

**An Investigation of an Audit Expectation Gap Concerning the
Use of Computer Assisted Audit Techniques in Developing
Countries – the Case of Jordanian Audit Firms**

Abdel Razaq ‘Mohammad Said’ Al-Farah

B.A. (Accounting), Yarmouk University, 1997, Jordan

M.S. (Accounting), University of Jordan, 2001, Jordan

**A Dissertation Submitted in Fulfillment of the Requirement for The Degree of
Doctor of Philosophy at The University of Newcastle**

July, 2007

Certification

I hereby certify that the work embodied in this thesis is the result of original research and has not been submitted for a higher degree to any other University or institution.

(Signed)-----

Acknowledgement

I sincerely thank Almighty Allah, for his quittance and blessing.

I would like to express sincere thanks to my supervisor Emeritus Professor Frank Clarke. I am very appreciative of the valuable support, supervision, guidance, and motivation he provided. His support exceeded his formal responsibilities. Because of this, I regard him as more than a supervisor. I will never forget his great encouragement to me in my working towards achieving to this degree.

My great respect goes to my father and mother for their encouragement and generous prayers for my success, and to my brothers and sisters for their support, and wishes.

Special appreciation goes to my brother Dr. Khalid Al-Farah, for his continuous support and advice in different stages of my life; to him I owe a huge debt.

I wish to express my profound appreciation to all Jordanian audit firms which participated in this research; to all who assisted me in collecting data, to all who assisted and contributed to my research in any capacity, especially to Dr. Raed Al- Zoghoul for his statistical help, and to Ruth Massey for proofreading the thesis.

I would like to express many thanks to the staff and colleagues of the School of Business at Ourimbah Campus for their friendship, help and support.

My personal gratitude to my wife Fatima, for her love, sacrifices, understanding, and encouragement. Without her patience and constant support nothing would have been achievable; to her I owe a huge debt. Finally, I would like to thank my children, Lana, Dana and Zaid for their understanding and sacrificing their time to enable me to finish the thesis.

Table of Contents

Certification.....	ii
Acknowledgement	iii
Table of Contents	iv
List of Tables	xii
List of Figures.....	xv
Abstract.....	xvi
Chapter 1: Introduction to the Study: Misplaced Expectations.....	1
1.1 Introduction – the Importance of Auditors’ Practices.....	1
1.2 Professional Crossroads – An Uncompetitive Technical Base?	3
1.2.1 Jordan’s Corporate Sector.....	5
1.2.2 The Structure of the Audit Market in Jordan	7
1.3 The Research Problem	9
1.4 Significance of the Study.....	11
1.5 Thesis Structure.....	12
Chapter 2: Auditing Computer Based Accounting Information Systems.....	13
2.1 Introduction – the Implications of Computer Technology	13
Part One: The Impact of Information Technology on Accounting, Auditing, and Auditors; and the CAATs-Related Auditing Standards	14
2.2 Information Technology and Accounting	14

2.3	Information Technology and Auditing.....	16
2.4	Information Technology and the Auditor	18
2.5	Auditing Standards Specifying and Otherwise Encouraging the Use of CAATs... ..	20
Part Two : Data Organization, Processing, and Audit Approaches Within Computerized Accounting Systems		23
2.6	Data Organization and Processing Within Computerized Systems.....	23
2.6.1	Data Organization within Computerized Files.....	24
2.6.2	Data Processing Approaches.....	25
2.6.2.1	Batch Input / Batch Processing	26
2.6.2.2	On-line Input / Batch Processing.....	27
2.6.2.3	On-line Input / Real-Time Processing.....	28
2.7	Auditing Approaches to Computer-Based Accounting Systems.....	29
2.7.1	Auditing Around the Computer	30
2.7.2	Auditing Through the Computer	32
2.7.3	Auditing With the Computer.....	35
2.8	Summary	35
Chapter 3: Jordan, the Field of the Study		37
3.1	Introduction	37
3.2	Jordan - Historical Background.....	40
3.3	Factors Influencing the Orientation of Accounting in Jordan	42

3.4	The Emergence of the Amman Financial Market and its Effect on the Accounting and Auditing Profession	44
3.5	Development of an Auditing Profession in Jordan.....	46
3.6	The Legal Framework for the Auditing Profession in Jordan.....	48
3.6.1	Practicing Auditing – Easy Professional Entry - Law (No. 10/1961).	49
3.6.2	Professional Auditing Examination - Law (No. 32/1985)	52
3.6.2.1	The JACPA – a Professional Landmark.....	54
3.6.3	Organizing the Practice of the Public Accounting Profession - Law (No. 73/2003).....	55
3.7	Financial Reporting by the Public Companies in Jordan and Its Influence on the Use of CAATs.....	57
3.7.1	Financial Reporting in the Companies Law (No. 22/1997)	58
3.7.2	Financial Reporting in the Securities Law (No. 76/2002).....	59
3.7.3	Financial Reporting in the Banks Law (No. 28/2000)	60
3.7.4	Financial Reporting in the Insurance Regulatory Law (No. 33/1999).....	61
3.7.5	Financial Reporting and Computerized Audit Techniques	62
3.8	Accounting and Auditing Education in Jordan.....	62
3.9	Summary - Auditing’s Push toward Maturity in Jordan	68
Chapter 4: Information Technology and Auditing Related Literature.....		70
4.1	Introduction - Contemporary Auditing.....	70
4.2	The History of Computerization and the Literature Related to the Use of Computers by Business Firms in Jordan	71

4.2.1	The History of Computer Usage in Jordan	71
4.2.2	Literature Related to the Use of Computer Technology in Jordanian Organizations.	72
4.3	Studies Related to the Use of Information Technology in Auditing in Jordan..	76
4.4	The Literature Studying the Impact of Information Technology on the Auditing Process.	80
4.5	Summary – Audit Technology an Imperative.....	90
Chapter 5: Computer Assisted Audit Techniques Related Literature		92
5.1	Introduction – Widespread Use of Audit Technology.....	92
5.2	The Computer Assisted Audit Techniques Literature	93
5.2.1	The Literature That Surveys Different CAATs Available to Auditors	93
5.2.2	The Literature Reporting Studies of the Uses of CAATs by Internal Auditors	94
5.2.3	The Literature Reporting Studies of the Uses of CAATs by both External and Internal Auditors.	102
5.2.4	The Literature on Studies of the Uses of CAATs by External Auditors	110
5.3	Summary - the Literature Discussing CAATs	112
Chapter 6: The Common Computer Assisted Audit Techniques.....		115
6.1	Introduction – the Application of CAATs.....	115
6.2	Test of Application Controls v. the Substantive Testing CAATs.....	116
6.3	Testing of Application Controls CAATs	117
6.3.1	Test Data	118
6.3.2	Base Case System Evaluation (BCSE)	120

6.3.3	Integrated Test Facility (ITF).....	121
6.3.4	Parallel Simulation (PS).....	123
6.3.5	Source Code Comparison.....	125
6.3.6	Flowcharting Program.....	125
6.3.7	Reprocessing	126
6.3.8	Tracing	126
6.3.9	Mapping	127
6.3.10	Snapshot.....	128
6.4	Substantive Testing CAATs.....	130
6.4.1	Embedded Audit Module (EAM).....	130
6.4.2	System Control Audit Review File (SCARF).....	131
6.4.3	Audit Hooks	133
6.4.4	Generalized Audit Software (GAS)	133
6.4.5	Utility Programs.....	134
6.4.6	Custom Designed Software.....	134
6.5	Summary - CAATs and State-of-the-art Auditing	135
	Chapter 7: The Study's Methodology	137
7.1	Introduction – a Technology Expectations Gap	137
7.2	The Study Questions and Hypotheses.....	138
7.3	The Research Design	144
7.3.1	Population of the Field Study.....	145

7.3.1.1	Justification for Selecting the Jordanian Audit Firms Undertaking the Audit of Public Shareholding Companies as the Population of the Study.....	146
7.3.1.2	Justification for Selecting the Kingdom of Jordan as the Country for the Field Work.....	147
7.3.2	Sampling Frame and Procedures for Selecting the Thesis Sample	148
7.3.3	Participants in the Field Study	149
7.3.4	The Questionnaire as an Instrument to Collect the Study Primary Data.....	150
7.3.4.1	Methods of Developing the Questionnaire.....	151
7.3.4.2	Distribution and Collection of the Questionnaire.....	155
7.3.4.3	The Internal Consistency of the Thesis Instrument.....	157
7.4	Data Analysis Methods	158
7.5	Summary	160
Chapter 8:	Research Results.....	161
8.1	Introduction - Descriptive Statistics and Hypotheses testing	161
8.2	Demographic Data (Questionnaire Part 1)	161
8.2.1	EDP Audit Managers' Gender	161
8.2.2	EDP Audit Managers' Age	162
8.2.3	EDP Audit Managers Professional Experience in EDP Auditing.....	163
8.2.4	Country of Graduation of Jordan's EDP Audit Managers	163
8.2.5	Last Degree Discipline of the EDP Audit Managers	164
8.3	Descriptive Statistics Regarding the Use of CAATs (Questionnaire Part 2) ...	165

8.4	Descriptive Statistics Regarding the Potential Benefits of Using CAATs (Questionnaire Part 3).....	171
8.5	Descriptive Statistics Regarding the Obstacles Constraining the Use of CAATs (Questionnaire Part 4).....	179
8.6	The Internal Consistency of the Thesis Instrument	188
8.7	Normality Assumptions Check.....	188
8.7.1	The Kolmogorov-Smirnov Test	189
8.7.2	The Probability Plots (p-p).....	191
8.8	Hypotheses Testing.....	192
8.8.1	Hypotheses 1 and 2 Relating to the Audit Gap and the Use of Computer Assisted Audit Techniques (Part 2 of the Questionnaire).....	193
8.8.2	Hypotheses 3 and 4 Relating to the Perception of the Potential Benefits of CAATs Usage by Jordanian Audit Firms (Part 3 of the Questionnaire)	199
8.8.3	Hypotheses 5 Relating to the Barriers Constraining the Use of CAATs by Jordanian Audit Firms (Part 4 of the Questionnaire)	202
8.9	Summary	206
Chapter 9: Discussion, Conclusions and Recommendations		207
9.1	Introduction	207
9.2	Caveats	208
9.3	Future Research	208
9.4	Survey Findings	209
9.4.1	Demographic Data Results Discussion	209

9.4.2	A Catalogue of Confusing Inconsistencies - The Use and Awareness of the Potential Benefits of, and the Obstacles Constraining the Utilization of CAATs.....	209
9.4.3	The Hypotheses.....	217
9.5	Recommendations of the Study	220
9.6	Peroration.....	222
	Bibliography of the Works Cited.....	224
	Appendix A Survey Information Sheet (Sample)	238
	Appendix B Questionnaire	239
	Appendix C First Reminder Letter (Sample).....	246
	Appendix D Second Reminder Letter (Sample).....	247

List of Tables

Table 1.1: Key Statistics of the Amman Stock Exchange (1998-2005)	6
Table 1.2: Major Financial Data for Selected Public Shareholding Companies in Jordan (2005).....	6
Table 1.3: Jordanian Audit Firms that have an International Affiliation with the Big Accounting Firms.....	8
Table 1.4: Jordanian Audit Firms with No International Affiliation	8
Table 2.1: Examples of Difference between Auditing around the Computer and through the Computer.....	34
Table 3.1: The Jordanian Universities offering a Bachelor's Degree in Accounting (2004).....	64
Table 3.2: Audit Courses and Computerized Accounting Courses Leading to a Bachelor's Degree in Accounting Offered by a Sample of Six Jordanian Universities (2004-2005).....	64
Table 5.1: SRI (1977) EDP Audit Tools and Techniques Survey	97
Table 5.2: SRI (1977) EDP Audit Tools and Techniques Survey that had a Good Future Potential	98
Table 5.3: IIA (2004) Audit Software Survey and Uses.....	101
Table 5.4: Tobison and Davis (1981) CAATs Survey, Familiarity and Uses.....	104
Table 5.5: Garsombke and Tabor (1986) CAATs Survey - Preferred Uses According to Specific Tasks	106
Table 5.6: Weiss (1980) Evaluation of Software Validation CAATs.....	108
Table 5.7: Lovata (1990) CAATs Survey	111
Table 6.1: Similarity and Contrast between Test Data and Integrated Test Facility Techniques	123
Table 7.1: The Thesis Sample.....	149
Table 7.2: Survey Part (2) Summary	152
Table 7.3: Survey Part (3) Summary	154

Table 7.4: Survey Part (4) Summary	155
Table 7.5: The Questionnaire Response Rate	155
Table 8.1: Jordanian EDP Audit Managers' Gender	162
Table 8.2: Jordanian EDP Audit Managers' Age Category	162
Table 8.3: Jordanian EDP Audit Managers' Years of Professional EDP Auditing Experience.....	163
Table 8.4: Jordanian EDP Audit Managers' Country of Last Degree	164
Table 8.5: Jordanian EDP Audit Managers' Last Degree Discipline	164
Table 8.6: The Mean and the Standard Deviation of the EDP audit managers' Answers Concerning the Frequent Use of CAATs.....	169
Table 8.7: The Frequency and Percentage of the EDP Audit Managers' Answers Concerning the Frequent Use of CAATs.....	170
Table 8.8: The Mean and the Standard Deviation of the EDP Audit Managers' Answers Concerning the Awareness of Potential Benefits of Using CAATs	176
Table 8.9: The Frequency and Percentage of the EDP Audit Manager's Answers Concerning the Awareness of Potential Benefits of Using CAATs	177
Table 8.10: The Mean and the Standard Deviation of the EDP Audit Managers' Answers Concerning the Obstacles Categories	180
Table 8.11: The Mean, the Standard Deviation, the Frequency, and Percentage of the Jordanian EDP Audit Managers' Answers Concerning the Obstacles Constraining the Use of CAATs.....	181
Table 8.12: Reliability Analysis for Parts 2, 3, and 4 of the Questionnaire.....	188
Table 8.13: One-Sample Kolmogorov-Smirnov Test for the Usage of CAATs, the Awareness of CAATs Benefits, and the Obstacles Constraining the Use of CAATs ..	190
Table 8.14: One-Sample T-Test Statistics for the Usage of CAATs by Jordanian Audit Firms	194
Table 8.15: One-Sample T-Test for the Usage of CAATs by Jordanian Audit Firms	194
Table 8.16: Mean Scores, T-Value for the Usage of All CAATs by Jordanian Audit Firms	195

Table 8.17: Independent-Samples T-Test Group Statistics for the Usage of all CAATs by Affiliated and Non-affiliated Jordanian Audit Firms.....	196
Table 8.18: Independent- Samples T- Test for Equality of Means for the Usage of CAATs by Affiliated and Non-affiliated Jordanian Audit Firms	196
Table 8.19: Independent-Samples T-Test Group Statistics for the Usage of All CAATs by Affiliated and Non-Affiliated Jordanian Audit Firms.....	197
Table 8.20: Independent-Samples T- Test for the Usage of All CAATs by Affiliated and Non-Affiliated Jordanian Audit Firms	198
Table 8.21: One-Sample T-Test Statistics for the Awareness of CAATs Potential Benefits by Jordanian Audit Firms	200
Table 8.22: One- Sample T-Test for the Awareness of CAATs Potential Benefits by Jordanian Audit Firms.....	200
Table 8.23: Mean Scores, T-Value for the Awareness of All Surveyed CAATs Potential Benefits By Jordanian Audit Firms.....	201
Table 8.24: Results of Relationship between the Awareness of the CAATs Benefits and the Level of CAATs Usage.....	202
Table 8.25: The Four Major Obstacles Categories Constraining CAATs Utilization by Jordanian Audit Firms.....	203
Table 8.26: One-Sample T-Test for the Obstacles Categories Constraining CAATs Utilization by Jordanian Audit Firms	205
Table 8.27: Mean Scores, T-Value of all Surveyed Obstacles Constraining CAATs Utilization by Jordanian Audit Firms	206
Table 9.1: Ranking CAATs According to the Usage Mean	210
Table 9.2: Ranking CAATs According to the Percentage of EDP Auditors Not Using Each CAAT.....	211
Table 9.3: Ranking the Perceived Benefits According to Mean Responses	213
Table 9.4: Ranking the Obstacles Constraining Jordanian Audit Firms' Use of CAATs	216

List of Figures

Figure 1.1: Jordanian Auditing Market Share (%).....	10
Figure 2.1: Auditing around the Computer.....	30
Figure 2.2: Auditing through the Computer	33
Figure 4.1: Market Capitalization of ASE Companies Distributed by Sector, December 2005.....	73
Figure 4.2: Information Technology Revenues by Industrial Sectors (Jordan 2002)....	76
Figure 6.1: The Test Data CAAT	119
Figure 6.2: The Integrated Test Facility CAAT	122
Figure 6.3: The Parallel Simulation CAAT	124
Figure 6.4: The Snapshot CAAT	129
Figure 6.5: The Embedded Audit Module CAAT	131
Figure 6.6: The System Control Audit Review File CAAT.....	132
Figure 8.1: The Mean Scores Answers to Obstacles Constraining the Use of CAATs by Jordanian Auditors	179
Figure 8.2: Normal P-P plot of the Usage of CAATs.....	191
Figure 8.3: Normal P-P plot of the Awareness of CAATs Benefits.....	192
Figure 8.4: Normal P-P plot of Obstacles to the Use of CAATs.....	192

**An Investigation of an Audit Expectation Gap Concerning the Use of
Computer Assisted Audit Techniques in Developing Countries – the Case of
Jordanian Audit Firms**

Abstract

Auditing in Jordan employs relative primitive techniques in testing internal controls and substantive testing of companies' computer generated financial records. Arguably, against a background of Jordanian companies using computerized systems it is reasonable to suspect a potential for the general public to entertain expectations that Jordan's auditors use cutting-edge technology in the form of Computer Assisted Audit Techniques. Generally they do not. *Reasonable expectations*, bearing in mind the widespread use of computerized information systems by Jordanian companies. The audit profession in Jordan is exposed to overseas influences from the affiliation of Jordan's audit firms with the leading international auditors. It is reasonable to expect a flow-on of the use of CAATs by those overseas affiliates to the local profession's fieldwork. This study is motivated by the potential for the general public to be misled. A survey of Jordanian firms reveals that Jordan's auditors do not use contemporary technology in a manner consistent with their knowledge of it. That is a curious outcome. For the majority of companies listed on the Amman Stock Exchange are audited by Jordanian firms with overseas affiliates using CAATs in their domestic audits, the benefits of using CAATs are recognized by the Jordan audit firms, and CAATs usage is recognized by them to be essential in a computerized environment. Strangely CAATs have relatively greater support from Jordanian firms without, than from those with, an overseas affiliate.

Low audit fees, the small size of the local firms, lack of education and training programmes to inculcate necessary EDP auditing skills, and the high cost of CAAT technology, emerge as obstacles inhibiting the use of CAATs. Auditing in Jordan is anomalous, relatively immature, and its technically primitive practices possibly engender misleading expectations concerning how it goes about its work.

Chapter 1

Introduction to the Study: Misplaced Expectations

1.1 Introduction – the Importance of Auditors’ Practices

In recent years corporate collapses have placed debate regarding what and how auditors undertake their professional task firmly on the agenda of the accounting profession, regulators and the public (Humphrey, Moizer and Turley, 1992, p.47). Against a background of alleged auditor failure, auditors have been singled out for special attention, frequently accused of being dilatory, corrupt or inept. Financial scandals have been recurrent features of the commercial environment in the developed commercial world, with the well-known and frequently cited cases including Enron and WorldCom in the United States and HIH Insurance and One.Tel in Australia. Frequently, these collapses have been associated with allegations of poor governance and, in particular, questionable auditing practices (Clarke, Dean and Oliver, 2003), management’s unethical behavior (Trute, 2005), fraud, or the failure of the management to comply with regulatory rules and generally accepted accounting principles.

These scandals had enormous destructive effects on the domestic and international commercial and financial sectors, with more than \$A5.3 billion being, for example, the expected losses from the HIH case, and an estimated \$US450 billion loss of shareholder value in respect of the five large corporate failures in United States, including Enron and WorldCom (Clarke et al., 2003). These circumstances have been a catalyst for pressure on the auditing profession to “lift its game”, to issue high quality audit reports,

with a greater degree of reliability, timeliness and credibility. The *quality* of the audit function constitutes one of the focal issues that audit expectations consistently address (Humphrey et al., 1992). Thus, the methods auditors actually employ have an understandable bearing not only on whether quality audits are a reality, but also on public expectations regarding whether quality is likely to have been achieved. Arguably, those expectations influence public perceptions of the quality of audits and the credibility of auditors' reports.

Against this background the expectations of the public-at-large regarding auditors' capacity to detect accounting malpractices have been questioned. This has given added fuel to the argument that there is an expectations gap regarding auditors' obligations to detect fraud. It might equally be said to have raised questions regarding the techniques and the recourse to latest technology the public expects auditors to use, and those they actually employ.

Various studies confirm the existence of an audit expectation gap, but mostly in respect to the exposure to fraud: Gay and Schelluch (1993) in Australia; Humphrey, Moizer and Turley (1993) in UK; Frank, Lowe and Smith (2001) in the US; Best, Buckby and Tan (2001) in Singapore; and Dixon, Woodhead and Sohlman (2006) in Egypt. This version of audit expectation gap has a long and persistent history, having been introduced to the auditing literature by Liggio (1974), although the basic idea was in existence before 1974 (Lee, 1970). Humphrey (1977, p.9) defines the expectation gap as:

...a representation of the feeling that auditors are performing in a manner at variance with the beliefs and desires of those for whose benefit the audit is carried out.

That description shows that whereas the term has been employed with a particular focus on the detection of fraud, it initially referred generally to misconceptions and false

expectations that the public reasonably held regarding not only what auditors did, but also equally how they did it. Reviewing the existing, and extensive, literature concerning the audit expectation gap in respect of fraud detection *per se* is not the main focus in this thesis; rather it is whether if there is a gap between reasonable public expectations regarding the extent to which Jordanian auditors use cutting-edge technology in the form of Computer Assisted Auditing Techniques (CAATs). It is thus a focus on whether the users of publicly listed companies' audited financial statements attribute an unwarranted quality of reliability to the financial statements of companies audited by the leading Jordanian audit firms, by virtue of false expectations regarding the extent to which those auditors utilize CAATs while they perform their daily auditing functions. If the public holds false expectations on that score, financial statement reliability is being attributed on a false premise. Any such gap needs clarification, resolution (AICPA, 1978, p.xi). Accordingly, this thesis investigates the practices of audit firms in Jordan.

1.2 Professional Crossroads – An Uncompetitive Technical Base?

Jordan's audit profession is a small player in a developing country, arguably needing to engage contemporary technology in order to participate in world best practice as the country moves towards being an open market economy in which resources and capital are scarce.

To that end, to enhance the economy in Jordan, steps have been taken by its government to attract foreign investment. Key reforms have been undertaken in respect of the information technology, pharmaceuticals, tourism, and services sectors. Foreign and domestic investment laws now grant specific incentives to investments in priority

sectors. A number of economic developments reflect those incentives: Jordan became a World Trade Organization (WTO) member in April 2000; a U.S.-Jordan Free Trade Agreement (FTA) came into force in December 2001; and in May 2001, the government converted the Aqaba port into a special economic zone (SEZ) offering special incentives to investors.

These Jordanian governmental reforms towards economic enhancement through encouraging foreign investments require confidence in the commercial environment, confidence in the securities market, for which an imperative is a competent, a highly skilled, and a creditable audit profession to increase the reliability of companies' financial information. Nurturing an efficient and technically advanced audit profession is crucial to assuring the commercial public of the veracity of audited financial statements issued by transnational companies operating in Jordan. That Jordan's auditors are using the latest technologically advanced data processing and accounting technologies is an expected imperative (Arens and Loebbecke, 2000).

Jordanian audit practice is thus *reasonably expected* to be using the latest audit technology, inculcating the appropriate skills through equally contemporaneous audit education, with a view to engendering confidence in the financial market, thereby establishing a pre-condition for enhancing the image of the local economy, and raising the status and the competencies of the profession so that it compares favorably with that of the more developed western countries. Default in that regard would leave Jordan's auditors unable to compete, at a crossroad and, arguably, without the prospect of a viable professional future. Casual observation suggests that, notwithstanding what in the circumstances would be reasonable public expectations, generally Jordan's auditors do not use computer assisted techniques.

Curiously, the audit literature indicates that no previous studies have been undertaken into reasonable public expectations and the use of contemporary audit technology by Jordanian audit firms. Nor has there been examination of whether, indeed, Jordanian audit firms are fully cognizant of the potential benefits of using the available technologies in performing their fieldwork, as one might expect of their counterparts in developed western countries. Major obstacles are said to inhibit Jordanian audit firms utilizing state-of-the-art technologies in their daily audit work. The validity of such claims is contestable. Little evidence has been adduced either the obstacles *per se*, or their relative intensities. Accordingly, identifying their prevalence, and the barriers to overcoming them requires investigation. This thesis examines those related questions and issues with a view to providing evidence to support policy decisions aimed at meeting the imperative that Jordanian auditing becomes competitive in the global market, and narrows the audit technology gap.

1.2.1 Jordan's Corporate Sector

Over the last decade Jordan's economy and Jordanian capital markets showed an overall improvement in the performance of economic activity in response to the Government's initiatives: 201 public shareholding companies were listed on the Amman stock exchange ASE by the end of 2005, compared with 150 by the end of 1998; their market capitalization by end of 2005 rose by 104.6% to \$US37,559 million, compared to \$US18,357 million by end of 2004; and the top 8 companies, for example, are substantial by international standards. In addition, foreign investment represents 45.0% of market capitalization by the end of 2005 (Tables 1.1 and 1.2). Those data are indicative of the level of international pressure for the Jordanian audit profession to become technically competitive with western firms.

Table 1.1: Key Statistics of the Amman Stock Exchange (1998-2005)

	1998	1999	2000	2001	2002	2003	2004	2005
Number of Listed Companies	150	152	163	161	158	161	192	201
Market Capitalization (\$US million)	5,854	5,828	4,943	6,305	7,083	10,948	18,357	37,599
Value Traded (\$US million)	654	549	471	942	1,339	2,613	5,343	23,762
Non-Jordanian Ownership of Market Capitalization (%)	43.9	43.1	41.7	38.5	37.4	38.8	41.3	45.0
Market Capitalization / GDP (%)	73.5	72.3	58.4	75.7	80.4	116.8	184.7	326.6

Source: ASE (2005a)**Table 1.2: Major Financial Data for Selected Public Shareholding Companies in Jordan (2005)**

Company Name		Paid In Capital	Market Capitalization	Total Shareholders' Equity
		(\$US million)		
1	Arab Bank	248	15,691	2,619
2	Housing Bank for Trade and Finance	141	2,815	526
3	Capital Bank of Jordan	143	474	183
4	Jordan Petroleum Refinery	45	248	90
5	The Jordan Cement Factories	85	957	283
6	The Arab Potash	117	1,526	363
7	Jordan Telecom	352	1,937	574
8	Jordanian Electric Power	70	322	123

Source: ASE Company Guide (2005b)

Studies have confirmed that Jordanian companies in various sectors have been using computerized systems to organize of their financial operations for a considerable time,

(Al-Dahan and Makamrah, 1990; Al-Ashi, 1991; Al-Shammari and Al-Shaikh, 1993; Malhas, Attyeh, Khasseb, Saydem, Diab and Hindawy, 2003). Therefore, when these companies select an audit firm to undertake their accounts auditing they, and the investing public, might reasonably be thought to have *expected* it to provide them with the cutting-edge technology appropriate to the audit of their computerized accounting systems (Manson, McCartney, Sherer and Wallace, 1998).

1.2.2 The Structure of the Audit Market in Jordan

During the last few decades, the auditing profession in Jordan has witnessed considerable growth. Various important factors have driven this progress: the social and economic development in Jordan, and the huge increase in the investment of capital in various public commercial sectors. The consequences on the commercial sector of these factors are illustrated in Tables 1.1 and 1.2. If it is to share in the consequential growth in the need for related professional services, the audit profession in Jordan must be competitive in the international audit market. Jaghoub (1993) noted a need for a *catch-up*, attributing the lack of audit training programs at that time, and the absence of monitoring systems regarding the quality of the audit services to be constraints, resulting in a low quality of indigenous audit and assurance services of a kind likely to inject the financial markets with the necessary confidence. Over the last decade there have been only minor structural changes in Jordan's audit profession. Arguably the impact of these has been out-stripped by the impact of the growth in the economy.

Against that background, twenty six (26) audit firms in Jordan undertake the auditing of its publicly listed companies. As a matter of public knowledge, ten (10) of the twenty six are affiliated with the big international accounting firms, and thus ought to be

motivated and expected to apply the same state-of-the-art technology in their work on local companies as is applied by their international partners in their home countries; sixteen (16) of the firms are without international affiliations (Tables 1.3 and 1.4; Naser, 1998; Al-Omari, Jahmani and Salimi, 1999; Naser and Al-Khatib, 2000; Naser, Al-Khatib and Karbhari, 2002).

Whereas perhaps considered second-*tier* firms, it is not unreasonable to expect that the Jordanian firms without international affiliations would nevertheless have access to and be encouraged in the use of contemporary audit techniques on a scale close to, equal of that of those with an affiliation.

Table 1.3: Jordanian Audit Firms that have an International Affiliation with the Big Accounting Firms

	Audit Firm	International Partner
1	Allied Accountants	Ernst and Young
2	Bawab and Co	PricewaterhouseCoopers
3	Saba and Co	Deloitte Touche Tohmatsu
4	Khleaf and Co	KPMG
5	National Brothers (BDO)	BDO International
6	Arab Professionals	Grant Thornton
7	Audit and Consult Consortium	Moore Rowland International (MRI)
8	Ghawi CPA Jordan	Baker Tilly International
9	Ghosheh and Co.	Nexia International
10	Ibrahim Al-Abbasi and Co.	Polaris International

Table 1.4: Jordanian Audit Firms with No International Affiliation

	Audit Firm		Audit Firm
1	Arabian Audit Group	9	Mahmoud Saadeh and Co.
2	Talal Abu-Ghazaleh and Co.	10	Seemer Mustafa
3	Ma'moun Faroukah and Co.	11	Michel Sindaha and Co
4	Riyad Al-Jinini and Co	12	Professionals for Auditing and Consultancy
5	Rida Al kabariti Auditing Office	13	Adel Habeb and Co
6	Hawit , Fasheh and Co.	14	Ta'meh Abu Sha'ar
7	Arab Certified Accountants	15	Marouf Al Megbel
8	Khalefa and Al-Raayan	16	Intl. Pro. Bureau Consulting and Auditing

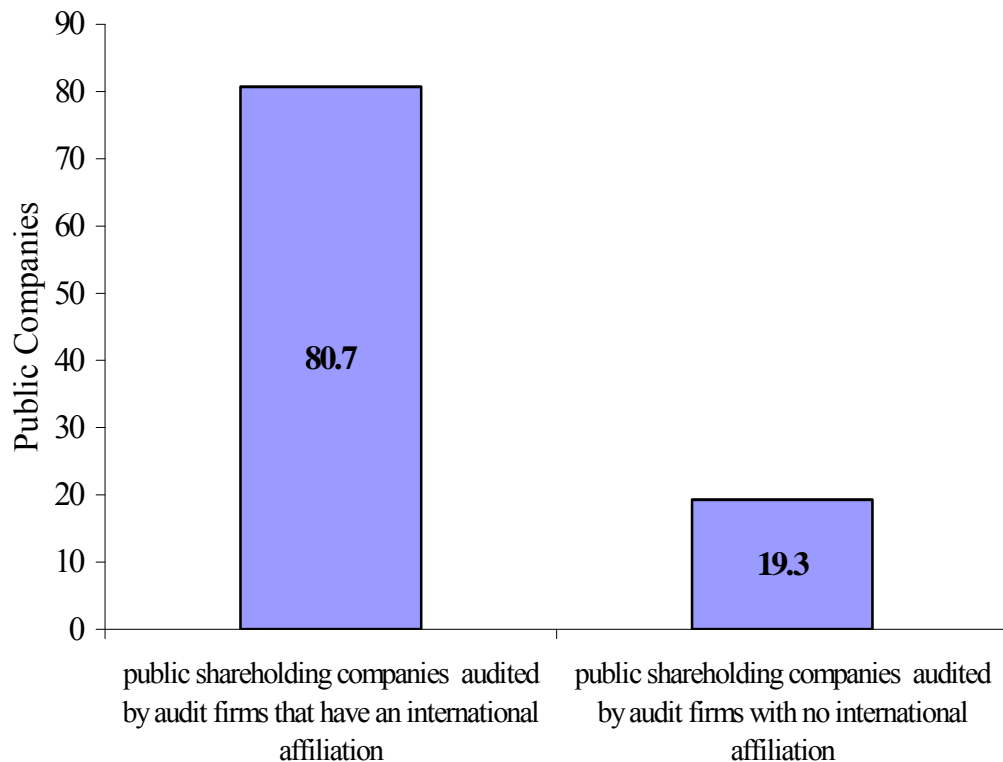
1.3 The Research Problem

In developing countries, particularly in Jordan, the publicly listed companies prefer appointing an audit firm affiliated with an international accounting firm able to provide them with access to cutting-edge, state-of-the-art, auditing techniques. Expectations of that access are supported by several studies. Naser et al. (2002), for example, confirmed that the affiliated audit firms in Jordan have their audit quality and credibility to protect. Predictably, internationally affiliated Jordanian audit firms are larger and better supported by experts from the international affiliates than the smaller local firms lacking an affiliation (Al-Omari et al., 1999; Naser and Al-Khatib, 2000). Wallace, Naser and Mora (1994, p.47), propose that bigger accounting firms are “backed by the expertise of the international firms to which they are affiliated”. Balvers, McDonald and Miller (1988) found that the large audit firms in the US possess technological advances over their competitors. And studies have found that clients prefer large audit firms, in order to take advantage of available economies from specialized audit technology (Francis and Simon, 1987; Johnson and Lys, 1990). Al-Omari et al. (1999) had also found that in Jordan the credibility of the financial statements is increased if they audited by firms which have an international affiliation.

But, it appears unequivocal that the users of financial statements in Jordan reasonably believe that the internationally affiliated auditors supply them with high quality audit reports that are the products of utilizing state-of-the-art audit technology. Computerized accounting systems have been long-used by Jordan’s public shareholding companies to organize their accounting systems, necessitating a high quality of commensurable audit services with a greater degree of credibility, and reliability. This has encouraged public companies in Jordan to select, where possible, audit firms with international affiliations,

to benefit from the high reputation they enjoy, and for the perception it engenders that they are technologically contemporaneous. This is borne out by the 80.7% majority market share of the Jordanian audit firms with international affiliation (Figure 1.1).

Figure 1.1: Jordanian Auditing Market Share (%)



Source: ASE Company Guide (2004)

That *Big 4* and *Second tier* auditors would use CAATs is a reasonable expectation on the part of the users of auditors' reports on the financials of Jordanian companies that have computerized systems. Insofar as they do not, there is arguably a *gap* between what would be a reasonable public expectation and Jordanian audit practice.

Accordingly investors, creditors and other users of financial statements might be expected to reasonably anticipate that for the most part Jordanian audit firms utilize the latest technology when auditing large public companies.

This thesis explores the implications of those international affiliations and the expectations they encourage. It explores the following questions:

- whether according to the technology employed by Jordanian auditors, there are grounds to suspect that reasonable public expectations may not be fulfilled;
- whether there is a conscious perception by Jordan's audit profession of the potential benefits of the CAATs usage; and,
- whether there are any obstacles to the use of CAATs by audit firms in Jordan.

1.4 Significance of the Study

Nowadays, where information technology is indigenous to almost every aspect of the commerce, Jordanian auditors must be familiar with a computerized environment, a knowledge of CAATs is essential for dealing with the more complex computer setting auditors now face (Lovata, 1990). This investigation of the presence of audit technology, and where the Jordanian audit firms stand in relation to it, will characterize the use of advanced computer assisted audit techniques by international audit firms worldwide, and how Jordanian firms are coping with the newest audit technology. Supporting Jordanian auditing firms in familiarizing with these techniques will encourage them to make use of these techniques, potentially reduce any audit technology gap, and enhance the effectiveness and efficiency of the auditing profession in Jordan. Such a study will benefit different groups: the findings regarding the use of CAATs should provide a basis for increasing their usage by Jordan's audit firms; an increased use of CAATs should provide the necessary support for revamping the curricula in audit education for Jordan's universities; improved audit education should enhance the professional status of the audit profession in Jordan; the increased

credibility of Jordanian companies' financials should enhance confidence in Jordan's corporate governance; and the increased credibility of the financial status and regulation of Jordan's companies should engender confidence in Jordan's commercial sectors within the global economy.

1.5 Thesis Structure

The remainder of the thesis comprises a further eight chapters. In Chapter 2 the computerized accounting information systems auditing, information technology and accounting, auditing, and auditor related issues are discussed: the professional standards that relate to the use of CAATs are elaborated: and the aspects of computerized accounting systems enabling external auditors to handle the auditing process in an efficient manner, are demonstrated. Chapter 3 discusses auditing in Jordan as the field of study. Chapters 4 and 5 provide a review of related literature. Chapter 6 extends chapter 5 with explanations of the uses, advantages and disadvantages of the computer assisted audit techniques, appearing in auditing literature. Chapter 7 examines the methodological aspects of the study, the means of data collection, and the analytical techniques to be applied to them. In Chapter 8 an analysis is undertaken of the data collected, and the tests of the research hypotheses explained. Chapter 9 discusses the result, draws the conclusions from the study and outlines the policy recommendations they invite.

Chapter 2

Auditing Computer Based Accounting Information Systems

2.1 Introduction – the Implications of Computer Technology

The introduction of computer systems was one of the most important commercial technological developments in the second half of the last century (Yang and Guan, 2004). During initial stages of the development of computers business firms used mainframe computers characterized by their large size, high cost of operation, and (in current terms) slow processing speeds, in contrast with the current microcomputers, the PCs, characterized by their small size, low operating costs, and the high processing speeds.

Decreasing costs of hardware and software, high processing speed, error reduction and other advantages of the computer systems, have driven businesses' transfer to computerized accounting systems. The use of computers has impacted the way accounting transactions are processed, ranging from the absence of input documentation, to the lack of visible (hard copy) transaction trails. By eliminating the traditional paper version of the *audit trail* new accounting technology has created the need for new audit techniques to ensure the integrity of computer based accounting systems. CAATs have been created to meet that need.

In *financial statement auditing*, the external auditor's primary objective is to attest to the fairness of the company's financial reports, through internal control testing and substantive testing. Testing internal control aims to confirm the existence, assess the

effectiveness, and check the continuity of operation of those internal controls in which reliance is to be placed, whilst substantive testing aims to verify the accuracy and verifiability of the financial statement data. To achieve the financial statement audit target in a computerized environment auditors must know how the accounting data are entered, organized, and processed in the computerized accounting system. That entails an understanding of the appropriate audit approaches in an advanced technological environment.

This chapter comprises two parts. In Part One the impact of computer technology on accounting, auditing and auditors is explored. The various international auditing standards and guidelines that encourage the use of CAATs are surveyed. In Part Two data organization, computerized processing methods, and the appropriate auditing approaches in computerized systems, are discussed.

Part One

The Impact of Information Technology on Accounting, Auditing, and Auditors; and the CAATs-Related Auditing Standards

2.2 Information Technology and Accounting

The use of information technology in different aspects of everyday affairs, in particular in business, has changed data processing practices (Bakshi, 2001). Clearly, computer systems can execute huge volumes of different everyday tasks, from processing payroll to simulating the outcome of diverse corporate decisions. Strategic auditing entails running sensitivity analyses against different scenarios, a process almost impossible

without employing the latest accounting information technology. It is impossible to evaluate or run worthwhile audit simulation tests without CAATs.

Technical advances and growth in both the hardware and software of computerized systems have improved the operating performance and minimized the operating cost of computer-based systems. Therefore, businesses' major functions - planning, supervision, accounting, auditing, and frequently performed daily management activities - have been automated. Enhancement of organizational effectiveness and efficiency was the main stimulus for organizations to transfer from the manual accounting systems to the computerized systems. Automation of the accounting systems has increased throughout organizations worldwide, due to the features and benefits of the computerized systems. Wilkinson, Cerullo, Raval and Wong-On-Wong (2000) addressing this issue noted that huge numbers of daily accounting transactions can be undertaken and recorded smoothly using computerized processing; the computerized accounting systems simplifying the accounting procedure by increasing the accuracy of the calculation, speeding-up transaction processing, decreasing the cost of processing the transactions and other data, and increasing the productivity of employees.

The characteristics of computerized accounting information systems were, and remain, the main incentives for business to incur the high cost of transferring from the manual accounting systems toward utilizing the computerized systems. The auditing objectives in computerized environments support the traditional auditing objective (Weber, 1999). Against that background it is to be noted that the transfer of accounting systems from the manual to the computerized has not so much changed the overall objective of the financial statement audit - to collect and evaluate evidence regarding management's assertions in their financials, and to determine whether overall financial statements meet

with specified quality criteria - as computerization has changed the methods that must be used in performing compliance and substantive testing (Watne and Turney, 1990).

2.3 Information Technology and Auditing

Taylor and Glezen (1997, p.4) define the Financial statement auditing as the:

gathering of evidence on the financial statement assertion of an entity and using such evidence to determine whether the assertion adheres to generally accepted accounting principle or another comprehensive basis of accounting.

On the other hand, according to the International Standard on Auditing ISA 200 and Australian Auditing Standard AUS 202, financial statement audits aim to enable the auditor to express an opinion as to whether the financial statements are prepared, in all material respects, in accordance with an identified financial reporting framework (AuASB, 2002a, p.4; IAASB, 2004b, p.179).

Accordingly, obtaining and evaluating evidence has been influenced by the introduction of computerized accounting systems (Weber, 1999). To evaluate the reliability of the computerized accounting system controls, auditors of necessity need to use new audit techniques. Thus, the use of CAATs can greatly support auditors in their task of gathering the necessary evidence for management's assertions regarding the financial statement contents, and to determine whether those assertions conform to the International Financial Reporting Standards (IFRS) or the appropriate current national accounting prescriptions.

Computerized accounting systems necessitate the use of CAATs in auditing where the internal accounting controls are contained within a computer application, and the accounting transactions data being stored in machine-readable form entered directly into the system. In this setting, management frequently substitutes the source documents

with computer records, and the calculations are performed without leaving visible evidence. In that environment, accounting transactions are generated and executed by the computer programs (Loebbecke, Mullarkey and Zuber, 1983; Elliott and Jacobson, 1987). In manual accounting systems the auditor can trace transactions physically through an 'audit trail' consisting of source documents - orders, delivery records, quotations, journals, ledgers, work sheets, and the like. In contrast tracing an original transaction forward to a summarized total or a summarized total backward to an original transaction through the audit trail in that way, is generally no longer possible where the data are directly entered into computers. Source documents are eliminated or reduced. The utilization of CAATs in these situations is clearly necessary (Wagner, 1969).

