7	9.9	9.9	14.1
3	17	23.9	23.9	38.0
4	26	36.6	36.6	74.6
5	18	25.4	25.4	100.0
Total	71	100.0	100.0	

Mean 3.69  
Std. Deviation 1.090



**Figure 11 Auditing an ERP implementing company leads to less substantive testing compared to non-ERP implementing company**

### 6.7 Findings on hypothesis 4

**Hypothesis 4:** *ERP systems will improve audit quality and efficiency by providing real-time information*

To ascertain the validity of this hypothesis, the respondents were asked three sets of questions. The twelfth question in the questionnaire and the first question for hypothesis 4 was that “*auditors spent less time to trace audit trail when auditing an ERP implementing company*”. The improvement in audit quality and efficiency was measured by the time spent in tracing audit trail. As can be seen from table 6.6, 34.9 percent or 22 respondents appear quite uncertain about the statement while 28.6 percent of the respondents somewhat disagreed with the statement. Further, 11.1 percent or 7 respondents totally disagreed with the statement. Although a little more than 25 percent agree on the statement, however, it was not sufficient to confirm the hypothesis as approximately 40 percent of the respondent disagreed with the statement. In addition, that question had a mean value of 2.83, which further cast doubt on the validity of the hypothesis. Further, an independent samples t-test did not reveal any significant

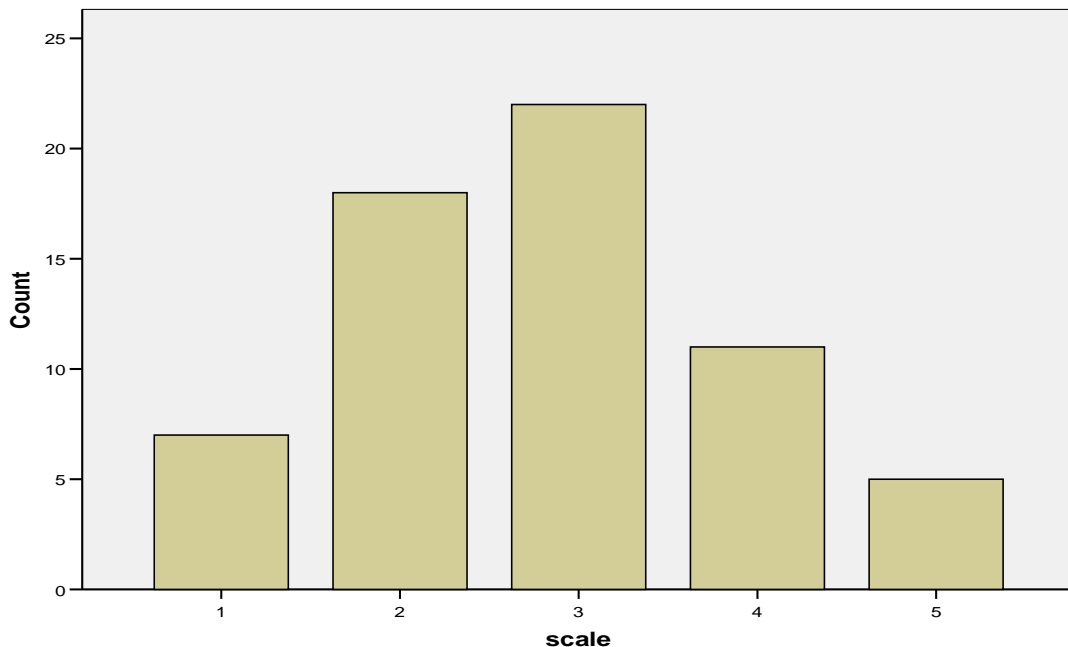
difference between the group of IS auditors and Non IS auditors (see Appendix 6). A single sample t-test was used to test the validity of the mean using a 95% confidence interval and a hypothesized mean value of 3. The result showed a p-value of 0.213 (refer to Appendix 2) which indicated that a significant difference could not be established between the two mean values. This further cast doubts on the validity of the mean value and does not offer support for hypothesis 4.

**Table 6.6 when auditing an ERP implementing company less time is spent by auditors to trace audit trail**

**Q12**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	11.1	11.1	11.1
	2	18	28.6	28.6	39.7
	3	22	34.9	34.9	74.6
	4	11	17.5	17.5	92.1
	5	5	7.9	7.9	100.0
	Total	63	100.0	100.0	

Mean 2.83  
Std. Deviation 1.100



**Figure 12 when auditing an ERP implementing company less time is spent by auditors to trace audit trail**

The second question relating to the fourth hypotheses was that “*auditors spent less time to assess and retrieve information when auditing an ERP implementing company*”. The degree of improvement in audit quality and efficiency was measured by the time spent to assess and retrieve information in an ERP audit. The result reveals that respondents were evenly split with more totally disagreeing with the statement. Although 27.7 percent or 18 respondents somewhat agreed and 10.8 percent totally agreed however, 24.6 percent of the respondent also somewhat disagreed while 13.8 percent totally disagreed (refer to Appendix 15). The result also indicated that the respondents were not sure about this question and as such decided to be non-committal (23.1 percent). In addition, the respondents that disagreed with the statement were significantly greater and as such, this question could not confirm or add support to hypothesis 4. Also the mean value of the question was 2.97, which did not hold up the statement, that when auditing an ERP implementing company less time is spent to assess and retrieve information. A single sample t-test was used to test the validity of the mean using a 95% confidence interval and a hypothesized mean value of 3 and it produced a the t-value of 2.01 in absolute terms and a corresponding p-value of 0.842, showing that a significant difference could not be established between the variables (refer to Appendix 2). This further weakened validity of the question. The t-test on this question did not offer support for hypothesis 4. In addition, an independent samples t-test did not reveal any significant difference between the group of IS auditors and Non IS auditors (see Appendix 6).

The third question relating to the fourth hypothesis was that “*ERP systems have functionalities that can enhance auditing and audit processes*”. The degree of improvement was measured by that availability of functions in an ERP system that can support and enhance audit processes. The result revealed that 80 percent of the respondent agreed that ERP systems have functionalities to enhance audit processes (refer to Appendix 15). Only 7.2 percent of the respondents disagreed while 12.9 percent where undecided on the statement. The question had a mean value of 4.09, which provide huge support to hypothesis 4. Further, an independent samples t-test did not reveal any significant difference between the group of IS auditors and Non IS auditors (see Appendix 6). In addition, a single sample t-test was used to test the validity of the mean

using a 95% confidence interval and a hypothesized mean value of 3 and it produced a p-value of less than 0.000. This result adds support and validity to the question and hypothesis 4.

Furthermore, the reliability analysis conducted revealed that the variables used in measuring hypothesis 4 had an alpha value of 0.571 (refer to Appendix 16). This was considered a little as it was below the acceptable value.

## **6.8 Evaluation of the Empirical Results**

Four hypotheses were formulated and tested in order to investigate the impact of ERP system on audit process. Based on the evidence presented in this chapter, hypothesis 1 *Auditors will experience changes in audit procedures and processes after ERP implementation* was accepted. Hypothesis 1 was measured and tested using five variables outlined in questions 2 to 6. These variables were ‘changes in audit processes and procedures’, ‘changes in auditing approach’, ‘IS auditors involvement’, ‘auditing tools utilized’ and ‘time spent in business processes’. The empirical result revealed that auditors agreed that they experienced changes in traditional audit processes and procedures when auditing an ERP implementing company. A single sample t-test and independent sample t-test was used to statistically validate and confirm these results. Furthermore, the result indicated that these changes were not as a result of using different auditing tools as the empirical result of auditing tools difference did not provide any significant distinction between tools utilized in an ERP implementing company and a non-ERP implementing company. This finding further bolstered the hypothesis by suggesting that cause of changes did not arise from auditing tools.

The finding also discovered that a different approach was unavoidable when auditing an ERP implementing company. This variation in approach also adds support to the hypothesis since the changes will be obviously in audit processes and procedures. Additionally the level of involvement of IS auditors was measured to determine whether it was considered a necessity in auditing an ERP implementing company. As expected, the result presented a clear indication that auditors considered IS auditors as an important

member of the audit team in an ERP implementing company audit. This result suggested that auditors believed that an ERP implementing company required more expertise than typically needed in a non-ERP implementing company. In addition, the finding observed that auditors spent more time in understanding the business processes in an ERP implementing company compared to a non-ERP implementing company. This further supported hypothesis 1 since the more time was spend than typically required in an ERP implementing company audit. All these provided evidence and support to accept hypothesis 1.

Based on the empirical evidence presented hypothesis 2 *Auditors will experience increased control risk after ERP implementation* was accepted. Hypothesis 2 was measured and tested using four variables outlined in questions 7 to 8 and questions 10 to 11. The variables used to measure the validity of the hypothesis were ‘time spent in assessing control risk’, ‘time spent in test of controls’, ‘inter-related business problems’, and ‘IS auditors role in ERP implementation’. On the time spent in assessing control risk, the finding indicated that auditors spent more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company. This can be interpreted that auditors believed that control could be potentially compromised in an ERP implementing company and as such commit more time to ensure reliability. This finding added support to hypothesis 2. Additionally, auditors moderately agreed that they spent more time in test of control in an ERP implementing company compared to a non-ERP implementing company. Although the amount of time spent in test of control measures was a little less than the amount of time spent on assessing control risks however, the finding also revealed that control was of enormous concern for auditors in an ERP implementing company audit. This difference in time provides evidence that auditors believe control was heightened in an ERP implementing company compared on the non-ERP implementing company. This result added support to the hypothesis. Furthermore, the finding observed that auditors were very concerned about a problem in one business process leading to a problem in a related business problem. The empirical result suggested that auditors overwhelmingly expressed this issue as imminent when auditing an ERP implementing company. From this finding, it can be interpreted that

auditors perceived an increase in control risk when auditing a company that has implemented an ERP system. This finding strongly supported hypothesis 2 that auditors will face increased control risk after ERP implementation. Based on these control risk auditors revealed that it was necessary for IS auditors to be part of the implementation team when a company wants to implement ERP system. The auditors believe that including an IS auditor was vital in solving some of the control and integrity concerns that they face when auditing an ERP implementing company. All these finding and result provided support to accept hypothesis 2.

Hypothesis 3 *Auditors will experience decreased substantive testing after ERP implementation* was accepted based on the empirical evidence. The finding revealed that auditors conducted less substantive testing in an ERP implementing company compared to a non-ERP implementing company. This could be partly because ERP system offered an integrated solution to companies' business processes and there by limiting the need for rigorous substantive testing when auditing an ERP implementing company. This finding was considered very significant in this study because it also collaborated the finding in hypothesis 1 suggested that ERP implementing company audit brought changes in the traditional audit processes and procedures.

Based on the evidence presented in this chapter, hypothesis 4 *'ERP systems will improve audit quality and efficiency by providing real-time information'* was rejected. Hypothesis 4 was measured and tested using three variables outlined in question 12 to 14. The variables were 'time spent by auditors to trace audit trail', 'time spent to assess and retrieve information' and 'the functionalities of an ERP system'. Surprisingly the result indicated that auditors did not spend less time to trace audit trail in an ERP implementing company as proposed in the hypothesis. This result was unexpected because it was assumed that ERP system with its real-time capabilities would have provided auditors with less time-consuming audit trail. However, it can be argued that since the earlier finding in hypothesis 2 indicated that more time was spent by auditors to understand the business process in an ERP implementing company, therefore it may be that such time was lost in understanding the system and business process rather than in tracing the audit

trail. Consequently, this result did not provide any support for hypothesis 4. In addition, the finding of the second variable that measured the time spent to assess and retrieve information in an ERP implementing company did not reveal any difference too. This was also considered surprising, as one would assume that information retrieval in an ERP implementing company will be on a real-time basis. This finding was also consistent with the previous result on the time spent to trace audit trail. This result cast serious doubt on the validity of hypothesis 4, as it could not offer any support to this hypothesis. The result of the third variable used in hypothesis 4 revealed that ERP system had functionalities that can enhance auditing and audit processes. This finding was important because it demonstrated that although ERP implementing companies audit did not provide less time in audit trail and information retrieve however, ERP systems could improve and enhance auditing and audit process. This empirical result provided support for hypothesis 4 but it was not enough to accept this hypothesis. The result only confirmed that ERP systems could potentially improve audit quality and efficiency but such improvement was not by providing real-time information as proposed in hypothesis 4.

## **6.9 Validity, Reliability, and Generalizability**

This section evaluates the validity, reliability and generalizability for the analyzed empirical evidence. This is necessary to assess the quality of the study and determine whether it qualifies to contribute to general body of knowledge. Some factors that might have affected the results of the empirical evidence are discussed.