Recently, greater importance is being placed on the use of CAATs by the international auditing standards boards (Lovata, 1990). In the international setting, the International Auditing and Assurance Standards Board have issued the International Auditing Practice Statement (IAPS 1009)¹ and the Australian Auditing and Assurance Standards Board have issued its IASB compatible Australian Auditing Guidance Statement (AGS 1060) "*Computer Assisted Audit Techniques*". Both encourage CPA auditors to use the CAATs, stating that:

CAATs may improve the effectiveness and efficiency of auditing procedure. They may also provide effective tests of controls and substantive procedures where there are no input documents or a visible audit trail, or where population and sample size are very large (AuASB, 2001, p.5; IAASB, 2004a, p.762).

¹ At December, 2004 meeting, the International Auditing and Assurance Standards Board (IAASB) announced the withdrawal of the following four International Auditing Practice Statements (IAPSs): (i) IAPS 1001, IT Environments - Stand-Alone Computers, (ii) IAPS 1002, IT Environments - On-Line Computers Systems, (iii) IAPS 1003, Environments - Database Systems, (iv) IAPS 1009, Computer Assisted Audit Techniques. The IAASB concluded that the need for these IAPSs has been superseded by the assumption of computer processing in the revised standards on understanding the business and assessing the risks of misstatement. These IAPSs has been withdrawn effective December 31, 2004.

Bierstaker, Burnaby and Thibodeau (2001) have confirmed that the use of CAATs can achieve a tremendous gain in auditing effectiveness and efficiency. Where the use of CAATs reduces the audit cost and increases the speed and the accuracy of auditing process (Wallace, 2002), it facilitates access to any database and performs a hundred percent compliance and substantive testing of the accounting transaction (Brazina and Leauby, 2004), inspects and analyzes huge amounts of data maintained in the computerized file (Bierstaker et al., 2001). In addition CICA (1994, pp. 12-14) indicated that the use of such audit techniques can: (1) enhance audit economy and efficiency by reducing the audit cost, through faster extraction of audit samples, the footing of ledgers and the reconciliation of significant accounting populations, with a greater accuracy in comparison to manual procedures, (2) enhance audit effectiveness by increasing the likelihood of discovering material misstatement and by allowing the auditor to concentrate audit planning on high risk areas. Moreover, audit techniques provide auditors with précis information on the actual impact of financial statement errors, and (3) enhance the professional image of particular auditors by improving their audit market-share through enhanced effectiveness, efficiency, and economy.

Jordan, as a developing country that has applied the ISAs, is indeed reasonably expected and required to apply the specific standards related to CAATs to get the benefits of these techniques to enhance their national auditing quality.

2.4 Information Technology and the Auditor

In manual accounting information systems auditors rely on the audit trail, requiring examination of paper documents. Evolution of computerized information systems has altered considerably the way in which information is recorded, processed, and reported

(Nieschwietz, Pany and Zhang, 2002), necessitating the utilization of computerized audit techniques.

Advances in CISSs synchronized with the widespread automation of accounting have created a new set of challenges confronting auditors and resulted in a setting in which they must be able to use and understand current related information technology if they are to audit computerized accounting systems effectively. Perry (1977) confirmed this, explaining that auditors must become increasingly involved with computerized systems to ascertain that the data they process are accurate and complete. This involvement requires a thorough knowledge of both the operations of the organization and its data processing techniques.

The International Standard on Auditing (ISA 220) specifies that auditors must attain and maintain the technical standards and professional competence required for them to perform the audit function with due care (IAASB, 2004c). In the Australian environment, for example, to conform to Auditing Standard AUS 206 “*Quality Control for Audit Work*” it is expected that:

the firm is to be staffed by personnel who have attained and maintain the technical standards and professional competence required to enable them to fulfill their responsibilities with due care” (AuASB, 2002b, 6-b.p.5) - Audit work is to be assigned to personnel who have the degree of technical training and proficiency required in the circumstances (AuASB, 2002b, 6-c.p.5).

This reflects the general international perspective regarding the technical competencies required of audit staff in the international environment. In addition to the international and Australian auditing standards, the first general standard of the AICPA’s Generally Accepted Auditing Standards (GAAS) requires that auditors should acquire an adequate technical training and proficiency as an auditor (AICPA, 1972).

Based on the above, in order for auditors to fulfill their responsibilities with due care in the computerized environment, they should be able to understand, be proficient in, computerized accounting systems – understand the technicalities of how the data are entered, processed, organized in the computers' files, and able to evaluate the application controls designed to ensure information processed by the accounting system is 'correct'. In this context Boynton and Johnson (2005, p.439) confirmed that auditors should be familiar with the various components of IT systems: the hardware, software, data organization and processing methods.

Accordingly, familiarity of auditors with information technology is not only an essential aspect of contemporary auditing, it is also considered a supplementary competency element required of auditors of the data emerging from computerized accounting information systems (Watne and Turney, 1990). In that setting, Elliott and Jacobson (1987) assume that auditors equipped only with pencil and paper, a calculator and the conventional methods of gathering audit evidence will confront difficulties. Indeed, they will be unable to fulfill, at a professional level, their statutory obligations.

It follows that to apply the ISAs effectively, Jordanian auditors must be educated in the use of CAATs, and in particular have sufficient information technology skills to undertake their auditing in the expected professional manner.

2.5 Auditing Standards Specifying and Otherwise Encouraging the Use of CAATs

The rapid acceleration in the use of computerized accounting systems creates the need for auditing standards and auditing guidelines that regulate auditing undertaken in an IT environment (Yang and Guan, 2004). That this is a normal expectation is indicated by

the various authoritative bodies, such as the International Auditing and Assurance Standards Board, the Australian Auditing Standards Board, the American Institute of Certified Public Accountants, and the Information Systems Audit and Control Association, having issued standards in this area.

ISA 330-19 for example, states that:

The use of computer assisted audit techniques (CAATs) may enable more extensive testing of electronic transactions and account files. Such techniques can be used to select sample transactions from key electronic files, to sort transactions with specific characteristics, or to test an entire population instead of a sample (IAASB, 2004d, p.341).

Likewise the International Auditing and Assurance Standards Board through its Auditing Practice Statement IAPS 1009 - “*Computer Assisted Audit Techniques*”, encourages CPA auditors to use CAATs, stating that:

CAATs may improve the effectiveness and efficiency of auditing procedure. They may also provide effective tests of controls and substantive procedures where there are no input documents or a visible audit trail, or where population and sample size are very large (IAASB, 2004a, p.762).

Thus, the pressure to use CAATs is an international phenomenon. Australia’s AUS No. 214 article 11, for example, indicates that CAATs can be used for both tests of controls and substantive tests to collect *sufficient appropriate audit evidence*, and to gather audit evidence on an entity utilizing CISs (AuASB, 1995). To this affect AUS 214 article 20 states that:

it may be difficult or impossible for the auditor to obtain certain data for inspection, confirmation or inquiry without computer assistance (AuASB, 1995, p.10).

Further, the Australian Auditing and Assurance Standards Board directs CPA auditors to use CAATs on the grounds that doing so leads to an increase in audit efficiency and effectiveness (AuASB, 2001, p.5).

In the United States, the AICPA Auditing Standard SAS 48 - "*The Effects of Computer Processing on the Audit of Financial Statements*" - also encourages the use of CAATs. To that end, SAS 48 confirms that CAATs might increase the efficiency of performing audit procedures in a computerized environment, adding in support of CAATs-based audits that by doing so the 'complete audit population' could be reviewed, rather than a mere 'sample' (AICPA, 1984). And, the AICPA's SAS 94, concerning assessment of internal control activities in information technology systems, states that:

it is not practical or possible to restrict detection risk to an acceptable level by performing only substantive test for one or more financial statement assertions. In such circumstances, the auditor should obtain evidential matter about the effectiveness of both the design and operation of controls to reduce the assessed level of control risk (AICPA, 2001, p.336).

So, SAS 94 emphasizes CAATs-based testing of controls (in addition to substantive testing) to gather the appropriate quanta of evidence about the management assertions (Cerullo and Cerullo, 2003).

The Information Systems Audit and Control Association (ISACA) through its Guideline ISG1.2.1-4 states that CAATs are important tools for the information systems auditor performing the routine audit processes, indicating that CAATs can be used both for testing controls and in substantive testing, as their utilization generates a large volume of audit evidence (ISACA, 1998).

Consensus in the international setting that CAATs should be used when dealing with a computerized accounting environment is well evidenced. It is generally agreed that the use of CAATs increases audit efficiency and improves audit effectiveness. Arguably, it is a professional obligation that auditors keep pace with technology. Jordanian auditors in their compliance with the international standards on auditing are in effect obliged to use CAATs to improve the overall quality of the audit services provided to the public,

for the potential benefit of the whole country, and with the objective of narrowing the audit technology gap, thereby raising the image for Jordanian auditing profession and the level of confidence in Jordan's financial markets.

Part Two

Data Organization, Processing, and Audit Approaches Within Computerized Accounting Systems

2.6 Data Organization and Processing Within Computerized Systems

With the growing use of computerized accounting systems entities have been processing economic transaction electronically. Information technology is almost indigenous to the contemporary business environment. Nearon (2005) has explained that in 1995 there were almost 550 million computers worldwide, and that almost all enterprises (irrespective of their size) use computers to organize of their accounting records. Therefore, auditors must have the skills to evaluate the reliability of digitized evidence to support their audits opinions.

Accordingly, to accomplish their responsibilities with due care in the computerized environment, and to satisfy the technical and professional competencies required by the international standards on auditing, auditors should have adequate technical training to achieve proficiency in their understanding of how data are organized and processed within the computerized environment, such as will allow them to assess internal control and undertake the necessary substantive tests in advanced computerized accounting systems.

2.6.1 Data Organization within Computerized Files

Accounting is a systematic process entailing the recording, updating, retrieving and reporting of data. Data organization methods refer to the ways in which data are arranged within a computer file (Boynton and Johnson, 2005). Frequently two methods are used to organize the data in a computerized accounting system - the *traditional file* and *database* methods (Gill and Cosserat, 1996).

In the *Traditional File Method*, two types of files are maintained: a *master* file containing up-to-date information about a particular class of data such, as ‘accounts receivable, accounts payable, payroll, inventory’, and the *transaction* file amassing details of the individual transactions of the same class occurring during a period and periodically used to update the permanent records contained in a master file. Separate master and transaction files are maintained for each application relating to the accounts receivables, and accounts payable, etc.. The data in the master and transaction files are accessible for only the single application program for which the files were created, resulting in the redundancy of data *across* files.

In contrast, the development of *databases* undergirded modern methods of managing organizational data. Hagg, Cummings and McCubbrey (1999) defined the database as a collection of related information organized and accessed according to its logical structure. The *Database* approach consolidates data records and objects² into a data file that can be accessed by all authorized application programs. For example, in respect of customer records, their names, addresses and other common types of data could be shared with several applications in banking, such as cheque processing, an ATM

² The objects comprise data values describing the attributes of an entity

system, and savings accounts. These data can be consolidated into a common customer database, rather than being kept in separate files.

According to Boynton and Johnson (2005), in the database method, the master file and the related transaction file are organized for direct access processing, and neither is required to be maintained in any particular order, whereas in a traditional file method, separate master and transaction files are maintained for each application. Thus, the creation and updating of single direct access file for all accounts using common data is the major advantages for the database method, eliminating duplication.

2.6.2 Data Processing Approaches

Data resulting from business transactions - such as sales, purchases, deposits, withdrawals, and payments must be captured and processed by an organization's information system to support its operations. In computerized accounting systems, information processing refers to the method by which data are entered into and processed by the computer, to the timing of the recording and the updating of accounting data within the computerized accounting system (Jones and Rama, 2006).

Data entry methods ranging from the *Traditional Data Entry* method in which the users of the accounting information systems capture the transaction source document (e.g. purchase orders, sales order forms) and enter the data using the keyboard of a data entry terminal, to the *Source Data Automation* method in which transactions data are entered directly into the information systems. In this context O'Brien (1999) explains that different devices can be used to achieve the automation of the source document. These include: point of sale (POS) terminals, automated ATMs, optical character recognition (OCR) - computer software designed to translate images of handwritten or typewritten

text (usually captured by a scanner) into machine-editable text- and other advanced technology such as pen-based tablet PCs for remote data entry, touch screens, and voice recognition systems for data entry.

Concerning the processing, three different techniques are commonly used to process the data within computerized systems: *batch input / batch processing*, *on-line input / batch processing*, and *on-line input / real-time processing*. As complexity of the accounting information system increases, the move is commonly from batch to real-time processing. Accordingly, the data processing methods are indicative not only of the complexity of the accounting information systems, but also of the most appropriate approach to be utilized in the audit of them.

2.6.2.1 Batch Input / Batch Processing

Batch input / batch processing is based on the accumulation of similar type of transactions data, for example sales invoices or purchase orders that are normally recorded on paper, being entered in computer-based accounting systems and processed in batches. Under this approach transactions data are processed periodically when the transaction file is processed against the old master file, such as the 'accounts receivable master file' or 'accounts payable master file'.

Payroll data are a common example in respect of which batch input / batch processing is undertaken - whereby at the end of each pay period each worker's time-card is entered into the payroll system, and after all the time-cards have been entered and processed as a batch to support the issue of employees' monthly pay cheques or bank credits.

This method of data processing is justified on cost saving criteria (Adams, Grose and Lesson, 2004). The main drawback for batch processing is that the master file is not

updated until the data are processed. Therefore, in this conventional method of processing, there is a time lag between the occurrence of transactions and the processing of the related data. This has the potential of invoking improper management decisions based on out-of-date information. In the batch input / batch processing approach, source documents such as purchase orders, sales invoices, are prepared manually. Thus, the input to the computerized accounting system is paper sourced and may be retained, resulting in source documents (hard copy) being available. In these simple processing systems the audit trail is visible, the auditor can trace the transactions from the source documents to the summary accounts and vice versa. It is anticipated that auditing 'around the computer' is frequently considered the appropriate audit approach to deal with an accounting information system utilizing the batch processing method.

2.6.2.2 On-line Input / Batch Processing

Here, transactions data are entered into the accounting information system immediately they occur, and the transaction file is processed periodically to update the master file. This approach differs from batch input / batch processing in that electronic equivalents are substituted for the journal source (Bondar and Hopwood, 2004). Therefore, in this approach the source documents representing the core for the accounting cycle begin to be stored electronically. Paper sourced documentation starts to disappear. Accordingly, it is predictable that the auditor of on-line input / batch processing accounting systems will start to search for electronic means to retrieve the source documents - the need for the computerized auditing techniques emerges. This approach has drawbacks similar to those of the batch input / batch processing approach with the master file not including the current accounting information that would assist managers in their daily work decisions, because the processing occurs only periodically.

2.6.2.3 On-line Input / Real-Time Processing

With on-line input / real-time processing the transactions data are captured and processed immediately. Therefore, the master file in this approach is updated concurrently with the accounting event, and the output data reflect the current situation of the enterprise. Management using this processing approach has contemporary data upon which to base its decisions.

The degree of complexity is increased in the real-time data processing systems, for the transactions data are processed as they originate, without the delay related to accumulating data batches. Data are input directly to the accounting system from online transaction terminals; paper based source documents are eliminated and replaced by the equivalent machine-readable formats.

The level of automation in real-time processing varies from the *simple* (in need of human intervention), to the *highly sophisticated* (requiring no human involvement). In a simple real-time processing system requiring intervention, an accountant may enter a purchase order on the data terminal, which is then submitted automatically to the purchasing department for further processing. The real-time point of sale system is another example, where the sales personnel use an optical scanner to scan the electronically stored data printed on the product, and the customer's credit or debit-card. The data relating to the transaction are transmitted automatically to the billing and inventory systems for immediate real-time processing, without further human involvement (Bondar and Hopwood, 2004).

In the more advanced computer-based accounting information systems, transactions and the data relating to them may be initiated automatically on the occurrence of an event. A

company information system may (without human intervention) create a purchase order when inventory quantity is low or reaches a specified re-order point meshing with predicted sales or production needs. Moreover, by using an Electronic Data Interchange (EDI) system, a computer can use a communication line to electronically submit purchase orders to the desired supplier's computer systems (Gill and Cosserat, 1996). The main challenges facing auditors dealing with the real-time processing are that the controls are built into the computer system, and the possible absence of audit trails. Transaction and other files could not be retained for a long period, necessitating the use of more advanced audit techniques to facilitate a continuous, rather than periodic, audit process (Helms, 2002). In this context, Hansen and Hill (1989, p.407) explain:

EDI can virtually eliminate paper flow in the order, delivery, invoice, payment cycle because the computer based network enables transactions to be initiated, recorded, approved, and executed electronically.

Thus, in the more technically advanced environment auditors are required to compensate for *access* losses by using new audit approaches to enable internal controls to be tested and to perform the substantive tests supporting the formation of the audit opinion. It is predictable that auditing 'through the computer' and 'with the computer' are the appropriate auditing approaches that could be used by auditors dealing with accounting information systems utilizing real-time processing.

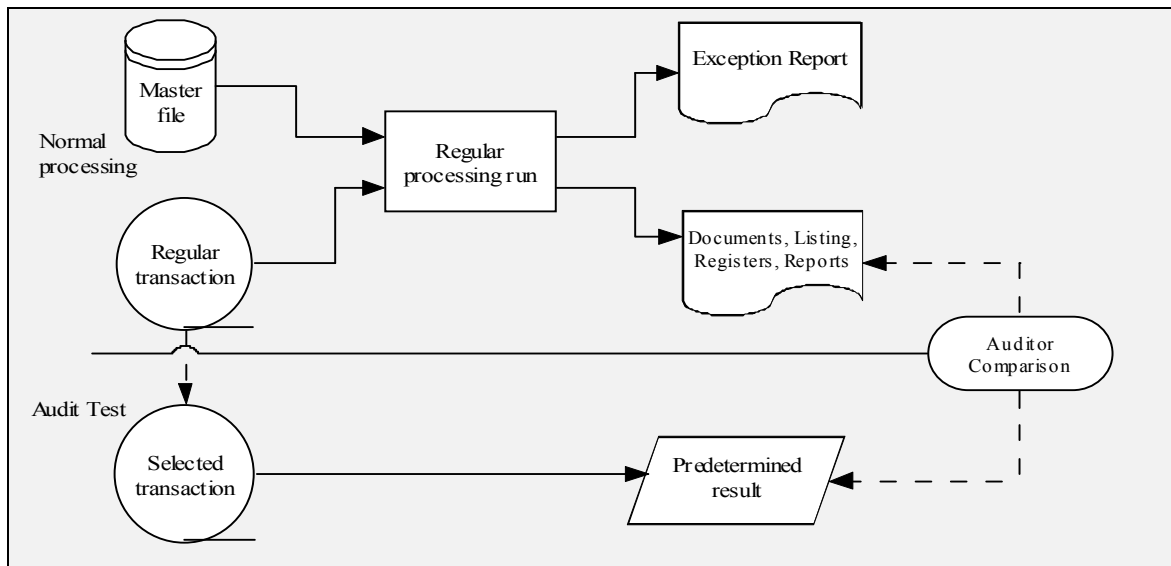
2.7 Auditing Approaches to Computer-Based Accounting Systems

Depending upon the complexity of the accounting information system, three audit approaches are described conventionally for auditing computer-based accounting systems: *auditing around the computer*, *auditing through the computer*, and *auditing with the computer*.

2.7.1 Auditing Around the Computer

In this approach auditors presume that the computer processing is reliable if it can be demonstrated that actual outputs of the accounting application produce the correct result from a set of inputs to the processing system (Wilkinson et al., 2000). Thus, this approach concentrates on the input and output of the computer and completely ignores the computer processing *per se*. The “*black box*” method is so-called because the computer’s processes are treated as ‘unknown’. Instead of testing processing operations and computer programs in a direct way, expected outputs for sample transactions are manually calculated, and compared with the computer-produced output, to infer the *accuracy* of computer processing, as illustrated in Figure 2.1. This approach is similar to the conventional methods of auditing manual accounting systems, in which auditor is able to trace the source documents for the selected sample transactions to summary accounts, and vice versa.

Figure 2.1: Auditing around the Computer



Source: Wilkinson et al. (2000, p.352)

Auditing *around the computer* is a traditional means of auditing in a computerized environment. Rushinek and Rushinek (1984) indicate that the early auditing of

computerized accounting systems used the around the computer approach, to offset auditors' limited familiarity with the technicalities of electronic processing and audit procedures.

The availability of three main conditions enable auditors to utilize the around the computer approach in periodic processing applications (Wilkinson et al., 2000). First, the audit trail must be available and complete. This means that the source documents, for the transactions data, and the summary reports are visible. Second, the data flow diagrams and system flowcharts should be available. The fulfillment of the above conditions assists the auditor to understand the functional features of the accounting application program and to trace every transaction from source document to the summary account. Finally, the processing operations need, of necessity to be relatively simple and low in volume. The more sophisticated the computerized accounting system and the larger the volume of transactions, the greater the need for advanced audit techniques to cope with this system.

The main advantages of this approach are that the auditor does not interrupt the regular operation of an accounting application during the audit, its generally low cost, that advanced computer skills of the auditor are not required, and its ease of comprehension by auditors, management and EDP personnel (Cash, Baily and Whinston, 1977). In contrast, auditing employing this approach may take long time, especially if the volume of the audit work is large. Furthermore, as the auditors do not use the facility of the computerized techniques for internal control assessment or substantive testing, their work on transaction data is limited most likely to a sample and not to the entire population - a condition that could minimize the probability of detecting frauds and irregularities in the financial statements. No formal inference can be made concerning

how the process handles any data not examined (Cash et al., 1977). Generally, to enhance the credibility of the audit service, auditors should switch to other auditing approaches that allow assertions about the processing of the accounting applications, rather than merely verifying the input output relationship.

2.7.2 Auditing Through the Computer

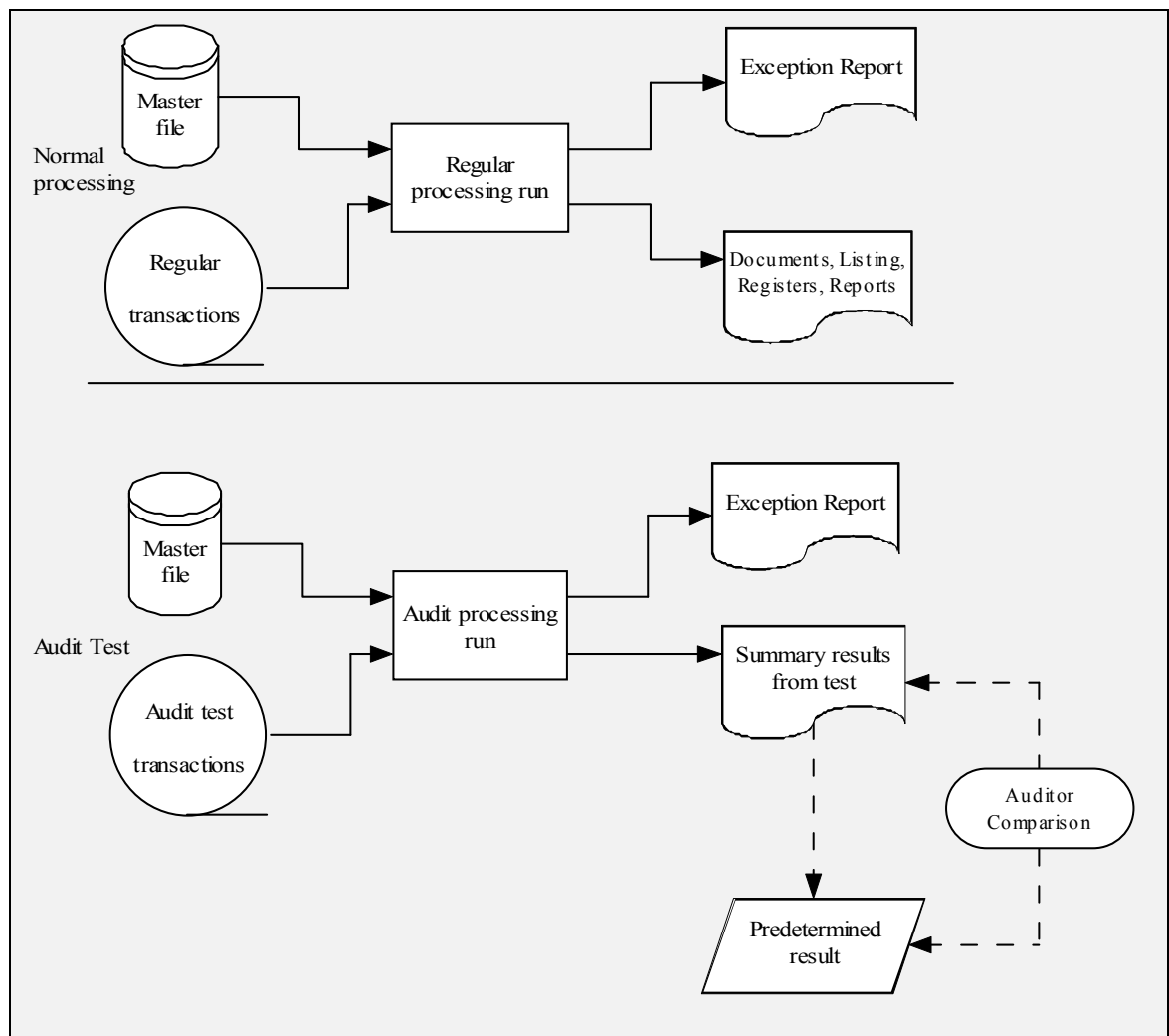
Advances in computer technology, along with complex accounting systems frequently make auditing around the computer an inadequate mechanism by which to verify the reliability and accuracy of accounting application processing. Thus a *through the computer* approach is frequently pursued.

Auditing through the computer assumes that if the processing of the accounting application system is reliable, then the output is correct. Accordingly, this approach concentrates on the processing operation of the computer based system, rather than the reconciliation of input data with output data, to test its accord with pre-calculated output, as in the around the computer auditing approach.

Through the computer auditing should be used when the internal control is built into a computer program, the audit trail is impaired, source documents are unavailable, the accounting information system processing is complicated, and when the processing volume is large. In these situations, the auditor cannot trace the transactions manually from the source documents to the summary accounts, and vice versa. A major part of the audit trail is invisible, possibly exacerbating inherent complexities in the processing. Through the computer auditing is suitable for the accounting applications using direct and real-time processing.

Accordingly, to audit through the computer, auditors utilize CAATs, such as the *Test Data Technique*, the *Integrated Test Facility Technique*, and the *Parallel Simulation Technique*. Here, for example, an auditor may process test data transactions through the client's accounting system and compare the results with a predetermined result to verify the reliability of the computerized application processing controls, Figure 2.2.

Figure 2.2: Auditing through the Computer



Source: Wilkinson *et al.* (2000, p.352)

Table 2.1 below illustrates the differences between auditing *around* the computer and *through* the computer when auditing the internal control of the accounting application.

Table 2.1: Examples of Difference between Auditing around the Computer and through the Computer

Internal Control	Auditing around the computer	Auditing through the computer
<i>Credit is approved for sales on account</i>	Select a sample of sales transactions from the sales journal and obtain the related customer sales order to determine the credit manager's initials are present, indicating approval for sales on account.	Obtain a copy of the client's sales application program and related credit limit master file and process a test data sample of sales transaction to determine whether the application software properly rejects those test sales transactions that exceed the customer's credit limit amount and accept all other transactions.
<i>Payroll is processed only for individuals currently employed</i>	Select a sample of payroll disbursements from the payroll journal and verify by reviewing human resources department files that the payee is currently employed.	Create a test data file of valid and invalid employee ID numbers and process that file using a controlled copy of the client's payroll application program to determine that all invalid employees ID numbers are rejected and that all valid employees ID numbers are accepted.
<i>Column total for the cash disbursement journal are subtotaled automatically by the computer</i>	Obtain a printout of the cash disbursements journal and manually foot each column to verify the accuracy of the printed column totals.	Obtain an electronic copy of the cash disbursements journal transactions and use Generalized Audit Software (GAS) to verify the accuracy of the column totals.

Source: Arens and Loebbecke (2000, p.340)

Auditing *through the computer* attempts to achieve two main objectives: first, the verification of the adequacy of the processing controls built into the accounting application program; and second, an assurance that the accounting data are processed in an accurate manner (Moscove, Simkin and Bagranoff, 2003).

2.7.3 Auditing *With the Computer*

In addition to the invisibility of the audit trails, lack of paper source documents, machine-readable files and accounting records, accounting information systems are becoming so large and complex, that frequently the accounting input and output data are stored in a huge database system. In these circumstances manual audit processes are impracticable, if not actually impossible (Reneau, 1977). To this end, auditing with the computer enables the auditor to utilize the accuracy, speed, and direct access facility of computer systems to audit the computer files and the data base system. According to Singleton (2006), the Generalized Audit Application is the most common CAAT technique currently used to audit *with the computer*, for it enables the extraction and analysis of the data to read an 'entire' file instead merely of samples from it; the extraction of all exceptions, instead of statistically projecting the rate of exceptions in it; and the determination of data characteristics and data profiles (Goldsmith, 1999). (More details of GAS are in section 6.4.4).

2.8 Summary

This chapter has explored how accounting has been impacted by the introduction of computerized systems, and in consequence, how computerized accounting systems necessitate the use of CAATs to collect the necessary auditing evidence to evaluate the reliability of the accounting systems, how the consequential challenges require auditors to acquire the latest audit skills, education and technology, to be capable of complying with the international standards on auditing. Worldwide, auditing standards and guidelines encourage auditors to use CAATs in computerized environments. Features of computerized accounting information systems and how they enable external auditors to

undertake auditing processes in an efficient manner have been examined and shown to justify the assumption that CAATs should be employed in the audit of companies with computerized accounting systems. Their use by Jordanian auditors would thus be a reasonable expectation.

Chapter 3

Jordan, the Field of the Study

3.1 Introduction

Several accounting and corporate scandals in Jordan had a dramatic impact on the economy and undoubtedly had significant ramifications, in terms of both foreign investment and the perceived credibility of Jordanian corporate governance.

Most well known of those Jordanian cases were the Petra Bank collapse, when in early 1990 it was the second largest bank in Jordan after the Arab Banking Corp, and the collapse of Global Business - the Credit Facility case - at the beginning of 2002 (Ayyoub, 2002).

The Petra bank affair arose in 1988 when Jordan's economy faced financial difficulties. The Central Bank of Jordan (CBJ) was facing liquidity problems due to the deep decline on the value of the Jordanian dinar. Foreign currency reserves declined. In 1989, the CBJ (in an effort to prop up the currency) requested that the local banks lodge thirty-five percent of their foreign currency assets in their CBJ accounts. Petra bank was unable to comply, and at the end of 1989, the CBJ replaced Petra's Board and investigations began. Thereafter, "the report by Arthur Andersen found that Petra's assets had been overstated by \$US200 million. In three areas, there were huge bad debts (about \$US80 million); "unsupported foreign currency balances at counter-party banks" (about \$US20 million); and money purportedly due to the bank which could not be found (about \$US60 million)" (Leigh and Whitaker, 2003).

According to Mayer (2004), on April, 1992 a military tribunal in Jordan concluded that Petra's management was guilty of thirty-one charges, including embezzlement, theft, forgery, currency speculation, making false statements, and making non-performing loans to themselves, to their friends, and to their family's other financial enterprises.

In contrast, the management of the computer company, Global Business, allegedly falsified official documents to obtain credit from several banks, which granted the loans without sufficient collateral (Ayyoub, 2002).

These scandals had enormous destructive effects on the Jordanian financial sector, with losses of more than \$US328 million being in respect of the Petra bank case (Haddad, 2003), and an expected \$US100 million in outstanding bank loans in respect of the Global Business credit facility case (Hayashi, Mouashe and Thomas, 2003).

These high profile collapses of local companies placed the Jordanian auditing profession in the spotlight, and prompted the questioning of the quality of the audit services they provided to the public, and of the credibility that might be accorded their audit opinions. The collapses and their aftermaths potentially exacerbated the gap in public expectations regarding how audits were conducted, and in turn weakened confidence in the corporate governance environment in Jordan, undermining local and foreign investors' perception that the Jordanian securities market was orderly and well-regulated.

In this context, the key reforms, which have been adopted by the Jordanian government to improve and promote its investment environment to attract foreign investment (noted earlier in 1.2), need to be supported by the enhancement of the local corporate governance environment, of which audit practice is a major component.

As one of the main pillars of the corporate governance environment, audit services in Jordan arguably need the injection of the benefits from the introduction of the latest audit technology to lift this aspect of corporate governance to a higher level, enhance its credibility by narrowing any audit technology gap and in turn drive success of Jordanian governmental reforms. As the Petra Bank and the Global Business affairs indicated, corporate governance in Jordan is not well developed. Audit, in particular, is generally technologically inappropriate for the audit of companies using contemporary accounting technology. That weak corporate governance environment remains the main barrier confronting entry by foreign investors (Hayashi et al., 2003).

This chapter comprises nine sections. Section two provides a brief description of kingdom of Jordan, its location, population, and language, providing insights into the underlying legal, social and economic setting for this study. Section three discusses the factors influencing the orientation of accounting in Jordan. Discussion of the emergence of the Amman Financial Market in section four exposes its effect on the development of the accounting and auditing profession. The development of the auditing profession in Jordan is discussed at section five. Section six discusses the legal framework regulating the auditing profession. Jordanian financial reporting and its significance for the application of computerized audit techniques are reviewed in section seven. Section eight provides insight into accounting education at Jordanian universities, with an emphasis on the extent of instruction in auditing and particularly computerized information system auditing, and an evaluation of its impact on the qualification of Jordanian auditors is presented. Critical aspects of those several matters are summarized in section nine.

3.2 Jordan - Historical Background

The Kingdom of Jordan is steeped in history and had been a major site for civilization. The Nabateans, an Arab people with their base in Petra, were amongst the first to settle in Jordan. The Nabatean Kingdom lasted until 106 A.D., when it was conquered by the Romans. After the division of the Roman Empire in the late 4th century A.D., Jordan came under the rule of the Byzantine, or eastern Roman, empire. In the 7th century A.D., the Byzantines were expelled by invading Muslim armies. In later centuries, the region was overrun by tribes from central Asia, including Seljuk Turks, Mongols, and Tatars. In 1516, Jordan was made part of the Ottoman Empire, and this period came to an end with the Arab Revolt, between 1915 and 1918.

On April 25, 1920 Britain and France agreed at the San Remo conference to impose a French mandate on Syria and Lebanon, and a British mandate on Iraq, Palestine and Jordan. In 1921, all of what is now Jordan was founded under the name of the Emirate of Transjordan, with British patronage, on the East Bank of the Jordan River. Accordingly, Jordan was dependent on Great Britain, the financing and ultimate control of the country's armed forces resided in London (Hells, 1992).

Upon signing the treaty of Transjordan in May 15, 1923, Britain formally recognized the Emirate of Transjordan, as a state under the leadership of Emir Abdullah. The treaty stipulated that Transjordan would be prepared for independence under the general supervision of the British High Commissioner in Jerusalem. Thereafter, Jordan witnessed a period of consolidation to its systems and state building institutions between the two world wars. However, the British government continued to *guide* Transjordan's foreign relations, finance, and fiscal policy. In 1928, Emir Abdullah promulgated the constitution, which provided for a parliament. Elections were held in

February 1929, bringing to power the first Legislative Council of 21 members. In 1939, a local cabinet government (Council of Ministers) was formed. In 1946, Jordan gained independence upon signing the Treaty of London. Transjordan adopted “The Hashemite Kingdom of Jordan” as its official name, and in 25 May 1946, Abdullah was proclaimed King of the Hashemite Kingdom of Jordan.

The Hashemite Kingdom of Jordan is a constitutional monarchy, ruled by His Majesty King Abdullah II. Executive power is vested in the Council of Ministers, which is appointed by the King and is accountable to a bicameral parliament. The King appoints the Upper House, while the Lower House deputies are directly elected.

Jordan is a small, developing Arab country, within an area of 92,342 square kilometers, located in the Middle East, bounded on the north by Syria, the northeast by Iraq, the south and southeast by Saudi Arabia, and on the west by the West Bank and Israel.

In 2003, Jordan’s population, the majority (38.1%) residing in cities - mainly the capital Amman, was estimated at 5.5 million, of which 52.7% was male (DOS, 2004). The official language is Arabic, but English is used widely in commerce and government, is taught in schools as a second language and is the language for teaching science and business in Jordanian universities. The widespread use of the English language facilitates the process of accessing the internet network, western textbooks, journals and more specifically the western accounting and auditing literature worldwide by Jordanian academics and students in the different accountancy schools. Accordingly, it is expected that the educated people in Jordan are apprised of the latest auditing technology used in accounting by corporations worldwide, especially those in Britain, the European Union and the United States. Moreover, it is reasonably anticipated that Jordanian auditors by

complying with International Standards on Auditing will pursue the latest standards issued regarding CAATs.

3.3 Factors Influencing the Orientation of Accounting in Jordan

Understandably, social, economic, and political factors have had a considerable impact upon the way accounting, and auditing is practised and regulated in Jordan.

On the social side, as a consequence of English being used instead of the Arabic language during the British colonization, many accounting documents, rules procedures have been derived from those prevailing in the United Kingdom (Hells, 1992). Moreover, many Jordanian students have studied accountancy abroad (mainly in the UK and the US) contributing to accounting practitioners potential awareness of Anglo-American auditing practices. The major problem lies in their less than widespread use in Jordan.

On the economic side, and during the British occupation, the Jordanian economy was described as, at best, primitive; accounting practice was limited to simple bookkeeping. Al-Rai and Dahmash (1998) explain that at the early period of establishing the country:

The Jordanian economy was very simple and composed mainly of agricultural business. Accounting practices, therefore, were limited or nonexistent (p.179).

After the independence, during 1950-1960 the Jordanian government established large enterprises to engage in activities such as potash extraction and fertilizer production. Growth of the economy since has made significant demands upon accounting in Jordan. According to El-Issa (1984) the economic growth in developing countries requires accounting procedures and standards to meet the needs of the developing economy. For without them industry remains relatively primitive, unlikely to attract the level of

investment necessary for international expansion and general participation in globalization, key elements in the development of a modern economy and international capital market.

During the 1970's the government continued to expand the public sector, and established the Amman Financial Market (AFM) to arrange the national savings programme and organize the issuing and trading of the public companies' shares. Consistent with the above, according to Al-Rai and Dahmash (1998) the creation of AFM was one of the major reasons requiring the use of an efficient set of accounting and auditing standards.

Politically, Jordan has maintained strategic local and western alliances. After independence, Jordan maintained close relations, especially 'economic ties', with Britain and the West. For Jordan as a country without natural resources conducive to mining, petrol production and water development, depends on aid from Arab and western countries (mainly the US and the UK) to achieve its development plans. Hoogvelt (1997), in this regard, indicates that the condition of aid and development programmes to the developing countries depended mainly on the readiness of these countries to assume social, cultural and political changes. Thus, as Kamla (2004, p.12) described the situation for countries depending on western aid:

They adhered to development and economic programmes prescribed to them by Western experts, whether working in multinationals operating in these countries, including accounting firms, or in international organizations such as the World Bank and IMF.

In view of that, accounting in Jordan has been influenced by the UK, when its accounting practices were applied during the period of British occupation and through its aid to Jordan after independence. On the other hand, the US has influenced the

accounting practices in Jordan through its investment in Jordanian commerce and since 1950 through its continuous economic assistance and the natural desire of developing economies to benefit from the US industrial might.

In this context, the influence of Western accounting systems continued in Jordan even after independence. The clearest evidence of the continued influence was the adoption of the International Accounting and Auditing Standards by Jordanian enterprises. Accordingly, Hells (1992) categorizes accounting practice in Jordan as being in accord with the *British-American Model*. But Hells' characterization may well be a too simplistic a view of Jordanian accounting development. For, despite linkages with US accounting and auditing through the operations of the Big 4 firms in Jordan, Jordan's adoption of the IFRSs and the ISAs is more consistent with the British and EU developments than those in the US, which has refused to adopt the international accounting and auditing standards, preferring to remain with its FASB prescriptions.

3.4 The Emergence of the Amman Financial Market and its Effect on the Accounting and Auditing Profession

Public shareholding in companies have existed in Jordan since 1930, when the first Jordanian company, the Arab Bank Corp., was established. It was followed by the Cigarettes and Tobacco Companies in 1931, the Jordanian Electric Power in 1938, and Jordan Cement Factories in 1951. The first corporate bonds were issued at the beginning of the 1960s. Prior to 1978 unregulated share trading of the public share holding companies was undertaken through unregistered offices in Jordan. As a result, in order to mobilize national savings, organize the process of issuing and trading financial securities and to protect small investors, the government collaborated with the

International Finance Corporation of the World Bank to establish the Amman Financial Market. It commenced operations in January 1978 as a public financial institution with legal, administrative, and financial independence, operating under the auspices of the Minister of Finance.

The AFM had the features normally found in both a stock exchange and a government securities and exchange commission. It was thus both the trading authority and the corporate regulator in Jordan. The AFM has the appropriate power to promote the development of the securities market and to regulate the activities of member firms dealing in securities as underwriters, brokers, and investment advisors, and in effect, to regulate the trading market as such. To this extent, the AFM functioned not only as a typical bourse, but also as an organizing and regulating body.

In 1997, the Jordanian Government adopted a comprehensive restructural reform policy for the capital market of Jordan built upon what had been accomplished during the previous twenty-one years, aiming to bring the Jordanian securities industry up to international standards.

The main features of the restructural and reform policy according to the provisions of the Securities Law (No. 23/1997) were the institutional changes in the capital market, the introduction of the automation of the trading and clearing and settlement operation, removal of obstacles restricting investment, strengthening the monitoring and surveillance of the capital market, introducing new financial services and new financial instruments to achieve the highest level possible of transparency and to provide the right environment to achieve the orderly dealing in securities.

The reform program contemplated the establishment of three new Institutions: the Jordan Securities Commission, a Stock Exchange, and a Securities Depository Center. According to the provisions of the Securities Law (No. 23/1997), the Jordan Securities Commission (JSC) was established in 1997 as a Government body to regulate and monitor Jordan's capital market. The Amman Stock Exchange (ASE) was formally launched in March 1999. Managed by the private sector; it is a non-profit legal entity with administrative and financial autonomy. A Securities Depository Center (SDC) was established in May 1999 as a private sector entity to initiate the registration and transfer of ownership of securities traded and the settlement of prices of such securities among financial brokers.

Creation of the AFM has had a major impact on the accounting and auditing profession in Jordan (Al-Rai and Dahmash, 1998). Prior to the AFM companies' financial reporting was addressed mainly to the government and to the creditors. Afterwards, to assist investors make informed investment decisions, the demand for more financial disclosure, credible financial reporting and for audited financial statements increased. Establishment of the AFM has encouraged the investors to establish more public companies. In turn, the formal and informal demands on the accounting and auditing profession understandably have also increased.