The empirical evidence and result was obtained through an online questionnaire survey. The questions were very clear and unambiguous (See Appendix 1). The questionnaire was sent to 365 auditors but only 100 responded by actually filling in the survey while only 71 of the responses was actually useful for the analysis. A higher response rate would have added more validity and generalizability. However, I believe that the result was still reasonable to provide a good valid analysis.

Another limitation could be that the study was conducted in one country and as such, the respondents were mainly from Finland. However, auditing practice and procedures are usually uniform and cut across countries. In addition, international audit practice governed audit practices in countries. Therefore, the result obtained from this study can be seen to be applicable in wider European context and beyond.

For a study of this nature, limitation will exist in the area of knowledge and experience of the respondents. There was no way to measure what respondents considered appropriate experience in an audit engagement. However, the respondents were asked about their level of experience to ensure that the target sample was achieved. In addition, the respondents were selected from the corporate database of auditors and were considered knowledgeable in providing reliable information. Therefore, the results obtained are considered reliable.

## **6.10 Chapter Summary**

This chapter discussed and analyzed the empirical research. 100 responses were received through webropol representing a responses rate of 27.4 %. The responses were analyzed to test the validity of the hypothesis formulated.

Hypothesis 1 was accepted since the result indicated that auditors experienced changes in audit processes and procedures when auditing an ERP implementing company. Hypothesis 2 was also accepted, as there was evidence of increased control risk after ERP implementation. One sample t-test was used to test to reliability of the results obtained. Further, hypothesis 3 was accepted as the result showed that there was decreased substantive testing in an ERP implementing company compared to a non-ERP implementing company.

However, hypothesis 4 was rejected, as the result did not find any evidence that ERP systems will improve audit quality and efficiency through real-time information assess. The result could not establish any link with ERP systems providing timely audit trail or

providing quick access to information but it revealed that ERP systems had functionalities to enhance auditing and audit processes.

## **7 Conclusion**

This chapter will draw conclusion from the empirical result and discuss its implications. Section 7.1 will discuss the contributions of the research while section 7.2 will present the suggestions for future research.

### **7.1 Analysis of the Contribution**

The aim of this research was to study the impact of ERP system on the audit process. The study attempted to find out if there were changes in audit process as a result of ERP implementation. The result from the empirical study revealed that there were significant changes in audit processes due to ERP implementation. This meant that auditors had to evolve from the traditional audit process in order to conduct audit in an ERP implementing company. The result further showed that the need for IS auditors is increasingly becoming inevitable in the audit profession. Auditors indicated that it was very essential in an ERP audit to have an IS auditor as part of the audit team. This means that there is need for auditors to be technologically equipped in order to handle future challenges as more companies implement ERP systems.

The research has clearly discovered that auditors felt control risk was increased after ERP implementation. It showed that ERP implementation brought about some concerns for auditors in the areas of assess controls. Although ERP vendors argued that ERP systems have robust assess control protocols, however, auditors consider control procedures to be vulnerable after ERP implementation and as such spent more time and resources than typically spent to ensure that it was not compromised. Auditors perceived this vulnerability to arise during the implementation phase of ERP systems. In addition, auditors suggested that IS auditors should play active role in the implementation phase of ERP systems in a company to ensure controls are not compromised during the early phase.

This research also found that ERP implementation affected the level of substantive test conducted in an audit engagement. The paper found that auditors performed less substantive testing in ERP implementing company compared to non-ERP implementing company. This was very significant for this research because substantive test was considered a vital stage in audit process. This showed that auditors were utilizing the unique capabilities of ERP systems in auditing functions and that ERP system could be valuable to auditors. It can be argued that as auditors begin to use the features of ERP system, more changes in audit process may emerge.

This research also found that not all anticipated benefits were generated in an ERP audit. Although ERP systems provided a real-time information flow, it did not imply that auditors would spend less time in audit trail and information retrieval. Auditors believed that ERP systems did not provide them with timely information when performing an audit engagement. This was also a key finding because it would have been understandingly argued that timely assess to information will be derived from an ERP audit. However, the study also noted that ERP systems had in-built functionalities to enhance auditing but that such functionalities were not in the area of information retrieval. Therefore, auditors need to have the technological expertise to achieve efficient utilization of ERP functions in an audit engagement.

## **7.2 Suggestions for Further Research**

There are various possibilities to conduct further research based on the literature and the empirical findings. It would be interesting to study whether it more rewarding for auditors when auditing an ERP implementing company compared to traditional non-ERP implementing company audit. This is because there seem to be merit and demerit in ERP system audit as found in this current study. A more narrow study could be carried out to reveal whether ERP audit have lead to greater efficiency when compared to non-ERP audit.

Also it would interesting to study why auditors are not obtaining the much alleged benefits of ERP systems with regard to faster audit trail and timely information retrieval. As ERP vendors continue to emphasize ERP systems ability to provide seamless flow of information, it would be very interesting to investigate whether it transcends to auditing functions or whether auditors are technologically deficient in utilizing ERP systems. This would further explain and evaluate ERP systems ability to facilitate audit process.

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## Appendix 1

The questionnaire

Cover Letter

Dear respondents,

I am a master's student at the Swedish School of Economics and Business Administration in Helsinki, and the enclosed survey is part of a master's thesis at the program in Advanced Financial Information System. The research objective is to examine the impact of ERP system on the audit process. Hence, the target respondents are auditors that have audited a company with ERP implementation as well as a non-ERP company.

The survey takes around 10 minutes to fill-in and send and it consists of questions regarding auditing an ERP implementing company and a non-ERP implementing company. In case you do not have any opinion regarding one or several of the above questions, just tick "0".

By **ERP implementing company**, I refer to a company that has implemented an Enterprise Resource Planning system enabling integration of business processes across functional areas.

By **Non-ERP implementing Company**, I refer to companies that have not implemented an ERP system but have disparate application systems used within its functional areas.

By **IS auditors**, I refer to Information System auditors with specialized knowledge and skill in Information system.

I understand your extremely busy schedule and time constraint however; your filling out this survey will be of tremendous value to this research work.

Best Regards.

Joseph Nwankpa

[Joseph.nwankpa@hanken.fi](mailto:Joseph.nwankpa@hanken.fi)

## Questionnaire

- 1) Have you been part of an audit team that audited in an ERP implementing company and a non-ERP implementing company?

Yes No

If you answer No please skip all other questions below

- 2) When auditing in an ERP environment auditors experience changes in traditional audit processes and procedures. 1 = Totally Disagree 5 = Totally agree 0 = No opinion.

- 3) Auditing an ERP implementing company requires a different approach compared to auditing a non-ERP implementing company. 1 = Totally Disagree 5 = Totally agree 0 = No opinion

- 4) IS auditors are essential part of the audit team when auditing an ERP implementing company. 1 = Totally Disagree 5 = Totally agree 0 = No opinion

- 5) The auditing tool used to audit an ERP implementing company differs from the tool used in a non-ERP implementing company. 1 = Totally Disagree, 5 = Totally agree 0 = No opinion.

- 6) More time is spent understanding the system and business process in an ERP implementing company as opposed to a non-ERP implementing company? 1 = Totally Disagree 5 = Totally agree 0 = No opinion

- 7) Auditors spend more time in assessing control risk in an ERP implementing company compared to a non-ERP implementing company. 1 = Totally disagree 5 = Totally agree 0 = No opinion

- 8) Auditors spend more time in test of control when auditing an ERP implementing company compared to a non-ERP implementing company. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 9) Auditing an ERP implementing company leads to less substantive testing compared to non-ERP implementing company. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 10) When auditing an ERP implementing company you are aware that a problem in one business process will lead to a problem in a related business process. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 11) During ERP implementation project the IS auditor should be part of the implementation team to address control and infrastructure integrity in the company. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 12) When auditing an ERP implementing company less time is spent by auditors to trace audit trail. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 13) When auditing an ERP implementing company less time is spent to assess and retrieve information. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 14) ERP systems have functionalities that can enhance auditing and audit processes. 1 = Totally Disagree 5 = Totally agree 0 = No opinion
- 15) How many years have you been working as an IS auditor in case you are one?

Appendix 2: Result from Single Sample T-test on Question 2 to Question 14

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q2	71	3.61	.963	.114
Q3	71	3.83	1.000	.119
Q4	71	4.13	.877	.104
Q6	71	3.80	.995	.118
Q7	71	3.62	1.258	.149
Q8	71	3.45	1.296	.154
Q9	71	3.69	1.090	.129

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q2	5.298	70	.000	.606	.38	.83
Q3	7.003	70	.000	.831	.59	1.07
Q4	10.824	70	.000	1.127	.92	1.33
Q6	6.802	70	.000	.803	.57	1.04
Q7	4.152	70	.000	.620	.32	.92
Q8	2.930	70	.005	.451	.14	.76
Q9	5.335	70	.000	.690	.43	.95

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q5	66	3.23	.989	.122

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q5	1.867	65	.066	.227	-.02	.47

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q10	68	4.00	.864	.105
Q11	68	3.99	1.139	.138

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q10	9.546	67	.000	1.000	.79	1.21
Q11	7.131	67	.000	.985	.71	1.26

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q12	63	2.83	1.100	.139

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q12	-1.259	62	.213	-.175	-.45	.10

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q13	65	2.97	1.237	.153

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q13	-.201	64	.842	-.031	-.34	.28

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q14	70	4.09	.974	.116

**One-Sample Test**

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q14	9.324	69	.000	1.086	.85	1.32

Appendix 3. Result from Independent Sample T-test (Auditor will experience changes in audit processes and procedures after ERP implementation) Non IS Auditors vs. IS Auditors.

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q2 Non IS Auditors	53	3.64	.963	.132
IS Auditors	18	3.50	.985	.232
Q3 Non IS Auditors	53	3.85	.988	.136
IS Auditors	18	3.78	1.060	.250
Q4 Non IS Auditors	53	4.09	.925	.127
IS Auditors	18	4.22	.732	.173
Q6 Non IS Auditors	53	3.79	1.007	.138
IS Auditors	18	3.83	.985	.232

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q2	Equal variances assumed	.265	.609	.536	69	.594	.142	.264	-.385	.668
Q3	Equal variances assumed	.012	.912	.260	69	.796	.071	.275	-.477	.619
Q4	Equal variances assumed	.597	.442	-.532	69	.597	-.128	.241	-.608	.352
Q6	Equal variances assumed	.054	.817	-.150	69	.882	-.041	.273	-.586	.504

**Group Statistics**

Group		N	Mean	Std. Deviation	Std. Error Mean
Q5	Non IS Auditors	48	3.10	.973	.140
	IS Auditors	18	3.56	.984	.232

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q5	Equal variances assumed	.204	.653	-1.674	64	.099	-.451	.270	-.990	.087

Appendix 4: Result from Independent Sample T-test (Auditors will experience increased control risk after ERP implementation ). Non IS Auditors vs. IS Auditors.

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q7 Non IS Auditors	53	3.51	1.295	.178
IS Auditors	18	3.94	1.110	.262
Q8 Non IS Auditors	53	3.45	1.338	.184
IS Auditors	18	3.44	1.199	.283

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q7	Equal variances assumed	3.363	.071	-1.273	69	.207	-.435	.342	-1.116	.246
Q8	Equal variances assumed	.680	.412	.024	69	.981	.008	.356	-.702	.719

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q10 Non IS Auditors	50	4.04	.832	.118
IS Auditors	18	3.89	.963	.227

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q10	Equal variances assumed	.717	.400	.634	66	.529	.151	.239	-.325	.627

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q11 Non IS Auditors	50	3.94	1.219	.172
IS Auditors	18	4.11	.900	.212

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q11	Equal variances assumed	2.059	.156	-.543	66	.589	-.171	.315	-.800	.458

Appendix 5: Result from Independent Sample T-test (Auditors will experience decreased substantive testing after ERP implementation) Non IS Auditors vs. IS Auditors.

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q9 Non IS Auditors	53	3.68	1.123	.154
IS Auditors	18	3.72	1.018	.240

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q9	Equal variances assumed	1.495	.226	-.144	69	.886	-.043	.299	-.640	.554

Appendix 6: Result from Independent Sample T-test (ERP systems will improve audit quality and efficiency by providing real-time information) Non IS Auditors vs. IS Auditors.