3.5 Development of an Auditing Profession in Jordan

During the British mandate, British accountants established local accounting firms in their Middle East mandates, mainly in Egypt, Palestine, and Iraq. They employed residents of the region to audit branches or subsidiaries of British companies and to audit local companies with British ownership. For Jordan, during the early period

following the foundation of the country, because the economy was primitive (being noted earlier in 3.3 'mainly agricultural'), no audit firms were based in the country, and auditors from the west bank of the river Jordan carried out all of the accounting or auditing work.

During the 1930's, following the promulgation of the Jordanian Constitution and the election of the Legislative Council and the emergence of the new Jordanian public companies, the demand upon accounting and auditing services in Jordan increased such that an indigenous profession was inevitable. This materialized during the 1940's, when a fledgling Jordanian accounting and auditing profession began to emerge. In 1944 the first Jordanian audit firm - George, Kader and Co., commenced practice. Due to the political issues resulting from the Arab Israeli war, a second audit firm, Saba and Co., moved from Jerusalem into Jordan in 1948 to open a permanent office in Amman. Those two firms dominated the Jordanian audit market until the beginning of 1950s.

Establishment of public companies and the economic growth after the early years of independence encouraged foreign audit firms to open branches in Jordan - of note were Russel and Co. and Whinney, Murray and Co in 1950.

According to Al-Rai and Dahmash (1998, p.180):

After the Arab Israeli war in 1948, the west bank became a protectorate of the Hashemite kingdom of Jordan. The new link between the West bank and East bank created a new structure in the Jordanian society. New ideas were exchanged and the need for more economic development emerged.

To satisfy the increasing needs for economic development during 1950-1960, the Jordanian government established large enterprises, such as the Jordan Cement Factories in 1951, Jordan Phosphate Mines in 1953, Jordan Petroleum Refinery in 1956, and Potash extraction in 1958. Throughout the following years, the number of

enterprises continued to increase regularly. Demand for accounting and audit services increased commensurably. As a result, more auditing firms were established, and, by 1975 twenty auditing firms were operating in Jordan.

Auditors in the local audit firms ‘practised’ without particular permission or license. Neither laws nor regulations were in place to control the auditing profession after independence. In this context, it is reasonable to presume that the lack of regulation may have contributed to there being no stated professional standards or skills required of auditors as prerequisites to entry to the Jordanian auditing profession. In that setting, it is to be expected that the quality of auditing was adversely influenced. This state of affairs with the auditing profession operating in a completely unregulated environment, without any practice guidance rules, continued until 1961.

3.6 The Legal Framework for the Auditing Profession in Jordan

Since the accounting and auditing professional bodies did not emerge in Jordan until 1987, in the absence of an effective accounting and auditing profession the government bore the full responsibility for regulating accounting and auditing practice.

Growth in the Jordanian economy and the increased number of auditing firms necessitated the formal organizing of the profession. The absence of pressure from the Jordanian accounting bodies for self-regulation opened the way for the government to usurp the regulatory role. Thus, government commenced regulating the auditing market through legislation. During 1961-2003, the government issued three laws to regulate the local auditing profession. In 1961, the first auditing law was issued with the intention of introducing a *licensing* mechanism for entry to the auditing profession. This was amended in 1985, introducing a written examination as a prerequisite to receiving an

3.6.1 Practicing Auditing – Easy Professional Entry - Law (No. 10/1961).

The auditing profession in Jordan was officially created with the promulgation in 1961 of the “*Law for Practicing of the Auditing Profession, Law (No. 10 / 1961)*”.

According to Law (No. 10/1961), public accountants in Jordan must be licensed to practice. The auditing license was issued by a *licensing committee*, comprising representatives of the Deputy Ministry of Finance, Deputy Ministry of National Economics, Deputy Audit Bureau, Head of the Commerce Department at the Ministry of National Economics, and one Certified Accountant nominated by the President of the Audit Bureau.

Whilst it prescribed that the licensing committee contain auditing practitioners with a long professional experience, the governmental members dominated the structure, since the government adopted the organizing of the auditing profession. Understandably, the profession was very weak during these years, to the extent that it could not affect any decisions relating to it.

Under Law (No. 10/1961), applicants applying for the audit profession license had to hold *one* of the following:

First, be a member of a recognized public accounting body. Since no accounting or auditing professional bodies existed in Jordan during these years, all applicants

satisfying this requirement came from outside of Jordan, mainly from the UK and the US (Hells, 1992); or

second, applicants had to hold a degree from a university or an equivalent institution of learning with specialization in commerce, economics, or finance, and have one year's experience as an audit manager or as a senior auditor in a government agency or in a licensed audit firm. Thus, the license was granted not only to those holding an accounting degree, but also to holders of finance and economic degrees. The wisdom of that was contestable for, as technical specialists, auditors of necessity must be appropriately qualified academically and possess the necessary practical experience. Merely to be well educated is clearly no indication of possessing a developed business acumen. It is to be expected that the non-accounting practitioners were the less proficient, their auditing work not drawing upon a solid knowledge of accounting and business matters; or

third, hold a high school certificate with four years experience as a senior auditor in a government agency or in a licensed audit firm; or

fourth, have completed junior school and have worked on a full time basis as a senior auditor in a government agency or in a private office for a period of six years prior to the enactment of the law.

Thus, according to the third and fourth requirements of Law (No. 10/1961), an audit license could be granted to anyone who had completed high school or completed junior school. In effect this meant that during that period an audit license in Jordan was available to all the 'school educated', regardless their academic qualifications or business experience, or indeed what they had been taught.

Thus, Law (No. 10/1961) completely ignored academic experience, and depended for granting the license on the practical side. It appears to have been heavily weighted in favor of recruiting ex-government agency employees into auditing. But according to Al-Mekbel (2004) the experience in government agencies was generally insufficient grounds for granting such licenses. The government agencies mentioned in the third and fourth requirements captured a wide category of workers, even to the extent that it included those who audited (*counted*) post-office stamps. By virtue of the licensing for the practicing auditing profession in Jordan at that time being divorced from precise academic qualifications, knowledge and expertise, the audit market was filled with ‘unsuitable’ practitioners.

Any auditor who had practiced in the public accounting profession for two years before the enactment of the Law (No. 10/1961) was granted a license directly under a *grandfather* clause – a circumstance further indicating and exacerbating the ease of entering the profession.

During the period 1961-1985, in which the Law (No. 10/1961) operated, several factors influenced the quality of the auditing profession in Jordan, and led to weakening it. Besides the loose requirements for licensing, the absence of local professional bodies that could help in the regulation of audit work, cultivate an ethos of compliance, and evaluate the non-compliance with accounting or auditing standards, contributed to the profession’s weakness.

Finally, Law No. 10/1961, in contrast with worldwide practices, did not require applicants to sit a professional *screening* examination as an entry prerequisite. This almost guaranteed that in any comparison with western audit practice Jordanian practice

would fare poorly. It is to be noted that Law (No. 10/1961) continued in force until 1985.

3.6.2 Professional Auditing Examination - Law (No. 32/1985)

In 1985, auditing law (No. 10/1961) was amended by the “*Law of Auditing Profession. Law (No. 32/1985)*”, for the first time requiring aspiring auditors to sit an audit examination as a prerequisite to practicing in Jordan. The audit examination is perceived to be an important development to ensure that the auditors have the necessary educational background, skills, practical experience, and competencies (Delaney, 1995). The examination comprises two parts covering a range of accounting topics such as, managerial accounting, business law, accounting practices, auditing, and income tax. The content of the Jordanian auditing profession’s examination was parallel in focus with that of the American Institute of Certified Public Accountant (El-Rajabi and Gunasekaran, 2004).

According to Law (No. 32/1985), the auditing profession was to be administered by the Board of Auditing Profession (BAP) composed of the following members: the President of the Audit Bureau to be BAP President, the Deputy of Audit Bureau, the Deputy of Ministry of Finance, the Deputy of Ministry of Industry and Trade, the Director General of the Income Tax Department, the Deputy Governor of the Central Bank, the Amman Financial Market manager, two academics, and three Certified Accountant. The main responsibility for the Board of Auditing Profession was to manage the licensing of auditors through conducting the auditing professional examination.

The structure of the Jordanian Board of Auditing Profession was heavily criticized in Matar (1994). Matar’s study indicated that the composition of the BAP lacked fairness,

where the proportion for the professional members of the BAP was three out of twelve (25 percent), while the governmental members comprise the majority, meaning that the profession remained under the control of the government, not the profession itself. In 1985, there was no professional body to influence the decisions related to auditing practice or the composition of the BAP. Accordingly, it was government dominated.

Under Law (No. 32/1985), the applicants should hold *one* of the following qualifications to be entitled to sit for the audit profession exam: a Bachelor's degree or equivalent in accounting with a minimum of three years experience in accounting and auditing, of which at least one year is to be in auditing; a Masters degree or equivalent in accounting, with a minimum of two years experience in accounting and auditing, with at least one year in auditing; a Bachelor's degree or equivalent from the faculties of commerce or economics or law with a minimum of five years experience in accounting and auditing, with at least one year in auditing; a Community college degree (Diploma) in accounting with a minimum of six years experience in accounting and auditing, of which at least two years are in auditing; or be any one who has worked for the Audit Bureau or any other governmental department for seven years as a chief auditor and holds a Bachelor's degree or equivalent.

Comparing Law (No. 10/1961) with Law (No. 32/1985) regarding the auditors licensing requirements it is noticeable that Law (No. 32/1985) was stronger in its moves to lift the quality of the auditors. Applicants had to sit for a written audit examination, described by El-Rajabi and Gunasekaran (2004, p.1033) as "a screening device to insure that a member will not receive the license to perform the attest function before proving ability to practice public accounting". Whilst the first and second requirements specified the Bachelor's and Masters degree in accounting, which is more suitable for auditors than

other qualifications, again, by recourse to general educational qualifications of any variety,- non-accounting graduates and holders of a diploma certificate, satisfied the qualifying criteria to sit the auditing examination.

Holders of a Ph.D. in accounting with a minimum of one year's auditing experience or two years teaching experience and those possessing professional certificate from any internationally recognized certified public accountants institutes or associations (such as the *Chartered* or *Certified* certificate) were exempted from the examination.

Against that backdrop, the Law (No. 32/1985) founded the first professional auditing body in Jordan, The Jordanian Association of Certified Public Accountants. As such, it was a significant step towards the development and regulation of the auditing profession.

3.6.2.1 The JACPA – a Professional Landmark

The Jordanian Association of Certified Public Accountants (JACPA) was founded in 1988 by the JACPA By-Law (No. 42/1987), issued to accordance with Article 18 of the auditing profession Law (No. 32/1985).

The Association had been attached to the BAP and chaired by the president of the Audit Bureau. As such, the JACPA aims to raise the educational and technical standards of the profession in Jordan. To attain these the JACPA faced the need to: develop the technical level of the Association's members, monitor the professional code of ethics, encourage and support scientific research in different fields of the auditing profession, determine and prescribe the generally accepted auditing standards, and raise the awareness with the rules and principles of accounting.

To this end the JACPA has worked diligently toward the development of the auditing profession in Jordan. The main achievement for the JACPA was the recommendation for adoption of International Financial Reporting Standards IFRS, with effect from January 1990.

3.6.3 Organizing the Practice of the Public Accounting Profession - Law (No. 73/2003)

In 2003 a new auditing law was issued, the “*Law of Organizing the Practice of the Public Accounting Profession. Law (No. 73/2003)*”. This law addresses a contemporary basis for practicing the public accounting profession to guarantee the reliability of the financial statements presented by companies and other institutions. In this regard Law (No. 73/2003) aimed to achieve the following: organizing the practice of the auditing profession; ensuring compliance by Jordanian companies with International Accounting and Auditing Standards; developing the technical and educational abilities of the Jordanian auditors; ensuring compliance of the auditors with the code of professional ethics; and enhancing auditors’ integrity and independence.

To achieve the above, a *high council* for accounting and auditing was established headed by the Minister of Industries and Trade, and also comprising: the Minister of Finance, the Governor of the Central Bank, the President of the Audit Bureau, the General Director of the Insurance Committee, the Controller of the Companies, the Chairman of the Board Commissioner of the Jordanian Securities Commission, the President of the Public Accountant Association, three public accountants, an experienced accountant from the Private Sector, and one Professor from a reputable Business School.

Consistent with the composition of the past committees, the composition of the auditing *high council* was dominated the governmental members, with only 25% being practitioner auditors. Therefore, professional members remain a minority in the council. Arguably, domination by government representatives has resulted from the weakness of the JACPA, to the extent that it was deemed that it was still in its infancy (Hells, 1992).

Law (No. 73/2003), for the first time, requires that the applicants complete a training period at a certified public accountant office, in addition to passing the audit examination prerequisite. It is reasonable to expect that this new arrangement should enhance the quality of the auditing profession, ensure that public accountants are trained at a well-known office, and that they obtain the necessary practical skills to enter the profession.

Applicants now had to hold *one* of the following qualifications in order to be entitled to sit for the audit professional examination: a Bachelor's degree with a major in accounting; a Diploma in accounting; a related Bachelor's degree, not in accounting, but with accounting courses meeting a minimum threshold; or a Professional Certificate from an acceptable professional body. To enhance the quality of the auditing profession under the new law, eligibility to sit the auditing examination was granted only to those holding an accounting degree or who had studied a specified minimum of accounting courses. It is expected that the holder of the accounting degree will be more efficient and appropriate auditors than others without that credential. Thus, Law (No. 73/2003) tries to link the practical aspects of auditing, through the training program at a well-known audit office, with a solid knowledge of academic matters, through the accounting degree. Under the Law (No. 73/2003), therefore, the JACPA received additional power to enhance its role in developing the auditing profession.

Currently the JACPA can establish a disciplinary committee to impose one or more of the following sanctions upon members for malpractice: admonition, warning, suspending the auditor's license for a period not exceeding two years, and termination of the auditor's license. Accordingly, the JACPA possesses the authority to inspect the audit firm's working papers, through a specialized inspection committee. Moreover, the Association can now draft its own rules and regulations and has the right to maintain a special record for all auditors.

For the first time, the JACPA now has the power, the means, and the authority to play a vital role in development of the auditing profession. This new authority should encourage the Association to start exercising its power in the best manner. Enhancing the quality of the profession should be based on a strong professional base, requiring Jordanian auditors to engage their Association to exert pressure towards the technical advancement of the profession.

Finally, the audit profession in Jordan should keep corporate financial reporting in Jordan free of intentional or unintentional manipulations. As the Jordanian economy has experienced several corporate and accounting scandals, Jordanian audit firms like other international CPA firms have to utilize the benefits of best practice technology, such as CAATs, to detect frauds, errors, and irregularities.

3.7 Financial Reporting by the Public Companies in Jordan and Its Influence on the Use of CAATs

Financial reporting in Jordan is regulated through the commercial laws. The main legislation governing Jordanian financial reporting comprises:

- The Companies Law (No. 22/1997)

- The Securities Law (No. 76/2002)
- The Banks Law (No. 28/2000)
- The Insurance Regulatory Law (No. 33/1999)

The Companies Law regulates all types of companies; the Banking Law regulates the banks, while the Insurance Law regulates the insurance companies. In the same context, the Securities Law regulates all companies regarding listing and trading matters in the financial markets.

3.7.1 Financial Reporting in the Companies Law (No. 22/1997)

According to the Companies Law (No. 22/1997), Jordanian companies are divided into General Partnership, Limited Partnership, Limited Liability Company, Limited Partnership in Shares, Public Shareholding Company. The securities of public shareholding companies can be listed and traded in the capital market and their minimum paid in capital is 500,000 Jordanian dinars (JD)³.

According to the Companies Law (No. 22/1997) public shareholding companies are obligated to appoint an auditor. Duties are assigned to the Jordanian auditor according to the Companies Law - the major responsibility being to audit companies' accounts in accord with the recognized auditing rules, the auditing profession's principles and its scientific and technical standards. Moreover, an auditor is to review the financial and administrative by-laws of the company and its internal financial controls, to ensure their suitability for the company's business and the safeguarding of its assets. Accordingly, auditors in Jordan are responsible for assessment of companies' internal control, in

³ Roughly 1 JD= 1.41 USD.

addition to undertaking the appropriate substantive tests. Thus, where Jordanian companies have been using computerized systems to organize of their accounting records, auditors are expected to use the appropriate technology to perform their work with high proficiency.

In accordance with Companies Law (No. 22/1997), all the public shareholding companies are required to prepare and issue their annual audited financial statements - their balance sheets, income statements, and cash flows statements - within three months from the end of the company's fiscal year. Further, each public company is to prepare and issue its semi-annual financial statements, certified by the company auditors within 60 days from the end of the half-year period. The Law requires accountants and auditors to comply with the International Financial Reporting Standards and the International Standards on Auditing.

3.7.2 Financial Reporting in the Securities Law (No. 76/2002)

The Securities Law in Jordan (No. 76/2002) also requires all public shareholding companies to prepare and issue their annual audited financial statements, within a period not exceeding three months from the end of its fiscal year. Semi-annual financial statements with comparisons to the same period of the preceding fiscal year, are to be prepared within a period not exceeding one month from the end of the half-year period. Moreover, each company shall declare their primary results upon primary revision of such by its auditor, within no more than 45 days from the end of its fiscal year. The primary results shall at a minimum include the following: net revenues, expected net profit (or loss) prior to tax, designated income tax for the expected profits, minority rights in the profits, the proportion of the net profit attributable to the company's

shareholders after deducting the designated tax and the minority rights, and a summary of the company's performance during the fiscal year.

In addition to the above, the Directives for listing securities on the Amman Stock Exchange, issued by virtue of the provision of article (72) of the Securities Law (No. 76/2002), requires the listed companies on the *first market* (one of the stock exchange markets governed by strict conditions) to issue quarterly reviewed financial statements, within one month of the end of the relevant quarter. All the financial statements shall be prepared consistently with the IFRSs, and the ISAs shall be adopted in auditing them.

3.7.3 Financial Reporting in the Banks Law (No. 28/2000)

The Central Bank of Jordan (CBJ) is considered the main surveillance authority besides the Ministry of Industry and Trade and the Jordanian Securities Commission, scrutinizing and regulating the banks. The CBJ has issued laws and regulations, the most important of which is the Banks Law (No. 28/2000).

According to the Banks Law (No. 28/2000), the auditors' main duties are: (i) to assist the bank to maintain correct records and accounts, (ii) review and scrutinize the adequacy of the internal auditing and the internal control procedures and provide recommendations thereon, (iii) submit an annual report on the results of auditing the accounts of the bank showing its actual financial position, and attaching to the report an opinion on such accounts, and (iv) furnishing the Central Bank with a certificate stating an audit opinion on the adequacy of the bank's doubtful debt provisions and any deficit in the provisions required for the bank's assets, pursuant to the orders issued by the Central Bank for the purpose.

According to Al-Dahan and Makamrah (1990) banks in Jordan have used computerized systems since 1973. Therefore it is anticipated that nowadays banks' daily operations in Jordan are fully computerized, employing new computerized technology such as electronic fund transfer systems and the electronic fund transfer at point of sale (EFTPOS). In these advanced circumstances the banks' managements and the financial statements users can be anticipated to reasonably expect the auditors in Jordan to employ CAATs in assessing the internal controls and undertaking the necessary substantive test.

3.7.4 Financial Reporting in the Insurance Regulatory Law (No. 33/1999)

The Jordanian Insurance Commission (JIC) was established in 1999 to regulate and scrutinize insurance companies' operations, in addition to the inspections undertaken by the Ministry of Industry and Trade and the Jordanian Securities Commission. The JIC issued the Insurance Regulatory Law (No. 33/1999), regulating the financial reporting and the implementation of International Financial Reporting Standards and International Standards on Auditing in the insurance sector.

In compliance with the Insurance Regulatory Law (No. 33/1999), all insurance companies in Jordan are to prepare and issue annual audited financial statements compliant with the IFRSs within two months of the end of the fiscal year, and reviewed semi-annual financial statements within one month of the end of the half-year. Furthermore, on a quarterly basis insurance companies are required to submit the financial reports and statements forms for supervisory purposes to the Insurance Commission within one month from the end of the related quarter, except for the fourth quarter, when it is to be within two month from the end of that quarter. These reports

are to be certified by the company auditor indicating their consistency with the records of the Company.

3.7.5 Financial Reporting and Computerized Audit Techniques

The importance of financial reporting in Jordan is indicated by the extent to which each of the commercial laws addresses different articles in relation to it. The public shareholding companies listed on the Amman Stock Exchange in Jordan are divided into four main sectors, the banking, insurance, services, and industrial sectors. The above discussion of the financial reporting required by different laws clearly shows that the number of financial statements required from public shareholding companies in different commercial sectors is substantial, and has increased over time. These circumstances place pressure on the auditing profession to complete the audits of the companies' records, to enable companies to issue their financial statements within the legal time limits. Moreover, both the Companies Law (No. 22/1997) and the Banks Law (No. 28/2000) require auditors to undertake tests of the internal control systems for each company under audit. These factors jointly make the use of computer assisted audit techniques a necessity, pursuant to issuing timely audit reports, with a greater degree of reliability, and credibility. It is expected by using computerized techniques auditors can accelerate the auditing process while maintaining a high quality in the auditing work.

3.8 Accounting and Auditing Education in Jordan

There is considerable evidence of the significant role the audit education can play in narrowing users' misconceptions regarding the auditing processes being employed (Beck, 1973; Mednick, 1986; Monroe and Woodliff, 1993; Porter, 1993; Gramling, Schatzberg and Wallace, 1996; Pierce and Kilcommins, 1996; Dixon, Woodhead and

Sohliman, 2006). Auditing education and continuous auditing training programs are also vital to raising and enhancing the audit profession's performance, thus contributing to reducing any public misconceptions regarding how Jordanian auditors undertake their tasks.

University education in accounting did not exist in Jordan prior to 1965. Jordanian students went to the Universities in neighboring countries or overseas to continue their business studies (Hells, 1992). The majority of the Jordanian licensed public accountants have graduated in Iraq, Egypt, Lebanon, Syria, a minority from the Jordanian Universities and a few from United States and British Universities. In 1962, the first Jordanian public University, Jordan University, was established. Three years later the Faculty of Economics and Administrative Science (FEAS) of Jordan University was established.

In 1981, a second FEAS was established at the second public University, Yarmouk University. By 1990, demand for higher education caused private Universities to start to appear. In 2004, seven public and nine private Jordanian Universities offered a Bachelor's degree in accounting (MoHE, 2004), as shown in Table 3.1.

Table 3.1: The Jordanian Universities offering a Bachelor's Degree in Accounting (2004)

University Name			
Public Universities		Private Universities	
1	Jordan University	1	Philadelphia University
2	Yarmouk University	2	Al-Isra University
3	Mo'tah University	3	Applied Science University
4	The Hashemite University	4	Amman Private University
5	Al-al Bayt University	5	Petra University
6	Al-Husien Ibn Talal University	6	Al-Zaytoonah University
7	Alplqa Applied University	7	Irbid National University
		8	Jerash Private University
		9	Zarka Private University

Source: (MoHE, 2004)

Each of the sixteen universities offers a Bachelor's degree in accounting following the credit-hour system. Table 3.2 shows the computer oriented and auditing related courses in the accounting curriculum of sample of six Jordanian Universities.

Table 3.2: Audit Courses and Computerized Accounting Courses Leading to a Bachelor's Degree in Accounting Offered by a Sample of Six Jordanian Universities (2004-2005).

University Name	Auditing		Computer Skills		Accounting Information Systems		Accounting Applications on Computer	
	Compulsory	Elective	Compulsory	Elective	Compulsory	Elective	Compulsory	Elective
Jordan University	√	-	√	-	√	-	-	-
Yarmouk University	√	-	√	-	-	√	-	√
The Hashemite University	√	-	√	-	√	-	-	-
Al-Isra University	√	-	√	-	√	-	√	-
Applied Science University	√	-	√	-	√	-	√	-
Amman Private University	√	-	√	-	√	-	√	-

Source: Jordanian Universities Accounting Department 2004-2005.

A closer look at the accounting curriculum of the auditing and computerized accounting courses at the accounting curriculum of each of the above sampled universities shows that:

- a.** Auditing Courses are theoretical, aiming to identify the theoretical framework of auditing, types of auditing, professional behavior, types of audit evidence and documentation, audit planning, evaluation of internal control, and types of audit reports.
- b.** Computer Skills courses are mainly theoretical, comprising a general introduction to computer systems, computer application packages such as word processing, spreadsheets, PowerPoint, and Internet. These courses usually include a short period of practical training.
- c.** Accounting Information Systems aims to study traditional as well as computerized accounting information systems (analyzing, designing, and developing).
- d.** The Accounting Applications on Computer courses are mainly practical in which students are trained to use computers, and use accounting software for recording and classifying financial transaction, preparing the financial statements, and inventory control.

It is to be noted that the 'accounting curricula' in Jordanian universities still do not include advanced auditing courses of the kind likely to produce qualified auditors who will challenge the highly developed environment.

Thus, to enhance the auditing profession's performance, and to enable the Jordanian audit firms to compete with the international audit firms as the world moves towards globalization, requires accounting education in Jordanian universities to structure their education and qualification programs with a view to approximating the standard of the programmes in the developed countries (Boritz, 1999). In this context, the International

Federation of Accountants through its International Accounting Education Standards Board (IAESB) issued International Education Guideline IEG 11, requiring the accounting academic institutions to include the various IT related courses within their accounting curriculum. In respect of auditors it stated that:

Professional accountants serving in an audit role must have a reasonable understanding of the main computer assisted auditing techniques, their strengths, requirements and limitations (IAESB, 2003).

Accordingly Universities, as the unique supplier for the auditing market in Jordan (Matar, 1994), should graduate accounting students with an understanding of, and indeed actively inculcate the necessary skills relating to use the most up-to-date audit technology.

Table 3.2 depicts the accounting curriculum in the typical Jordanian university not including courses on topics like *advanced auditing*, or *auditing using computers*, or *computerized audit techniques*, or any allocated time in a *specialized audit laboratory* for training in how to use the different auditing packages or other computerized audit techniques. It is to be expected that the absence of such courses from accounting curricula in the Jordanian universities has a negative effect on Jordanian auditors' qualifications and skill-base, and, in turn, on the quality of the professional audit services provided to the public.

Computerized accounting education in Jordanian Universities was the main theme for Tabari's (2000) study. He concluded that there is a gap between the computer skills and knowledge taught to undergraduate accountancy students in Jordanian Universities and what is required in practice. Moreover, he found that dealing with *auditing packages* is

one of the main computer skills and knowledge demanded by the challenges in the Jordanian market.

In order to improve the computerized accounting education in Jordan, Tabari recommended that Universities should provide students with adequate hardware and software accessibility. Furthermore, he opined that computer applications and accounting related courses should be compulsory for all accounting students and that courses should be practical, rather than theoretical courses.

In the same context, the academic qualification of the Jordanian auditors was addressed by Siam (1999). His study indicated that Jordanian auditors (like other international auditors) worked and studied hard to reach a specific scientific level, but faced practical work that differs from their theoretical studies. He confirmed that newly graduated accounting students working as auditors are not sufficiently skilled to fulfill their duties. He concluded that the academic qualification of Jordanian auditors has some negative features due to the weakness of the accounting curriculum at the Jordanian Universities. Thus, according to Siam, limitations in the accounting curriculum were in three different areas: 1) The content of the auditing courses, which includes only the theoretical component of auditing, such as; auditing definition, types, standards, the procedures to perform the audit work, the types of audit evidence, and ultimately audit reports. The auditing courses do not include any practical work. 2) Teaching methods for auditing courses are inefficient, insofar as the textbooks are theoretical, and lecturers do not adopt any practical approach or employ case studies by which to clarify the theory. 3) The number of credit hours for audit courses as a total of the whole Bachelors degree credit hours is insufficient. According to Siam undergraduate students in

accountancy schools study only 3 credit hours in auditing (3.6% of the total credit hours) is inadequate to cover the breadth and spread of auditing science.

To raise the skills of Jordanian auditors Siam suggested the following: first, that auditing text books must be changed to those adopting both the theoretical and practical aspects, and the auditing teaching techniques should be tailored to make use of the practical facets of auditing; and, of necessity, lecturers should have satisfactory practical experience in auditing. In addition, the entire auditing education process should utilize computerized techniques, to deal with the highly developed auditing technology. Finally, the credit hours for audit courses should be increased, or that accountancy departments should grant a minor or a major degree in auditing.

3.9 Summary - Auditing's Push toward Maturity in Jordan

In 1921, Jordan was established under the British mandate. Jordanian economy was simple. Accounting practices were limited. The Anglo-American model was adopted in accounting as a result of social, political, and economical factors. During the 1930s, the Jordanian government established large size enterprises demanding accounting and auditing services. Jordanian auditing firms emerged in the beginning of 1940s.

The auditing profession was regulated by governmental laws, with the government dominating the Auditing Boards governance of the auditing profession. The absence of professional accounting and professional auditing bodies was the main reason behind the government domination. Reviewing the auditing requirements and the regulations controlling the auditing market in Jordan revealed that it lacks the articles specifying or requirements that auditors utilize computerized techniques in the computerized environment.

Jordanian commercial laws have required companies to present audited quarterly, semi-annual, annual financial statements, and other financial reports. Auditors are required to assess companies' internal control structures. In this context, it is anticipated that these requirements should motivate auditors to utilize the latest audit techniques in undertaking their activities, whilst maintaining high quality audit reports.

Accounting education, accounting curricula, auditing textbooks, and teaching methods (at the accountancy schools) in the Jordanian Universities continue to lag behind the advanced technological developments in accounting information systems used by Jordan's business firms. It is against this background that Jordanian audit firms lack the skills base by which to utilize the latest audit technologies. And expectations that they do are possibly misconceived.

Chapter 4

Information Technology and Auditing Related Literature

4.1 Introduction - Contemporary Auditing

In a computerized environment Tucker (2001, p.43) notes that:

Gone are the days when auditors could examine manually prepared cash-receipt journals and check registers, trace monthly totals to hand written entries in the general ledger (noting erasure or change) and examine manually prepared worksheets combining general ledger accounts for the first pencil draft of the financial statements.

Specific CAATs for testing computerized information systems have been developed to be used by external auditors in various phases of financial statement audits. For example, *Generalized Audit Software* enables auditors to gain access to *live* accounting data stored in different file structures that are machine-readable only (AICPA, 1994). Whilst *Integrated Test Facility* and *Parallel Simulation*, for example, validate the correctness of the accounting application module (Rittenberg and Schwieger, 1997; Weber, 2004).

CAATs can result in tremendous achievements in terms of efficiency and effectiveness. Moreover, the use of CAATs becomes an essential part of the audit procedures for auditors when are dealing with complicated and integrated CISs (Warren, Edelson and Parker, 1994).

Three themes underscore this chapter. Section two reviews the history of computerization in Jordan and discusses the literature related to the usage of computers in various Jordanian business firms. This is with a view to showing the widespread uses

of computerized accounting systems by Jordanian companies that underpins the likely presence of an audit technology gap between the audit techniques used by auditors and auditees' accounting systems. Section three discusses and critically reviews the literature on the usage of information technology in auditing processes by Jordanian audit firms to show that the auditing market in Jordan lacks studies that have concentrated on the actual use of specialized audit techniques.

Whereas the impact of information technology in terms of the benefits on the audit process and on auditors' proficiency have been studied and investigated by many researchers, it is to be noted some of these studies identified that CAATs-related benefits were based on arguments and perceptions, rather than on actual field studies of the phenomena, including: Bierstaker, Burnaby and Thibodeau (2001), Kanter (2001), Wallace (2002), and Brazina and Leauby (2004). Thus, reviewing these studies in section four is to derive a list of common benefits to be investigated in the field by explaining and evidencing the potential benefits of CAATs to Jordanian auditors, this chapter is expected to serve as a motivator for them to use CAATs.

4.2 The History of Computerization and the Literature Related to the Use of Computers by Business Firms in Jordan

4.2.1 The History of Computer Usage in Jordan

Computer technology was introduced to Jordan three and a half decades ago. Al-Dahan and Makamrah (1990), Al-Shammari and Al-Shaikh (1993) have indicated that the use of computers in Jordan dated from 1969, when the Royal Scientific Society provided the computerized technical service for Jordanian organizations. Until 1977, only five local business firms were actually using the technology (Nasser, 1987). However, the decade after 1977 witnessed a huge increase in computer usage in Jordan, in the mid of

1980s the cost of computing started to decline and large Jordanian business enterprises and institutions commenced to utilize the computers to manage their daily work. During the decade a total of 3192 computers were installed in local, public, and private business firms (Nasser, 1987; Kulchitsky, 2004).

As a result, and as organizations in Jordan commenced to utilize computers generally, it was predictable that accounting systems in Jordanian companies reacted to this IT growth. The use of accounting applications in Jordanian organizations emerged therefore with the first use of computerized systems; the evidence is that accounting applications such as payroll, personnel, billing, and statistics have been utilized by Jordanian organizations since the 1970s (Kulchitsky, 2004).

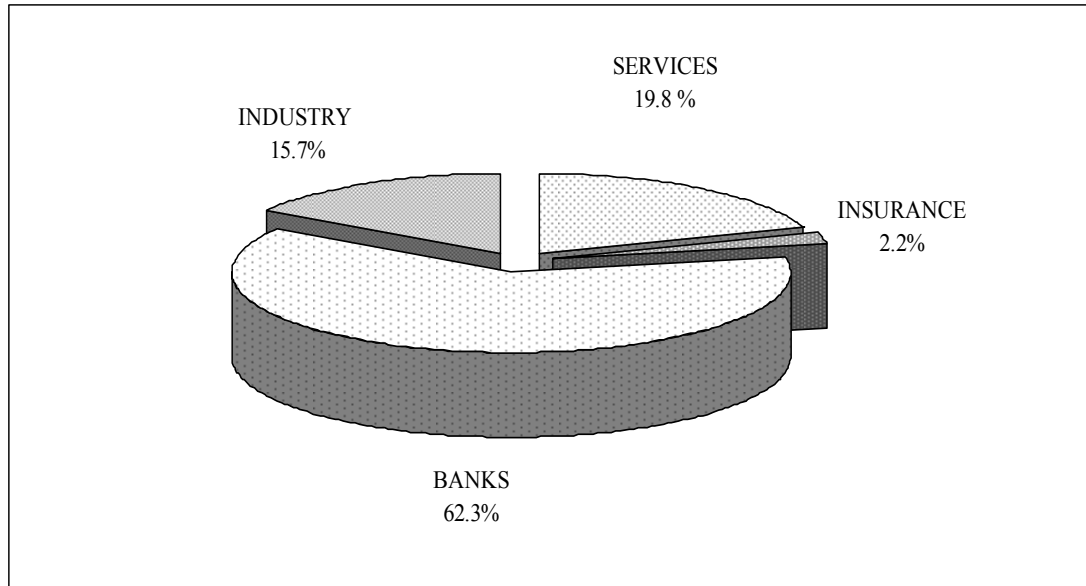
4.2.2 Literature Related to the Use of Computer Technology in Jordanian Organizations

The impact of computerization on the work activities of banks listed on the Amman Stock Exchange in Jordan was studied by Al-Dahhan and Makhamreh (1990). The Jordanian banking sector represents the largest business sector in Jordan, where 15 local banks with aggregate market capitalization of \$US23,389.3 million at the end of 2005 represented 62.3 percent of the listings on the Amman Stock Exchange (ASE 2006), Figure 4.1.

Al-Dahhan and Makhamreh (1990) explained that the banking industry has used computer technology since 1973. They found that computerization in Jordanian banks improved the information received by decision makers, improved the control and supervisory functions of different banks units, enhanced the quality of their services to

customers, and that the information generated by computers was perceived to be accurate and reliable by bank managers and employees.

Figure 4.1: Market Capitalization of ASE Companies Distributed by Sector, December 2005



Source: (ASE, 2006).

The extent of computer usage by small businesses in Jordan was studied by Al-Ashi (1991). His study showed that the use was infrequent, and that effective training methods were required. Management of the firms examined was reportedly excited and enthusiastic at the prospect of using the computer technology.

Al-Shammari and Al-Shaikh (1993) explored the extent of computer usage by publicly listed industrial companies representing the third largest public commercial sector in Jordan, with a market capitalization of 15.7 percent of the total market capitalization of the ASE at the end of 2005 (ASE, 2006, Figure 4.1). By surveying 45 functional managers in industrial companies with a response rate of 91 percent, the study investigated the duration of computer usage, its advantages, and the barriers to use. They concluded that the majority of Jordanian industrial firms used computers,

observing that the use of computer systems by the Jordanian manufacturing sector dates back to the years preceding 1983. In regard to the benefits of using computerized systems by industrial companies they found that “the major advantages of using computers were speed, accuracy, cost reduction, storage and retrieval capability and performance of complex operations” (p.421), and recommended that in order to improve computer usage the Jordanian industrial sector should concentrate on computer training. That invited an inference that the lack of training inhibited the use of computers on a wider scale.

Malhas, Attyeh, Khasseb, Saydem, Diab and Hindawy (2003) studied the extent of communication and information technology usage in 1542 Jordanian commercial companies. They found that the majority of the Jordanian commercial firms utilized contemporary communication and information technology in their daily activities - their accounting operations, electronic mail and printing being the main areas of computer application.

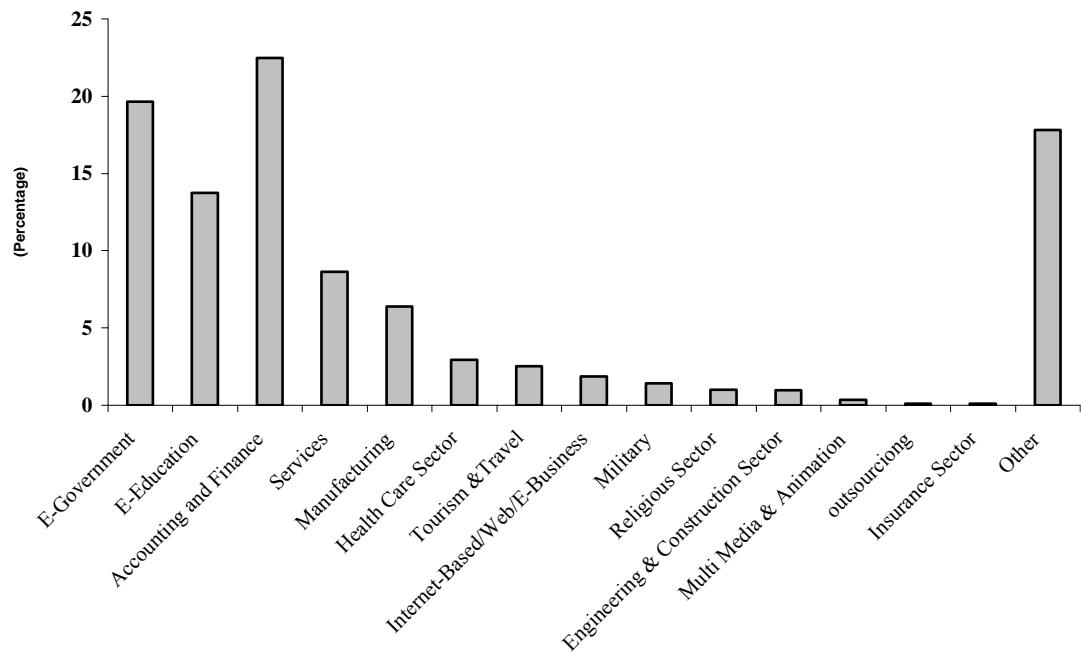
In 1999, information and communication technology (ICT) sector development became one of the most important economic targets for the Jordanian government. Based on that, and in response to King Abdullah II's request, Jordan has taken major steps towards creating a dynamic and practical approach to participating in the international information and communication technology sector. Jordan's information technology leaders, under the supervision of the government, created a *REACH* initiative entailing five facets: 1. Regulatory framework, 2. Enabling environment and infrastructure, 3. Advancement of national IT programs, 4. Capital and finance, 5. Human resource development.

REACH can thus be perceived to be the country's national technology policy as it encompasses all the goals sought through its ICT sector. According to REACH (2003) its goals and targets are: by the end of 2004, the country will have generated 30,000 ICT and ICT-related jobs; will be earning \$US550 million per year in exports and will have attracted \$US150 million in foreign direct investment; the benefits of accelerated growth in the ICT sector will not be limited to economic gains; social benefits will include an empowered population, improved public services, and better education for all Jordanians. The anticipated strategic benefits include greater efficiency of government, creation of a knowledge-based economy, enhanced economic competitiveness, and less dependence on traditional markets. In turn, IT has become a major contributor to Jordan's economy. IT gross revenue increased by 159 percent in 2004, and reached \$US440 million, up from \$US170 million in 2001 (MoICT, 2005).

Advances in information technology and the accelerated use of computerized systems in different public companies and in the governmental institutions, have pushed the Jordanian legislature to enact the Banks Law (No. 28/2000) (article number 92), and through the Securities Law (No. 76/2002) (article number 113) to recognize electronic records as acceptable evidence in all banking and securities cases. Further, Jordanian E-Transactions Law (No. 85/2001) (article number 7) specified that computerized data have the same legal recognition as written documents. The Jordanian Banks Law (No. 28/2000) extended its recognition to the electronic records as approved evidence in all banking situations by exempting all banks that employ computers to organize of their financial operations, from maintaining commercial books.

In 2002, the Information Technology Association in Jordan (INTAJ) surveyed the information technology industry market in Jordan. INTAJ found accounting and

Figure 4.2: Information Technology Revenues by Industrial Sectors (Jordan 2002)



Source: INTAJ (2003).

Accordingly, it is expected that with the increasing spread of the automated accounting information systems, it is an imperative for Jordanian auditors to use electronic techniques to retrieve accounting data to audit effectively the computerized accounting systems in place.

4.3 Studies Related to the Use of Information Technology in Auditing in Jordan

Few studies have dealt specifically with usage of information technology in auditing in Jordan. Thnaibat's (2003) study aimed to determine the extent to which the external auditors in Jordan utilize information technology in planning, controlling and documenting audit work, and the effect of information technology on the efficiency and

effectiveness of the audit process. Moreover, the study attempted to find the relationship between the audit firms' characteristics - their experiences, size (number of auditors) - and the extent of information technology used in audit process. To achieve these objectives, 100 Jordanian audit firms were surveyed with a response rate of 61 percent. The questionnaire comprised three main parts; 'audit planning', 'audit controlling', and documentation of the 'audit processes'.

In the planning section, auditors were asked to determine the degree to which they used computers in the various audit-planning steps. This section concentrated mainly on using computers to assess audit risk, determining the sample size, selecting the sample items, and preparing the audit program.

In the second part, enquiring into controlling the audit process, auditors were asked to determine to what degree they used computers to record the time spent on each audit step, documenting the cost of each audit task and its control.