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q12 Non IS Auditors	45	2.84	1.147	.171
IS Auditors	18	2.78	1.003	.236

**Independent Samples Test**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Q12 Equal variances assumed	.811	.371	.216	61	.830	.067	.309	-.552	.685

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q13 Non IS Auditors	47	2.87	1.244	.182
IS Auditors	18	3.22	1.215	.286

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q13	Equal variances assumed	.048	.827	-1.021	63	.311	-.350	.343	-1.035	.335

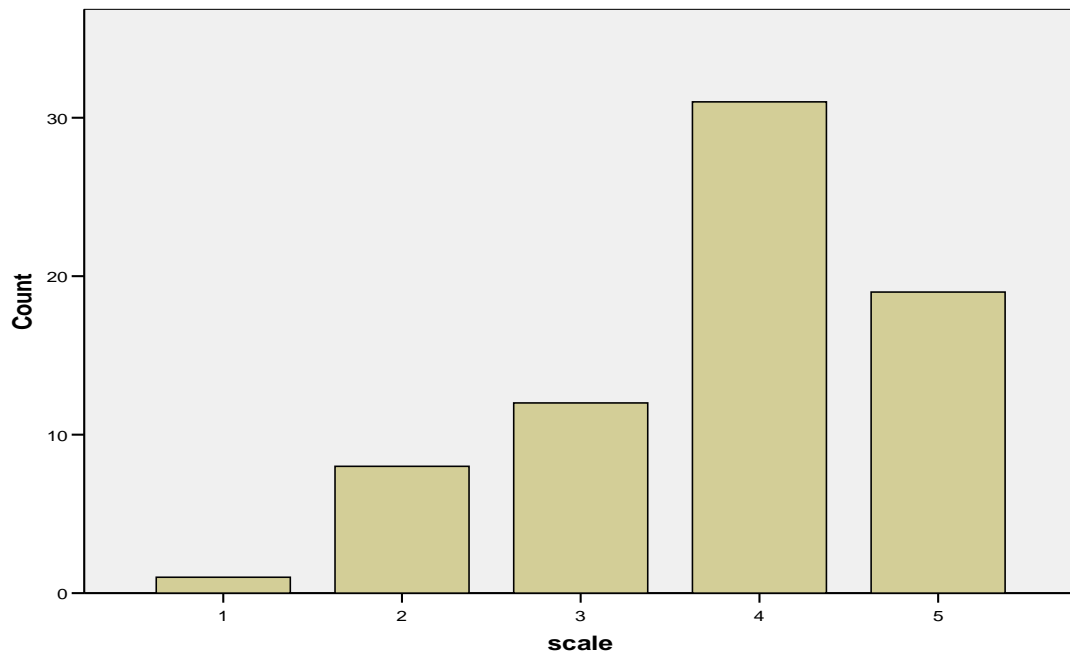
**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q14 Non IS Auditors	52	3.98	1.038	.144
IS Auditors	18	4.39	.698	.164

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q14	Equal variances assumed	.379	.540	-1.547	68	.126	-.408	.264	-.934	.118

Appendix 7: Table and chart representing responses on Question 3



*Auditing ERP implementing company requires a different approach compared to auditing a non-ERP company*

**Q3**

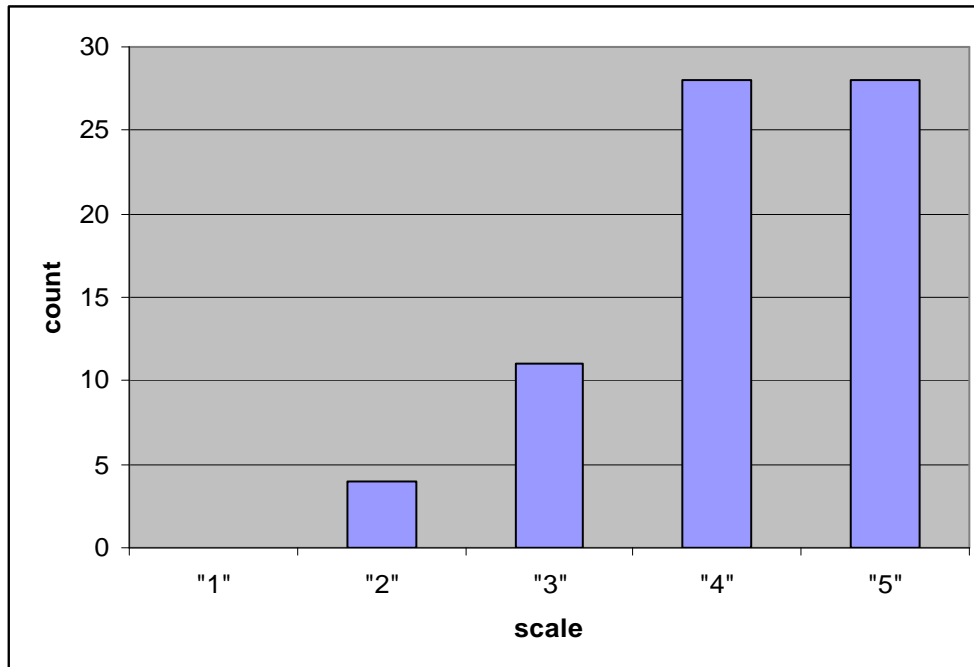
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	1	1.4	1.4	1.4
2	8	11.3	11.3	12.7
3	12	16.9	16.9	29.6
4	31	43.7	43.7	73.2
5	19	26.8	26.8	100.0
Total	71	100.0	100.0	

Mean 3.83

Std. Deviation 1.000

*Auditing ERP implementing company requires a different approach compared to auditing a non-ERP company*

Appendix 8: Table and chart representing responses on Question 4



*Auditors are essential part of the audit team when auditing an ERP implementing company.*

**Q4**

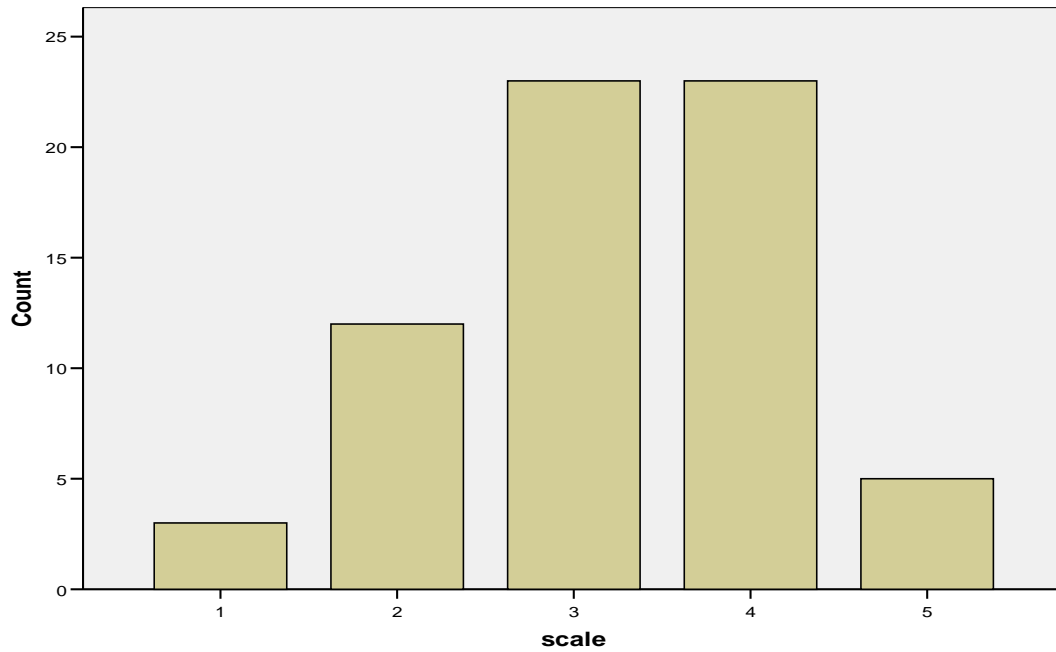
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	5.6	5.6	5.6
	3	11	15.5	15.5	21.1
	4	28	39.4	39.4	60.6
	5	28	39.4	39.4	100.0
Total		71	100.0	100.0	