Part three addressed the documentation of the audit process. Auditors were asked to determine to what degree computers were used to prepare memoranda forms, confirmations letters, documenting the accounting systems, and maintaining and updating the permanent file.

The study concluded that (to a limited extent) auditors in Jordan use information technology in planning, controlling, and documenting the audit work. They argued that the use of information technology in the audit process would improve its efficiency and effectiveness. In respect of the audit firms' characteristics, Thnaibat (2003) showed that audit firms' experience and size influence the extent of their auditors' usage of information technology.

In order to increase the usage of information technology in different audit processes by Jordanian audit firms, Thnaibat's (2003) study recommended that training courses should be held by the Public Accountant Association in Jordan to familiarize auditors with audit technology, and that the Jordanian regulators of the auditing profession should introduce new regulations that encourage the use of audit technology in audit processes, such as: developing quality control standards and screening entrants' skills through the medium of *professional* exams.

The extent of Jordanian auditors' acceptance of using information technology in auditing process was studied by Khaddash and Siam (2003). Defining the relevant IT as the application of electronic means in undertaking the audit work, they surveyed a sample of 60 auditors in the big ten audit firms in Jordan, 41 of whom responded (to give a 68.3 percent response rate. They argued that audit firms using IT are more motivated towards the development and competition to provide their clients with a good quality service.

The study showed that though the Jordanian auditors were aware of the need to use information technology in auditing, its use remained at *an early stage*.

With the purpose of increasing the usage of information technology in different audit processes by Jordanian audit firms, Khaddash and Siam (2003) recommended that awareness of the importance of using information technology in auditing should be enhanced, that the rewards of using information technology in auditing (such as reduced audit cost and increases audit efficiency) should be promoted, and that auditors should have to attend information technology training courses.

Whereas Khaddash and Siam (2003) and Thnaibat (2003) are considered the only two Jordanian studies of the use of computer systems by auditors in Jordan and both studies confirmed that Jordanian auditors made some use of information technology in the audit process, neither explored which specific computer assisted audit techniques that might be used for Jordanian auditors to breakthrough the technology gap. Thus, it is to be expected that more research is required to familiarize auditors with the techniques utilized worldwide, to identify what is used locally, and in consequence indicate to Jordan's professional auditing bodies the current state of local EDP auditing practice. In contrast with the studies of Lovata (1990) in the US, and Manson, McCartney, Sherer and Wallace (1998) in US and UK, in which the samples comprised EDP auditors, particularly those reasonably expected to have extensive IT professional experience, both Jordanian studies drew samples from general auditors rather than from the EDP auditors.

Thnaibat's (2003) study revealed that Jordanian auditors argued that the use of the information technology in auditing process enhances the efficiency and effectiveness of the audit procedures. In this context, the Khaddash and Siam (2003) study showed that the auditors in Jordan are aware of the importance of using IT in auditing. But, most notably, whilst both Jordanian studies confirmed that the use of audit technology by Jordanian auditors is interesting, and regardless of the information technology benefits that auditors can enjoy, neither perceived it an imperative.

It is predictable that not using cutting-edge technology to obtain evidence supporting electronic transaction impacts the quality of audit services. This was evidenced recently by a World Bank working group through its assessment of corporate governance in the

Jordanian commercial environment. Regarding the Jordanian auditing market, it reported that:

The big four accounting firms, as well as half a dozen domestic ones, dominate the market,..... There are 300-400 smaller auditing companies, of lower quality” (Berg and Nenova, 2004, p.12).

But (as noted earlier in chapter 1), and confirmed in this chapter, Jordanian organizations rely heavily on sophisticated information technology systems to manage their daily business transaction and strategic accounting records alongside their latest innovations in the accounting, investment, and banking information systems. These circumstances demand an advanced competent audit profession likewise utilizing comparable contemporary audit techniques as used worldwide by counterparts in western countries, if it is to comply with the international standards on auditing. The use of such contemporary specialized audit techniques would enable audit firms in Jordan to provide the public with a service characterized by high quality. It would indicate to the various stakeholders in publicly listed companies that Jordan’s audit firms are up-to-date with the international standards on auditing. Such a development might well be expected in turn, to narrow any audit technology expectation gap, engender confidence in audited financial statements, and enhance Jordanian governance to attract investment to the country.

4.4 The Literature Studying the Impact of Information Technology on the Auditing Process

The importance of audit techniques arises from the effectiveness and efficiency they inject into the audit process. To justify an IT investment CPA auditors need to understand the potential benefits resulting from IT implementation (Banker, Chang and

Kao., 2002). Different studies have described the impact in terms of the benefits of information technology on the audit process.

Recent accounting scandals perpetrated by prominent companies worldwide have made fraud detection a primary focus of studies addressing accounting failure. CAATs have been identified as appropriate tools in the contemporary business environment to detect financial statement frauds (Coderre, 2000).

Advances in information technology have been claimed to make business firms more vulnerable to fraud. For example, Coderre (2000, p.1) noted that:

Advances in the technology of distributed processing, remote access to corporate systems and worldwide networking increase entities' vulnerability to information reporting breaches.

Fraudulent financial reporting has cost the world economies billions of dollars a year; the Association of Certified Fraud Examiners (ACFE), estimating that \$US600 billion of companies' revenues was lost in 2002 as a result of *occupational fraud* - corruption, asset misappropriation, and fraudulent financial reporting, with average proportional losses tending to be greater for smaller firms than larger firms (ACFE, 2002).

Accordingly, the use of computer assisted audit techniques to detect financial statement fraud was emphasized by Brazina and Leaby (2004, p.30):

As firms of all sizes turn to computerized systems to operate their business, more frauds are being committed using computer assisted means. The same technology used to create this type of fraud, however, can also detect it.

The features of CAATs facilitating the process of fraud detection Brazina and Leaby (2004, p.30) noted as being :

[access] any data base, import data into a working file without limited size, perform compliance and substantive test to 100 percent of the

information, document the testing performed and communicate the results.

They invite and encourage small CPA audit firms to use CAATs in the manner of large CPA firms and to engage fully the benefits of these techniques. Indeed, the use of CAATs by small audit firms to detect fraud is important, due to the fact that the small businesses are possibly more vulnerable to fraud than the large firms (Martin, 1998; ACFE, 2002).

It is anticipated that using CAATs in a developing country like Jordan will enable auditors to gain access to databases, and perform audit procedures on unlimited samples of the accounting transactions. Ultimately this will support auditors' efforts to generate high quality audit reports, and increase the likelihood of the detection of fraud, enhancing investors' confidence in the audited financial statements shaken by local accounting scandals (noted earlier in chapter 3).

Brazina and Leauby (2004) added that CAATs are readily accessible to large and small firms alike, confirming that the small CPA firms have the opportunity to use the CAATs, these techniques being more effective than traditional manual auditing, reasonably priced, were user friendly, and thus available to much wider audience.

In Jordan, many obstacles may delay progress in the auditing market. Low audit fees are considered one of the main problems (Almaleky, 2000). Thus arguably, and contrary to the findings of Brazina and Leauby (2004), the availability of CAATs in the auditing market in developing countries and especially in Jordan - where the resources are scarce- may be frustrated by the seemingly (albeit) small, but nonetheless prohibitive costs.

Enhancing the public accounting firms' productivity by using CAATs was investigated by Banker et al. (2002). They studied the production function of an international public accounting firm after amendments to its IT environment – the construction and expansion of network infrastructure (increasing in the number of laptops) to facilitate audit work, and the introduction of new audit software. Quantitative data were collected about the firm over 24 months before and after the adoption of the new IT environment. Interviews with audit managers and staff at different ranks were also conducted. They found that auditors utilized CAATs to perform internal control assessment and substantive testing. Moreover, CAATs helped auditors automate the working papers and to organize the audit procedures in a common list.

According to that study the introduction of IT influenced auditors' efficiency in various ways: (i) saving auditors' efforts in comparison with manual auditing, (ii) increasing auditors' accuracy and precision, (iii) reducing the time required to undertake the audit, (iv) supporting audit managers to make consistent audit decision, and (v) reducing the mundane audit work, thus allowing the auditors to concentrate on high risk areas and complex auditing issues. For, according to Taylor and Glezen (1997, p.132) many activities by company's management could cause the auditor to assess certain areas of an audit as "high risk" - poor internal controls, large inventory losses, unusual banking activities, exceptionally large expenses and purchases, and results of both external and internal audits were ignored by management. Understandably, those activities require more concentration and more time from an audit perspective, thus the use of CAATs may assist auditor to perform extra analytical procedures compared to the normal procedures especially for the involved accounts.

Banker et al. (2002), found that in the year after the implementation of new IT techniques both the audit firm's revenues and its efficiency increased by 16 percent and 3 percent respectively, compared with the year that preceded the implementation.

This is a common experience. For example, enhancing the performance and productivity of Australian audit firms by using information technology was studied by Castner, Ferguson and O'Keefe (2001). They investigated the software used by audit firms to perform external audits, enquiring into possible relationships between the audit and client characteristics and the type of software used, and between specialized audit software uses and the auditor productivity. To achieve these purposes, 370 Australian audit firms were surveyed with a response rate of 8 percent.

Castner et al. (2001) concluded that, basic software, such as word processing and spreadsheets, was the most commonly used in audits. Big 5 and second-tier firms, more than the smaller firms, concentrated on internal control testing when collecting audit evidence. Thus, the research found that 86 percent of the big 5 and the second-tier firms used "off the shelf" specialized audit software such as *CaseWare*, whereas only 29 percent of smaller audit firms used specialized audit software. Client size and complexity was found to have influenced usage of information technology in audits and that there was a positive relationship between audit fees and the information technology used. Applications of technology tended to increase as audit fees increased. The study found that firms using specialized audit software have greater productivity, and are able to earn substantially greater fees than those that do not use it, regardless of the audit firm's status.

Understandably, as many audit firms in Jordan are affiliated with the big international accounting firms worldwide (noted earlier in section 1.2.2) they are expected to receive

information technology support from their international partners and thus are reasonably expected to apply the same state-of-the-art technology.

The nature and extent of the use of audit automation in the day-to-day practices of auditors in the UK and the US auditing firms were studied by Manson et al. (1998). Audit automation, was defined as “the application of information technology to accelerate or enhance the quality of audit procedures previously carried out manually”(p.233). Data were sought from partners responsible for IT in the audit process in the largest 40 audit firms (based on the fee income) in the UK, and the 50 largest audit firms in the US.

With a questionnaire response rate of 47.5 percent for UK firms, and 42 percent for the US audit firms, respondents were to identify the extent to which audit staff used computers in planning, controlling, and recording tasks. The study concluded that the US audit firms made a greater use of audit automation in the planning, controlling, recording of the audit work. Enhancement in audit quality was ranked the highest benefit from introducing audit automation, followed by reduction in audit cost, and acquisition of competitive edge compared with other firms. Ultimately, this study found that the ‘training’ was the largest ‘cost’ of injecting IT into the audit processes.

Manson et al. (1998) argued that the cost of employee training and learning were greater than the cost of hardware and software due to the high opportunity cost associated with training and learning. It is to be noted that whereas they studied computer use *in general* in the audit process, and they did not attempt determining any specific computerized assisted audit techniques utilized through different audit processes.

The impact of information technology on the audit process (planning, testing, and documentation) and the future implications of technological trends for the auditing profession were discussed by Bierstaker et al. (2001); Kanter (2001); and Wallace (2002). According to Kanter (2001), the conventional manual accounting systems have their limitations - lack of timeliness, delaying working processes, high transaction processing costs, high manpower costs, and high paper storage costs with lack of backup. He had observed that to overcome these problems, which weaken the effectiveness and efficiency of the accounting systems, many enterprises had moved to a paperless environment. He found that audit firms compensated for the lack of a paper audit trail by utilizing state-of-the-art technology such as the Integrated Test Facility technique to verify processing authenticity, accuracy, and completeness; the Snapshot technique to inspect the transaction processing at a specific point in time; and the Systems Control Audit Review File technique to monitor the systems processing of transactions. On the other hand, Wallace (2002) claimed that CAATs can achieve large tasks while assessing an entity's internal control – for example: the consistent application of predefined business rules and performing complex calculations in processing large volumes of transactions data, thereby enhancing the accuracy of the processing and its internal monitoring. CAATs were also perceived capable of data analysis functions and other audit tasks, such as ratio analysis, cut-off-testing, accounts receivable or payable aging examinations, matching supplier information against employee data, looking for split invoices, testing for duplicate invoices, analyzing payroll for unusual payments, testing for number duplication, last two digit test, identification of identical or near identical entries in data subsets. Similarly, Bierstaker et al. (2001) noted that computer technology was deemed to have a dramatic impact on almost every phase of the audit process. Their conclusion was that computer technology

nowadays assists the external auditor in both internal control testing and substantive testing. In this context, they stated that:

...computers are used to generate client specific internal control templates to help identify the strengths and weaknesses in a system ... [and] audit software can now inspect analyzes and select vast amount of data (pp. 160-162).

Wallace (2002) also confirmed that auditors could attain various benefits when they use CAATs: (i) simplifying calculations, (ii) high speed and accuracy in performing audit processes, (iii) issuing audit reports in less time, (iv) distributing the audited financial results more quickly and clearly, and (v) discovering fraud, manipulation, and misstatement.

Regarding the future implications of technological trends for the auditing profession both Bierstaker et al. (2001), and Kanter (2001) argued that most audit firms had converted to, or were in the process of converting to, electronic working papers. Kanter extended that, claiming:

the periodic audit will be replaced by the continuous audit as organization continuo to increase the amount of financial data presented on the web (p.46).

In these circumstances, Bierstaker et al. (2001), Kanter (2001), and Wallace (2002) noted that auditors' knowledge of, and their ability to utilize, CAATs in their audit work had become important facets of contemporary audits; moreover, Wallace (2002) stated that: "The CPA profession must keep up with technology advances or pay dearly" (p.38), and showed that the reward from using computers in audit processes included: reduced auditing cost, enhanced audit confidence, and financial report timeliness.

The impact of audit automation on audit practices of United Kingdom audit firms was explored by Manson, McCartney and Sherer (2001). More specifically, they

investigated how information technology in auditing was used as a competitive tool in promoting the audit firm with clients and prospective clients. They stated that:

Information technology in general is associated with effectiveness, efficiency and cost reduction, and that audit automation is a tangible manifestation, a symbol, of this for the audit firms. Therefore, it is not surprising that audit firms introduce audit automation because it reinforces visibly those attributes they wish to convey to their clients, potential clients and graduate recruits (p.126).

In this regard, CICA (1994) confirmed (in respect of Canadian firms) that using state-of-the-art audit techniques would enhance the effectiveness and efficiency of audit firms, and increase their market share, by enhancing their competitiveness and profitability.

Manson et al.(2001) interviewed audit staff at all levels in two of the Big 5 audit firms in UK. The study showed that audit managers attempted to increase the investment on development and implementation of audit automation to maintain their competitive position in the audit market, by showing clients that they are up-to-date with the technology, providing them with identical technology and services supplied by their audit competitors.

Accordingly, the literature indicates that Jordanian auditors *of necessity* must familiarize with leading edge technology, be aware of the huge potential benefits resulting from IT implementation - the enhancement of the efficiency and effectiveness of the auditing services in Jordan to cope with the vagaries of a more competitive audit environment.

Thus, drawing upon that review of the literature related to information technology, auditing processes, and the International Standards on Auditing and Guidelines related

to CAATs usage, the related benefits most cited and proposed for survey by this thesis are that CAATs:

- lead to more accurate and precise auditing,
- Save the time required to achieve the overall audit procedures compared to the time taken by manual auditing,
- Save the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing,
- accelerate the overall audit process leading to issue the financial statements in less time,
- reduce the overall audit costs,
- inject the overall audit process with the auditor's self-confidence,
- allow the auditor to concentrate on the client's highest audit risk areas,
- improve the quality of the overall audit work,
- improve the quality of the audit clients' financial reporting,
- facilitate the process of detecting financial errors,
- provide auditors with powerful audit tools to detect frauds,
- increase the auditor's credibility,
- enhance stakeholders' trust in the auditors,
- help clients distinguish the most skilled auditors,
- assist the auditing firms to obtain more clients,
- improve decision-making in the different stages of the overall audit process,
- improve auditor productivity,

- improve the overall efficiency of the audit firm'; and that
- CAATs are an essential aspect of any audit work.

Accordingly this thesis investigates the awareness of Jordanian audit firms of the above broad audit benefits to be derived from using CAATs. Moreover, it investigates the relationship between the audit firms' awareness of those benefits and the level to which they use them.

4.5 Summary – Audit Technology an Imperative

The purpose of this chapter was: (1) to review the related literature discussing the use of computers in the Kingdom of Jordan; (2) review the related literature on the use of information technology, specifically in auditing process in the Kingdom of Jordan; and (3) review the related literature on how technology used in auditing impacts the audit processes and the auditor *per se*.

The following points relevant to the focus emerged:

1. The use of CAATs in auditing processes has become an essential part of an effective contemporary audit, particularly when the audit client utilizes a computerized accounting system.
2. Business firms in Jordan have long perceived the importance of using computers in their accounting.
3. Acceleration in computer usage by international business firms and more specifically by Jordanian business firms has pushed Jordanian legislature to accept electronic data and computer printouts as evidence in all banking and securities cases, to the extent that they exempt corporations utilizing computers in their financial operations from maintaining 'conventional' commercial books.

4. Jordanian auditors believe that the use of information technology in auditing processes will increase efficiency and effectiveness in their work, but their real usage of information technology remains minimal.
5. It expected that the time is opportune for Jordanian auditors to be more aware of the information technology revolution and to the global transfer from manual accounting systems to computerized accounting systems.
6. Jordanian audit firms currently, *of necessity*, must engage fully in the state-of-the-art computerized auditing techniques, enjoy their benefits, enabling Jordanian audit firms to compete with international audit firms. As the globalization ‘dissolves’ national boundaries, international companies have established branches in Jordan, and large local companies have their own international branches.
7. Despite the significant number of studies of the impact of technology on auditing procedures, studies about Jordanian applications of CAATs were found to be minimal. No previous study has enquired into potential public expectations about how Jordanian auditors undertake their audit of companies computerized accounting systems, the actual use of specialized audit techniques such as CAATs, and the awareness of Jordanian audit firms to the potential benefits from using them.

Chapter 5

Computer Assisted Audit Techniques Related Literature

5.1 Introduction – Widespread Use of Audit Technology

Reviewing the literature reveals the paucity of available studies that have dealt with the use of information technology - as a general descriptor- in the auditing process in the case of Jordan. No studies were found that had investigated the Jordanian use of *computer assisted* audit techniques. This lack of Jordanian studies contrasts with the international focus of many studies appearing in accounting and auditing journals addressing the subject of CAATs, and the Auditing of Computer-Based Information Systems chapters on Electronic Data Processing and Accounting Information Systems in textbooks. The studies and contributions in the texts include Cash, Baily and Whinston (1977), Rittenberg and Davis (1977), SRI (1977), Weiss (1980), Goossens and Schouten (1981), Tobison and Davis (1981), Abdel-khalik, Snowball and Wragge (1983), Vasarhelyi and Lin (1985), Garsombke and Tabor (1986), Elliott and Jacobson (1987), Lee (1988), Lovata (1990), Cushing and Romney (1994), Lanza (1998), Bodnar (2000), Wilkinson, Cerullo, Raval and Wong-On-Wong (2000), Bakshi (2001), Hall (2001), Kanter (2001), Liang, Lin and Wu (2001), Nieschwietz, Pany and Zhang (2002), Rezaee, Sharbatoghlie, Elam and McMickle (2002), Braun and Davis (2003), Moscove, Simkin and Bagranoff (2003), Romney and Steinbart (2003), Hall and Singleton (2005).

A major focus underlying this chapter is the discussion and review of the related literature on the use of computer assisted audit techniques by both internal and external auditors to perform audits of financial statements. In turn, this chapter is to achieve two aims: first, to expose how the Jordanian audit firms are generally out of step regarding the widespread uses of CAATs that could motivate them to use the same technology as employed routinely by their international partners. Second reviewing these studies will facilitate the compilation of a list of common computer assisted audit techniques, which are presently available to be explored in the field by this thesis.

5.2 The Computer Assisted Audit Techniques Literature

The literature discussing the subject of CAATs was, to large extent, categorized into four main classes: the first surveys the CAATs available to both external and internal auditors (Cash et al., 1977); the second addresses the actual use and perceived effectiveness of CAATs by internal auditors such as SRI (1977); the third investigates CAATs uses by both internal and external auditors such as Garsombke and Tabor (1986), and the final category studies the actual uses of CAATs by external auditors (Lovata, 1990).

5.2.1 The Literature That Surveys Different CAATs Available to Auditors

The available CAATs for both internal and external auditors were surveyed by Cash et al. (1977). They aimed to enhance an efficient expansion of effort in EDP auditing research. Thus, they reviewed the existing literature concerning auditing and computer information systems, and discussed various types of CAATs. These were divided by them into two types: (i) the CAATs used to verify the *phases* of the processing, such as: Test Decks, Integrated Test Facility, Mapping, Concurrent Processing, Parallel

Simulation, Controlled Processing or Reprocessing, Program Code Checking, and Flowchart Verification; (ii) the CAATs used to verify the *result* of the processing, such as: Custom Designed Program, Generalized Audit Software, and Database Management Systems.

Whereas the Cash et al. (1977) study reports on the literature discussing computerized audit techniques up to 1977, no attempt was made to survey the actual use of these techniques by external or internal auditors.

As most of these techniques were known and discussed before 1977, this thesis assumes that Cash et al. (1977) surveyed audit techniques that must be known and used currently in the new millennium, three decades later. However, if still unknown and not used by auditors and in particular by Jordanian auditors - where the publicly listed companies and the users of the audited financial statements reasonably expect Jordanian audit firms to utilize the CAATs - the exploration of perceptions held by the audit firms in Jordan regarding potential benefits from using CAATs, and the obstacles constraining the Jordanian audit firms' use of them, should provide insight into the possible reasons for their absence from audit practice.

5.2.2 The Literature Reporting Studies of the Uses of CAATs by Internal Auditors

Different studies appeared in the auditing literature discussing the actual uses and the associated effectiveness of using different CAATs by internal auditors: Stanford Research Institute (1977), Abdel-khalik et al. (1983), and Jackson (2004).

Stanford Research Institute SRI (1977)⁴ studied the impact of information technology on the internal audit profession. Singleton and Flesher (2003) concluded that three main factors contributed and encouraged the IIA to implement the SRI study: first, that “pioneers had been pressing their clients or management to accept some of the ideas concerning EDP auditing issues like security, qualified staff, and up-to-date audit techniques... often without result”(p.40). Second, the proposition that senior audit management in companies, including management of large regional firms, Big 8 audit firms, and the AICPA, overlooked the use of computerized accounting applications by various organizations and continued to execute the audit as had been done historically. Finally, the Equity Funding Corporation⁵ of America scandal in 1973, (where fictitious entries were made to generate phony insurance policies with the help of computers, to increase the earnings per share). These factors mutually put severe pressure on auditors to get involved with the EDP auditing and on auditing supervisory bodies to carry out research on EDP auditing.

The SRI study aimed to: (i) identify the state of current practice in EDP auditing; and (ii) to increase managements’ awareness of changes in the data processing environments that affect internal audit and the control governing data processing.

⁴ SRI (1977): was one of the recognized studies of various EDP internal auditors that were undertaken for the Institute of Internal Auditors.

⁵ The last financial statement showed \$US 3 billion in receivables from insurance policies of which \$US 2 billion were fraudulent.

To this end, the SRI research team interviewed the internal audit directors or the EDP managers of 45 large organizations⁶ and surveyed another 1500 organizations in Canada, the United States, Europe, and Japan.

The SRI study revealed that: (1) internal auditors were found utilizing 28 EDP audit tools and techniques, which could be grouped into seven broad categories (Table 5.1): (a) audit planning and management, (b) testing computer application program controls, (c) selecting and monitoring data processing transactions, (d) Verification of data, (e) analysis of computer programs, (f) computer service center, and (g) application system development; (2) the internal EDP audit staff required training and experience in data processing to audit effectively in IT environment; (3) many organizations are not evaluating their audit and control functions in data processing environment, therefore top management should assess its audit and control programs periodically; and (4) internal auditors should participate in the system development stage to ensure that the suitable audit and control checkpoints are built into new computerized accounting application.

Regarding the use of CAATs, the SRI found that 32.6% of the organizations surveyed were using Generalized Audit Software and 26.6% were using the Test Data technique, with the study reporting them as the most frequent used CAATs by internal auditors. Despite reporting minimal uses by internal auditors of some of the surveyed techniques, SRI expected that many of these techniques had a good future potential (Perry, 1978, Table 5.2).

⁶ These organizations represent a variety of industry groups and government.

Table 5.1: SRI (1977) EDP Audit Tools and Techniques Survey

Audit Planning and Management

Audit Area Selection
Simulation Modeling
Scoring
Multisite Audit Software
Competency Center

Testing Computer Application Program Control

Test Data Method
Base Case System Evaluation technique
Parallel Operation
Integrated Test Facility
Parallel Simulation

Selection And Monitoring Data Processing Transactions

Transaction Selection
Embedded Audit Data Collection
Extended Record

Verification

Generalized Audit Software
Terminal Audit Software
Special Purpose Audit Programs

Analysis Of Computer Programs

Snapshot
Manual Tracing and Mapping
Computer Aided Tracing And Mapping
Control Flowchart

Computer Service Center

Job Accounting Data Analysis
Audit Guide
Disaster Testing

Application System Development

Post installation Audit
Control Guidelines For Use During System Development
System Development Life Cycle
System Acceptance and Control Group
Code Comparison

Source: SRI (1977, p.57)

Table 5.2: SRI (1977) EDP Audit Tools and Techniques Survey that had a Good Future Potential

Audit Technique
Audit Area Selection
Simulation Modeling
Multisite Audit Software
Test Data Method
Integrated Test Facility
Parallel Simulation
Embedded Audit Data Collection
Generalized Audit Software
Terminal Audit Software
Control Flowchart
Job Accounting Data Analysis
Audit Guide
Disaster Testing
Post Installation Audit
Control Guidelines for Use During System Development
System Development Life Cycle
System Acceptance and Control Group
Code Comparison

Source: Perry (1978, p.10)

In summary, two major issues can be deduced from the SRI (1977) study. First, it is to be expected that the extent of internal auditor awareness and knowledge of the efficiency and effectiveness of using CAATs was the significant reason underpinning the increasing number and variety of CAATs used by the internal auditors. Second, the widespread use of the techniques surveyed in SRI (1977) gives an important and clear insight into the extent of the pressure on auditors to assess the internal control of auditees, and to audit *through the computer* in an environment characterized by an advanced and rapid use of IT. This was one of the leading studies concentrating on the uses of CAATs by internal auditors only; providing guidance for EDP auditors during recent years (Singleton and Flesher, 2003).

The effect on the nature, timing, and extent of external auditor's procedures by internal auditors using CAATs was studied by Abdel-khalik et al. (1983). More specifically, they studied the effect on the judgments of external auditors in planning audit programs (accounts receivable and accounts payable systems) of internal auditors' use of three particular computerized audit techniques (Test Data, Generalized Audit Software, Integrated Test Facility).

According to Abdel-khalik et al. (1983), the techniques, which were studied, were chosen in accord with the following criteria: Test Data (as the most frequently used program verification technique), Generalized Audit Software (as the most frequently used verification of output technique), and Integrated Test Facility (as the most promising of the techniques for continuous auditing of on-line systems). 59 external (top partner) auditors from the largest three accounting firms in the United States were interviewed. They concluded that the use of CAATs by internal auditors affected the planning of the audit programs of the external auditors and each of the three computerized audit techniques had an equal relative importance.

The Abdel-khalik et al. (1983) study showed how an organization's environmental factors, specifically the internal auditors' practices, impacted the procedures used by external auditors. Indeed, this was further emphasized by Lovata (1988, p.76) when she confirmed that: "audit procedures are determined to a great extent, by clients accounting environments", and by Rittenberg and Davis (1977) confirming that the use of *Test Data* techniques and *Embedded Audit Routines* by the internal auditor had moderate to significant effects on both the scope and the approach of the external auditor. In this context, it is reasonable to say that acceleration in using computerized accounting systems by Jordanian business firms (noted in 4.2.2) would reasonably be expected to

affect significantly the audit techniques utilized by their internal audit department, and in consequence, how Jordanian external auditors embraced and sought to acquire a greater understanding of the EDP techniques utilized by their clients' internal audits, as promoted by the International Standard on Auditing ISA 610–9:

The external auditor should obtain a sufficient understanding of internal audit activities to identify and assess the risks of material misstatement of the financial statement and to design and perform further audit procedure (IAASB, 2007, p.553).

Thus, although the Abdel-khalik et al. (1983) study surveyed only external auditors, it focused on the use of the CAATs by internal auditors; it did not investigate their use by external auditors.

Recently the IIA (2004) conducted the annual audit software survey on the 2004 use of CAATs. According to Jackson (2004), the software surveys are conducted from within the membership of the IIA, an organization that represents 85,000 auditors worldwide. Respondents included audit directors, chief audit executives, and IT audit directors from a broad range of industries, organizations, and countries. The survey showed: 86 percent of respondents reported that they used CAATs to extract or import data from information systems for auditing purposes. 94 percent were reported to be using CAATs-based data analysis tools. In contrast, 50 percent of the respondents reported that they used CAATs for fraud detection and prevention purposes and 38 percent for continuous monitoring purposes. The results of the audit techniques and their usage surveyed by the IIA (2004) appear in Table 5.3.

The survey also revealed that Audit Computer Language (ACL) software was chosen as the clearly preferred technology over other specialized audit software tools for data extraction, data analysis, fraud detection, and continuous monitoring. Moreover, ACL

technology had the highest levels of overall customer satisfaction in all four categories (Jackson, 2004).

Table 5.3: IIA (2004) Audit Software Survey and Uses

Type of CAATs Used By Internal Auditors	Percentage of Usage (%)
Sarbanes-Oxley Compliance Software	22
Data Extraction Software	86
Data Analysis Software	94
Fraud Detection And Prevention Software	50
Network Security Assessment Software	28
Audit Management Software	78
Risk Management / Analysis Software	96
Control Self Assessment Software	33
Continuous Monitoring Software	38

Source: Jackson (2004)

The IIA undertakes its questionnaire annually, indicating the worldwide professional importance attached to the use of CAATs by internal auditors. The results of IIA survey clearly demonstrate that most of the corporations worldwide utilize the computerized systems for the storage and processing of their data. Accordingly, the Jordanian auditing profession and accounting education systems must react to the rapid growth of computerized accounting systems usage. First, the auditing profession in Jordan could be expected to consider the annual IIA survey, to know the extent to which companies use the computerized accounting systems, and in particular, to what extent the companies' internal auditors utilize CAATs, which in turn influence to a greater extent, the procedures and the tools used by the external auditors as emphasized by Rittenberg and Davis, 1977; Abdel-khalik et al., 1983; and Lovata, 1988. Second, accounting education in Jordan might be expected to benefit from the annual IIA survey. More specifically the time is opportune for accounting education in Jordan to cope with the

information technology age. But, the analysis of auditing related courses in the accounting curricula of a sample of Jordanian Universities reveals that the usual accounting curriculum in the Jordanian university is out of step with EDP auditing education elsewhere. The analysis shows accounting curricula not including courses on topics like *advanced auditing*, or *auditing by using computers*, *computerized audit techniques*, or any allocated time in a *specialized audit laboratory* for training in how to use the different auditing packages or other computerized audit techniques (noted earlier in 3.8). In this context, Siam (1999) suggested that urgent attention should be given to the EDP auditing in the accounting curricula at the Jordanian universities.

Contrasting the IIA (2004) survey with the IIA (1998) survey shows that the use of CAATs for fraud detection and prevention purposes increased by 92 percent, and that the use of CAATs for continuous auditing purposes increased by 58 percent (Glover, Prawitt and Romney, 2000; Salierno, 2001). The progressive increase in the use of CAATs reflects the significance of these techniques as effective tools to detect financial statement frauds (Coderre, 2000). Thus, one could expect external auditors' use of CAATs to increase parallel to that by the internal auditors, to enable them to cope with the challenges imposed by the increased cases of accounting and auditing scandals worldwide. In Jordan, it has not.

5.2.3 The Literature Reporting Studies of the Uses of CAATs by both External and Internal Auditors

The actual use of CAATs by both external and internal auditors was investigated in the Tobison and Davis (1981) study of seventeen computer assisted audit techniques used by 98 internal and external auditing members of the Minnesota EDP Auditors Association. 60 auditors responded to the survey, of which 75 percent represented the

internal auditors. The surveyed techniques were grouped into three evidence collection functions:

1. Test of Data records techniques: Generalized Audit Software, Customized Audit Software, Audit Modules, Utility Programs, Timesharing Services, and Data Base Management System Query Facilities;
2. static (after processing) tests of application programs techniques: Program Comparison Software, Test Data technique, Test Data Generator, Logging, Accounting Data, Program Logic Review, and Tracing Software; and
3. dynamic (concurrently with processing) tests of application programs techniques: Integrated Test Facilities, Simulation of Parallel Processing, Extended Records, and Tagging Selected Records.

In respect of those matters the respondents were asked to indicate their familiarity with EDP auditing techniques, and how often they had used each technique in the past three years, to identify which group of auditors uses EDP auditing techniques the most, whether the techniques produced the desired result, and to assess the techniques' efficiency in terms of both time and cost. Their results are presented in Table 5.4.

Thus, Tobison and Davis (1981) found that the auditors were familiar with most of the techniques, that data record testing techniques were the most often used, static program testing techniques had the next highest frequency of use, and dynamic program testing techniques were the least often used. Moreover, they found that some of the techniques, which were used most often, were rated less effective and efficient than some of the techniques, less often used. The techniques that were ranked as the top in both efficiency and effectiveness were: Generalized Audit Software, Customized Audit Software, Integrated Test Facility, Timesharing Service, and the Database Query

Facility. Importantly, there was disagreement between external and internal auditors concerning which group makes greater use of some of the techniques.

Table 5.4: Tobison and Davis (1981) CAATs Survey, Familiarity and Uses

Technique	Familiarity (%)	Usage (%)
Generalized Audit Software	98.3	66.7
Customized Audit Software	96.7	48.3
Utility Programs	91.7	43.3
Logging	96.7	25.0
Program Logic Review	93.3	23.3
Test Data	96.7	21.7
Accounting Data	85.0	20.0
Timesharing Services	78.3	18.3
Parallel Simulation	91.7	15.0
Data Base Query Facilities	71.7	15.0
Audit Modules	93.3	13.3
Integrated Test Facilities	93.3	11.7
Tagging Selected Records	88.3	11.7
Tracing Software	80.0	6.7
Extended Records	63.3	3.3
Program Comparison Software	85.0	1.7
Test Data Generator	86.7	1.7

Source: Tobison and Davis (1981, p.4 and 22)

Table 5.4 shows that the Tobison and Davis (1981) study revealed a low percentage usage of some CAATs, to the extent that some were not used by external auditors or internal auditors. In this regard, they did not try to investigate the reasons driving not using some of the techniques or the low usage percentage, but inferred that the newness of the techniques was a factor.

To investigate the factors that may driving EDP auditors to consider using different CAATs Garsombke and Tabor (1986) examined three factors related directly to EDP

techniques and their uses: (i) cost to use the techniques, (ii) skills needed to use the techniques, and (iii) the effectiveness of the techniques in performing a specific task: and two related to auditors' characteristics: (i) familiarity with the techniques, and (ii) the auditor classification - either as an internal or external auditor.

They divided the CAATs into two main categories: (i) test program logic and control (compliance test) techniques, in which three compliance test techniques were examined: Integrated Test Facility, Parallel Simulation, and Test Data; (ii) verify the output of the accounting systems (substantive test) techniques, where three substantive test techniques were examined: Embedded Audit Module, Generalized Audit Software, and Utility Program. 454 internal and external auditors selected from the membership of the Electronic Data Processing Auditors Association in the United States were surveyed; 105 auditors responded to the survey of which 80 percent were internal auditors. The specific audit tasks were presented to determine the circumstances under which the various techniques would be used are outlined in Table 5.5.

Predictably, Garsombke and Tabor's study revealed that different CAATs were used according to the different audit tasks. And more specifically, that the Generalized Audit Software and the Utility Programs were preferred to perform the given substantive testing tasks, while the Test Data, Parallel Simulation, and the Generalized Audit Software were the chosen techniques to perform the compliance testing tasks, as shown in Table 5.5. In contrast, the study found that the perceived effectiveness of the techniques was the main factor driving EDP auditors to consider using different CAATs. The study revealed that auditors' preferences for a particular technique are not dependent on the perceived cost of the technique or on the skills required to use a

Table 5.5: Garsombke and Tabor (1986) CAATs Survey - Preferred Uses According to Specific Tasks

Audit procedures	Task	Audit Task	The more appropriate techniques according to each task	The less appropriate techniques according to each task
<i>Substantive Testing Tasks</i>	A	To compare test counts from the taking of physical inventory with the computerized inventory records.	Generalized Audit Software Utility Programs	Integrated Test Facility Embedded Audit Module Parallel simulation Test Data technique
	B	To sort the computerized inventory records by a specified field in each record	Generalized Audit Software Utility Programs	Integrated Test Facility Embedded Audit Module Parallel simulation Test Data technique
<i>Compliance Testing Task</i>	C	To test the logic of input validation routines (edit checks) programmed into the inventory application program.	Generalized Audit Software Parallel simulation Test Data technique	Integrated Test Facility Embedded Audit Module Utility Programs

Source: Garsombke and Tabor (1986)

Arguably, in Jordan the familiarity with CAATs and other factors such as the accounting education and training, and the local auditing laws and regulations, are expected to influence the shape and extent of the audit technology practices. Regarding the education and training factor, many studies and authoritative bodies recommended that EDP auditing topics should be included in the undergraduate auditing curriculum (Dascher, Fischetti, Giese, Kelley, McDonald, Schiff and Zakin, 1974; Boritz, 1999; Nieschwietz et al., 2002; Riccio and Sakata, 2002; IAESB, 2003), but, it was indicated (section 3.8) that EDP auditing related courses are still not included within the accounting school curricula at Jordanian universities. On the legislation front, the auditing market in Jordan lacks auditing laws and regulations requiring the use of CAATs, encouraging them to be used or even to monitor or regulate their use. These are

factors worthy of enquiry in the Jordanian context. It is to be expected that were Jordanian auditors to be familiar with the potential benefits, increasing their awareness of the techniques' effectiveness and efficiency, they would be buoyed by the experiences of their counterparts in developed countries. There, the effectiveness of the techniques was the main factor that explains their use of CAATs, according to Garsombke and Tabor (1986).

To help the EDP auditors choose an efficient audit technique from various available CAATs, Weiss (1980) enquired into the factors that may be affecting the evaluation of those CAATs used by EDP auditors to verify the controls and the processing logic of an accounting application. For the study the techniques were classified as (i) static techniques (those allowing auditors to perform the verification process at specific point of time), and (ii) continuous techniques (by which auditors might monitor the accounting application on continuous basis and concurrently with clients' processing).

Two static techniques were evaluated: Parallel Simulation, and Test Data; and four continuous techniques: Integrated Test Facility, Snapshot, Tracing, and Mapping. Weiss (1980) interviewed various users⁷ of the techniques to identify their associated use, and implementation costs. Therefore, he classified each technique according to its type, objective, and cost behavior. These are shown in Table 5.6.

⁷ The study did not explicitly identify further details regarding the interviewed persons.

Table 5.6: Weiss (1980) Evaluation of Software Validation CAATs

Technique	Type	Objective	Fixed Cost <i>1= Lowest</i>	Variable Cost <i>6= Highest</i>
Test Data	Static	Verification of program logic	2	4
Parallel Simulation	Static	Verification of program logic	3/4	1/2
Integrated Test	Continuous	Verification of system	6	3
Snapshot	Continuous	Analysis of critical modules	3/4	1/2
Tracing	Continuous	Critical path auditing	1	6
Mapping	Continuous	Auditing of exception through summary statistics	5	5

Source: Weiss (1980, p.49)

Weiss (1980) used a comparative analysis approach taking into consideration all dimensions appearing in Table 5.6. According to him, the analysis revealed that: in regard to static techniques, the Test Data technique was associated with a high variable cost due to test planning, creating test data, pre-calculating the result, run and analysis the test data. In contrast, Parallel Simulation was associated with greater fixed cost attributed to total times involved in documenting, designing, coding, and testing procedures. Regarding the continuous auditing techniques, Integrated Test Facility was ranked the highest fixed cost technique, due to the extreme care needed because of fictitious transactions⁸ during live production processing. Snapshot was categorized as a high fixed cost because of the analysis issues and design of all the automated triggering

⁸ In this technique a *dummy* company's files are created within the accounting application system's files, where the processed audit test data transaction will update the dummy files and does not impair the actual master files; the dummy files, for example, may be a fictitious employee in the database if the accounting application is a payroll system, or may be a counterfeit stock item in the database if the application is an inventory system (see chapter 6).

Although Weiss (1980) studied the type, objective, and cost behaviors factors that could support the external or internal auditors to choose an efficient tool, he did not study the actual use, familiarity, and the potential benefits of the CAATs by the auditors.

5.2.4 The Literature on Studies of the Uses of CAATs by External Auditors

Little research addresses the actual use of and the familiarity with different computer assisted audit techniques by external auditors. Most of the research has focused on decision aids such as expert systems (Boritz, 2002). Lovata (1990) examined the use of the different types of CAATs and the accounting areas in which they were used by surveying 744 Electronic Data Processing EDP auditors among the big 8 audit firms in the US. 204 EDP auditors responded to the questionnaire, giving a response rate of 29%.

Based on the structure⁹ audit firms provide for the audit process and taking into consideration the assumption that the technology of a firm is expected to affect the use of EDP techniques, Lovata (1990) segregated audit firms into those highly structured, those with intermediate structures, and the unstructured.

Lovata's study concluded that: (i) unstructured firms tend to use computer assisted audit techniques the most, followed by the highly structured, then the intermediate structured firms; (ii) the most often used technique is Generalized Audit Software followed by Flowcharting techniques and the Custom Design Program; (iii) accounts receivable was the most common area in which CAATs were applied followed by inventory accounting and management, with accounts payable and the general ledger third. Table 5.7 shows the CAATs and the corresponding familiarity surveyed by Lovata.

⁹ Bamber and Snowball (1988, p. 492) define audit structure as "the extent to which auditors' task-related behaviors are subject to formalized prescriptions and restraints". Cushing and Loebbecke (1986, p. 32) defined a "structured audit methodology" as: "A systematic approach to auditing characterized by a prescribed, logical sequence of procedures, decisions, and documentation steps, and by a comprehensive and integrated set of audit policies and tools designed to assist the auditor in conducting the audit."

Table 5.7: Lovata (1990) CAATs Survey

<i>Audit Technique</i>	<i>Not Familiar (%)</i>
System Control Audit Review File (SCARF)	50.5
Sampling Audit Review File (SARF)	42.1
Mapping	35.6
Tagging and / or Tracing	18.8
Embedded Audit Routine	11.9
Integrated Test Facility (ITF)	9.8
Concurrent Processing	8.9
Controlled Processing Or Reprocessing	5.9
Parallel Simulation	3.9
Flowcharting	0.5
Test Data	0.5
Generalized Audit Software	0
Custom Designed Programs	0

Source: Lovata (1990, P.64)

The Lovata (1990) study concentrated on the use of EDP audit tools by the external auditors, and showed that they were highly familiar with the most of the common CAATs. Despite that high degree of familiarity with all the techniques, Lovata showed that several techniques were used infrequently.

Most of the Lovata surveyed techniques had long been the subject of discussion in EDP auditing textbooks, or had featured in the technical auditing journal literature. Thus, the low percentage usage provides motivation not only to investigate auditors' awareness of the potential benefits associated with these techniques, but also to identify the obstacles facing auditors in a developing country to the use of them.

Accordingly, this review of literature on computer assisted audit techniques provides a timely justification to enquire into the following commonly used CAATs:

1. Test Data
2. Base Case System Evaluation (BCSE)
3. Integrated Test Facility (ITF)
4. Parallel Simulation (PS)
5. Source Code Comparison
6. Flow Charting Program
7. Reprocessing
8. Tracing
9. Mapping
10. Snapshot
11. Embedded Audit Module (EAM)
12. System Control Audit Review File (SCARF)
13. Audit Hooks
14. Generalized Audit Software (GAS)
15. Utility Programs
16. Custom Design Software

5.3 Summary - the Literature Discussing CAATs

The above review of prior studies of computer assisted audit techniques indicates that they have been the focus of surveys into the use of CAATs available by both internal and external auditors. Some researchers have studied the uses and effectiveness of CAATs, and others have investigated the factors that may help auditors choose the most efficient techniques, driving the uses of some of the techniques, but not others.

Most of the studies have shown that the CAATs are widespread technical phenomena, spread across the international CPA firms and amongst the internal auditors; moreover, they indicated the increasing number and the widespread uses of the CAATs.

Most extended studies were of the uses of CAATs by internal auditors (SRI, 1977; Abdel-khalik et al., 1983; IIA, 2004). Garsombke and Tabor (1986), Tobison and Davis (1981) concentrated on the use of CAATs by internal auditors also, and with external auditor respondents amounting to only 20 and 25 percent respectively. Indeed, the concentration of the prior studies on the use of CAATs by internal auditors possibly reflects a current perception that the use of CAATs by internal auditors is more important than their use by external auditors.

Arguably, bearing in mind the potential of their applications, the use of CAATs by external auditors could be equally important as their use by internal auditors. This is particularly so where both face huge advances in computerized accounting systems, and both are required to assess the accounting application controls and to undertake the necessary substantive tests (Engle, 1999).

The importance of using CAATs by external auditors was clearly established through chapter 2, where different authoritative bodies globally have issued standards or guidelines requiring external auditors to utilize CAATs while dealing with a computerized environment. These standards and guidelines and the literature reviewed in chapter 4 clearly indicate the potential benefits external auditors could enjoy through engaging the CAATs (section 4.4). In addition, external auditors are required to understand the techniques and procedures used by their clients' internal auditors. ISA 610, for example, entails the independent external auditors to consider the procedures

performed by internal auditors (IAASB, 2007), which in turn affect the nature, timing, and extent of independent auditors procedures.

In Jordan and in accordance with the Companies Law (No. 22/1997) and the Banks Law (No. 28/2000), external auditors are required to assess the companies internal control. Dealing with a computerized environment characterized by the invisibility of the calculations, diminishing or non-existent audit trails, and source documents, in addition to the built-in internal accounting controls, make auditing procedures difficult or impossible without computer assistance. Thus, it is reasonable to assume that Jordanian auditors would be utilizing CAATs.

Most of the prior research studying the use of computer assisted audit techniques (regardless whether by internal or external auditors) has showed a variable, often slight, usage of some of the CAATs. One could expect that exploring the reasons driving not using some of the CAATs might enhance the current practice of the computer assisted audit techniques worldwide. None of the previous studies attempts to investigate those reasons. Those matters would have particular policy implications for Jordanian audit practice.

To that end, the CAATs usage phenomenon now requires further understanding by extending the familiarity and uses of the Lovata (1990) study, by surveying external auditors in a developing country to capture an understanding of the likely factors impacting usage in a relatively 'green field' site - Jordan.

Chapter 6

The Common Computer Assisted Audit Techniques

6.1 Introduction – the Application of CAATs

The task of the auditor is to decide whether the financial statements are fairly presented in accordance with prescribed accounting standards. To achieve this goal, the auditor pursues audit objectives, designs procedures, and collects evidence concerning management's assertions in the financial statements. Evidence is collected by performing two major audit procedures: (i) *control risk assessment* - by obtaining an understanding of the internal controls structure and tests of controls on which some reliance will be placed. This step designed to assure that sufficient internal controls are in the place and functioning properly: and by (ii) *substantive testing* of the details of transactions, and balances. The objective of the substantive testing is to evaluate the amounts and disclosure in the financial statements. Accordingly, to achieve the audit objectives auditors may use different types of CAATs.

In this chapter, a clear understanding will be crafted regarding the rationale underpinning the CAATs most frequently employed in those processes. More specifically, the main objective here is to elucidate the use of the sixteen CAATs which were proposed by the researcher to be surveyed by this thesis (noted earlier in chapter 5). The *when*, *where*, and *how* each technique is being used through different auditing procedures, and the major advantages and pitfalls of each technique are explained. Accordingly, this chapter in conjunction with the previous chapters achieves the thesis

benefits (1.4) - by surveying and synthesizing the literature related to use of CAATs, to provide the means of familiarizing Jordanian Audit firms with different CAATs used worldwide.

6.2 Test of Application Controls v. the Substantive Testing CAATs.

The International Auditing Practice Statement (IAPS) 1009 defines CAATs as follows:

CAATs are computer programs and data the auditor uses as part of the audit procedures to process data of audit significance contained in an entity's information systems. The data may be transaction data, on which the auditor wishes to perform tests of controls or substantive procedures, or they may be other types of data. For example, details of the application of some general controls may be kept in the form of text or other files by applications that are not part of the accounting system. The auditor can use CAATs to review those files to gain evidence of the existence and operation of those controls (IAASB, 2004, p.762).

Accordingly, CAATs are categorized according to their designated tasks. CAATs may be used in performing various audit procedure including substantive testing, analytical review, information systems control testing, and access and testing clients' data files (ISACA, 1998, p.410). In addition, International Auditing Practice Statement added two other uses - *sampling* programs and for *recalculations* (IAASB, 2004, p.762). Vasarhelyi and Lin (1985, p.80) indicated that auditors could use computerized audit techniques to perform two major audit tasks: to check the "information processing system internal control procedure" and to verify the "details of transactions and balances".

A review of the literature reveals diverse views regarding the classification of CAATs. This issue is confirmed by Cash, Baily and Whinston (1977, p.815) where they opined that "there are problems of uniqueness in classification that arise due to the multiple purposes and outputs of the techniques". Based on that, the most frequent classifications

of the CAATs that were presented and discussed in the auditing literature are as follows: “testing application controls techniques... [and] examining transaction details and, account balances - Substantive testing techniques” (Hall, 2001, p.879), or techniques for verifying the “phases of processing” and techniques to “verify the result of processing” (Cash et al., 1977, p.814). While Garsombke and Tabor (1986) refer to them as the mechanisms by which to “test program logic and controls...[and] verify output” techniques (p.50). Abdel-khalik, Snowball and Wragge’s (1983) classification was “program verification technique...[and] verification of output technique” (p.217). Finally Elliott and Jacobson (1987) sorting was “access and test clients’ data file...[and] application program and programmed controls” techniques (p.210). Thus, CAATs have been described in connection to diverse, but related, audit functions.

Despite those different applications, CAATs are generally divided into two main classes, those used to *test the application of controls* - the testing of computer program controls that provide information about the accuracy and completeness of an application process, and the *substantive testing* CAATs - which extract data from files and databases providing auditors with evidence of the details underlying a transaction or account balances.

6.3 Testing of Application Controls CAATs

Accounting application is the software that processes business transaction. As such the accounting application software could be a payroll system, a retail banking system, an inventory system, a billing system (Sayana, 2002). In testing the application controls of the computerized accounting information systems, the following ten CAATs are the techniques frequently listed: *Test Data, Base Case System Evaluation, Integrated Test*

Facility, Parallel Simulation, Source Code Comparison, Flowcharting Program, Reprocessing, Tracing, Mapping, and Snapshot.

6.3.1 Test Data

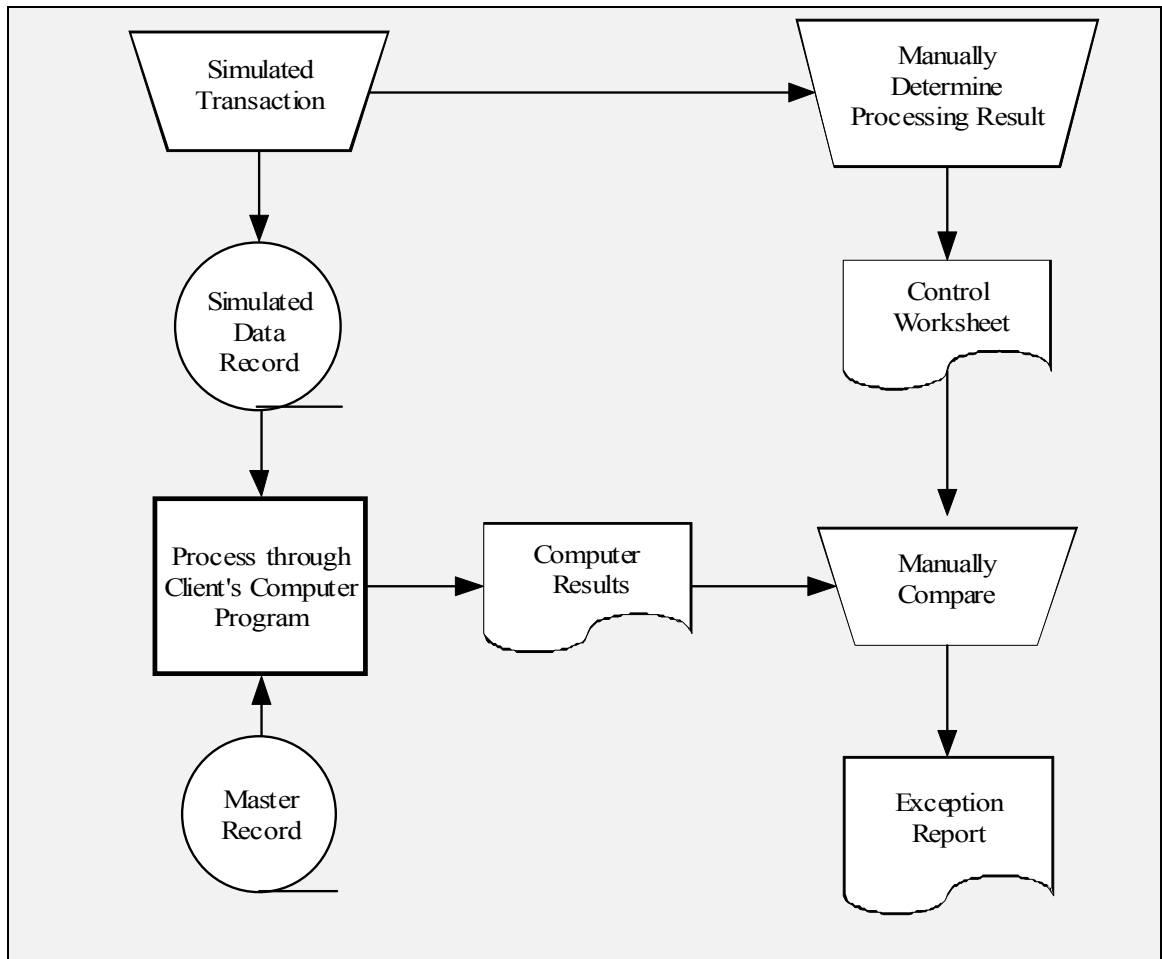
The Test Data technique is based upon the simulated or hypothetical sets of data prepared by the auditor (the *test data*). The hypothetical test data are processed through the auditees' application program, under the auditor's supervision. This process is accomplished in a separate operation, while the client's program not functioning. Therefore, the auditor is required to ensure that the application under review is the actual production application used in the daily processing activities. This verification could also be accomplished by using other CAATs such as Source Code Comparison technique (Weber, 1999).

The auditor compares the output results of each test data against the pre-calculated results. Correspondence between the two attests that the processing controls are reliable. Dissimilarity from the pre-determined results is the basis for further investigating for weak controls or erroneous processing, as illustrated in Figure 6.1.

The main objectives of test data techniques are ascertaining the integrity of application programs (Hall and Singleton, 2005), and the efficiency of the control procedure built into the application programs (Bakshi, 2001). The accuracy and completeness of the processing are also tracked (Rezaee, Sharbatoghlie, Elam and McMickle, 2002).

The *Test Data* technique was also known as *test deck* when the test data were entered to the accounting application system from punched cards and used primarily to verify the application programs at the implementation phase (Cushing and Romney, 1994).

Figure 6.1: *The Test Data CAAT*



Source: Watne and Turney (1990, p.410)

Test Data has both advantages and disadvantages. The major advantages are: it is easy to understand (Goossens and Schouten, 1981; Lee, 1988; Wilkinson, Cerullo, Raval and Wong-On-Wong, 2000); does not need a great degree of technical knowledge (Abdelkhalik et al., 1983; Wilkinson et al., 2000); and can be run in a separate operation. Thus it does not have any adverse impact on the production processes of the clients (Weiss, 1980).

Its major potential pitfalls lie in the preparation of the test data. In this regard, Cash et al. (1977), Goossens and Schouten (1981), and Lee (1988) considered the preparation of a complete set of test data 'impracticable'. Goossens and Schouten (1981), Wilkinson et

al. (2000), Hall (2001), Romney and Steinbart (2003), and Hall and Singleton (2005) assumed that composing test data is 'very time-consuming'. It is also said to be hypothetical, not verifying the real production data (Bodnar, 2000). *Test Data* is also considered as a static technique because it assesses the clients software only at the time of the review (Wilkinson et al., 2000).

To that end, to facilitate the checking of the processing accuracy and verifying every logic path in the application program, comprehensive test data are required, containing both correct and incorrect transactions. The accounting application program will accept the correct transactions data, whereas the incorrect will be rejected and reported through the exception report.

Thus, the preparation of the test data is considered the principal element in this technique. It is not a straightforward process, for it requires that the auditor has an intimate familiarity with, and an understanding of, the system under review. Clearly, it is time consuming. Besides, any new amendment to the clients' software requires a follow up from the auditor to inject the necessary revision and alteration to the test data to fit with new features of the production application, to grant this technique its legitimacy and validation.

6.3.2 Base Case System Evaluation (BCSE)

The test data technique is considered as a basis for other techniques. BCSE, for example, is a technique based on the test data concept. Its main feature is that it uses a complete set of test data containing all possible arrays of transaction data that can test every logic path in the clients' accounting application.

BCSE can be replaced with Test Data if the latter includes a complete set of test data. This is expected to be the main reason that most descriptions do not mention it as a separate technique and merge it with test data technique.

Hall (2001), Hall and Singleton (2005) considered the BCSE technique as a reference which can be used in system development testing, and in any future modification in the program under review.

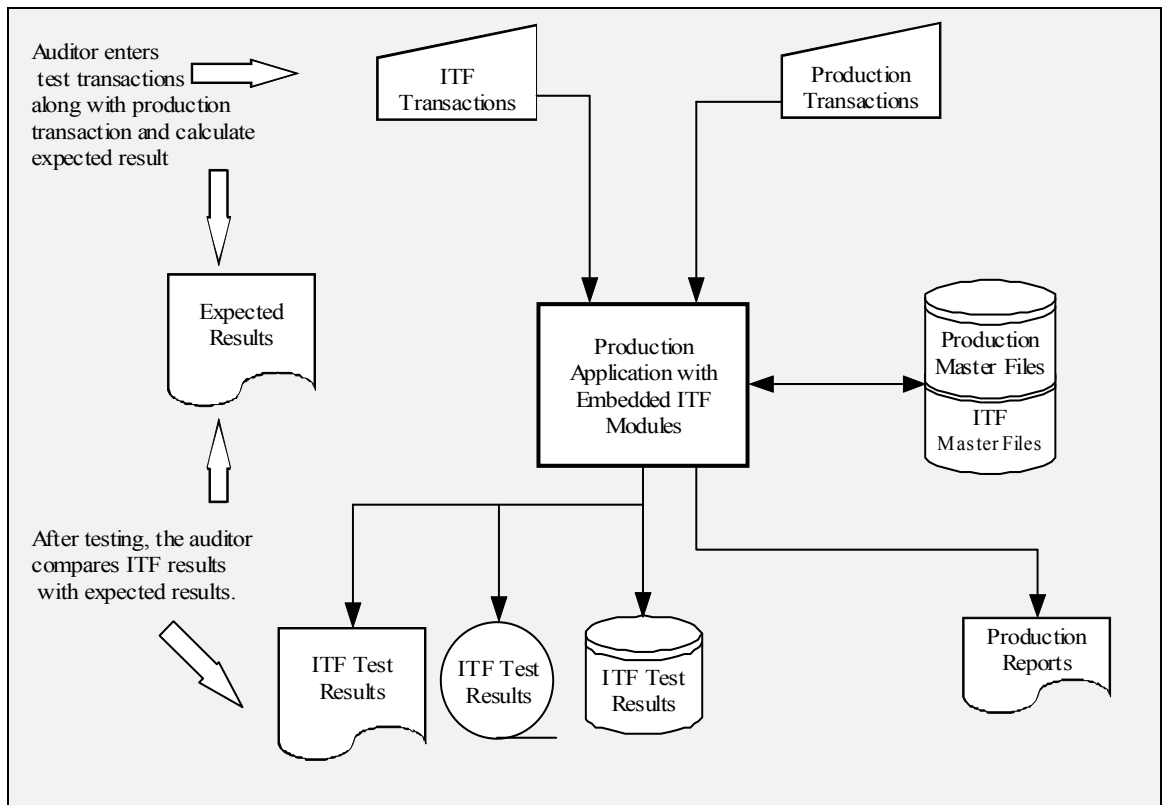
6.3.3 Integrated Test Facility (ITF)

The test data techniques' efficiency deteriorates when applied to more complicated, and on-line processing accounting systems. In such settings it is better to utilize a more comprehensive audit technique such as ITF (Moscove, Simkin and Bagranoff, 2003). ITF is also based on the test data technique and has the same objective - to verify the logic and control of the clients' application software - but during its regular working by the client – rather than separately.

To fulfill ITF tasks the auditor creates *dummy* company files within the application system's files, in circumstances in which the processed audit test data transaction will update the dummy files' and not impair the actual master files. For example Weber (1999, p.759) explained that where the accounting application is a payroll system the dummy files may be a fictitious employee in the database; if the application is an inventory system the database might be inserted with a counterfeit stock item. Moreover, if the application is an electronic data interchange EDI system auditors may work jointly with auditors in other businesses and insert a dummy entity in the database of their client's business, or the database of other businesses with which their own business or client interacts.

The auditor will monitor the audit test data while it is processed against the dummy master files. The audit test data are entered concurrently with the *live* data, so the clients' accounting application must have special codes to distinguish dummy and actual records. The updated dummy company file will be compared with the prescribed results to expose disparities, as Figure 6.2 illustrates.

Figure 6.2: The Integrated Test Facility CAAT



Source: Hall (2001, p.887)

The major features distinguishing the ITF from Test Data technique are that ITF evaluates application controls during normal operations (Braun and Davis, 2003); the test is run without interfering with the user's operation (Hall, 2001). In contrast, the probability of contamination of client's actual data with the audit test data transaction is considered a major ITF drawback (Goossens and Schouten, 1981; Hall, 2001; Moscove

et al., 2003). Table 6.1 summarizes the similarities and differences, contrasting the Test Data CAAT and the Integrated Test Facility CAAT.

Table 6.1: Similarity and Contrast between Test Data and Integrated Test Facility Techniques

<i>Feature</i>	<i>Test Data CAAT</i>	<i>Integrated Test Facility CAAT</i>
Concept	Based on hypothetical test data	Based on hypothetical test data
Objective	It aims to verify application control and processing accuracy and completeness	It aims to verify application control and processing accuracy and completeness
Processing systems	Suited for batch processing systems	Suited for on-line processing
Timing	Computerized accounting information systems are tested separately from normal production area	Computerized accounting information systems are tested during regular production processing
Using	Used with simple computerized accounting information systems	Used with complex accounting information systems and on-line processing
Static and continuous auditing	Static auditing technique	Continuous auditing technique
Fake company	It does not use a <i>fake company</i>	It uses a <i>fake company</i>

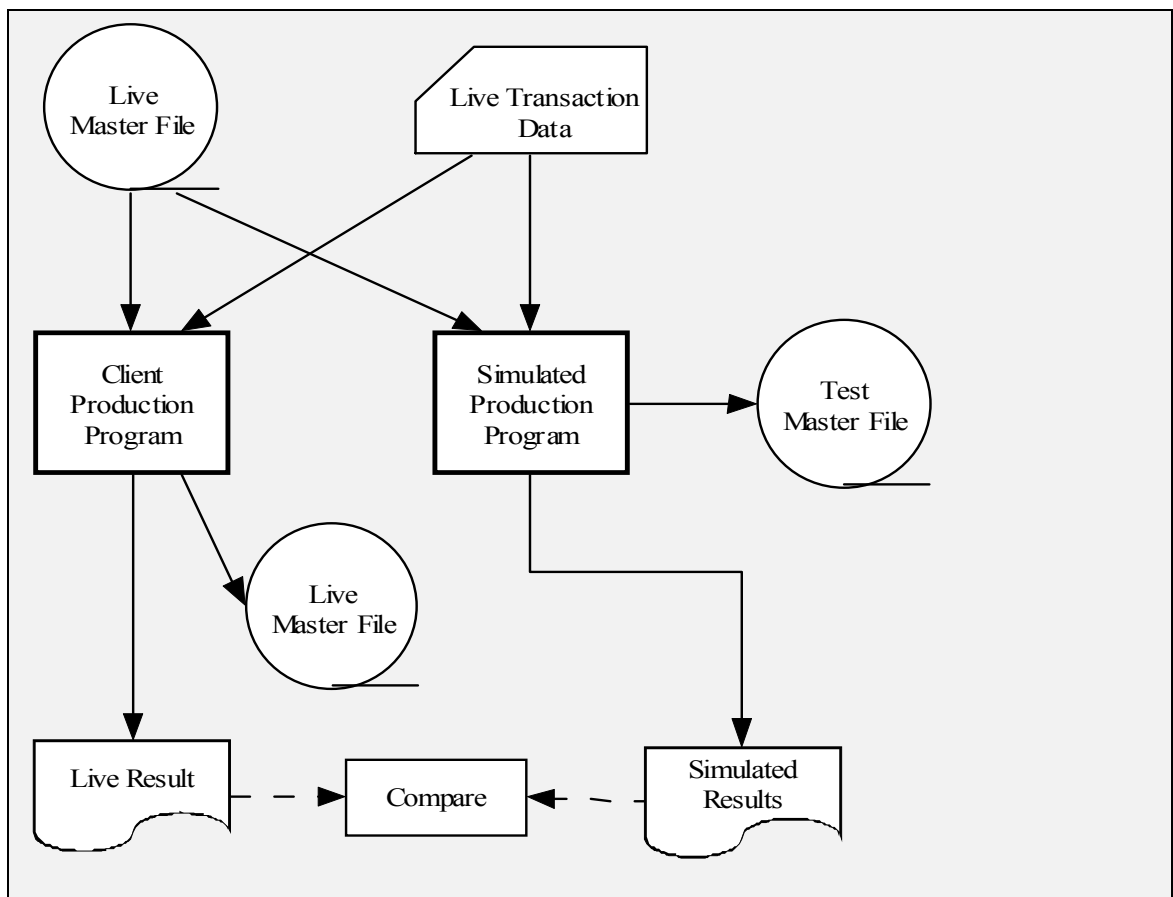
6.3.4 Parallel Simulation (PS)

The PS technique is a test of controls intends to evaluate the effectiveness of the application control activities. PS is used to identify unlawful alterations to the client's accounting application software (Cushing and Romney, 1994; Romney and Steinbart, 2003). In that setting Cash et al. (1977) considered it a most powerful tool in the verification phase of processing. In this regard, Lee (1988) confirmed that the PS technique enables the auditor to perform a full independent examination of the accounting application calculations, and inspection of any application amendments.

Utilizing the PS technique entails the auditor writing an accounting program to capture the whole or part of the client's actual computerized accounting information system's functions under review.

The input to the PS program is the client's actual accounting transaction data. The processing of those data by the auditor PS program can be undertaken either concurrently with the real processing or separately. The output of the PS program is compared against the company's actual processing. The two outputs must correspond: and divergences are scrutinized. Figure 6.3 illustrates this process.

Figure 6.3: The Parallel Simulation CAAT



Source: Vasarhelyi and Lin (1988, p.260)

Thus the PS technique eliminates the need for test data (Moscove et al., 2003), minimizing the impact on the actual production data. Further, the technique is characterized by its reliability and creditability, because it draws on the program that is prepared by an independent auditor. In contrast, the process of writing a simulation

program is not only time consuming, but also requires adequate specialized programming knowledge by the auditor (Wilkinson et al., 2000; Moscove et al., 2003).

6.3.5 Source Code Comparison

The Source Code Comparison technique is primarily a comparison program designed to identify unofficial variations to the clients' accounting application under review (Cushing and Romney, 1994). Auditors may use this technique to ensure that they audit the correct version of the accounting application software (Weber, 1999). To use this, the auditor should initially review the documentation for any approved modification to the accounting application.

Weber (1999) argued that the Source Code Comparison technique is a straightforward approach of identifying changes made to accounting applications. He added that this is usually neither costly to purchase nor to execute, and requires little computer skill. However, the auditor must be equipped with high information technology skills, to identify the implications of any discrepancy found in the code (Goossens and Schouten, 1981).

6.3.6 Flowcharting Program

Flowcharting software techniques are used for program analysis. This software utilizes the source version of the accounting application to generate a flowchart of the program and its processing logic (AICPA, 1994; Helms, 2002). The auditor then analyzes the flow of logic through a computer program to demonstrate the controls in the computerized accounting program. Flowcharting programs can be used for both testing controls and substantive testing (Watne and Turney, 1990), to provide a comprehensive understanding of the computerized accounting application's structure.

6.3.7 Reprocessing

The reprocessing technique is directed toward detecting unauthorized variations in accounting application software (Romney and Steinbart, 2003). A copy of the client's accounting application software is used for periodical checking that the application has not been injected with changes. The auditor uses the application copy to reprocess the real accounting transactions, processed through the client's current accounting application. Comparison of the two outputs test for any inequality. This technique does not provide the auditor with a full assurance that the accounting application program will function properly throughout the year as, according to Cash et al. (1977) and Wilkinson et al. (2000), it utilizes the actual accounting data as the input and does not use carefully prepared hypothetical test data to distinguish between the valid and invalid.

6.3.8 Tracing

Tracing techniques are used to discover any *unauthorized* or *unexecuted programs instruction*, or *wrong logic paths* (Cushing and Romney, 1994). This technique is one of the features that may be built into the system software (Weiss, 1980). Its use has to be initiated by the auditor (Cushing and Romney, 1994).

Here, the auditor can use the prepared test data (Hall and Singleton, 2005) or the client's actual accounting transaction data (Cushing and Romney, 1994) as input to the client's accounting application software. The auditor will *tag* the accounting data (*test* or *real*) with a unique code – accordingly the label “*Tagging and Tracing*” as indicated by Cash et al. (1977), Goossens and Schouten (1981). Through the facility of this technique, an auditor will gradually *trace* the data path through the clients' application

program's processing stages to monitor (piece by piece) the effect of each program instruction on the accounting data throughout all the stages, whereas these execution stages occur quickly in the regular processing. This technique generates a report of all the sequentially executed instructions, analysis of which is used to verify that the program *works* as specified, and to expose unauthorized or unexecuted programs instructions.

The tracing technique allows the auditor to gain detailed knowledge of the application program during the production processing (Goossens and Schouten, 1981). On the other hand, this technique requires a high level of computer skills to apply and analyze the results (Lee, 1988).

6.3.9 Mapping

The mapping technique is intended to inspect the computer codes. More specifically it enables specification of “redundant, inaccessible, exception and error” codes (Cash et al., 1977, p.820).

The actual accounting data are the input (Lee, 1988). To implement, the auditor initiates the mapping concurrently with the normal processing of the accounting systems. *Mapping*, then, will analyze the flow of the accounting transactions through the processing logic of the accounting program (Bodnar, 2000). This technique provides the auditor with a result report of all unexecuted program codes. To verify the reason for the unexecuted codes entails further investigation, which may lead to the exposure of unauthorized or fraudulent codes. Applying and interpreting the results of the mapping technique requires a high degree of programming skills (Cash et al., 1977; Lee, 1988; Watne and Turney, 1990; Romney and Steinbart, 2003).

Cash et al. (1977) and Watne and Turney (1990) indicate that the mapping technique may also be found in the auditing literature with other labels: *missed branch indicator*, *control monitors*, and *logic supervisor*.

6.3.10 Snapshot

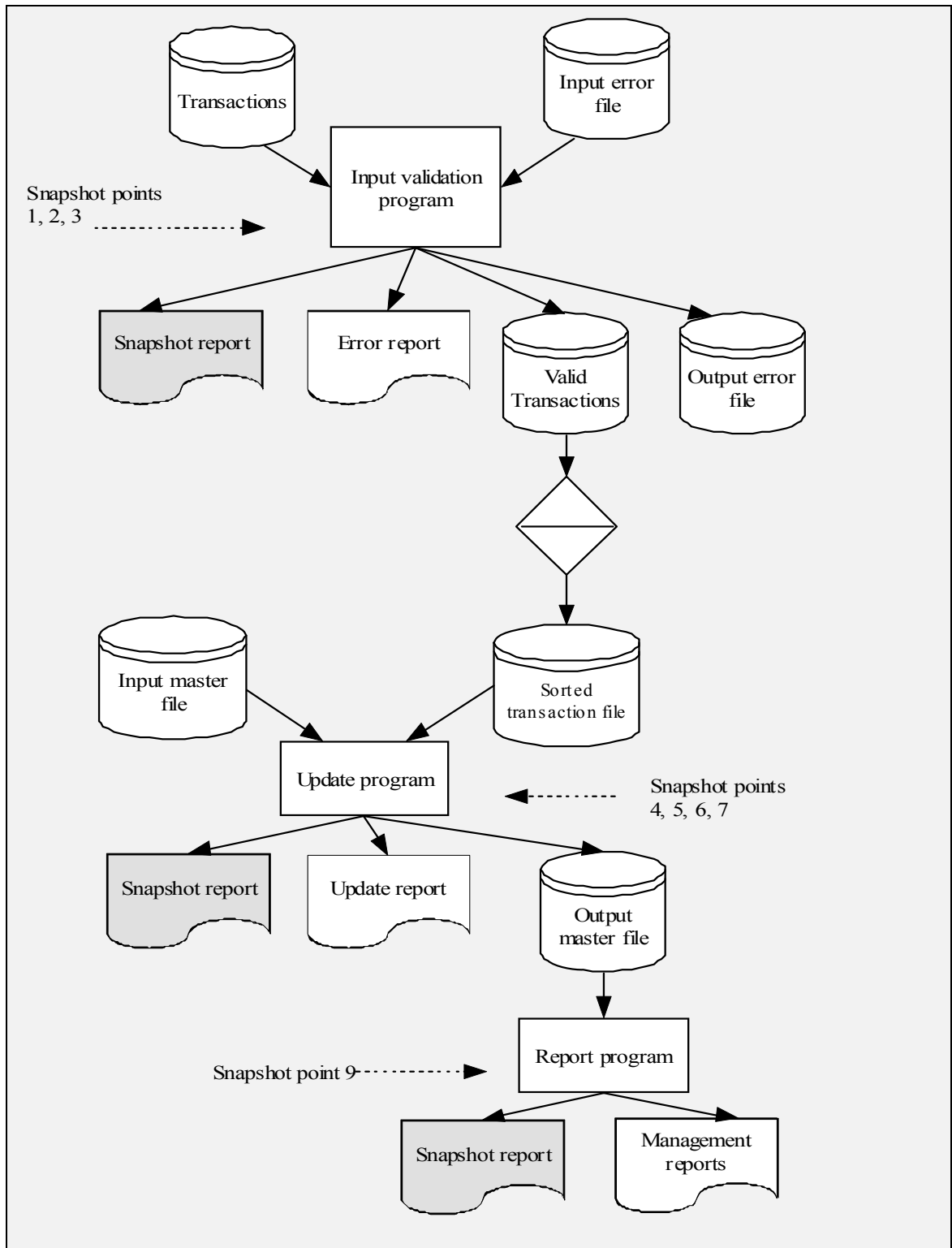
When auditors have to deal with a complex or large accounting application system it is difficult, frequently impracticable, to perform transaction tracing. Instead, auditors use the *Snapshot* technique that enables them to execute a *transaction walkthrough* (Cushing and Romney, 1994; Weber, 1999). Snapshot allows the auditor to inspect the transaction processing at a specific point in time. It is a module embedded at particular processing points in the client's accounting application program at those points where they deem material processing occurs (Kanter, 2001). Materiality of the accounting data (such as the dollar size of the transaction) processed at each processing point is an important criterion in respect of where to establish the *snapshot points* within the application system.

To execute the snapshot, selected accounting transactions are identified with unique codes triggered to the snapshot functions, or they may be programmed to execute snapshots of specified transactions in accord with some type of sampling plane (Weber, 1999). The snapshot module takes a *picture* of these transactions before and after processing operation and stores the results in a special file for further investigation by the auditor (Figure 6.4).

Rittenberg and Schwieger (1997) described the snapshot technique as:

A powerful technique and, with a proper planning, can be used to trace transactions through processing across the country. For example, a transaction initiated in Denver can be traced through to the update of the master file in Chicago (p.309).

Figure 6.4: The Snapshot CAAT



Source: Weber (1999, p.763)

Examination of the snapshot output files enables auditors to confirm that all processing steps have been correctly executed (Moscove et al., 2003), and to trace an accounting transaction through a sophisticated accounting application system, testing the correctness and completeness of its processing.

6.4 Substantive Testing CAATs

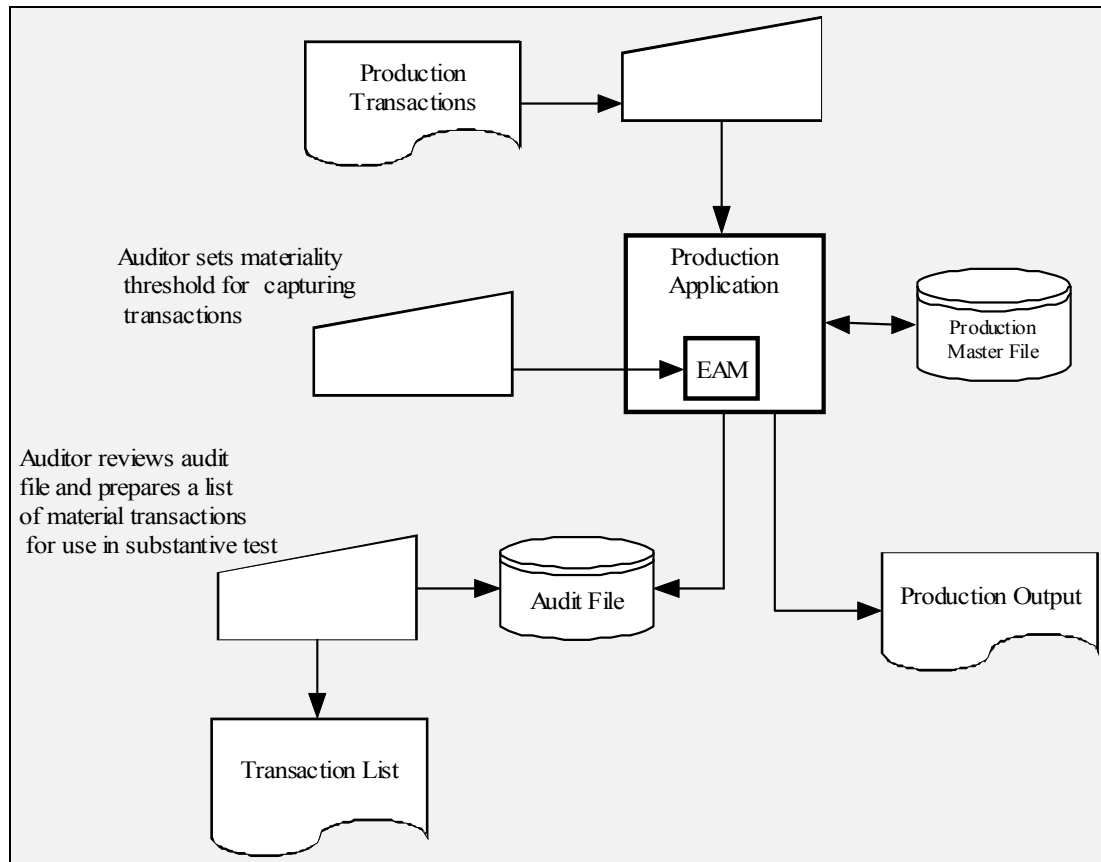
The testing of controls and the substantive testing are mutually dependent. The more, the auditor can test the application controls, the greater the reliance that can be placed on the application system, and the less substantive procedures are needed. Six computer assisted audit techniques assist auditors while performing substantive testing in computerized environments.

6.4.1 Embedded Audit Module (EAM)

Embedded audit modules (as depicted in Figure 6.5) are programmed routines built into the computer application software (AICPA, 1994). The EAM methods aim to detect *unusual, material, and fraudulent* transactions throughout the audit period (Hall, 2001). Some EAM capture transactions immediately they occur. Other EAMs capture transaction details in a log file to be analyzed by the auditors periodically.

Input to EAM programmes is the client's actual transaction data. EAMs thus provide the auditor with a comprehensive and continuous monitoring of transactions. SRI (1977), Rittenberg and Schwieger (1997) argue that the use of EAMs would increase with the increasing use of the on-line processing systems.

Figure 6.5: The Embedded Audit Module CAAT



Source: Hall (2001, p.890)

The auditor is responsible for determining the EAM parameters of the transaction-set to be captured. These data collection boundaries may be set during the system design stage or at the time of the audit (SRI, 1977).

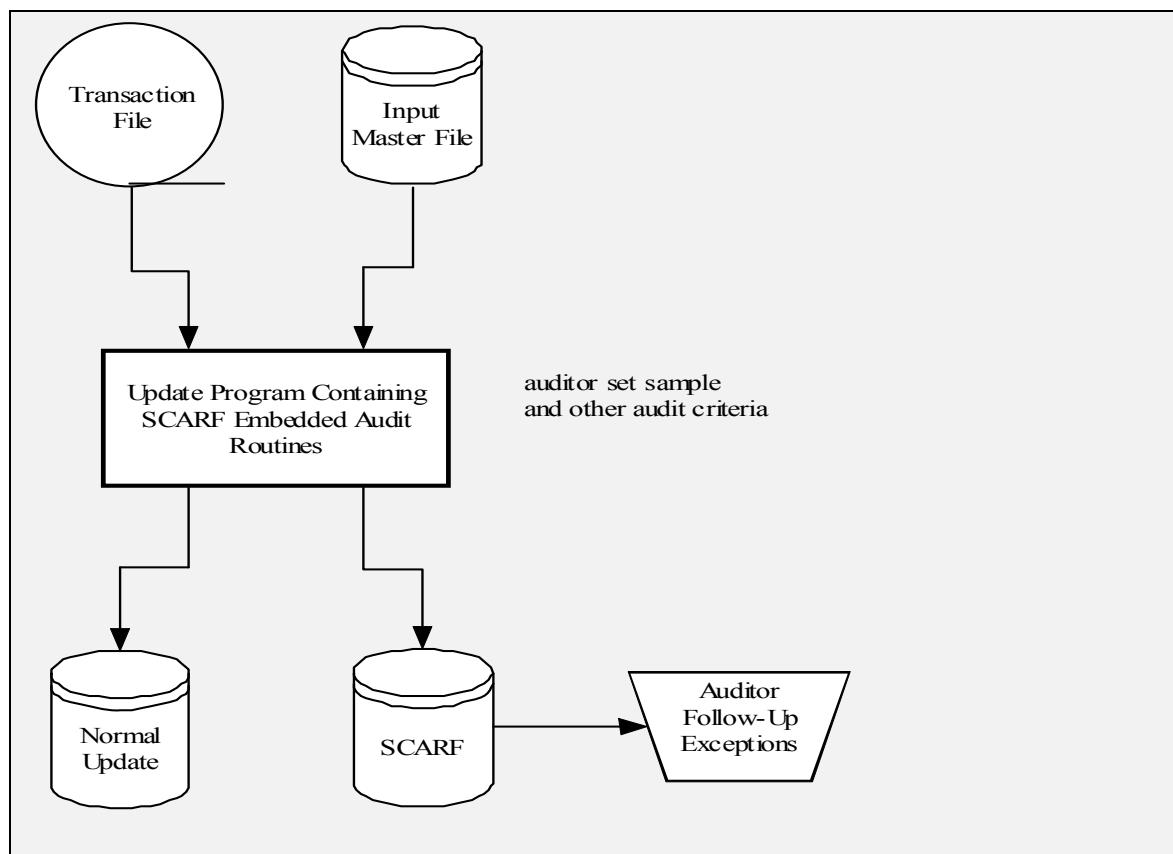
EAMs require high technical skills, and the high development, and maintenance costs that may emerge to be their potential pitfall (SRI, 1977; Vasarhelyi and Lin, 1988; Warren, Edelson and Parker, 1994).

6.4.2 System Control Audit Review File (SCARF)

SCARF is also a module embedded in the accounting application program. It is designed “to detect exception or unusual conditions” (Cash et al., 1977, p.821); it

Romney and Steinbart (2003, p.334) have indicated that the main accounting transactions that might be copied to SCARF are those “exceeding a specified dollar limit, involving inactive accounts, deviation from company policy, or containing write-down of assets’ values”, for example, cash sales data above a certain amount or all credit sales above certain dollar values without the proper management approvals (Wilkinson et al., 2000).

Figure 6.6: The System Control Audit Review File CAAT



Source: Kanter (2001, p.46)

6.4.3 Audit Hooks

Audit hooks enable the auditor to discover unusual, irregular, or fraudulent transactions. Again, this technique is a module that may be embedded in the application software to flag questionable, suspicious or unusual, transactions.