Mean 4.13

Std. Deviation 0.877

*IS auditors are essential part of the audit team when auditing an ERP implementing company.*

Appendix 9: Table and chart representing responses on Question 5



*Auditing tool used to audit an ERP implementing company differ from tool used in a non-ERP implementing company.*

**Q5**

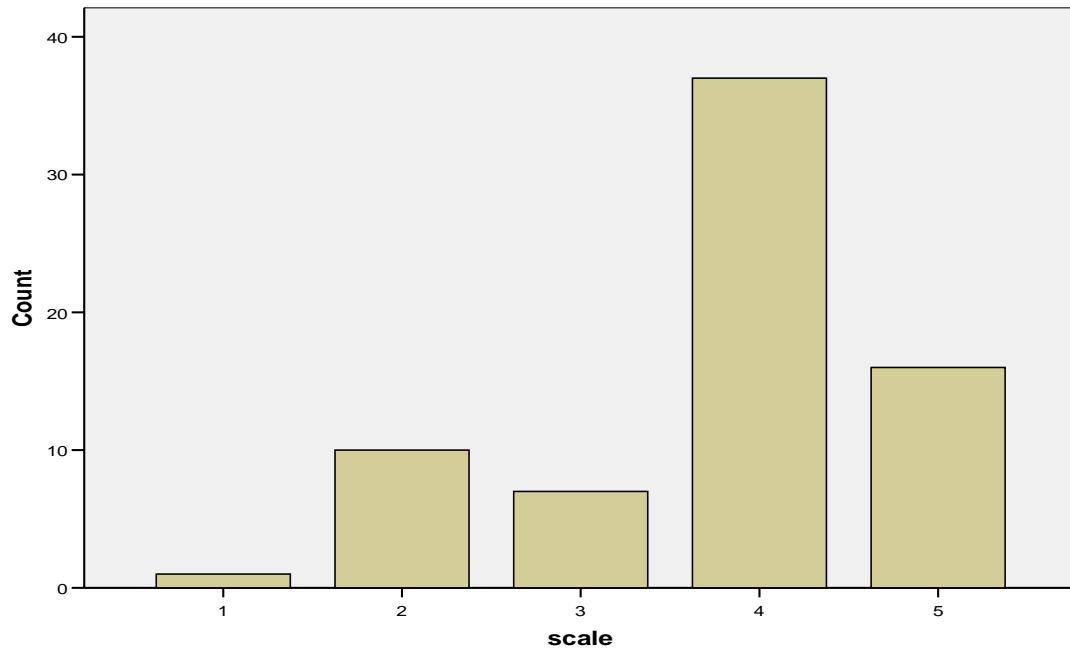
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	4.5	4.5	4.5
	2	12	18.2	18.2	22.7
	3	23	34.8	34.8	57.6
	4	23	34.8	34.8	92.4
	5	5	7.6	7.6	100.0
	Total	66	100.0	100.0	

Mean 3.23

Std. Deviation 0.989

*Auditing tool used to audit an ERP implementing company differ from tool used in a non-ERP implementing company*

Appendix 10: Table and chart representing responses on Question 6



*More time is spent understanding the system and business process in an ERP implementing company compared to a non-ERP implementing company.*

Q6

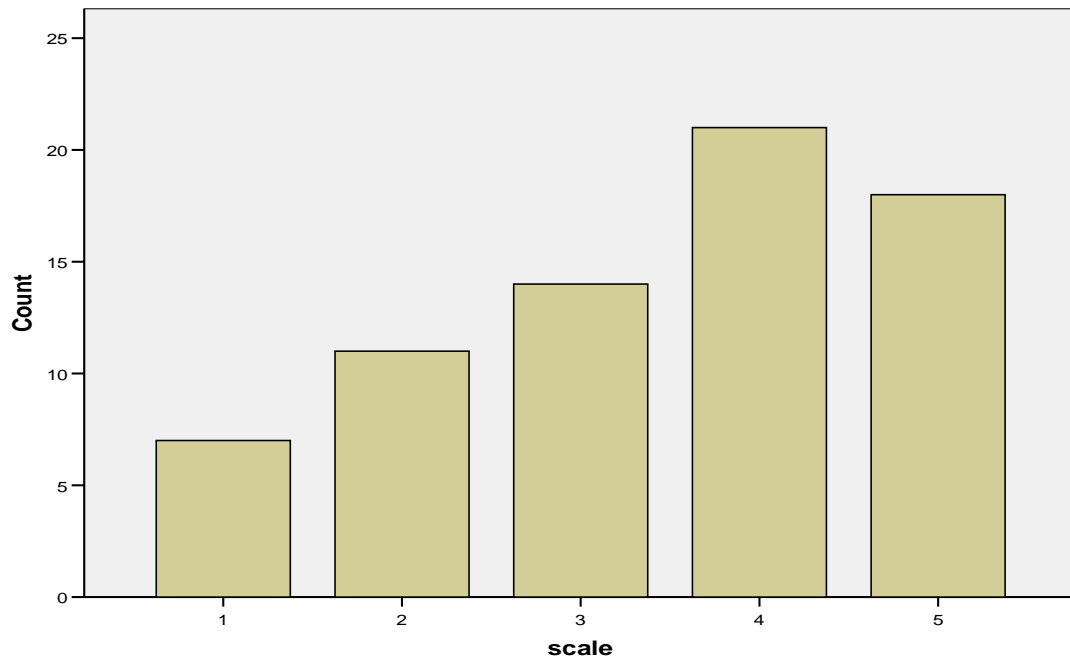
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	1	1.4	1.4	1.4
2	10	14.1	14.1	15.5
3	7	9.9	9.9	25.4
4	37	52.1	52.1	77.5
5	16	22.5	22.5	100.0
Total	71	100.0	100.0	