The *hooks* are auditor-initiated concurrently with normal processing of the client's accounting system. This utilizes the actual accounting data as an input, the auditor determining the criteria for the transactions that will be subjected to the audit hooks (Bakshi, 2001). A real-time red flag appears on the auditor's screen when anomalies or unusual events arise (Romney and Steinbart, 2003).

6.4.4 Generalized Audit Software (GAS)

Before the introduction of GAS, auditors spent considerable time “recalculating client totals, verifying data integrity, calculating sample sizes, inputting data into spreadsheets, preparing confirmations”. Advanced technology easily performs such tasks (Hunton, Bryant and Bagranoff, 2004, p.183). According to Lovata (1990) the familiarity of auditors with the GAS is almost universal thus, it was described as the most widely used computer assisted audit techniques (SRI, 1977).

GAS appeared in the mid-1960s as a program or set of programs facilitating data extraction and analysis, enabling the auditor to perform tests of controls and substantive tests on data maintained on computer files.

The frequent use of GAS is attributed to: (i) it does not need the high level of information technology skills needed for many of the other techniques; (ii) it is adaptable to different file structures and formats. Thus, generalized audit software

performs different audit functions, such as “record extraction, sorting, summarization, field statistic, field comparison, gap detection, duplicate detection, sampling, calculations, and exportation” (AICPA, 1994, p.136).

By using GAS auditors are able to access any accounting information system to interrogate the data stored.

6.4.5 Utility Programs

Utility programs are aimed to assist auditors undertake both control and substantive tests (AICPA, 1994). They are programs not specifically designed for audit purposes, but part of the client’s computer system. Weber (1999, p.682) pointed out that utility programs can be used by auditors to accomplish different tasks, for instance; (i) to carry out particular security functions such as detecting disk viruses, (ii) formatting and downloading the accounting data from mainframes to PCs, (iii) to perform functions that cannot be performed by other auditing software to recover a damaged disk files, and (iv) to assist with the development of new audit software. Such programs can assist auditors in performing other general-purpose task such as sorting, copying, creating, and printing files, merging files in an efficient and effective manner. Utility programs are easy to use, and it is readily available.

6.4.6 Custom Designed Software

Auditors may develop a specialized audit program, frequently labeled *Specialized Purpose Program* (Watne and Turney, 1990), to address specific auditing cases that surpass the ability of GAS or other packaged software (Warren et al., 1994). For example, one of the composite environments where custom design software could be

used is in respect of the accounting systems of communications companies. In this respect, Rittenberg and Schwieger (1997) explain that:

This software normally contains a number of utilities that might be used in different environments and often assists auditors in developing evidence in more complex computerized environments. For example, consider the technology used in telephone systems such as those at AT&T or MCI that controls the management of phone calls and gathers information for accounting and billing purposes. GAS is not normally designed to interface with such a complex computer environment. The auditor may choose to develop specific data extraction programs that can be efficiently used with several telephone companies or clients within several divisions of a larger company. (p.317)

And according to Weber (1999, p.692):

The term specialized does not mean the software performs only a narrow range of functions. Indeed, in some cases the software has extensive functionality. Rather, specialized means auditors have developed and implemented the software where the purpose and users of the software are well defined before the software is written.

Custom designed programs enable the auditor to interrogate files inaccessible by other data extraction programs, may be used to perform highly sophisticated calculations, and to more effectively deal with a large quantity of transaction (AICPA, 1994). By virtue of their likely *one-off* nature, they are generally expensive and time consuming (Watne and Turney, 1990).

6.5 Summary - CAATs and State-of-the-art Auditing

The main objective for this chapter has been to provide an elaboration of the nature and uses of the sixteen computer assisted audit techniques proposed to be surveyed in this thesis (noted earlier in chapter 5). It is to be noted that CAATs are mainly used to test controls and to execute substantive tests. Some may be used for both, notwithstanding their usual functional classification (Rittenberg and Schwieger, 1997). More than one

technique could be used to achieve the same audit task; some audit tasks require a combination of techniques at different stages. In order for external auditors and more specifically Jordanian auditors to engage fully in the state-of-the-art computerized auditing techniques, enjoying their benefits, to achieve efficiency and economy in the utilization of CAATs of necessity, they must understand the uses of each and be familiar with their related advantages and disadvantages. This necessitates appropriate educational initiatives entailing auditing curricula examining and inculcating CAATs skills, to differentiate those available so as to facilitate optimum selection of the most appropriate to fit the audit objective (Weiss, 1980; Rittenberg and Schwieger, 1997).

Chapter 7

The Study's Methodology

7.1 Introduction – a Technology Expectations Gap

Four primary aims underpin this study: first, to investigate the presence of the audit technology gap in Jordan concerning the use of CAATs by Jordanian audit firms; second to identify those specific CAATs that are utilized by Jordanian audit firms in performing financial statements auditing (to test the internal control and substantive testing); third, to identify the level of Jordanian audit firms' awareness to the potential benefits of using CAATs; and fourth, to specify the major obstacles constraining the use of CAATs by Jordanian audit firms.

Literature reviews have indicated that no previous study has dealt with the linkage between an *expectations gap* – the reasonable expectation by the Jordanian public-at-large contemporary audit technology (CAATs) would be used by Jordanian audit firms in their audit processes applied to Jordanian companies using computer technology. Therefore, it is assumed that against the background of the literature related to use of CAATs (Chapters 4, 5 and 6), and discussion of potential obstacles constraining Jordanian audit firms engaging CAATs fully, this study will expose the thin application of CAATs by Jordanian audit firms, familiarize them with the different CAATs used worldwide and be a catalyst for an increase in their use in Jordan. By this means there might be a narrowing of the audit technology gap – the gap between the techniques

actually used in the audit of Jordanian public companies and the reasonable expectations (in that respect) of the users of their audited financial statements.

This chapter presenting a description of the research methodology utilized in this thesis consists of five following sections addressing: the study questions and the hypotheses presented; the research design, the population, sampling frame, sample, participants, and the study instrument; the data treatment and the statistical measures used to analyze the data are described; and a summation of the main elements of the forgoing.

7.2 The Study Questions and Hypotheses

This thesis is underpinned by the following research questions:

1. Whether there is a gap in public expectations regarding the extent to which the Jordanian audit firms use CAATs in their audits of Jordanian ‘computer-using’ companies.
2. Whether there is a significant difference regarding the use of computer assisted audit techniques between the Jordanian audit firms that have an affiliation with the big international accounting firms and those without an international affiliation.
3. Whether there is a conscious perception by Jordan’s audit profession of the potential benefits of CAATs usage.
4. Whether there is a significant relationship between Jordanian audit firms usage of CAATs and their awareness of the potential benefits of CAATs.
5. Whether the perceived obstacles to the use of CAATs by audit firms in Jordan are real.

Examination of those questions will be through the analysis of data relating to the following hypotheses:

- **Hypotheses 1 and 2 : Relating to the Audit Technology Gap and the Use of CAATs**

The development of the perception of an audit technology gap proceeds first, from the hypothetical considerations developed in Chapter 1 to provide a rationale for the limited usage of CAATs in Jordan, and from the literature that discusses the history of computerization in Jordan, the use of computer technology in Jordanian public companies, and the use of information technology in auditing in Jordan, undertaken in chapter 4.

That literature showed that the use of computerization by Jordanian leading business firms, such as in the banking sector, dated from 1973, and extended to the industrial sector within the next few years. The majority of the public companies and governmental institutions currently utilize contemporary information technology. Moreover, the literature showed that the use of computerized accounting systems by different Jordanian organizations emerged with the first use of computerized systems. Most importantly, the literature showed that many of the local audit firms in Jordan have an affiliation with the big international accounting firms overseas that utilize the latest technological innovations in performing the assessment of internal controls and the substantive testing of their clients' accounts.

The focus of Hypotheses 1 and 2 was also justified by the Chapter 2 examination of the main auditing standards and auditing guidelines regarding the use of CAATs issued by various authoritative auditing bodies, such as the International Auditing and Assurance Standards Board, the Australian Auditing Standards Board, the American Institute of Certified Public Accountants, and

the Information Systems and Control Association. Chapter 2 showed how the computerized accounting systems predicated the use of CAATs in the contemporary environment.

Chapters 5 and 6 showed the widespread uses of CAATs by audit firms in western countries. Chapter 3 had clearly established that Jordanian businesses applied the International Financial Reporting Standards and the audit firms were attuned to the *spirit* of the International Standards on Auditing.

To that end, understandably the management of the public shareholding companies' and the users of the audited financial statements might reasonably expect Jordanian auditing firms to be using the cutting-edge technology commensurable with that technology underpinning companies' computerized accounting systems. Moreover, with many of its audit firms having an affiliation with major western accounting firms and, their compliance with the specific ISA related to CAATs, Jordan's audit firms are to be expected to be motivated to enhance their auditing quality.

Against that background, the two hypotheses are investigated. The first contemplates whether the perceived gap exists between the reasonable technology expectations of the users of the audited financial statements and the practices of external auditors regarding the use of CAATs. The second contemplates whether a difference exists in respect of CAATs usage between the Jordanian audit firms with an international affiliation and those without one. Stated in their null form:

H₀ 1: There is no gap in the reasonable expectations of the extent to which the Jordanian audit firms use CAATs while they perform their daily audit procedures on Jordanian public companies.

H₀ 2: There is no significant difference regarding the use of CAATs between the Jordanian audit firms with an international affiliation with the big international accounting firms and those without an international affiliation.

- **Hypotheses 3 and 4: The Perception of the Potential Benefits of CAATs Usage by Jordanian Audit Firms**

It is expected that showing Jordanian audit firms the huge benefits to be derived from using CAATs is an effective way to encourage auditors to utilize them. Several of the studies canvassed in Chapter 4 have justified the investment in audit technology on those grounds and reported the various benefits emerging from CAATs usage. Understandably, it is expected that exposing Jordanian audit firms to those benefits could encourage them to engage CAATs. That requires them to understand and be appreciative of the significance of those benefits. Thus, Hypothesis 3 is used to investigate audit firms' perceptions regarding the potential benefits of the CAATs, with a view to gaining an understanding of why their usage is so *limited* in Jordan. Hypothesis 4 seeks support for effective ways by which to encourage auditors to utilize CAATs; for example, by showing them the huge benefits derived from implementing CAATs. It investigates the relationship between the audit firms' awareness of the benefits of CAATs and the level of their usage. In the null form they are:

H₀ 3: There is a negative conscious perception by Jordanian audit firms of the potential benefits of using CAATs.

H₀ 4: There is no significant relationship between the awareness of the CAATs benefits and the level of CAATs usage by Jordanian audit firms.

- **Hypothesis 5: The Barriers Constraining the Use of CAATs by Jordanian Audit Firms**

Chapters 4, 5, and 6 contributed to the formulation and the content of this hypothesis, as did the discussion of key characteristics of the accounting and auditing profession and education in Jordan presented in Chapter 3, and the researcher's experience with the Jordanian accounting and auditing market.

The obstacles to using CAATs in Jordan could be divided into 4 categories.

The first group, conveniently categorized under the head *auditing education and training* include: (i) the accounting and auditing curricula at Jordanian universities, and (ii) the technical audit training courses related to CAATs.

The second, related to the *technical and financial obstacles* of using CAATs comprises: (i) familiarity with CAATs, (ii) the IT skills needed to use CAATs, (iii) the complexity of CAATs, and (iv) the cost of CAATs.

The third, linked to *the responsibility of professional bodies and commercial laws* in promoting the use of CAATs includes: (i) the encouragement and support for the use of CAATs by the Jordanian auditing professional bodies and

the government, and (ii) the laws and regulations regulating the use of CAATs by auditing firms.

The final barriers could be grouped as the *auditing market environment* and comprise: (i) the use of manual accounting information systems by Jordanian public companies, (ii) the low fees for the audit of public companies in Jordan, (iii) the size of the Jordanian audit firms, (iv) the competition between Jordanian audit firms, and (v) the potential disruptive impact of a change from manual auditing to computerized auditing by Jordanian audit firms.

Accordingly, this hypothesis is directed at providing an explanation of the existence and intensity of the major obstacles expected to be discouraging Jordan's audit firms utilizing CAATs. In its null form it states:

H₀ 5: *There are few obstacles constraining the use of CAATs by audit firms in Jordan.*

Hypothesis 5 can be divided into the following sub-hypotheses. In the null form they are:

H₀ 5_a: *There are few auditing education and training obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_b: *There are few technical and financial obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_c: *There are few (professional and commercial) laws-related obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_a: There are few auditing market environment related obstacles constraining the use of CAATs by audit firms in Jordan.

7.3 The Research Design

Research design might be considered the framework making the study tightly coherent. Many definitions have appeared in business research literature to describe research design. For example, Zikmund (2003, p.65) states:

A research design is a master plan specifying the methods and procedures for collecting and analyzing the needed information.

On the other hand, the ideal research design according to Sekaran (2003, p.136) is that which includes the following issues: the purpose of the study, type of investigation, extent of researcher interference, study setting, unit of analysis, and the time horizon. Further, Cooper and Schindler (2003, p.170) explain:

A research design is the strategy for a study and the plane on which the strategy is to be undertaken. It specifies the methods and procedures for the collection, measurement, and analysis of data

Finally, according to Kervin (1992, p.85), a research design could be grouped into three questions relating to: the choice of data; the variables chosen for examination; and the possible sources from which the data may be extracted.

Thus, though there are different definitions of the research design, it is reasonable that each covers (what generally are agreed to be) the essential facets.

Accordingly, showing major research elements that mesh to achieve or to provide answers for the thesis questions, or enable the thesis hypotheses to be tested properly represents the common core of every effective research design. To this end, and taking into consideration that the thesis uses a survey of Jordanian auditors as the data

collection method, the population, the sample, and the sample size, the survey instrument, and other essential research design issues are each discussed below.

7.3.1 Population of the Field Study¹⁰

To achieve the objectives of this study (as outlined in chapter 1 and elaborated in 7.1), this study deals with the auditing firms undertaking the audit of public shareholding¹¹ companies listed on the Amman Stock Exchange. Thus, the population for this study comprises all the Jordanian audit firms that undertake the audit of the publicly traded companies for the financial year 2004. The 2004 Companies Guide issued by the Amman Stock Exchange at the end of 2004, Profile of the Jordanian public companies, was the most recent data available regarding who audit Jordanian publicly listed companies. It comprises *public information*.

According to the records of the Jordanian Association of Certified Public Accountants (JACPA), Jordanian licensed auditors comprise 200 local audit firms, with 433 auditors in 2004. The majority of the Jordanian audit firms are located in Amman.

According to the annual companies guide, 26 Jordanian audit firms undertook the audit of publicly listed companies for the financial year 2004 (ASE, 2004).

The academic qualifications of their staff varied. The majority hold a Bachelor degree, some have a Masters degree, and others a PhD degree. A few have only diplomas or high school certificates. The majority of the Jordanian licensed practitioners graduated

¹⁰ Most of this section is based on statistical data the author obtained from the management of the JACPA.

¹¹ Public shareholding, publicly listed and publicly traded are used interchangeably.

from the neighboring Arab countries' universities - Iraq, Egypt, Lebanon, and Syria - as well as from the Jordanian universities, with a few being graduates of US and UK universities.

The professional certificate for Jordanian auditors enjoys a reputable status in Jordan; therefore, many practitioners try to obtain certification (such as the *Chartered* or *Certified* credentials). Accordingly, the number of the American *CPA* holders amongst the Jordanian practitioners reached 100 in 2004, and a few also held the British *Chartered* certification. With minor exceptions, it is reasonable to judge the Jordanian auditors of public companies 'well credentialed'.

7.3.1.1 Justification for Selecting the Jordanian Audit Firms Undertaking the Audit of Public Shareholding Companies as the Population of the Study

A number of reasons underpin the selection of the 26 audit firms undertaking publicly listed companies audits to be the population for this study. First, as many of these audit firms are affiliated with the big international accounting firms, they could be motivated and, expected to apply the same state-of-the-art technology in their work on Jordanian companies as that applied by their international partners in their own domiciles (noted in Chapter 1, sect., 1.2.2).

Further, audit firms that undertake the audit of publicly *large* capital companies, might be expected to have the greatest need of the most effective state-of-the-art audit applications. Moreover, 80.7% of public shareholding companies listed on the Amman Stock Exchange (ASE) are audited by the firms that have an international affiliation, compared to 19.3% audited by audit firms with no international affiliation (ASE, 2004). Accordingly, it is anticipated that those audit firms would be the most likely to utilize

the latest technology when auditing various large Jordanian commercial organizations (noted in Chapters 1 and 4, sections 1.3 and 4.2.2).

7.3.1.2 Justification for Selecting the Kingdom of Jordan as the Country for the Field Work

The selection of Kingdom of Jordan as the country for the fieldwork was based on several considerations.

- The obvious anomalies of Jordanian audit firms' international affiliations and their generally observable thin usage of CAATs in contrast with the high level of computer technology usage by Jordanian audit clients, and Jordan's mid-stage economic development in accounting and auditing.
- The study is funded by the Jordanian Public University, and it is an imperative, in the national interest, that the study is of the accounting and auditing in Jordan.
- There is a paucity of accounting and auditing literature on the state of such matters in developing countries, particularly relating to Jordan, as indicated by Kamla (2004, p.3).

Little is known about accounting practices and accounting regulations in the Arab Middle East, with most studies available in the English speaking world being concerned mainly with the larger and more economically significant countries of the Middle East, such as Egypt and Saudi Arabia.
- There is also a paucity of studies discussing in particular the use of CAATs in developing countries, as established while discussing the related literature in chapters 4 and 5.
- There is an indication that the Jordanian government is working towards a huge economic development and is eager to attract more foreign investment (1.2). Arguably, that will require a creditable audit profession, and a creditable auditing profession that, of necessity, would be expected to use cutting-edge technology.

- Jordan is an example of a developing country that has adopted both the International Financial Reporting Standards and the International Standards on Auditing. The Jordanian profession's translation into modernity is thus a salient example for expectations regarding countries in which accounting and auditing might be considered to be approaching maturity.

7.3.2 Sampling Frame and Procedures for Selecting the Thesis Sample

The sampling frame for choosing the sample was the Companies Guide database maintained by the Amman Stock Exchange (ASE), and the Auditor Guide database held by the Jordanian Association of Certified Public Accountants. The ASE Companies Guide contains financial and corporate information on all Jordanian publicly listed companies, and indicates who audits the public companies in Jordan. The JACPA guide was consulted to identify the addresses of the sample audit firms' offices.

More specifically, in selecting the audit firms' sample, the following steps were undertaken: first, the annual Companies' Guide issued by the Amman Stock Exchange for the financial year 2004 was reviewed. The Guide included a comprehensive financial report and corporate data for 192 companies listed at the ASE. Then, the corporate data for the financial year 2004 of all listed companies on the ASE were reviewed through the Companies' Guide to determine who audits the public shareholding companies in Jordan. The twenty-six audit firms were identified as those undertaking the audit of Jordanian publicly listed companies. According to Collis and Hussy (2003, p.66) "When the total population is small, it is normal to collect data about each member of the population"; therefore, due to small number of the Jordanian audit firms that undertake the audit of publicly listed companies, the entire population was selected as the study sample, Table 7.1.

Table 7.1: The Thesis Sample

<i>Audit Firms</i>			
1	Allied Accountants	14	Hawit , Fasheh and Co.
2	Saba and Co	15	Arab Certified Accountants
3	Ibrahim Al-Abbasi and Co.	16	Khalefa and Al-Raayan
4	Arab Professionals	17	Bawab and Co
5	Ghosheh and Co.	18	Mahmoud Saadeh and Co.
6	Arabian Audit Group	19	Seemer Mustafa
7	Talal Abu-Ghazaleh and Co.	20	Michel Sindaha and Co
8	Ma'moun Faroukah and Co.	21	Professionals for Auditing and Consultancy
9	Audit and Consult Consortium	22	Adel Habeb and Co
10	Khleaf and Co	23	Ta'meh Abu Sha'ar
11	Riyad Al-Jinini and Co	24	Brothers National Office
12	Rida Al kabariti Auditing Office	25	Marouf Al Megbel
13	Ghawi CPA Jordan	26	Intl. Pro. Bureau Consulting and Auditing

Finally, the Auditor Guide (which includes all the licensed auditors with their telephone numbers, e-mails, working firms, and postal addresses) issued by the JACPA was reviewed to extract the addresses of the audit firms sample.

Each audit firm had to meet various criteria to be included in the study sample. The criteria relate primarily to the location and functioning of the firms' audit work. First, the audit firm should be providing audit services, undertaken the audit of publicly traded companies on the Amman Stock Exchange for the financial year 2004 and be a local company. The Jordanian audit firms head offices were the targets for this thesis.

7.3.3 Participants in the Field Study

For the purpose of this study, the participant group comprised the Electronic Data Processing (EDP) Audit Managers in the Jordanian Audit Firms undertaking the audit of publicly listed companies for the financial year 2004. These practitioners might

reasonably be expected to be utilizing the latest audit technology and be aware of the precise level of technology used by their firms. These were the most likely to provide a high response rate by virtue of the contemporary professional significance of the issues.

7.3.4 The Questionnaire as an Instrument to Collect the Study Primary Data

To achieve the objectives of the study, and to collect the necessary data, a questionnaire was used as the primary mechanism of data collection.

Questionnaires are widely used for social research and they were described by Ghauri and Gronhaug (2005, p.125) as the most popular data collection method in business studies, whereby the researcher can satisfy many objectives concurrently in a single survey, in particular measure numerous variables, and test several hypotheses (Neuman, 2003). Moreover, questionnaires generally require little time and cost (Sekaran, 1999; Collis and Hussy, 2003). Zikmund (2003) too noted that surveys provide a quick, inexpensive, efficient, and accurate means of collecting information about a population.

A questionnaire was administered personally to collect the data, to enjoy its several advantages, compared to personal interviews and telephone surveys. The low cost compared favorably with other data collection methods, and if properly designed is participant-friendly, insofar as it can be completed whenever the respondents are available. Thus, there is a better chance that respondents will take time to think about their replies; a matter of particular importance in this study.

7.3.4.1 Methods of Developing the Questionnaire

The Questionnaire (see Appendix B) was developed after an extensive review of the relevant literature and similar studies, the ISAs relevant to the use of CAATs, and the review of other western countries' audit standards related to the thesis topic.

Testing the questionnaire before distribution was deemed necessary to ensure the questionnaire was clear and understandable (Remenyi, Williams, Money and Swartz, 1998; Collis and Hussy, 2003). Due to time, cost, and distance constraints, and to test the questionnaire for ambiguity the questionnaire was discussed on a weekly basis with the supervisor and academic staff in the school of accounting at University of Newcastle. The feedback and suggestions were taken into consideration in the design of the final survey instrument.

The questionnaire questions and statements were written in English and not translated to the Arabic language (the native language of Jordan), since English is widely used in business in Jordan; EDP audit managers of Jordanian audit firms are competent in English.

The questionnaire comprised four *parts* relating to, respectively: Part (1) profile of Jordanian EDP audit managers, Part (2) the frequent usage of CAATs, Part (3) the awareness of the benefits of the CAATs usage, and Part (4) the main perceived obstacles to the utilization the CAATs.

a) Part (1) of the Questionnaire (Demographic Data)

In Part (1), which was concerned with demographic data information, each EDP Audit Manager was asked to respond to questions about

1. gender
2. age
3. his/ her years of professional experience on EDP auditing
4. the country from which he/she got his/ her last degree
5. and his/her last degree discipline area

b) Part (2) of the Questionnaire (the Use of Computer Assisted Audit Techniques)

Part (2), consisted of one section, which posed questions against a list comprising the sixteen Computerized Audit Techniques compiled at the end of Chapter 5.

Table 7.2: Survey Part (2) Summary

<i>Survey Question</i>	<i>Question Summary</i>
1	I use the <u>Test Data</u> technique in my daily audit work
2	I use the <u>Base Case System Evaluation (BCSE)</u> technique in my daily audit work
3	I use the <u>Integrated Test Facility (ITF)</u> technique in my daily audit work
4	I use the <u>Parallel Simulation (PS)</u> technique in my daily audit work
5	I use the <u>Source Code Comparison</u> technique in my daily audit work
6	I use the <u>Flow Charting Program</u> technique in my daily audit work
7	I use the <u>Reprocessing</u> technique in my daily audit work
8	I use the <u>Tracing</u> technique in my daily audit work
9	I use the <u>Mapping</u> technique in my daily audit work
10	I use the <u>Snapshot</u> technique in my daily audit work
11	I use the <u>Embedded Audit Module (EAM)</u> technique in my daily audit work
12	I use the <u>System Control Audit Review File (SCARF)</u> technique in my daily audit
13	I use the <u>Audit Hooks</u> technique in my daily audit work
14	I use the <u>Generalized Audit Software (GAS)</u> technique in my daily audit work
15	I use the <u>Utility Programs</u> technique in my daily audit work
16	I use the <u>Custom Design Software</u> technique in my daily audit work

Table 7.2 summarizes the surveyed techniques addressed in Part (2) of the questionnaire. This Part was intended to elicit data by which to test the first two hypotheses, relating to the posited gap in the expectations of the Jordanian public using published financial statements – that Jordan’s auditors would be using CAATs (*H1*), and that there wasn’t any difference between the practices in that respect between the firms with and those without an international affiliation (*H2*).

A likert scale (ascending, 1-5, ‘1 = never used’ to ‘5 = very often used’) was used (Neuman, 2003), to elicit from each respondent information on how often they utilized the listed CAATs in their daily audit work.

c) Part (3) of the Questionnaire (the Awareness of Potential Benefits of Using Computer Assisted Audit Techniques)

Part (3), which enquired into the Jordanian EDP audit managers’ perceptions of the potential benefits of CAATs usage, comprised one section, which set out the nineteen statements compiled at the end of chapter 4, for them to consider.

Table 7.3 summarizes the statements respondents were asked to consider. This part of the questionnaire was intended to provide data that would give insights into the matters addressed in hypothesis *H3* - that Jordanian auditors did not have negative perceptions of the benefits of using CAATs, and *H4* that such negative perceptions had no significant influence on the extent of their use of CAATs in auditing Jordan’s public companies. Again an ascending (1-5 – ‘1 = strongly disagree’ to ‘5 = strongly agree’) likert scale was used, with each respondent being asked to rate each statement listed in terms of whether they agreed or disagreed with it.

Table 7.3: Survey Part (3) Summary

<i>Survey Question</i>	<i>Statements Summary</i>
1	CAATs usage leads to more accurate and precise auditing.
2	CAATs usage saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing.
3	CAATs usage saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing.
4	CAATs usage will accelerate the overall audit process leading to issue the financial statements in less time.
5	CAATs usage will reduce the overall audit costs.
6	CAATs usage will inject the overall audit process with the auditor's self-confidence.
7	CAATs usage will allow the auditor to concentrate on the client's highest audit risk areas.
8	CAATs usage will improve the quality of the overall audit work.
9	CAATs usage will improve the quality of the audit clients' financial reporting.
10	CAATs usage facilitates the process of detecting financial errors.
11	CAATs usage provides auditors with powerful audit tools to detect frauds.
12	CAATs usage will increase the auditor's credibility.
13	CAATs usage will enhance stakeholders' trust in the auditors.
14	CAATs usage will help clients distinguish the most skilled auditors.
15	CAATs usage will assist audit firm to obtain more clients.
16	CAATs usage will improves decision- making in the different stages of the overall audit process.
17	CAATs usage will improve auditor productivity.
18	CAATs usage will improve the overall efficiency of the audit firm.
19	CAATs usage is an essential aspect of any audit work.

d) Part (4) of the Questionnaire (Obstacles to Using Computer Assisted Audit Techniques)

Part (4), which was concerned with the obstacles to Jordanian audit firms' use of CAATs, consisted of one section comprising thirteen statements.

Table 7.4: Survey Part (4) Summary

<i>Survey Question</i>	<i>Statements Summary</i>
	<i>The audit firms in Jordan are not being utilized the CAATs due to</i>
1	Unfamiliarity with CAATs
2	EDP auditing courses are not covered by Jordanian accountancy school curricula
3	Lack of technical audit training courses related to the CAATs
4	Lack of the information technology skills needed to use CAATs
5	Difficulty in using the CAATs
6	Jordanian public companies are still employ manual accounting systems
7	Lack of encouragement and support by professional bodies and the government
8	Lack of laws and regulations that regulate the use of CAATs
9	Low audit fees
10	High cost of CAATs
11	Small size of the Jordanian audit firms
12	Lack of competition between Jordanian audit firms
13	Resistance to change for computerized auditing

Table 7.4 summarizes the statements appearing in Part 4 of the questionnaire. This was to elicit data relevant to the testing of hypothesis *H5* – that there were obstacles constraining the use of CAATs by the audit firms in Jordan.

A 1-5 likert scale (5 = *strongly disagree* to, 1 = *strongly agree*) reflected the negatively worded, statements. Thus, the likert scale was in effect in descending order.

7.3.4.2 Distribution and Collection of the Questionnaire

Data were collected from EDP Audit Managers in the Jordanian audit firms. Table 7.5 summarizes the response rate.

Table 7.5: The Questionnaire Response Rate

<i>Participants</i>	<i>Sent</i>	<i>Received</i>	<i>Response rate %</i>
EDP Audit Managers	26	21	80.8

Out of 21 respondents firms, there were 9 affiliated and 12 non- affiliated audit firms. The 21 respondent audit firms audit 94.3% of Jordanian publicly listed companies.

Regarding questionnaire administration, Remenyi et al. (1998) state that a questionnaire has to include a covering letter informing the respondents about different issues such as: the nature of the study, its significance, the purpose of the questionnaire, how long it takes to complete the questionnaire, the completed questionnaire due date; and further added that the researchers have to provide the respondents with some incentives such as a copy of the final results.

Accordingly, in December 2005 the thesis questionnaire addressed to the 26 Jordanian audit EDP Audit Managers, accompanied by a survey information sheet signed from both the researcher and the supervisor' was provided. The survey package included the following items in order to increase the likelihood of response rate:

- Official survey information sheet on the University of Newcastle official letterhead and signed by both the researcher and the supervisor.
- Full name and address of the respondent firms on the envelope.
- Full name and address of both the researcher and the supervisor on the survey information sheet for any concerns or enquiries.
- An introduction to the study and its aim explaining why the study was taking place and indicating that the respondent's participation was important to its success.
- An assurance of confidentiality stated on the survey information sheet.
- An indication that the result of the questionnaire will be sent to all participants.

The survey information sheet and the questionnaire are presented in Appendices A and B.

After five weeks, a total of 13 completed questionnaires (50 %) were received from 13 Jordanian audit firms.

According to Dillman (2000), some added measures, such as the multiple contacts could enhance the questionnaire response rate; at the same time (Page and Meyer, 2003, p.114) confirmed that the response rate could be increased from 20-35 percent for follow up calls and letters. Therefore in January 2006, a reminder letter (see Appendix C) accompanied by the questionnaire and the survey information sheet were provided again to the target respondents. After five weeks, by February 13, 2006, a further 5 questionnaires (19.2%) had been completed. Therefore, a total of 18 completed questionnaires (69.2%) from 26 Jordanian audit firms were received. In February 2006 a second reminder letter (see Appendix D) accompanied by the questionnaire, the survey information sheet and the first reminder letter were distributed. By March 2006, the end of the allocated period, another 3 completed questionnaires (11.5%) were available. Therefore, a total of 21 questionnaires (80.8%) from 26 Jordanian audit firms were completed. No questionnaires were completed after that date.

The research had ethics clearance from the University of Newcastle.¹²

7.3.4.3 The Internal Consistency of the Thesis Instrument

To measure the internal consistency of the likert scales, or the reliability of the likert scales, Cronbach's Alpha (examining the capability of the items and subset of items in

¹² Approval number H-140-1105.

measuring instruments independently measuring the same concept) was used, for the closer the alpha value approaches 1.0, the higher is deemed the scale of reliability (Sekaran, 2003).

Cronbach's alpha coefficient¹³ is widely used to measure internal consistency reliability.

According to the formula, S_i^2 denotes the variance for the k individual items and represents the true score. Thus if the questions selected do not represent the underlying concept and true scores, the items are all independent and the inter item correlation is low. Therefore, in this case the $S_{sum}^2 = \sum S_i^2$ and the reliability coefficient will equal to zero. On the other hand, if the items selected measures the construct and it is positively correlated across the subject then coefficient alpha will equal to 1.0.

7.4 Data Analysis Methods

The questionnaire instrument is the primary source of data for this study. The data collected in this study was analyzed using statistical package for social science (SPSS) program.

¹³ The formula for Cronbach alpha can be represented as follows:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum S_i^2}{S_{sum}^2} \right) \text{ where:}$$

α = Cronbach's alpha coefficient,

K = number of individual items,

S_i^2 = variances of the individual items, and

S_{sum}^2 = variance for the sum of all items.

All received questionnaires were reviewed for completeness and errors. The responses on the Likert scales scored in each returned questionnaire were converted to numeric codes and entered into SPSS. Coded responses entered in SPSS were used to perform the statistical analysis necessary to address the research questions.

Descriptive and inferential statistics have been used to analyze the collected data. Specifically, the mean, standard deviation, a Pearson correlation test, the Kolmogorov-Smirnov test, and the t-test analysis, were the statistical techniques used to analyze the collected data in the field study.

In testing the study hypothesis the following statistical test were utilized:

- The one sample t-test is appropriate to compare the mean score of a sample with a hypothesized population mean. The one sample t-test is used to test Hypotheses 1, 3, and 5.
- The independent samples t-test is also used to compare the mean scores of two groups on a given variable – to draw a comparison between those audit firms with an international affiliation and those without. Therefore the independent samples t-test is used to test Hypothesis 2.
- A Pearson correlation is used to test whether the awareness to the CAATs benefits and the CAATs usage are correlated. Thus, this test is used to test Hypothesis 4.
- To test the normality assumptions underlying the t-test, and the Pearson correlation test, the Kolmogorov-Smirnov test is used to decide if a sample comes from a population with a normal distribution: the normality assumption is further supported by the use of Probability (p-p) plots.

7.5 Summary

This research design, the research setting and the selection of the study participants, the construction and testing of the research questionnaire, the research procedures, by which the data were collected, and the methods used to analyze the data accorded with standard research protocols.

Statistical data and the results of the analysis will be presented in the next chapter, followed thereafter by discussion of the findings, explanations of their practical and policy implications, and the recommendations they evoke.

Chapter 8

Research Results

8.1 Introduction - Descriptive Statistics and Hypotheses testing

Chapter 7 explained the questionnaire, completed by the electronic data processing audit managers at Jordanian audit firms and the analytical methods used to test the hypotheses. This chapter presents the descriptive statistics and tests the hypotheses through the analysis the data collected by way of the questionnaire. The frequency distributions regarding the EDP audit managers' demographic data are presented in 8.2; and descriptive statistics concerning the uses of CAATs, the awareness of the potential benefits of CAATs, and the obstacles to use the CAATs by Jordanian audit firms are presented in 8.3, 8.4, and 8.5. Section 8.6 tests the internal consistency of thesis instrument. The normality assumption underlying the t-test and correlation test is addressed in section 8.7. Testing the hypotheses underlying this thesis is reported in section 8.8. The focus of this chapter is summarized in section 8.9.

8.2 Demographic Data (Questionnaire Part 1)

8.2.1 EDP Audit Managers' Gender

26 audit firms assume the responsibility for the audits of Jordanian public shareholding companies listed on the Amman Stock Exchange. 21 of those participated in this study. In respect of each, the respondents were the relevant Electronic Data Processing (EDP) audit Managers. Table 8.1 reports their genders; it shows that 20 (95.2%) were male. These data reflect that the auditing profession in Jordan is occupied mainly by males.

This is interesting insofar as in the western world accounting and auditing are perceived to be trending towards being a female dominated profession. Thus, the Jordanian position might be taken to be an index of the *immaturity* of the profession in Jordan relative to the western world.

Table 8.1: Jordanian EDP Audit Managers' Gender

<i>Gender</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Male	20	95.2	95.2
Female	1	4.8	100
Total	21	100	

8.2.2 EDP Audit Managers' Age

In contrast with the gender distribution above, the respondent are shown in Table 8.2 to be relatively young practitioners. The Table indicates that EDP audit managers are almost all young people where the ages of 14 (66.7%) were under the age of 40. Bearing in mind the latest surge in IT, it is reasonable to expect that the educational background of those managers reflect contemporary developments that they possess up-to-date information regarding the cutting-edge audit techniques that appear in different audit texts, and accordingly are reasonably expected to be familiar with latest western audit technology, and to press for professional engagement of them.

Table 8.2: Jordanian EDP Audit Managers' Age Category

<i>Age Category (years)</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
21-30	6	28.6	28.6
31-40	8	38.1	66.7
41-50	2	9.5	76.2
51 or more	5	23.8	100
Total	21	100	

8.2.3 EDP Audit Managers Professional Experience in EDP Auditing

Table 8.3 reports the frequency distribution regarding the respondents' experience. It shows that Jordanian EDP audit managers have sufficient theoretical and practical experience in auditing computerized accounting systems, with 15 of them (71.4%) having more than 5 years experience in EDP auditing. The Table further reveals 9 (42.9%) with more than 10 years of experience. Thus, it anticipated that the EDP managers' experience would be more than technically adequate to facilitate the necessary cooperation to have their clients' data in a state fit for the use of cutting-edge auditing techniques.

Table 8.3: Jordanian EDP Audit Managers' Years of Professional EDP Auditing Experience

<i>Years of Professional Experience</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
4 or less	6	28.6	28.6
5-9	6	28.6	57.1
10-14	3	14.3	71.4
15-19	3	14.3	85.7
20 and more	3	14.3	100
Total	21	100	

8.2.4 Country of Graduation of Jordan's EDP Audit Managers

In section 3.8, it was noted that university education in accounting did not exist in Jordan prior to 1965, that, generally Jordanian accounting students attended universities in neighboring countries or overseas to continue their business studies. Thus, Table 8.4 shows that 14 of the Jordanian EDP audit managers (66.7%) were graduates of institutions in Iraq, Egypt, Lebanon, Syria, plus the United States, United Kingdom and Canada, with only 33.3% graduates of Jordanian Universities. Accordingly, it is anticipated that by virtue of the majority of Jordanian EDP auditors having graduated

from accounting schools in which EDP auditing curricula might reasonably be assumed to be *cutting-edge*, that they would have received the best education in the use of audit technique available worldwide.

Table 8.4: Jordanian EDP Audit Managers' Country of Last Degree

<i>Country of Last Degree</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Jordan	7	33.3	33.3
Other Arab country	6	28.6	61.9
USA	5	23.8	85.7
UK	2	9.5	95.2
Others (Canada)	1	4.8	100
Total	21	100	

8.2.5 Last Degree Discipline of the EDP Audit Managers

Table 8.5 reports the frequency distribution regarding the Jordanian EDP audit managers' study discipline; it shows that 15 (71.4 %) hold a degree in accounting. As it is expected that the degree in accounting is more suitable than other disciplines for preparing for a career in auditing, that their auditing work is based on a solid knowledge of accounting and business matters. Therefore, the findings on areas of study indicate that the majority of EDP auditors in Jordan hold the most appropriate educational background insofar as their primary discipline is concerned.

Table 8.5: Jordanian EDP Audit Managers' Last Degree Discipline

<i>Last Degree Discipline</i>	<i>Frequency</i>	<i>Percent</i>	<i>Cumulative Percent</i>
Accounting	15	71.4	71.4
Business other than Accounting	4	19	90.5
Information Systems	1	4.8	95.2
Others	1	4.8	100
Total	21	100	

8.3 Descriptive Statistics Regarding the Use of CAATs (Questionnaire Part 2)

The aim of this section of the questionnaire was to collect data by which to evaluate the level of CAATs usage by Jordanian audit firms. Participants indicated their usage level on a 5-point likert scale (*very often*, to *never used*). Table 8.6 presents the mean and the standard deviation of respondents' answers concerning the use of the 16 CAATs listed. Table 8.7 reports the frequency and percentage of their answers regarding the CAATs usage. Item scores were summed and averaged to produce a score out of five, a higher score indicating a higher level of reported usage. To this end, the *very often*, *often* and *sometimes* likert ranking were considered *positive* regarding the use of the techniques, whereas *rarely* and *never* were taken to be negative responses. "3" on the likert scale was the midpoint concerning the average usage.

Accordingly, Table 8.6 and Table 8.7 suggest the following concerning the CAATs usage:

1. *Test Data*: here the result indicates *very often* use by 19%, 19% *often* and 38.1% *sometimes*. Thus, 16 EDP audit managers (76.2%) were utilizing the *test data technique* with an average use of 3.19. In contrast, 9.5% of the respondents reported that they *rarely used* the technique and 14.3% *never* used it. It is to be noted that although this technique was utilized, the frequent usage was (on average) close to *sometimes*. This technique is based on hypothetical data prepared by the auditor; it was therefore described as 'easy to understand', as not needing a great degree of technical knowledge, and capable of being run in a separate operation. It is generally acknowledged that it does not have any adverse effect on clients' production processes (sect., 6.2.1). Jointly, those characteristics could justify the relatively high usage rate of the test data technique.

2. The *Base Case System Evaluation (BCSE)*: the findings show only 4.8% reported using BCSE *very often*, 14.3% *often* and 28.6% *sometimes*. Therefore, 10 EDP audit managers (47.7 %) - less than the half the respondents were using this technique. It is to be noted that it was used with a mean of 2.38, suggesting that the BSCE average usage rate is nearer to *rarely* used. The results further show that whilst more than half (52.3%) were scored negatively; a third of the respondents *never used* it.
3. The *Integrated Test Facility (ITF)*: 61% EDP audit managers were using ITF *less than sometimes*: 28.6% *rarely* and 33.3% *never* used it. It seemed that Jordanian audit firms infrequently utilized this technique. This result was reinforced by the low average use of 2.24.
4. The *Parallel Simulation (PS)*: here respondents returned that 19% were *often* utilizing this technique, and 33.3% *sometimes*. Thus, 11 EDP audit managers (52.3%) were using the PS with a low average of 2.43- with 19% *rarely* used PS, and 28.6% *never* utilized it.
5. *Source Code Comparison (SC)*: of all the EDP auditors only (38.1%) of the respondents were utilizing the SC technique. It was *rarely used* on average with a mean of 2.14. In contrast, 61.9% of the respondents reported not using the technique - 28.6% scored *rarely used* and 33.3% *never*.
6. *Flow Charting Program (FC)*: 57.1% of the managers (19% were *often* using FC, 38.1% *sometimes*) reported utilizing this technique. Table 8.6 shows an average use of 2.57 - nearer to *sometimes*, being *never used* by 19%, and *rarely* utilized by 23.8%.