Mean 3.80

Std. Deviation 0.995

*More time is spent understanding the system and business process in an ERP implementing company compared to a non-ERP implementing company.*

Appendix 11: Table and chart representing responses on Question 8



*Auditors spend more time in test of control when auditing an ERP implementing company compared to a non-ERP implementing company.*

**Q8**

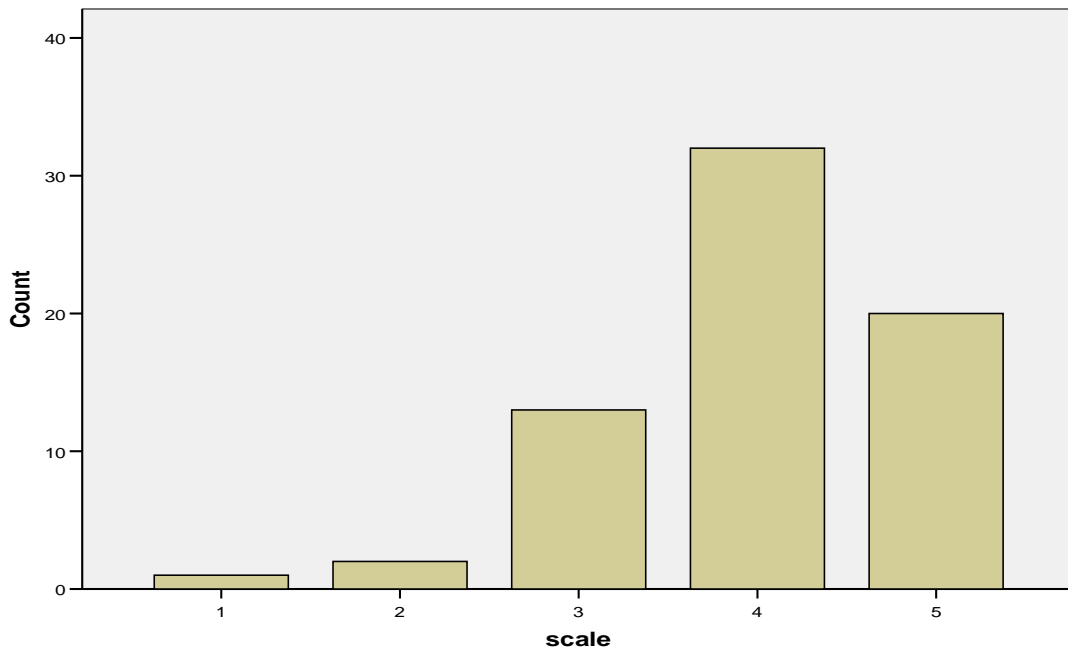
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	9.9	9.9	9.9
	2	11	15.5	15.5	25.4
	3	14	19.7	19.7	45.1
	4	21	29.6	29.6	74.6
	5	18	25.4	25.4	100.0
	Total	71	100.0	100.0	

Mean 3.45

Std. Deviation 1.296

*Auditors spend more time in test of control when auditing an ERP implementing company compared to a non-ERP implementing company.*

Appendix 12: Table and chart representing responses on Question 10



*Auditing an ERP implementing company you are aware a problem in one business process will lead to a problem in a related business process*

**Q10**

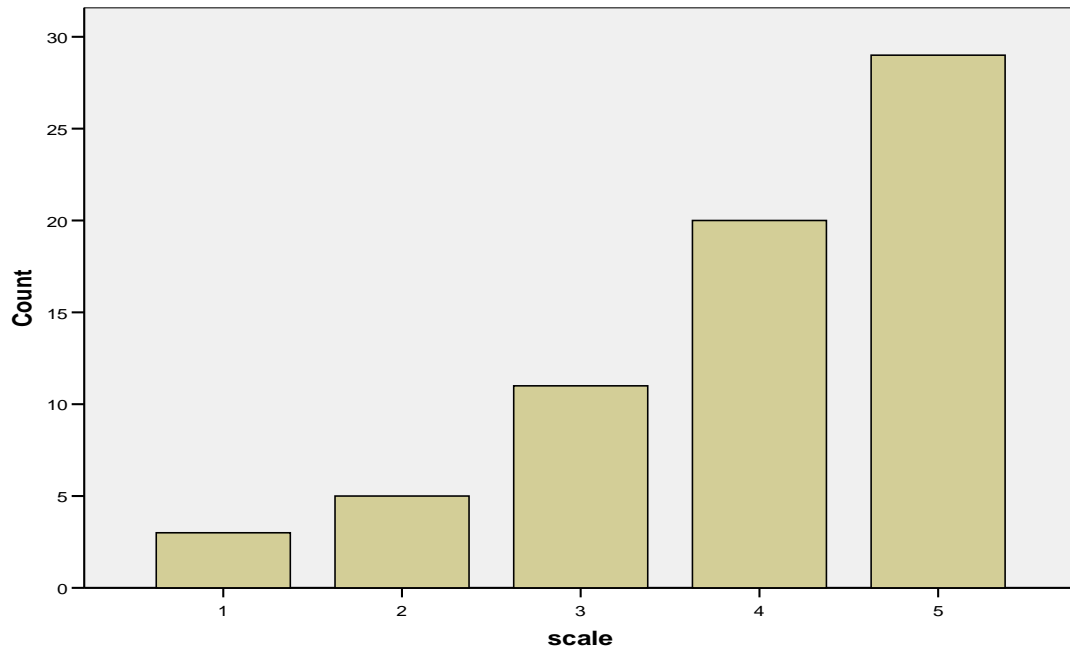
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	1	1.5	1.5	1.5
2	2	2.9	2.9	4.4
3	13	19.1	19.1	23.5
4	32	47.1	47.1	70.6
5	20	29.4	29.4	100.0
Total	68	100.0	100.0	

Mean 4.00

Std. Deviation 0.864

*Auditing an ERP implementing company you are aware a problem in one business process will lead to a problem in a related business process*