7. *Reprocessing*: 28.6% reported that they were using this technique *sometimes*, 14.3% *often*, 4.8% *very often*. In sum, 47.6% of the EDP managers were using the reprocessing technique; the average use of 2.48 was nearer to the *rarely* used; 52.3% were not using this technique -23.8% scored *never used* and 28.6% *rarely* used.
8. *Tracing*: 14 (66.7%) reported using this technique - between *often* used 23.8% and *sometimes* used 42.9%. The average usage at 2.74 was somewhat higher than the other techniques and relatively nearer to *sometimes* used. One of the possible explanations for the increasing percentage using this technique could be that it is one of the features that may be built into the system software meaning it is already available and does not entail incurring extra cost it by the audit firms.
9. *Mapping*: here, 52.4% of the respondents reported using this technique. The average usage was 2.57. Conversely, almost half of the respondents were not using mapping: 23.8% *never*, and 23.8% *rarely*.
10. *Snapshot*: 8 (38.1%) of the respondents were using this technique (4.8% *very often*, 19% *often*, and 14.3% *sometimes*). The usage mean of 2.29 was closer to *rarely* used. The results show notably 61.9% for the most part not using the technique - 23.8% *rarely* and 38.1% *never*.
11. *Embedded Audit Module (EAM)*: similarly to the snapshot technique, EAM was reported by 19% as *often* used, and 14.3% as *sometimes*; thus only 33.3% were using this technique with an average use of 2.14. Table 8.7 shows that 14 EDP audit managers (66.7%) were negatively inclined toward this technique (28.6% scored as *rarely* and 38.1% *never*).

12. *System Control Audit Review File (SCARF)*: like other embedded software SCARF was seldom used. Only 6 EDP audit managers (28.6%) scored above *sometimes*: this result was supported by the low usage rate of 2.14. The results further show that this technique was not used by 71.4% EDP audit managers - 42.9% *never* and 28.6 *rarely*.
13. *Audit Hooks*: equally so to SCARF, the Audit Hooks was hardly ever used. Only 7 EDP audit managers (33.3%) were scored as using this technique. The usage mean was 2.19 supporting the low percentage usage: of 66.7% EDP audit managers (38.1% *never* and 28.6 *rarely*) used the *Audit Hooks* technique.
14. *Generalized Audit Software (GAS)*: this software was universally known as the most frequently used technique to perform the substantive testing procedures. But this survey showed it to not be so in Jordan. Only 9.5% were using GAS *very often*, 19% *often* and 14.3% *sometimes* only - 42.9% of the respondents, with a usage mean of 2.43. In contrast, 14 (57.1%) of the respondents were reported not using GAS - 38.1% *never* and 19% *rarely*.
15. The *Utility Programs Technique (UP)*: the low percentage usage rate in the case of GAS could be relatively explained by the increase usage of the *utility* software. The findings were that this technique was almost positively used - with 14.3% using this technique *very often*, 19% *often*, and 19% *sometimes*; overall by 52.4%. With their usage mean 2.76 was closer to *sometimes*. But there remained a substantial non-usage by almost 47.6% of the respondents - 23.8% *never* and 23.8% *rarely*.
16. The Custom Design Software: only 38.1% were using this technique - 9.5% *very often*, 14.3% *often*, and 14.3% *sometimes*. Their usage mean 2.24 was closer to

rarely. Thus, a 61.9% majority was not using this technique - 47.6% *never* and 14.3% *rarely*.

Table 8.6: The Mean and the Standard Deviation of the EDP audit managers' Answers Concerning the Frequent Use of CAATs

<i>No.</i>	<i>CAATs Usage</i>	<i>Mean</i>	<i>Std. D</i>
1.	Test Data	3.19	1.29
2.	Base Case System Evaluation	2.38	1.24
3.	Integrated Test Facility	2.24	1.14
4.	Parallel Simulation	2.43	1.12
5.	Source Code Comparison	2.14	1.01
6.	Flow Charting Program	2.57	1.03
7.	Reprocessing	2.48	1.17
8.	Tracing	2.71	1.06
9.	Mapping	2.57	1.21
10.	Snapshot	2.29	1.31
11.	Embedded Audit Module	2.14	1.15
12.	System Control Audit Review File	2.14	1.35
13.	Audit Hooks	2.19	1.21
14.	Generalized Audit Software	2.43	1.43
15.	Utility Programs	2.76	1.41
16.	Custom Design Software	2.24	1.45

Table 8.7: The Frequency and Percentage of the EDP Audit Managers' Answers Concerning the Frequent Use of CAATs

<i>No.</i>	<i>CAATs Usage</i>	<i>Never</i>		<i>Rarely</i>		<i>Sometimes</i>		<i>Often</i>		<i>Very Often</i>	
		<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
1.	Test Data	3	14.3	2	9.5	8	38.1	4	19.0	4	19.0
2.	Base Case System Evaluation	7	33.3	4	19.0	6	28.6	3	14.3	1	4.8
3.	Integrated Test Facility	7	33.3	6	28.6	4	19.0	4	19.0	0	0.0
4.	Parallel Simulation	6	28.6	4	19.0	7	33.3	4	19.0	0	0.0
5.	Source Code Comparison	7	33.3	6	28.6	6	28.6	2	9.5	0	0.0
6.	Flow Charting Program	4	19.0	5	23.8	8	38.1	4	19.0	0	0.0
7.	Reprocessing	5	23.8	6	28.6	6	28.6	3	14.3	1	4.8
8.	Tracing	4	19.0	3	14.3	9	42.9	5	23.8	0	0.0
9.	Mapping	5	23.8	5	23.8	6	28.6	4	19.0	1	4.8
10.	Snapshot	8	38.1	5	23.8	3	14.3	4	19.0	1	4.8
11.	Embedded Audit Module	8	38.1	6	28.6	3	14.3	4	19.0	0	0.0
12.	System Control Audit Review File	9	42.9	6	28.6	2	9.5	2	9.5	2	9.5
13.	Audit Hooks	8	38.1	6	28.6	2	9.5	5	23.8	0	0.0
14.	Generalized Audit Software	8	38.1	4	19.0	3	14.3	4	19.0	2	9.5
15.	Utility Programs	5	23.8	5	23.8	4	19.0	4	19.0	3	14.3
16.	Custom Design Software	10	47.6	3	14.3	3	14.3	3	14.3	2	9.5

8.4 Descriptive Statistics Regarding the Potential Benefits of Using CAATs (Questionnaire Part 3)

The objective in this part of the questionnaire was to obtain data by which Jordanian EDP audit managers' awareness of CAATs potential benefits might be measured. Participants indicated their agreement on a 5-point likert scale (*strongly agree* - *strongly disagree*) to with a range of statements describing the potential benefits of CAATs. Item scores were summed and averaged to produce a score for subsequent analysis; the *strongly agree*, and *agree* were considered to be affirmations of the particular statement, while *disagree* and *strongly disagree* were considered negative sentiments. The neutral (3) on the likert scale was considered the midpoint indicating equivocal responses.

Table 8.8 presents the mean and the standard deviation of the EDP audit managers' answers concerning the awareness of potential benefits of using CAATs, while Table 8.9 shows the frequencies and percentages of their answers.

Accordingly, concerning the perceived benefits of CAATs, Table 8.8 and Table 8.9 summarize the general inferences to be drawn from the survey:

1. *CAATs usage leads to more accurate and precise auditing*: Notably, none of the EDP audit managers disagreed with this statement - 38.1% *agree*, and 33.3% *strongly agree*. Thus, 15 (71.4 %) perceived that the use of the CAATs leads to an accurate and precise audit. The accuracy and precision benefits was rated very high with a mean of 4.05 - strong reason for a suspicion that in the absence of prohibitive obstacles, Jordanian auditors would use CAATs, as a matter of ordinary procedure.
2. *CAATs usage saves the time required to achieve the overall audit procedures*:

There was a high cognizance by Jordanian EDP audit managers that the use of CAATs saves the overall time required to undertake audit procedures, compared with the time taken by manual auditing. 19 (90.5%) positively *agree* with this statement - 38.1% *agree*, and 52.4% strongly agree. None *disagreed* - a further outcome supporting expectations that CAATs would be used. The average scores for this statement were 4.43 supporting the high percentage agreement.

3. *Auditors' effort*: 18 (85.7 %) of the Jordanian EDP audit managers thought that the use of the CAATs saves the *effort* required to achieve the overall audit procedures compared to that required by manual auditing, where 57.1% *agree*, and 28.6% *strongly agree*. None *disagreed* with the statement. The mean for this statement was 4.14 supporting the high percentage of agreement
4. *Acceleration of the audit process*: 16 (76.2 %) of the Jordanian EDP audit managers realized that the use of the CAATs accelerates the overall audit process leading to the timely issue the financial statements - 57.1% *agree*, and 19% *strongly agree*. Again, none disagreed with the statement. The agreement mean was 3.95.
5. *Audit costs*: As the majority of the EDP audit managers (in point 2 and 3 above) believed that the use of CAATs saves both the auditing time and auditor efforts; it is plausible to predict that the majority would also hold the view that the cost of auditing processes would be reduced. Yet, contradicting such an expectation, only 12 respondents (57.1 % - 33.3% *agree*, 23.8% *strongly agree*) declared their belief that the use of the CAATs would reduce the overall audit cost It is reasonable to expect that other factors could have affected their thoughts regarding the costs of utilizing the technique itself, the necessary training and

the like. It is to be noted that the mean score for the cost statement was 3.62, close to *agree* on the scale.

6. *Auditor's self-confidence*: with 71.4% responding that they *agree*, and 4.8% *strongly agree* with this statement, 76.2 % of the Jordanian EDP audit managers supported a belief that the use of the CAATs would inject the overall audit process with the auditor- self-confidence. This perception was supported by the average agreement of 3.71.
7. *The concentration on high risk areas*: as Jordanian EDP audit managers acknowledged that the use of CAATs could save their time, efforts, and enhance their audit precision, they were expected to return a high score for this statement. Parallel with the responses for the other CAATs benefits, 47.6% said that they *agree*, and 23.8% *strongly agree* with this statement. Overall 15 (71.4 %) thought that the use of CAATs allow the auditors to concentrate on the client's highest audit risk areas. Only 4.8% *disagreed*. The average respondent agreement was 3.90, supporting the agreement percentage.
8. *Audit work quality*: consistent with the answers concerning CAATs benefits, such as: saving time and effort, enhance precision and accuracy, and facilitating concentration on the clients high risk areas, 16 (76.2 % - 57.1% *agree*, 19% *strongly agree*) of the respondents confirmed that the use of the CAATs could be expected to improve the overall quality of the audit work. None *disagreed* with this statement. The agreement mean was 3.95.
9. *Audited financial reporting quality*: as the responses implied beliefs that the use of CAATs would enhance the quality of the audit work, it is reasonable to

expect that the quality of the audited financial statements would be thought to be improved. 12 respondents (57.2 % - 42.9% *agree*, 14.3% *strongly agree*) thought that the use of CAATs improves the auditing financial reporting quality, and 9.5% *disagreed*. The 3.62 mean supported the agreement proportion.

10. *Financial errors detection*: with 10 (47.6 % - 33.3% *agree*, 14.3% *strongly agree*) a majority declared its belief that the use of the CAATs facilitates the process of detecting financial errors. Only 4.8% expressly *disagreed* with this statement. The scores mean was 3.57, supporting the agreement ratio.

11. *Frauds detection*: Jordanian EDP audit managers were less confident that the use of CAATs provides them with powerful audit tools to detect frauds. Only 33.3% declared that they *agree*, and 4.8% *strongly agree*, with the statement - that is 8 (38.1 %) of the respondents. Importantly, 28.6% expressly *disagreed* with this statement and 33.3% stood in neutral territory. The average agreement was 3.14, the lowest compared to that returned for the other statements.

12. *The auditor's credibility*: as the quality of the audit work improved the quality of the audited financial statements, one could expect beliefs that with the use of CAATs auditors' credibility would enhanced. That appears be the case in Jordan with 13 respondents (61.9 % - 38.1% *agree*, 23.8% *strongly agree*) in agreement, with an agreement mean of 3.86. This result suggests that those Jordanian auditors who have engaged the latest audit techniques are thought, as a consequence, to have enjoyed enhanced professional credibility. None disagreed with this statement.

13. *The stakeholders' trust in the auditors*: one could expect that as the credibility of

the Jordanian auditors increased, there would be a commensurable increase in corporate stakeholders' trust in them. But surprisingly, the Jordanian EDP auditors were less confident that the use of CAATs would increase stakeholders' trust. Only 8 (38.1 % - 28.6% *agree*, 9.5% *strongly agree*) confirmed this statement, whilst an equal percentage was *neutral*; and 23.8% *disagreed* with it. With the mean of 3.24 closer to neutral, the overall outcome might reasonably be taken to be more negative than positive.

14. *Distinguish the skilled auditors*: of all respondents only 11 (52.4 %) expressed the view that the use of CAATs will help clients distinguish the most skilled auditors. Conversely, 23.8% reported that they *disagree*, and the mean score was 3.29.
15. *Obtain more clients*: again respondents were less confident that using CAATs would assist the auditing firms win more clients. Only 33.4% were in agreement with this statement, 23.8 % in disagreement, whilst a sizeable 42.9% scored that they were *neutral*; understandably, at 3.14 the mean was closer to neutral.
16. *Decision- making process*: 15 respondents (71.4 %) said that they believe that the use of CAATs would improve decision-making in the different stages of the overall audit process. This agreement was supported by the average agreement of 3.67. Only 4.8% of the respondents were in disagreement with this statement.
17. *Auditor productivity*: with 66.7% *agree*, and 14.3% *strongly agree*, 17 respondents gave a strong affirmation of this statement indicating that the majority of Jordanian EDP audit managers perceived that the use of CAATs improved auditors' productivity. None of the EDP audit managers *disagreed*.

18. *Audit firm efficiency*: 15 (71.4 %) - 52.4% agree, and 19% strongly agree with this statement, indicating that Jordanian EDP managers thought CAATs would improve, overall, audit firm efficiency. Only 9.5% returned that they *disagree* with the statement.

19. *CAATs are an essential aspect of any audit work*: 16 (76.2 % - 23.8% strongly agree, and 52.4% agree) of all respondents thought that the use of CAATs is an essential aspect of any audit work, 9.5% were in disagreement. The scores mean was 3.90.

Table 8.8: The Mean and the Standard Deviation of the EDP Audit Managers' Answers Concerning the Awareness of Potential Benefits of Using CAATs

<i>No.</i>	<i>The use of Computer Assisted Audit Techniques</i>	<i>Mean</i>	<i>Std. D</i>
1.	Leads to more accurate and precise auditing	4.05	0.80
2.	Saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing	4.43	0.68
3.	Saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing	4.14	0.65
4.	Accelerate the overall audit process leading to issue the financial statements in less time.	3.95	0.67
5.	Reduce the overall audit costs	3.62	1.12
6.	Inject the overall audit process with the auditor's self-confidence	3.71	0.72
7.	Allow the auditor to concentrate on the client's highest audit risk	3.90	0.83
8.	Improve the quality of the overall audit work	3.95	0.67
9.	Improve the quality of the audit clients' financial reporting	3.62	0.86
10.	Facilitates the process of detecting financial errors.	3.57	0.81
11.	Provides auditors with powerful audit tools to detect frauds.	3.14	0.91
12.	Increase the auditor's credibility	3.86	0.79
13.	Enhance stakeholders' trust in the auditors	3.24	0.94
14.	Help clients distinguish the most skilled auditors.	3.29	0.85
15.	Assist the auditing firms to obtain more clients.	3.14	0.85
16.	Improve decision-making in the different stages of the overall audit	3.67	0.58
17.	Improve auditor productivity.	3.95	0.59
18.	Improve the overall efficiency of the audit firm	3.81	0.87
19.	Is an essential aspect of any audit work	3.90	0.89

Table 8.9: The Frequency and Percentage of the EDP Audit Manager's Answers Concerning the Awareness of Potential Benefits of Using CAATs

No.	CAATs Benefits	<i>strongly disagree</i>		<i>disagree</i>		<i>neutral</i>		<i>agree</i>		<i>strongly agree</i>	
		<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>
1.	CAATs usage leads to more accurate and precise auditing	0	0	0	0	6	28.6	8	38.1	7	33.3
2.	CAATs usage saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing.	0	0	0	0	2	9.5	8	38.1	11	52.4
3.	CAATs usage saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing.	0	0	0	0	3	14.3	12	57.1	6	28.6
4.	CAATs usage will accelerate the overall audit process leading to issue the financial statements in less time.	0	0	0	0	5	23.8	12	57.1	4	19
5.	CAATs usage will reduce the overall audit costs.	1	4.8	2	9.5	6	28.6	7	33.3	5	23.8
6.	CAATs usage will inject the overall audit process with the auditor's self-confidence.	0	0	2	9.5	3	14.3	15	71.4	1	4.8
7.	CAATs usage will allow the auditor to concentrate on the client's highest audit risk areas.	0	0	1	4.8	5	23.8	10	47.6	5	23.8
8.	CAATs usage will improve the quality of the overall audit work.	0	0	0	0	5	23.8	12	57.1	4	19
9.	CAATs usage will improve the quality of the audit clients' financial reporting.	0	0	2	9.5	7	33.3	9	42.9	3	14.3
10.	CAATs usage facilitates the process of detecting financial errors.	0	0	1	4.8	10	47.6	7	33.3	3	14.3
11.	CAATs usage provides auditors with powerful audit tools to detect frauds.	0	0	6	28.6	7	33.3	7	33.3	1	4.8

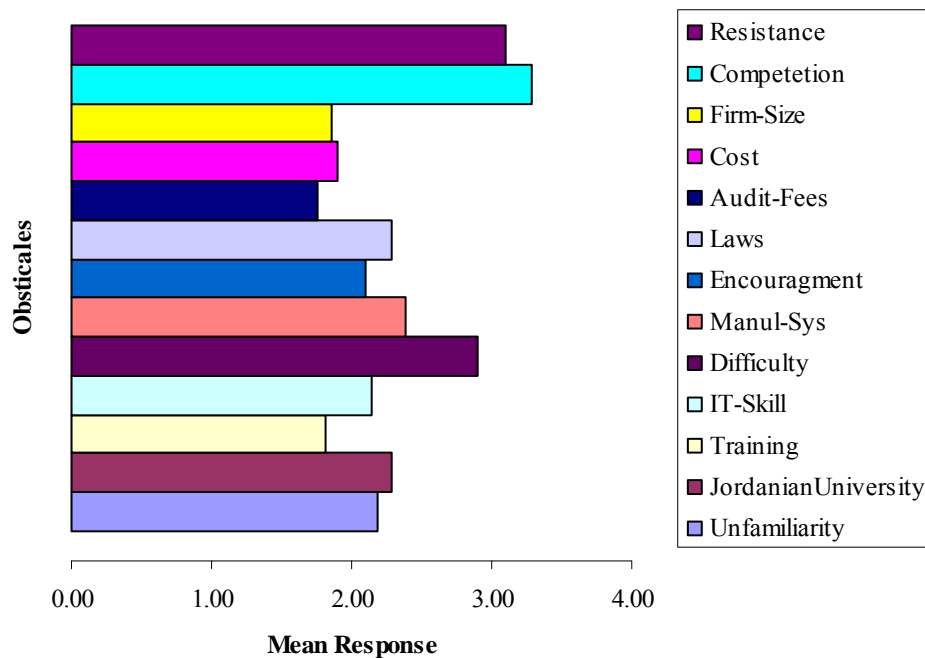
Table 8.9 (Continued): The Frequency and Percentage of the EDP Audit Manager's Answers Concerning the Awareness of Potential Benefits of Using CAATs

No.	CAATs Benefits	<i>strongly disagree</i>		<i>disagree</i>		<i>neutral</i>		<i>agree</i>		<i>strongly agree</i>	
		<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>
12.	CAATs usage will increase the auditor's credibility.	0	0	0	0	8	38.1	8	38.1	5	23.8
13.	CAATs usage will enhance stakeholders' trust in the auditors.	0	0	5	23.8	8	38.1	6	28.6	2	9.5
14.	CAATs usage will help clients distinguish the most skilled auditors.	0	0	5	23.8	5	23.8	11	52.4	0	0
15.	CAATs usage will assist audit firm to obtain more clients.	0	0	5	23.8	9	42.9	6	28.6	1	4.8
16.	CAATs usage will improves decision- making in the different stages of the overall audit process.	0	0	1	4.8	5	23.8	15	71.4	0	0
17.	CAATs usage will improve auditor productivity.	0	0	0	0	4	19	14	66.7	3	14.3
18.	CAATs usage will improve the overall efficiency of the audit firm.	0	0	2	9.5	4	19	11	52.4	4	19
19.	CAATs usage is an essential aspect of any audit work.	0	0	2	9.5	3	14.3	11	52.4	5	23.8

8.5 Descriptive Statistics Regarding the Obstacles Constraining the Use of CAATs (Questionnaire Part 4)

In this section of the survey the EDP audit managers were to indicate their agreement or disagreement with 13 statements (*Obstacles to using CAATs*) relating to possible circumstances discouraging Jordanian audit firms utilizing CAATs. Respondents rated the circumstances from code 1 (strongly agree) to code 5 (strongly disagree). Figure 8.1 shows the respondents answers expressed as a mean score for each of statement. A low score is taken to confirm the obstacles described and a score above the mean value of three (3) indicate disagreement with the statement.

Figure 8.1: The Mean Scores Answers to Obstacles Constraining the Use of CAATs by Jordanian Auditors



Source: Table 8.10

These *obstacles* statements (in part 4 of the questionnaire) were grouped to comprise 4 main *obstacle categories* (section 7.2). Table 8.10 shows the mean and the standard deviation of the EDP audit managers' answers concerning these four main obstacles categories. Table 8.11 meanwhile shows the mean and the standard deviation of the EDP audit managers' answers to each of the separate statements about *obstacles* to using CAATs by the Jordanian audit firms; and shows the frequency and percentage of their answers regarding the perceived obstacles.

Table 8.10: The Mean and the Standard Deviation of the EDP Audit Managers' Answers Concerning the Obstacles Categories

<i>Statistics</i>	<i>Auditing education and training obstacles</i>	<i>Technical and financial obstacles</i>	<i>The role of professional bodies and commercial laws</i>	<i>Jordanian auditing market</i>
<i>Mean</i>	2.05	2.29	2.19	2.48
<i>Std. D</i>	0.74	0.48	0.80	0.59

Table 8.11: The Mean, the Standard Deviation, the Frequency, and Percentage of the Jordanian EDP Audit Managers' Answers Concerning the Obstacles Constraining the Use of CAATs

No.	Obstacles to use the CAATs	Mean	Std. D	strongly disagree		Disagree		neutral		agree		strongly agree	
				Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
1.	Unfamiliarity with Computer Assisted Audit Techniques.	2.19	0.81	0	0	3	14.3	0	0	16	76.2	2	9.5
2.	The accounting and auditing curricula at Jordanian universities do not include courses in electronic data processing auditing	2.29	1.06	1	4.8	2	9.5	3	14.3	11	52.4	4	19.0
3.	The lack of technical audit training courses related to the Computer Assisted Audit Techniques.	1.81	0.60	0	0	0	0	2	9.5	13	61.9	6	28.6
4.	The lack of the information technology skills needed to use Computer Assisted Audit Techniques.	2.14	0.73	0	0	1	4.8	4	19	13	61.9	3	14.3
5.	The difficulty in using the Computer Assisted Audit Techniques.	2.90	0.94	1	4.8	4	19.0	9	42.9	6	28.6	1	4.8
6.	The use of manual accounting information systems by the Jordanian public companies.	2.38	1.12	1	4.8	2	9.5	6	28.6	7	33.3	5	23.8
7.	The lack of encouragement and support by the Jordanian auditing professional bodies and the government.	2.10	1.04	0	0	3	14.3	3	14.3	8	38.1	7	33.3

Table 8.11 (Continued): The Mean, the Standard Deviation, the Frequency, and Percentage of the Jordanian EDP Audit Managers' Answers Concerning the Obstacles Constraining the Use of CAATs

No.	Obstacles to use the CAATs	Mean	Std. D	strongly disagree		Disagree		neutral		agree		strongly agree	
				Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
8.	The lack of laws and regulations regulating the use of Computer Assisted Audit Techniques by auditing firms.	2.29	0.90	0	0	2	9.5	6	28.6	9	42.9	4	19.0
9.	The low fees for the audit of public companies in Jordan.	1.76	1.00	0	0	2	9.5	2	9.5	6	28.6	11	52.4
10.	The high cost of Computer Assisted Audit Techniques.	1.90	0.83	0	0	1	4.8	3	14.3	10	47.6	7	33.3
11.	The small size of the Jordanian audit firms.	1.86	0.96	0	0	2	9.5	2	9.5	8	38.1	9	42.9
12.	The lack of competition between Jordanian audit firms to obtain clients.	3.29	0.96	2	9.5	7	33.3	7	33.3	5	23.8	0	0
13.	The resistance inside Jordanian audit firms to change from manual auditing to computerized auditing.	3.10	1.04	2	9.5	6	28.6	5	23.8	8	38.1	0	0

From Figure 8.1, Table 8.10 and Table 8.11 the following should be noted concerning the perceived obstacles to utilizing CAATs by Jordanian audit firms:

I. Auditing Education and Training Obstacles:

This category consist of two obstacles represented by statements 2 and 3 in Table 8.10

- a. **Accounting Curricula at Jordanian Universities:** this was perceived a substantial obstacle, 15 (71.4%) respondent EDP audit managers being in agreement. Mean average responses were 2.29, supporting the agreement percentage. Jordanian EDP audit managers thus expressed their belief that the accounting and auditing curricula at the Jordanian universities continue to not include appropriate courses in electronic data processing auditing. This default constitutes a major problem for Jordanian audit firms' recruitment of CAAT-proficient staff. Only, 14.3%, where in disagreement with the statement, - 9.5% *disagree*, and 4.8% *strongly disagree*.
- b. **Technical Audit Training Courses:** 28.6% of the EDP audit managers *strongly agree*, and 61.9% *agree* with the statement - a strong consensus regarding this statement, with 19 (90.5%) of the Jordanian EDP audit managers indicating their belief that the lack of technical audit training courses inculcating CAATs skills discourages their use by Jordanian audit firms. None of the EDP audit managers *disagreed* with this statement. The average responses of 1.81 strongly support this statement.

Table 8.10 shows that the average response of the EDP audit managers for both statements was 2.05, suggesting that Jordan's audit firms face the obstacles resulting from inappropriate, deficient, auditing education and training programmes.

II. Technical and Financial Obstacles

This category consists of four obstacles represented by statement 1, 4, 5 and 10 in Table 8.10.

- a. **Unfamiliarity with CAATs:** 18 (85.7 % - 9.5% *strongly agree*, and 76.2% *agree*) expressed their belief that unfamiliarity with CAATs was a substantial obstacle to them being used by Jordanian audit firms. Only, 14.3% *disagreed* with the statement. The mean was 2.19, consistent with agreement percentage.
- b. **Lack of Information Technology Skills:** Here, 16 (76.2% - 14.3 % *strongly agree*, and 61.9% *agree*) agreed with the statement. Respondents were of the view that the lack of information technology skills required by Jordanian auditors to deal with these techniques discouraged their use of CAATs. Only, 4.8% *disagreed*; with a mean of 2.14 supporting the agreement percentage.
- c. **The Difficulty in using CAATs:** - 7 (33.3% - 4.8 % *strongly agree*, and 28.6% *agree*) agreed that CAATs technical difficulty discouraged their use of the techniques. Conversely, 19% of the EDP audit managers *disagreed*, and 4.8 *strongly disagreed*, disagreement of 23.8%. Interestingly, since respondents were reporting on their individual experiences, 42.9% scored a *neutral* response. The mean of the EDP audit managers' answers concerning the difficulty in using the CAATs was 2.90, close to the nominal neutral "3".
- d. **The High Cost of CAATs:** 17 (81% - 33.3% *strongly agree*, and 47.6% *agree*) agreed that where the resources are scarce, as in Jordan, the cost of using innovations such as CAATs discourages their utilization. Only 4.8% *disagreed*. The low mean of the EDP audit managers' answers concerning audit cost of CAATs at 1.90 was consistent. But the overall answer was arguably inconsistent

with the potential flow-on of technical infrastructure that might be expected by the firms affiliated with the international audit firms.

Table 8.10 shows that the average response of the EDP audit managers for the four statements was 2.29 supporting a view that in the case of Jordan, audit firms face *technical and financial obstacles* discouraging them to use CAATs.

III. The Role of Professional Bodies and Commercial Laws- Related Obstacles

This category comprised two obstacles represented by statements 7 and 8 in Table 8.10.

a. The Roles of the Jordanian Auditing Professional Bodies and the

Government: 33.3 % of the EDP audit managers *strongly agree*, 38.1% *agree* with the statement. Thus, as 15 (71.4%) were in agreement with this statement, it can be taken that in Jordan the lack of encouragement and support by the Jordanian auditing professional bodies and the government negatively affects the use of CAATs by Jordanian audit firms. Only 14.3% *disagree* with the statement. The mean of the EDP audit managers' answers concerning this statement was 2.10, which support the agreement percentage. It is plausible to say that one of the possible explanations for the low encouragement is the weak role of the auditing bodies in Jordan and particularly their lack of influence in governmental circles, (sect. 3.6.3).

b. The Lack of Laws and Regulations Regulating the Use of CAATs:

19% of the respondents *strongly agree*, 42.9 *agree* with the statement. Thus, 13 of Jordanian EDP audit managers (61.9%) were in agreement

with the statement indicating a strong informed belief that the lack of appropriate auditing legislation promoting the using of CAATs in the Jordanian auditing environment is an obstacle diminishing their use. Only 9.5% *disagree* with this statement. The mean was 2.29, which supports the agreement percentage.

Table 8.10 shows that the average response of the EDP audit managers for both statements was 2.19, indicating that Jordanian audit firms face *professional and commercial laws-related* obstacles discouraging them using utilizing CAATs.

IV. Jordanian Auditing Market

This category comprised five obstacles represented by statements 6, 9, 11, 12, and 13 in Table 8.10.

a. Use of Manual Accounting Information Systems by the Jordanian Public Companies: 57.1% said that they believed that public companies' use of manual accounting systems discourage them.; 23.8 % of the EDP said they *strongly agree*, and 33.3% *agree*. Conversely, 9.5% responded that they *disagree*, and 4.8% *strongly disagree*. The average at 2.38 was below the cut off point of 3 supporting the agreement percentage.

b. Low Auditing Fees: one could reasonably expect that the low auditing fees would discourage audit firms acquiring and utilizing cutting-edge audit technology. It appears to be the case of Jordan: 52.4% *strongly agree*, and 28.6% *agree*; thus 17 (81%) registered that they thought that low auditing fees constitute an obstacle to utilize CAATs. Only 9.5% *disagree* with audit fees statement. The mean response of 1.76 was supportive.

- c. **The Small Size of Jordanian Audit Firms:** 42.9 % of the EDP audit managers *strongly agree*, and 38.1% *agree*, a total of 17 (81%). Only 9.5% disagreed with this statement. The agreement percentage was supported by the low mean of 1.86.
- d. **The Competition between Jordanian Audit Firms:** that competition between audit firms as a result of showing their clients that they utilize the latest audit techniques compatible with their advanced computerized system, is reasonably expected to enhance the audit firms' reputations and win more clients. However, contrary to expectations in Jordan only 5 (23.8%) thought that the lack of competition between Jordanian audit firms was an obstacle to using the CAATs. Conversely, 33.3% of the EDP audit managers *disagreed*, and 9.5% *strongly disagree* with the statement, 42.8% of overall. This disagreement was consistent with the average agreement of 3.29.
- e. **The Change from Manual Auditing to Computerized Auditing:** only 8 (38.1%) of all the respondents *agreed* with this statement: 'resistance by Jordanian audit firms to change from manual auditing to computerized auditing'. Nonetheless the view was matched with 38.1% saying that they *disagree* with the statement. The disagreement percentage was supported by the average response of 3.10, which was greater than 3. Thus overall, in Jordan, the resistance by audit firms to convert from manual auditing to computerized auditing does not constitute a barrier that discourages the audit firms to use CAATs.

Table 8.10 shows that the average response for the five statements was 2.48 suggesting that in the case of Jordan the audit firm's face *auditing market* related obstacles discouraging them from using CAATs.

8.6 The Internal Consistency of the Thesis Instrument

The internal consistency Cronbach's alpha is computed for the likert scale in Parts 2, 3, and 4 of the questionnaire. Table 8.12 shows the results of reliability test.

Table 8.12: Reliability Analysis for Parts 2, 3, and 4 of the Questionnaire

<i>Questionnaire (part)</i>	<i>S c a l e</i>	<i>Number of items</i>	<i>Cronbach's Alpha</i>
2	<i>The Usage of CAATs</i>	16	.941
3	<i>The Awareness of CAATs Benefits</i>	19	.883
4	<i>Obstacles to Use The CAATs</i>	13	.707

According to Hair, Babin, Money and Samouel (2003, p.172) Alpha Coefficient range from 0.7 to < 0.8 is considered good, 0.8 to < 0.9 very good, and 0.9 excellent. Table 8.12, indicates that the *reliability coefficient* for all parts of the questionnaire is acceptable, and suggests that by virtue of the internal consistency, the results are likely to be reliable.

8.7 Normality Assumptions Check

To test the thesis hypotheses the one-sample t-test, independent-samples t-test, and a Pearson Correlation test were used. Those tests assume that the data are normally distributed. Therefore, the Kolmogorov-Smirnov test is used to decide whether the sample comes from a population with a normal distribution, and the normality assumption is supported by the using Probability plots (p-p) plot.

8.7.1 The Kolmogorov-Smirnov Test

The Kolmogorov–Smirnov for a single sample test is one of the goodness-of-fit tests.

According to Sheskin (2004, p.203):

Goodness-of-fit tests are employed to determine whether the distribution of scores in a sample conforms to the distribution of scores in a specific theoretical or empirical population (or probability) distribution. The goodness of fit tests are somewhat unique when contrasted with other types of inferential statistical test, in that when conducting a goodness-of-fit test a researcher often wants or expects to retain the null hypothesis. In other word, the researcher wants to demonstrate that a sample is derived from a distribution of a specific type (e.g., a normal distribution). On the other hand, in employing most other inferential tests, a researcher wants or expects to reject the null hypothesis -i.e. the researcher wants or expects to demonstrate that one or more sample do not come from a specific population or from the same population.

Accordingly, to test for normality, the Kolmogorov–Smirnov null hypothesis should be stated in the positive form: *the sample data are derived from a normal distribution*, while the alternative hypothesis should be stated in the negative form: *that the sample data are not derived from a normal distribution*. Thus, if the calculated significance is greater than the desired significance level of (0.05), the null hypothesis is supported and the sample is normally distributed. Table 8.13 shows the findings of the One-Sample Kolmogorov-Smirnov test for Parts 2, 3 and 4 of the questionnaire; it indicates that the significance level were 0.948, 0.998, 0.985 respectively: these significance values being greater than (0.05) the Kolmogorov–Smirnov null hypothesis is supported and the sample is to be taken as normally distributed.

Table 8.13: One-Sample Kolmogorov-Smirnov Test for the Usage of CAATs, the Awareness of CAATs Benefits, and the Obstacles Constraining the Use of CAATs

<i>S c a l e</i>	<i>Normal Parameters (a ,b)</i>		<i>Kolmogorov-Smirnov Z</i>	<i>Asymp. Sig. (2-tailed)</i>
	<i>Mean</i>	<i>Std. D</i>		
<i>The Usage of CAATs</i>	3.734	0.456	0.522	0.948
<i>The Awareness of CAATs Benefits</i>	2.381	0.435	0.395	0.998
<i>Obstacles to Use The CAATs</i>	2.432	0.898	0.457	0.985

a Test distribution is Normal.

b Calculated from data.

8.7.2 The Probability Plots (p-p)

Effecting the probability plots (p-p) was to support the findings of the Kolmogorov–Smirnov test, where the plots are generally used to determine whether the distribution of a variable matches a given distribution. If the selected variable matches the test distribution, the points cluster around a straight line. Figures 8-2, 8-3, and 8-4 show the normal p-p of (i) the usage of CAATs, (ii) the awareness of CAATs benefits, and (iii) the perceived obstacles to using CAATs. The Figures suggest that the assumptions underlying the test were approximately met - the normal probability plot shows that the line representing the scale distribution in the three parts of the questionnaire closely follows the diagonal, indicating the data set adhering to the normality assumption.

Figure 8.2: Normal P-P plot of the Usage of CAATs

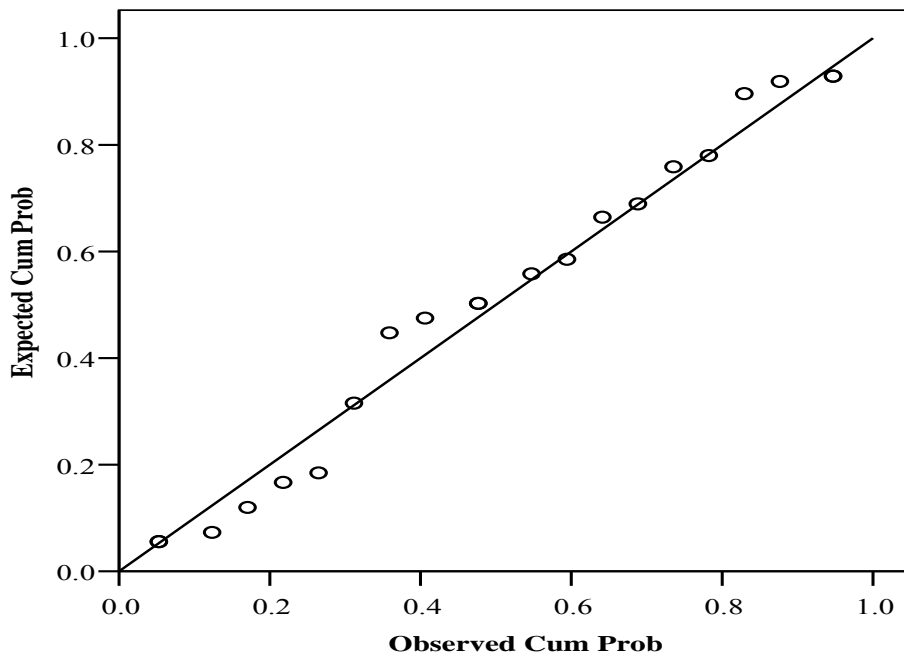


Figure 8.3: *Normal P-P plot of the Awareness of CAATs Benefits*

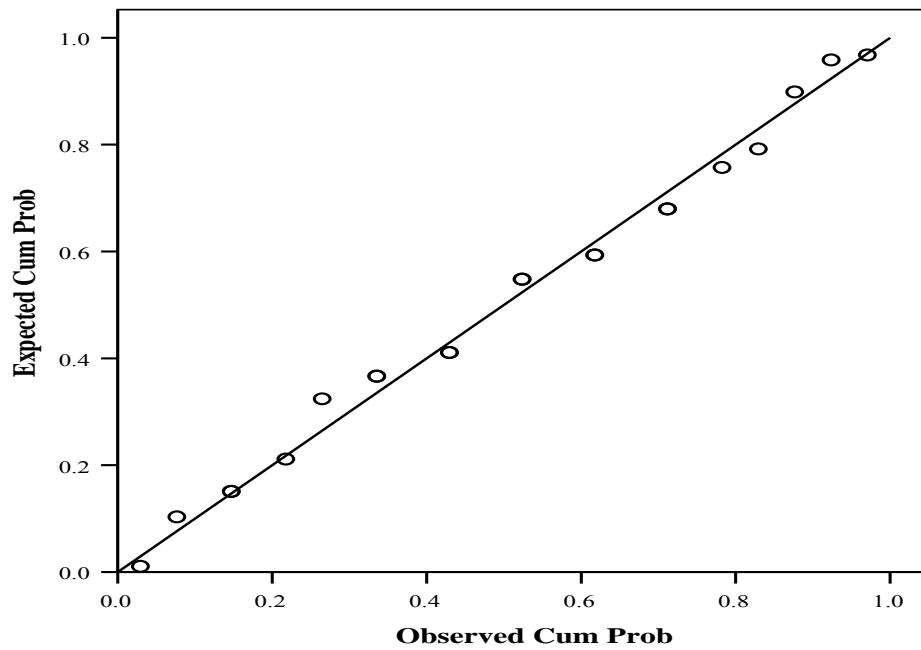
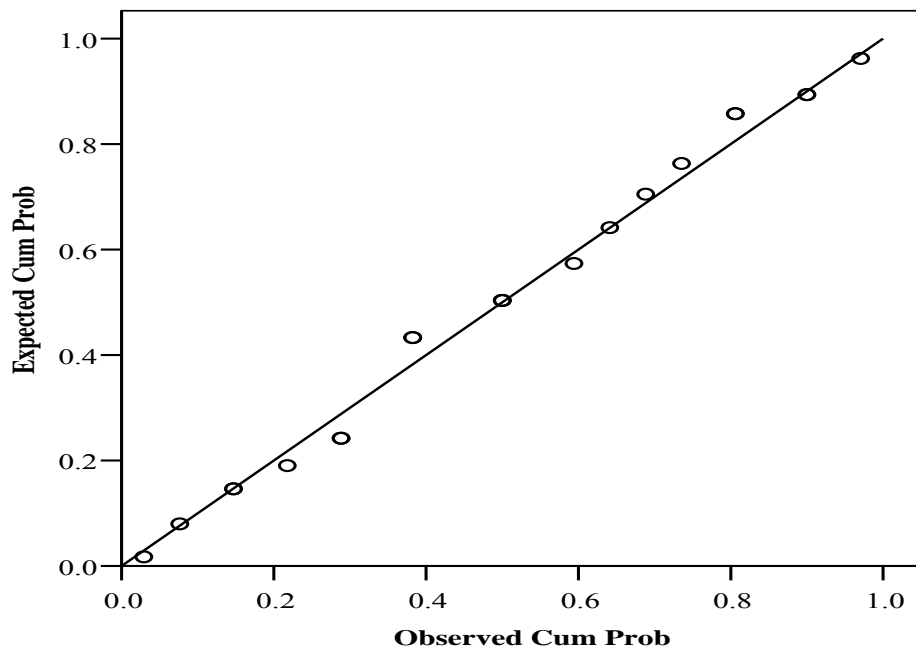


Figure 8.4: *Normal P-P plot of Obstacles to the Use of CAATs*



8.8 Hypotheses Testing

It is to be noted that Hypotheses 1, 3, and 5 of the study were stated in a directional form, thus, the one-tailed test was the proper test. Further, a significance level of 5

percent was used as it is the most common significance level for testing hypotheses in business and management research (Cavana, Delahaye and Sekaran, 2001, p.415).

Concerning the significance level in the one-tailed test Cavana et al.(2001, p.428) notes that:

the SPSS software provides significance levels only for two-tailed test and to run one tailed test the normal desired significance level should be doubled to 10 percent (giving a 90 percent confidence interval for a two sided test), which equivalent to a 5 percent significance level in each tail of a two sided t-test. They added that the calculated significance should be compared to 0.10.