Appendix 13: Table and chart representing responses on Question 11



*During ERP implementation project IS auditors should be part of implementation team to address control and infrastructure integrity*

Q11

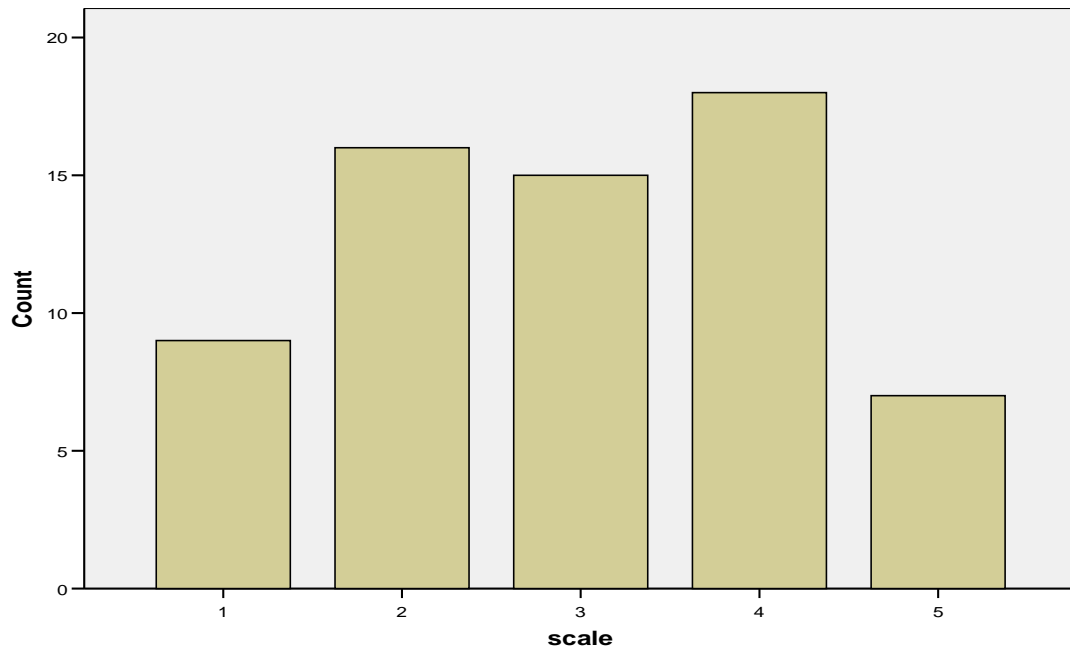
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	3	4.4	4.4	4.4
2	5	7.4	7.4	11.8
3	11	16.2	16.2	27.9
4	20	29.4	29.4	57.4
5	29	42.6	42.6	100.0
Total	68	100.0	100.0	

Mean 3.99

Std. Deviation 1.139

*During ERP implementation project IS auditors should be part of implementation team to address control and infrastructure integrity*

Appendix 14: Table and chart representing responses on Question 13



*When auditing an ERP implementing company less time is spent to assess and retrieve information*

**Q13**

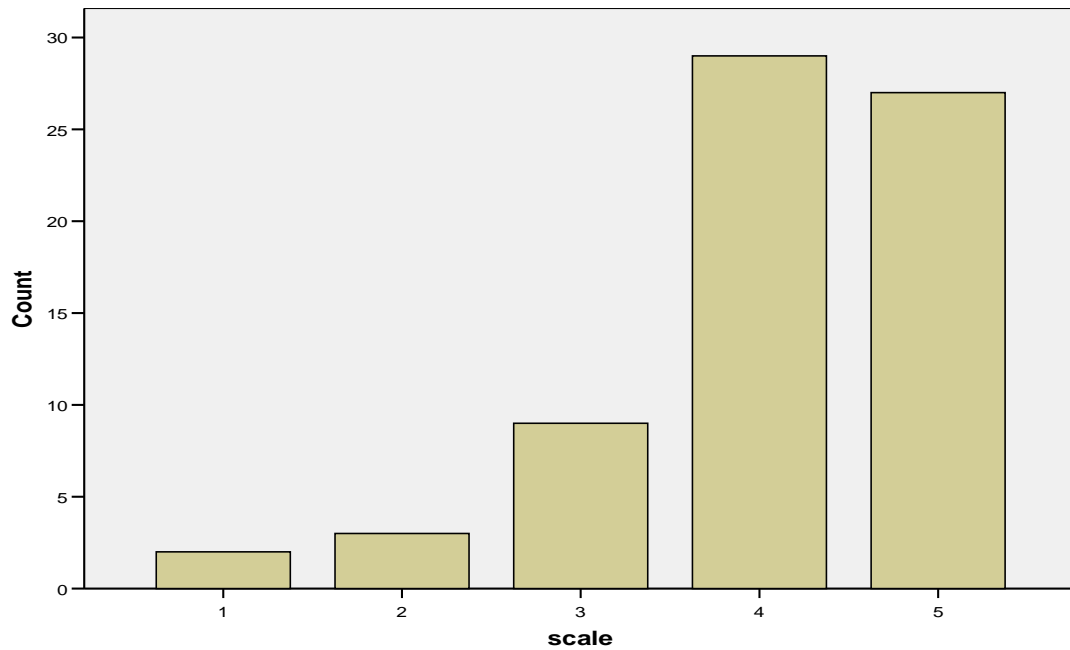
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	13.8	13.8	13.8
	2	16	24.6	24.6	38.5
	3	15	23.1	23.1	61.5
	4	18	27.7	27.7	89.2
	5	7	10.8	10.8	100.0
	Total	65	100.0	100.0	

Mean 2.97

Std. Deviation 1.237

*Table 6.24 when auditing an ERP implementing company less time is spent to assess and retrieve information*

Appendix 15: Table and chart representing responses on Question 14



*ERP systems have functionalities that can enhance auditing and audit processes.*

**Q14**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	2	2.9	2.9	2.9
2	3	4.3	4.3	7.1
3	9	12.9	12.9	20.0
4	29	41.4	41.4	61.4
5	27	38.6	38.6	100.0
Total	70	100.0	100.0	

Mean 4.09

Std. Deviation 0.974

*ERP systems have functionalities that can enhance auditing and audit processes.*

Appendix 16: Cronbachs Alpha Tables

*Cronbachs Alpha table of Question 7 and Question 8 (Hypothesis 2)*

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.860	.861	2

*Cronbachs Alpha table for Hypothesis 2*

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.504	.521	4

*Cronbachs Alpha table for Hypothesis 4*

**Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.571	.559	3