Accordingly, in testing Hypotheses 1, 3, and 5, the SPSS was adjusted to 90% confidence interval, and the calculated significance level was compared to 0.10. In contrast, Hypotheses 2, and 4 were stated in non-directional form, thus, the two-tailed test is the appropriate test and the calculated significance level was compared to 0.05.

8.8.1 Hypotheses 1 and 2 Relating to the Audit Gap and the Use of Computer Assisted Audit Techniques (Part 2 of the Questionnaire)

Hypothesis 1 addressed whether the EDP audit managers' responses indicated they were using CAATs equal to or greater than *sometimes* on average (there is no gap in the expectations of the extent, to which the Jordanian audit firms use CAATs), or whether they were using CAATs less than *sometimes* on average (there is a gap in the expectations of the extent, to which the Jordanian audit firms use CAATs). H1 of the study stated in the null;

***H₀ 1:** There is no gap in the reasonable expectations of the extent to which the Jordanian audit firms use CAATs while they perform their daily audit procedures on Jordanian public companies.*

Here the scale ranged from 1= *never* to 5= *very often*, thus 3 was selected to be the cut-off point (the likert scale mean) representing the hypothesized population mean (Cavana et al., 2001, p.426).

A one-tailed one-sample t-test was used to test Hypothesis 1. Table 8.14 shows hypothesis 1 test statistics; it indicates that the average use for the CAATs was around 2.4, which is between *sometimes used* and *rarely used*.

Table 8.14: One-Sample T-Test Statistics for the Usage of CAATs by Jordanian Audit Firms

<i>S c a l e</i>	<i>Mean</i>	<i>Std. D</i>
<i>The Usage of CAATs</i>	2.43	0.90

Table 8.15 shows the one-sample t-test findings for H1. The result indicates that H₀1 is not supported and the alternative hypothesis is supported. That suggests *there is a gap in the expectations of the extent, to which the Jordanian audit firms use CAATs while they perform their daily audit procedure*, in other word they, on average, use CAATs less than *sometimes*.

Table 8.15: One-Sample T-Test for the Usage of CAATs by Jordanian Audit Firms

<i>S c a l e</i>	<i>t</i>	<i>Sig. (2-tailed)</i>
<i>The Usage of CAATs</i>	-2.900	.009

The computed t-value for the usage of the 16 computer assisted audit techniques are presented in Table 8.16. The Table shows that *there was a gap in the expectations of the extent, to which the Jordanian audit firms use 12 CAATs while they perform their daily audit procedures*. In contrast, H₀1 was supported in respect of the: Test Data Technique, Tracing Technique, Mapping Technique, and Utility Programs Technique.

Table 8.16: Mean Scores, T-Value for the Usage of All CAATs by Jordanian Audit Firms

<i>CAATs</i>	<i>Mean Scores</i>	<i>t value</i>	<i>Sig. (2-tailed)</i>
Test Data Technique	3.19	.677	.506
Base Case System Evaluation Technique	2.38	-2.280	.034
Integrated Test Facility Technique	2.24	-3.074	.006
Parallel Simulation Technique	2.43	-2.335	.030
Source Code Comparison Technique	2.14	-3.873	.001
Flow Charting Program Technique	2.57	-1.910	.071
Reprocessing Technique	2.48	-2.057	.053
Tracing Technique	2.71	-1.240	.229
Mapping Technique	2.57	-1.627	.119
Snapshot Technique	2.29	-2.500	.021
Embedded Audit Module Technique	2.14	-3.408	.003
System Control Audit Review File Technique	2.14	-2.905	.009
Audit Hooks Technique	2.19	-3.068	.006
Generalized Audit Software Technique	2.43	-1.826	.083
Utility Programs Technique	2.76	-.773	.448
Custom Design Software Technique	2.24	-2.415	.025

Hypothesis 2 contemplated potential differences regarding the attitudes toward CAATs usage between EDP audit managers' in Jordanian audit firms having an international affiliation with a big international accounting firm and EDP audit managers in those without such an affiliation. Hypothesis 2 was as follows in its null form:

***H₀ 2:** There is **no significant** difference regarding the use of CAATs between the Jordanian audit firms with an international affiliation with the big international accounting firms and those without an international affiliation.*

Hypothesis 2 was tested with the independent-samples two-tailed t-test. The independent-samples t-test group statistics are presented in Table 8.17. It shows that the average use of the CAATs by audit firms that do not have an international affiliation

with the big international accounting firms was slightly higher than the average use by audit firms that have an affiliation. That runs counter to what one might expect.

Table 8.17: Independent-Samples T-Test Group Statistics for the Usage of all CAATs by Affiliated and Non-affiliated Jordanian Audit Firms

<i>Scale</i>	<i>International Affiliation</i>	<i>Mean</i>	<i>Std. D</i>
CAATs usage	Jordanian audit firms with no International affiliation	2.47	0.825
	Jordanian audit firms that have an International affiliation	2.38	1.038

Results of the independent-samples t-test for *equality of means* are shown in Table 8.18. The results for the t-test with equal variances assumed are used (Equal variances are assumed if the ‘Levene’s Test for Equality’ significance is greater than 0.5). The result suggests that H₀₂ was supported. Thus, it seems that in Jordan, there is **no significant** difference between the audit firms with an international affiliation with the big international accounting firms and those that do not, regarding the use of computer assisted audit techniques. That is an unexpected outcome. On the grounds that auditors with international affiliations ought by virtue of those connections have greater access to state-of-the-art- technologies, it invites speculation regarding the extent to which the use of audit technology is driven more by clients’ accounting systems than by access to the technology.

Table 8.18: Independent- Samples T- Test for Equality of Means for the Usage of CAATs by Affiliated and Non-affiliated Jordanian Audit Firms

<i>Scale</i>		<i>Levene's Test for Equality of Variances</i>		<i>t-test for Equality of Means</i>	
		<i>F</i>	<i>Sig.</i>	<i>t</i>	<i>Sig. (2-tailed)</i>
CAATs usage	Equal variances assumed	1.653	.214	.214	.833
	Equal variances not assumed			.207	.839

The independent samples t-test was used to test whether there is a difference between the affiliated and non-affiliated Jordanian audit firms regarding the use of all the 16 CAATs appeared in Part 2 of the questionnaire. Table 8.19 shows the mean and the standard deviation for the usage of all CAATs by affiliated and non-affiliated audit firms.

Table 8.19: Independent-Samples T-Test Group Statistics for the Usage of All CAATs by Affiliated and Non-Affiliated Jordanian Audit Firms

<i>CAATs</i>	<i>Audit Firm Type ^a</i>	<i>Usage Mean</i>	<i>Std. D</i>
<i>Test Data Technique</i>	N	3.17	1.19
	A	3.22	1.48
<i>Base Case System Evaluation Technique</i>	N	2.25	0.97
	A	2.56	1.59
<i>Integrated Test Facility Technique</i>	N	2.17	0.94
	A	2.33	1.41
<i>Parallel Simulation Technique</i>	N	2.50	1.17
	A	2.33	1.12
<i>Source Code Comparison Technique</i>	N	2.33	0.99
	A	1.89	1.05
<i>Flow Charting Program Technique</i>	N	2.67	1.07
	A	2.44	1.01
<i>Reprocessing Technique</i>	N	2.42	1.08
	A	2.56	1.33
<i>Tracing Technique</i>	N	2.92	1.08
	A	2.44	1.01
<i>The use of Mapping Technique</i>	N	2.67	1.23
	A	2.44	1.24
<i>Snapshot Technique</i>	N	2.42	1.38
	A	2.11	1.27
<i>Embedded Audit Module Technique</i>	N	2.17	1.12
	A	2.11	1.27
<i>System Control Audit Review File Technique</i>	N	2.08	1.31
	A	2.22	1.48
<i>Audit Hooks Technique</i>	N	2.50	1.24
	A	1.78	1.09
<i>Generalized Audit Software Technique</i>	N	2.67	1.56
	A	2.11	1.27
<i>Utility Programs Technique</i>	N	2.75	1.29
	A	2.78	1.64
<i>Custom Design Software Technique</i>	N	1.83	1.19
	A	2.78	1.64

a: **A** = Audit firms with an international affiliation, **N** = Audit firms with no international affiliation

The average usage for 9 techniques was slightly higher by the non-affiliated audit; in contrast the other 7 techniques average usage was higher by audit firms with an international affiliation.

The computed t-value and the significance level for the usage of the 16 CAATs are shown in Table 8.20. The results indicate that Ho2 was supported for all 16 CAATs, suggesting no *significant* difference between the Jordanian audit firms with a big international accounting firm affiliation and those without, regarding their use of computer assisted audit techniques.

Table 8.20: Independent-Samples T- Test for the Usage of All CAATs by Affiliated and Non-Affiliated Jordanian Audit Firms

CAATs		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Sig. (2- tailed)
Test Data Technique	Equal variances assumed	.491	.492	-.095	.925
	Equal variances not assumed			-.092	.928
Base Case System Evaluation Technique	Equal variances assumed	5.943	.025	-.547	.591
	Equal variances not assumed			-.510	.619
Integrated Test Facility Technique	Equal variances assumed	5.487	.030	-.325	.749
	Equal variances not assumed			-.307	.764
Parallel Simulation Technique	Equal variances assumed	.029	.867	.330	.745
	Equal variances not assumed			.332	.744
Source Code Comparison Technique	Equal variances assumed	.033	.859	.993	.333
	Equal variances not assumed			.983	.339
Flow Charting Program Technique	Equal variances assumed	.047	.831	.481	.636
	Equal variances not assumed			.485	.634
Reprocessing Technique	Equal variances assumed	.298	.592	-.264	.795
	Equal variances not assumed			-.256	.802
Tracing Technique	Equal variances assumed	.031	.863	1.015	.323
	Equal variances not assumed			1.025	.319
Mapping Technique	Equal variances assumed	.055	.817	.409	.687
	Equal variances not assumed			.408	.688
Snapshot Technique	Equal variances assumed	.160	.694	.519	.609
	Equal variances not assumed			.526	.605
Embedded Audit Module Technique	Equal variances assumed	.290	.596	.107	.916
	Equal variances not assumed			.105	.918
System Control Audit Review File Technique	Equal variances assumed	.393	.538	-.227	.823
	Equal variances not assumed			-.223	.826

Table 8.20 (Continued): Independent-Samples T- Test for the Usage of All CAATs by Affiliated and Non-Affiliated Jordanian Audit Firms

<i>CAATs</i>		<i>Levene's Test for Equality of Variances</i>		<i>t-test for Equality of Means</i>	
		<i>F</i>	<i>Sig.</i>	<i>t</i>	<i>Sig. (2-tailed)</i>
Audit Hooks Technique	Equal variances assumed	.816	.378	1.385	.182
	Equal variances not assumed			1.412	.175
Generalized Audit Software Technique	Equal variances assumed	1.004	.329	.873	.393
	Equal variances not assumed			.900	.379
Utility Programs Technique	Equal variances assumed	.808	.380	-.044	.966
	Equal variances not assumed			-.042	.967
Custom Design Software Technique	Equal variances assumed	1.567	.226	-1.530	.142
	Equal variances not assumed			-1.461	.166

8.8.2 Hypotheses 3 and 4 Relating to the Perception of the Potential Benefits of CAATs Usage by Jordanian Audit Firms (Part 3 of the Questionnaire)

Hypotheses 3 and 4 related to perceptions of the potential benefits to Jordanian audit firms from using CAATs.

Hypothesis 3 is concerned whether the EDP audit managers perceived the potential benefits from CAATs usage were ‘on average’ *greater than, equal to or less than* neutral. The “3” response represented the hypothesized population mean, where the scale in this part was ranged from 1= strongly disagree to 5= strongly agree. The third Hypothesis stated in the *null*:

H₀ 3: There is a negative conscious perception by Jordanian audit firms of the potential benefits of using CAATs.

The one-tailed one-sample t-test was used to test Hypothesis 3. Table 8.21 shows the one-sample t-test statistics results for Hypothesis 3. It suggests that the average level of

awareness of the potential benefits by Jordanian audit firms was high - at 3.73 which is close to *agree* on the likert scale.

Table 8.21: One-Sample T-Test Statistics for the Awareness of CAATs Potential Benefits by Jordanian Audit Firms

<i>S c a l e</i>	<i>Mean</i>	<i>Std. D</i>
<i>The Awareness of CAATs Benefits</i>	3.73	0.46

Table 8.22 shows the one-sample t-test findings for Hypothesis 3; it indicates that the significance value for ‘the awareness of CAATs benefits’ is 0.000. Therefore, H_0 3 was rejected and the alternative hypothesis supported, confirming Jordanian audit firms awareness of the potential benefits derived from using CAATs.

Table 8.22: One- Sample T-Test for the Awareness of CAATs Potential Benefits by Jordanian Audit Firms

<i>S c a l e</i>	<i>t</i>	<i>Sig. (2-tailed)</i>
<i>The Awareness of CAATs Benefits</i>	7.376	.000

Table 8.23 presents the computed t-value and the significance level for the awareness of 19 posited benefits of each of the CAATs. It shows a positive conscious perception by Jordanian audit firms in respect of 15 of the potential benefits. In contrast, H_0 3 was supported insofar as the analysis indicated that the respondents did not perceive that: the use of CAATs provides auditors with powerful audit tools to detect frauds, enhances stakeholders' trust in the auditors, helps clients distinguish the most skilled auditors, and assists the auditing firms obtain more clients.

Table 8.23: Mean Scores, T-Value for the Awareness of All Surveyed CAATs Potential Benefits By Jordanian Audit Firms

<i>The use of Computer Assisted Audit Techniques</i>	<i>Mean Scores</i>	<i>t value</i>	<i>Sig. (2-tailed)</i>
Leads to more accurate and precise auditing	4.05	5.966	.000
Saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing	4.43	9.682	.000
Saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing	4.14	8.000	.000
Accelerate the overall audit process leading to issue the financial statements in less time.	3.95	6.523	.000
Reduce the overall audit costs	3.62	2.540	.020
Inject the overall audit process with the auditor's self-confidence	3.71	4.564	.000
Allow the auditor to concentrate on the client's highest audit risk areas	3.90	4.990	.000
Improve the quality of the overall audit work	3.95	6.523	.000
Improve the quality of the audit clients' financial reporting	3.62	3.281	.004
Facilitates the process of detecting financial errors.	3.57	3.230	.004
Provides auditors with powerful audit tools to detect frauds.	3.14	.719	.480
Increase the auditor's credibility	3.86	4.954	.000
Enhance stakeholders' trust in the auditors	3.24	1.156	.261
Help clients distinguish the most skilled auditors.	3.29	1.549	.137
Assist the auditing firms to obtain more clients.	3.14	.767	.452
Improve decision- making in the different stages of the overall audit process	3.67	5.292	.000
Improve auditor productivity.	3.95	7.402	.000
Improve the overall efficiency of the audit firm	3.81	4.250	.000
Is an essential aspect of any audit work	3.90	4.663	.000

Hypothesis 4 addressed whether there was a relationship between the awareness of the Jordanian audit firms to the potential benefits of CAATs usage and their level of CAATs usage. Hypothesis 4 was as follows in its null form:

H₀ 4: there is no significant relationship between the awareness of the CAATs benefits and the level of CAATs usage by Jordanian audit firms.

The Pearson Product-Moment Correlation Coefficient is the most widely used measure of correlation or association employed with interval/ratio data (Sheskin, 2004). Thus a Pearson product-moment correlation was used to test Hypothesis 4. The findings are presented in Table 8.24. It reveals a significant *positive correlation of 0.558 (r=0.558) between the awareness of CAATs benefits and CAATs usage*. Thus, H₀4 was rejected and the alternative hypothesis was supported. It would be reasonable to expect that the awareness of the potential benefits of using CAATs (H3 and H4) would be accompanied by a high usage of them. That it is not (H1) might be explained by the relative immaturity of the Jordanian profession, and in particular the failure of the profession to require instruction in CAATs be a compulsory element in the audit curricula in the universities. It expected that this result could enhance the thesis objective of encouraging Jordanian audit firms to utilize the audit techniques.

Table 8.24: Results of Relationship between the Awareness of the CAATs Benefits and the Level of CAATs Usage

<i>Pearson product-moment correlation</i>	
Correlation coefficient	.558 (**)
Significant level	.009

** Correlation is significant at the 0.01 level (2-tailed).

8.8.3 Hypotheses 5 Relating to the Barriers Constraining the Use of CAATs by Jordanian Audit Firms (Part 4 of the Questionnaire)

Hypothesis 5 related to the constraints discouraging Jordanian audit firms using CAATs. This hypothesis comprises a primary proposition and four sub-propositions.

The main hypothesis tests the complete *obstacles* statements (Part 4 of the questionnaire) as a general indicator of obstacles to the use of CAATs. The 13 separate obstacle statements are then grouped into four main categories (sect., 7.2), to form four sub-hypotheses. The four *obstacles categories* and the statements that represent each category are presented in Table 8.25.

Table 8.25: The Four Major Obstacles Categories Constraining CAATs Utilization by Jordanian Audit Firms

<i>Major Obstacles categories</i>	<i>Statements representing each main categories</i>	
<i>Auditing education and training obstacles</i>	(i)	The accounting and auditing curricula at Jordanian universities
	(ii)	The technical audit training courses related to the inculcation of CAATs-skills.
<i>Technical and financial obstacles</i>	(i)	Familiarity with CAATs,
	(ii)	The IT skills needed to use CAATs
	(iii)	The technical difficulty in using CAATs
	(iv)	The cost of CAATs
<i>The role of professional bodies and commercial laws</i>	(i)	The encouragement and support by the Jordanian professional auditing bodies and the government for the use of CAATs
	(ii)	The laws and regulations governing the use of CAATs by auditing firms.
<i>Jordanian auditing market environment</i>	(i)	The use of manual accounting information systems by Jordanian public companies
	(ii)	The fees for the audit of public companies in Jordan
	(iii)	The size of the Jordanian audit firms
	(iv)	The competition between Jordanian audit firms
	(v)	The change from manual auditing to computerized auditing by Jordanian audit firms

Accordingly, Hypothesis 5 and the related four sub-hypotheses tested whether the EDP audit managers' responses indicated whether they were in agreement with the 13 obstacles statements overall (the entire obstacles), or the separate statements representing each obstacle category.

Again, the “3” (*neutral*) response on the scale represented the hypothesized population mean. As this part of the questionnaire was negatively worded, the likert scale was reversed, such that it ranged from 1=*strongly agree* to 5=*strongly disagree*.

Hypothesis 5 and the four sub hypotheses stated in the *null*:

H₀ 5: *There are few obstacles constraining the use of CAATs by audit firms in Jordan.*

Hypothesis 5 can be divided into the following sub-hypotheses. In the null form they are:

H₀ 5_a: *There are few auditing education and training obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_b: *There are few technical and financial obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_c: *There are few (professional and commercial) laws-related obstacles constraining the use of CAATs by audit firms in Jordan.*

H₀ 5_d: *There are few auditing market environment related obstacles constraining the use of CAATs by audit firms in Jordan.*

Hypothesis 5 and the sub-hypotheses were each tested with the one-tailed one-sample t-test.

Table 8.26 presents the one-sample t-test statistics results for hypothesis 5; it shows that the average agreement with the 13 obstacles for H5 was 2.31, which is close to *agree* on the likert scale. The Table further indicates that the average agreement with the

obstacles for all sub-hypotheses was below 3, closer to 2. Thus, the results suggest there are substantial obstacles to the use the CAATs by Jordanian audit firms.

Table 8.26: One-Sample T-Test for the Obstacles Categories Constraining CAATs Utilization by Jordanian Audit Firms

<i>Obstacles</i>	<i>Mean</i>	<i>Std. D</i>	<i>t</i>	<i>Sig. (2-Tailed)</i>
<i>Obstacles to Use the CAATs</i>	2.31	0.43	-7.360	.000
<i>Auditing Education and Training Obstacles</i>	2.05	0.74	-5.898	.000
<i>Technical and Financial Obstacles</i>	2.29	0.48	-6.873	.000
<i>Professional Bodies and Commercial Laws- Related Obstacles</i>	2.19	0.80	-4.648	.000
<i>Auditing Market Environment Related Obstacles</i>	2.48	0.59	-4.081	.001

The Table further presents the one-sample t-test findings for H5 and the sub-hypotheses; it shows that the significance value for ‘the Obstacle to utilize the CAATs’ and for all the obstacles categories was 0.000 except for auditing market environment related obstacles was 0.001. Therefore, H₀₅, H_{05a}, H_{05b}, H_{05c}, and H_{05d} were each rejected and the alternative hypotheses supported.

The computed t-values for the 13 obstacle statements constraining the use of CAATs by Jordanian audit firms are shown in Table 8.27. The results show that for 10 of the obstacles the constraints emerging were perceived to be substantial. In contrast, H₀₅ was supported for the following statements: ‘the difficulty in using the CAATs, the lack of competition between Jordanian audit firms to obtain clients, the resistance by Jordanian audit firms to change from manual auditing to computerized auditing’.

Table 8.27: Mean Scores, T-Value of all Surveyed Obstacles Constraining CAATs Utilization by Jordanian Audit Firms

<i>Statements</i>	<i>Mean</i>	<i>t</i>	<i>Sig. (2-tailed)</i>
Unfamiliarity with Computer Assisted Audit Techniques	2.19	-4.560	.000
The accounting and auditing curricula at Jordanian universities do not include courses in electronic data processing auditing	2.29	-3.101	.006
The lack of technical audit training courses related to the Computer Assisted Audit Techniques.	1.81	-9.068	.000
The lack of the information technology skills needed to use Computer Assisted Audit Techniques	2.14	-5.403	.000
The difficulty in using the Computer Assisted Audit Techniques.	2.90	-.462	.649
The use of manual accounting information systems by the Jordanian public companies	3.38	-2.540	0.02
The lack of encouragement and support by the Jordanian auditing professional bodies and the government.	2.10	-3.970	.001
The lack of laws and regulations regulating the use of Computer Assisted Audit Techniques by auditing firms.	2.29	-3.627	.002
The low fees for the audit of public companies in Jordan	1.76	-5.701	.000
The high cost of Computer Assisted Audit Techniques	1.90	-6.040	.000
The small size of the Jordanian audit firms.	1.86	-5.435	.000
The lack of competition between Jordanian audit firms to obtain clients.	3.29	1.369	.186
The resistance inside Jordanian audit firms to change from manual auditing to computerized auditing.	3.10	.418	.680

8.9 Summary

This chapter has provided insights into the utilization of CAATs by audit firms in Jordan, by reporting the descriptive statistics emanating from the survey and the results of testing the hypotheses developed in Chapter 7. The results evidence that regardless of the perceived benefits to be enjoyed from the use of CAATs in Jordan, the actual use of CAATs remains low, supporting the suspicion of a gap in public expectations regarding how Jordanian auditors undertake their task.

Chapter 9

Discussion, Conclusions and Recommendations

9.1 Introduction

The objectives of the thesis have been to investigate the presence of an audit technology gap concerning the use of CAATs, insofar as reasonable expectations of the Jordanian investing public were not being met, to identify the specific computer assisted audit techniques utilized by Jordanian audit firms in performing their daily work, and to identify the level of Jordanian audit firms' awareness to the potential benefits of using CAATs. With a view to developing proper solutions to the problem of scant (or lack of) CAATs utilization, the major obstacles claimed to be discouraging the use of CAATs by Jordanian audit firms were investigated. The overall objective of the study has been to obtain evidence to enhance the adoption and use of the computerized audit techniques such as will align reasonable public expectations with the reality regarding the use of audit technology in Jordan.

To achieve those objectives and to collect the necessary data, a questionnaire was the primary instrument employed, respondents being the EDP audit managers (responsible for information technology auditing) in the Jordanian audit firms.

This chapter is organized into five sections. Limitations of the research are stated in 9.2, whilst Section 9.3 sets out suggestions for future investigation. Section 9.4 discusses the research findings. Recommendations of the thesis are declared in 9.5.

9.2 Caveats

The sample in this study is small. The EDP managers selected were from only the audit firms undertaking the audit of publicly listed companies in Jordan - the large capital companies reasonably expected to invest in computerized accounting systems. The study has investigated the use of CAATs by twenty six (26) audit firms, and thus the findings may have limited generalisability to Jordan's smaller audit firms.

Second, the EDP audit manager respondents' views were taken to be representative of the entire audit firm opinion. That may not universally be justified in respect of EDP audit staff at different managerial levels.

9.3 Future Research

The results of this study suggest several areas for future research. First, the threats to their generalisability could be ameliorated through studies replicating this research using samples drawn from the entire population of Jordanian audit firms, and by expanding the participants to include more levels of EDP audit staff.

Second, the thesis findings show that perceived benefits of CAATs influence the level of CAATs usage. Future research is needed to explore the best ways to maximize awareness of CAATs. Knowledge of these mechanisms and the extent to which they affect the perceived benefits of CAATs, should be useful for evaluating and developing training strategies and implementing policies.

Third, as the thesis reports no significant difference between the audit firms with, and those without, an affiliation with the big international accounting firm regarding the use

of CAATs, future research in other developing countries is required to confirm or refute these findings and to further test their generalisability.

Future research is also required to investigate whether clients' characteristics affect the particular CAATs used. That may disclose more information about the range, type, and extent of CAATs used on audit engagements.

9.4 Survey Findings

9.4.1 Demographic Data Results Discussion

The results obtained from analyzing demographic data described in the following paragraphs revealed:

- The percentage of males participating in the questionnaire was (95.2%), the majority (66.7%) of whom were under 40, is indicative that the Jordanian auditing is male dominated.
- 71.5% of the EDP audit managers having more than 5 years experience in EDP auditing.
- 66.7% of the EDP audit managers graduated from foreign universities, with (71.4%) of the EDP audit managers' holding a degree in accounting.

9.4.2 A Catalogue of Confusing Inconsistencies - The Use and Awareness of the Potential Benefits of, and the Obstacles Constraining the Utilization of CAATs

Although this study reveals Jordanian auditors' general awareness of the benefits from using CAATs, little expectation of their use delivering a competitive edge, and the scant usage of them, they nonetheless appear to entertain the view that CAATs ought to be part of normal audit processes.

Survey data reveal that CAATs were under utilized by the Jordanian audit firms. Table 9.1 presents the mean ranking for all the 16 surveyed CAATs; the average usage was low, indicating that Jordanian audit firms utilize these techniques less than sometimes on average. The findings suggest that Test Data was the preferred technique to perform the assessment of application internal control, while Utility Programs were the preferred technique to perform the substantive testing. But, the Table further indicates that Reprocessing, Parallel Simulation, Generalized Audit Software, Base Case System Evaluation, Snapshot, Integrated Test Facility, Custom Design Software, Audit Hooks, Source Code Comparison, Embedded Audit Module, and System Control Audit Review File were rarely used. This finding contrasts with the SRI (1977) study findings that the majority of the above techniques have good potential. In the circumstances it is plausible to anticipate that some obstacles could inhibit auditors in Jordan utilizing these techniques.

Table 9.1: Ranking CAATs According to the Usage Mean

<i>CAATs</i>	<i>Mean Scores</i>
Test Data Technique	3.19
Utility Programs Technique	2.76
Tracing Technique	2.71
Mapping Technique	2.57
Flow Charting Program Technique	2.57
Reprocessing Technique	2.48
Parallel Simulation Technique	2.43
Generalized Audit Software Technique	2.43
Base Case System Evaluation Technique	2.38
Snapshot Technique	2.29
Integrated Test Facility Technique	2.24
Custom Design Software Technique	2.24
Audit Hooks Technique	2.19
Source Code Comparison Technique	2.14
Embedded Audit Module Technique	2.14
System Control Audit Review File Technique	2.14

Table 9.2 shows approximately 50% -70% of EDP respondents reporting that they never utilize 13 of the techniques. This is surprising bearing in mind that each of the surveyed techniques has been widely cited in the professional literature, and discussed in auditing textbooks for more than three decades. Interestingly, four of the least used techniques - System Control Audit Review File technique, Embedded Audit Module technique, Audit Hooks technique, and Snapshot technique- are all *embedded modules*, considered essential audit tools to audit on-line processing accounting information systems of the kind used by many Jordanian companies (SRI, 1977; Rittenberg and Schwieger, 1997). According to (SRI, 1977), (Vasarhelyi and Lin, 1988), and (Warren, Edelson and Parker, 1994), these techniques are associated with high technical skills and high maintenance cost, factors that possibly have affected their usage by Jordanian audit firms.

Table 9.2: Ranking CAATs According to the Percentage of EDP Auditors Not Using Each CAAT

<i>CAATs</i>	<i>Auditors not using the technique (%)</i>
System Control Audit Review File Technique	71.5
Embedded Audit Module Technique	66.7
Audit Hooks Technique	66.7
Integrated Test Facility Technique	62.0
Snapshot Technique	61.9
Source Code Comparison Technique	61.9
Custom Design Software Technique	61.9
Generalized Audit Software Technique	57.2
Base Case System Evaluation Technique	52.3
Reprocessing Technique	52.3
Parallel Simulation Technique	47.7
Utility Programs Technique	47.7
Mapping Technique	47.6
Flow Charting Program Technique	42.9
Tracing Technique	33.3
Test Data Technique	23.9

Contrasting these findings with the prior studies, it is to be noted that the IIA (2004) survey found that 86% of the surveyed organizations using the generalized audit software. Lovata (1990) similarly found generalized audit software the most frequently used, followed by flow-charting and custom design program. Likewise earlier, though sometimes in respect of differing packages, had, Garsombke and Tabor (1986), Tobison and Davis (1981), and SRI (1977). But it is noticeable that, as cited in those previous studies, generalized audit software was the most frequently used tool to perform substantive testing. But, Table 9.1 shows that generalized audit software was rarely used by Jordanian audit firms. That suggests that, contrary to what might be taken to be *best practice*, at least as it accords with the *most common* of western practices, Jordanian audit firms depend on the utility software to perform their substantive tests. The average use of the utility software was 2.76, close to *sometimes* on the likert scale. One possible reason for the use of utility software could be, as Castner, Ferguson and O'Keefe (2001) argue, that it is less expensive than the other specialized audit software and can be used in all a client's business areas.

That outcome also conflicts with the respondents indicating their awareness of the benefits of using CAATs - ranking savings in the time to achieve the overall audit (compared to that for manual auditing) the highest, followed closely by saving auditors' effort, enhancing the auditing precision, improving the quality of the audit work, and enhancing the auditor productivity, (Table 9.3). A possible explanation for those rankings could be the large number of financial statements required from public companies in different commercial sectors placing pressure on auditors for a timely completion of audits, so that client companies could issue their financial statements within the legal time limits for publication, (sect., 3.7.5).

The Table further presents that the least perceived benefits were assisting the auditing firms to obtain more clients, providing auditors with powerful audit tools to detect frauds, enhancing stakeholders' trust in the auditors, and helping clients distinguish the most skilled auditors.

Table 9.3: Ranking the Perceived Benefits According to Mean Responses

<i>Benefits of the use of Computer Assisted Audit Techniques (CAATs)</i>	<i>Mean</i>
Saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing	4.43
Saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing	4.14
Leads to more accurate and precise auditing	4.05
Accelerates the overall audit process leading to issue the financial statements in less time.	3.95
Improves the quality of the overall audit work	3.95
Improves auditor productivity.	3.95
Allows the auditor to concentrate on the client's highest audit risk areas	3.90
Is an essential aspect of any audit work	3.90
Increases the auditor's credibility	3.86
Improves the overall efficiency of the audit firm	3.81
Injects the overall audit process with the auditor's self-confidence	3.71
Improves decision- making in the different stages of the overall audit process	3.67
Reduces the overall audit costs	3.62
Improves the quality of the audit clients' financial reporting	3.62
Facilitates the process of detecting financial errors	3.57
Helps clients distinguish the most skilled auditors	3.29
Enhances stakeholders' trust in the auditors	3.24
Provides auditors with powerful audit tools to detect frauds	3.14
Assists the auditing firms to obtain more clients.	3.14

That the quality of the audit work was ranked here the fifth of the perceived benefit contrasts with the Manson, McCartney, Sherer and Wallace (1998) study of UK and US audit firms where *audit quality enhancement* was the highest ranked benefit from introducing the techniques. Jordanian perceptions were obviously a mixed-bag: for the

result shows that whereas audit firms in Jordanian positively perceived that the use of CAATs assist them in detecting financial errors, they were negatively perceived in respect of detecting financial statement fraud - a result inconsistent with Coderre (2000), Brazina and Leauby (2004), Wallace (2002), and IIA (2004).

In that context it is not surprising that respondents were less than confident that CAATs could deliver them any competitive edge, with statements to the effect that 'the use of CAATs helps clients distinguished the most skilled auditors' and 'the use of CAATs assist auditing firms to obtain more clients' ranking amongst the least perceived benefits. This is inconsistent with Manson et al. (1998) and CICA (1994). Perhaps that outcome can be explained on the grounds that whereas in the case of high competition amongst audit firms, each tends to utilize innovations to extract a competitive edge. In contrast, in a Jordan characterized by the lack of audit competition, little is to be gained, benefits would likely be minimal. Nonetheless, consistent with Warren, Edelson and Parker (1994), but inconsistent with the results regarding benefits and competitive advantages, Jordanian audit firms appear to consider that the use of CAATs should become an essential part of the audit procedure.

In summary, Jordanian audit firms are consistent with the previous studies in perceiving that the use of CAATs can enhancing enhance the audit quality (Manson et al., 1998); enhancing enhance the accuracy of the audit (Wallace, 2002); reduce the audit time and speed the auditing process (Banker, Chang and Kao., 2002; Wallace, 2002); assist auditors to detect errors and facilitate the concentration on the clients highest audit risk areas (Banker et al., 2002; Wallace, 2002); increase the auditor productivity and self confidence (Castner et al., 2001; Banker et al., 2002); and finally, lower the overall audit cost (Manson et al., 1998; Wallace, 2002). However, inconsistent with CICA

(1994); and Manson et al., (1998) Jordanian audit firms are less confident that CAATs will grant them a competitive edge.

Against that array of inconsistent responses, obstacles might loom to be the main reason why CAATs are generally not used. To that end the low fees (consistent with Almaleky, 2000) for the audit of public companies in Jordan ranks the highest perceived constraint followed by the lack of technical audit training courses addressing CAATs, the small size of the Jordanian audit firms, and the high cost of CAATs, with lower ranking for hostility to changes from manual to computerized auditing, and the difficulty in using CAATs (Table 9.4). Thus, it seems that Jordanian audit firms consider a large investment in contemporaneous audit techniques is not justified. But, as audit firms perceived the small size of Jordanian audit firms, and the high cost of the CAATs as the third and fourth largest obstacles consecutively, it might be expected that as the above three obstacles jointly diminish, the financial capacity of Jordanian audit firms to acquire the auditing techniques will increase and they will turn to them. But that is also possibly a catch-22 situation. For, those obstacles are mostly a function of size – were the audit market to increase, new entrants might be expected to the profession; were fees to increase because the growth in the audit market outstripped entrants to the profession – auditors would not be encouraged to improve their techniques; in any event, competition would eventually emerge (from new entrants to the profession or growth in those already in it and lower fees offered to win market share) and possibly hold fees down, Arguably, the scenarios are not encouraging in the absence of an altruistic drive to greater professionalism motivating the use of CAATs.

Table 9.4: Ranking the Obstacles Constraining Jordanian Audit Firms' Use of CAATs

<i>Obstacles to using CAATs</i>	<i>Mean</i>
The low fees for the audit of public companies in Jordan	1.76
The lack of technical audit training courses related to the CAATs	1.81
The small size of the Jordanian audit firms	1.86
The high cost of CAATs	1.90
The lack of encouragement and support by the Jordanian auditing professional bodies and the government	2.10
The lack of the information technology skills needed to use CAATs	2.14
Unfamiliarity with CAATs	2.19
The accounting and auditing curricula at Jordanian universities do not include courses in electronic data processing auditing	2.29
The lack of laws and regulations regulating the use of CAATs by auditing firms	2.29
The use of manual accounting information systems by the Jordanian public companies	2.38
The difficulty in using CAATs	2.90
The resistance inside Jordanian audit firms to change from manual auditing to computerized auditing.	3.10
The lack of competition between Jordanian audit firms to obtain clients	3.29

Interestingly, 'enhancing professionalism' is a potential *sleeping* factor. A lack of professional drive and non-imperative corporate laws and regulations regarding the use of CAATs (items 5 and 9 in Table 9.4) ranked highly as perceived obstacles. This is consistent with the literature reviewed in chapter 3 regarding the auditing profession in Jordan, exposing its auditing laws and the auditing professional bodies failing to regulate the use of CAATs or even requiring their use when auditing in computerized environments.

Clearly, IT-skilling has a low priority in Jordan. This is reflected by the lack of technical audit training courses addressing CAATs, which was ranked the second largest obstacle. One possible explanation could be Jordanian accountancy schools' curricula not including specialized data processing courses (Chapter 3). The Jordanian

education/university-related obstacles are also consistent with the literature review in (chapter 3, sect., 3.8) and Siam (1999) and Tabari (2000).

9.4.3 The Hypotheses

The hypothesis testing revealed the computer assisted audit techniques *under-used* by audit firms in Jordan, and that there was likely a gap in the reasonable expectations of the extent to which the Jordanian audit firms use CAATs in their daily audit procedures (H1). That non-usage would be less in respect of those firms with international auditor affiliations than those without was not supported. H2 was rejected. This result was strange in comparison with the previous studies and with the anticipated result. First, it is inconsistent with what would be the reasonable expectation of the audited financial statements users - that the internationally affiliated audit firms would be motivated and would use the same cutting-edge technology in their work on local companies as applied by their international partners in their home countries. Whereas they may have been 'more motivated', they clearly were not sufficiently motivated to have set aside any perceived obstacles to do so. Second, the result is also inconsistent with Naser et al. (2002) who confirmed that the affiliated audit firms in Jordan are sensitive in respect of the protection of their audit quality and credibility; with Al-Omari, Jahmani and Salimi (1999), Naser and Al-Khatib (2000) who claimed that Jordanian audit firms with an international affiliation are more supported (by experts from their international affiliates) than are the smaller local firms without an affiliation; with Wallace, Naser and Mora (1994) proposing that bigger accounting firms are "backed by the expertise of the international firms to which they are affiliated"; with Balvers, McDonald and Miller (1988) who had revealed that the big audit firms in the USA possess technological advantages over their competitors; with Castner et al.(2001) who confirmed that the big

5 and second tier firms in Australia tend to use a greater variety of software and to a greater extent than small firms; and finally with the several studies that noted companies tending to appoint large audit firms, in order to take advantage of available economies from specialized audit technology (Francis and Simon, 1987; Johnson and Lys, 1990). Thus, this result contests the significance of *international affiliation* in the developing countries and could be explained on the ground that audit firms in Jordan may tend to negotiate an international affiliation merely to connect its name to that of a big-name auditor without an arrangement for the predictable technology transfer.

In contrast, the results suggest that there was a positive conscious perception by Jordanian audit firms of the potential benefits from using CAATs, (H3). Thus, EDP audit managers in Jordan perceived the potential benefits of CAATs, an outcome possibly explained by Jordanian auditors being younger, well educated generally with an accounting degree, and the ability to read and write in English enhancing their familiarity with international literature addressing contemporaneous audit technologies.

A posited association between the awareness of the benefits to be derived from the use of CAATs and the level of their usage by Jordanian audit firms (H4) was supported. In general, the result here implies that the awareness of the CAATs benefits influences the level of their use by Jordanian audit firms. This result supports the overall motivations for the study - to enhance the adoption and use of computerized audit techniques, provide a better understanding of perceived obstacles to their use, and in turn narrow the audit technology gap in Jordan by surveying and synthesizing CAATs-usage related literature; and that by explaining their importance to, and illustrating their potential benefits in, auditors' daily work, this study will familiarize Jordanian Audit firms with the different CAATs used worldwide.

The obstacles thought to drive the low usage of the CAATs by audit firms in Jordan were addressed in H5, H5_a, H5_b, H5_c, and H5_d. The findings indicate that four different obstacles aggregate to play a vital role in discouraging the audit firms in Jordan using cutting-edge techniques - the current state of auditing education and training obstacles, perceived technical and financial obstacles, inept professional bodies and commercial laws related obstacles, and auditing market environment related obstacles.

This research shows that the low level of computer assisted audit techniques usage by audit firms in Jordan supports the suspicion of an audit technology gap between what the users of audited financial statements might reasonably expect underpins auditors' reports and the extent to which the Jordanian audit firms actually use the expected contemporaneous technologies. As a consequence Jordanian audit firms, in general, are technically inadequate for undertaking effective audits of the public companies-with computerized accounting information systems. In this context, there is a serious potential for the users of the financial statements of publicly listed companies to be misled, regarding both the reliability they attribute to the financial statements and the means by which auditors determine it. In Jordan, the credibility of the financial statements is increased if they are audited by firms with an international affiliation (Al-Omari et al., 1999). The findings of this study imply that increased credibility on that score is contestable, for where it is expected that the affiliated audit firms are more likely to be exposed to latest audit techniques – for the most part they are not!.

That contestability is even greater bearing in mind that Jordanian audit firms have indicated their cognizance of the importance and benefits of using CAATs. Accordingly, they might be expected to be motivated to use them. They do not! They

emerge overwhelmed by the perception of substantial obstacles discouraging them doing so.

Finally, the presence of an audit technology gap in the Jordanian audit market adversely affects one of the main pillars of Jordanian corporate governance - the protection expected from a competent audit profession employing cutting-edge technology. Hayashi et al. (2003) have identified weak corporate governance the obstruction confronting foreign investors and the flow of international capital into the Jordanian economy.

9.5 Recommendations of the Study

Several self-explanatory recommendations flow from the primary implication of this study – *that Jordan's audit profession is not meeting the professional standards reasonably expected of it.*

First, as the major regulator of the practice of accounting and auditing in Jordan (sect., 3.6), the Jordanian Government must encourage auditors to utilize the state-of-the-art audit techniques through the following: (i) introducing CAATs-related regulations requiring their compulsory use in the appropriate settings; and compatible guidelines to regulate all issues related to the computerized techniques - such as when to use the techniques, planning for the use of CAATs, and specifying the skills required by auditors employing CAATs, and (ii) as the cost of CAATs' implementation was identified amongst the strongest constraints to their use, the Jordanian Government should also facilitate the acquisition of the cutting-edge techniques and audit software by audit firms in Jordan through fiscal mechanisms - for example, exempting the

purchase of CAATs technology and other auditing software from any taxes, customs and other imposts.

Second, as the thesis results show that auditing education was failing regarding the inculcation of computerized auditing skills, cooperation and coordination should be increased between the accounting schools at Jordanian Universities and the professional auditing bodies in Jordan to overcome the gap between the technology that is used worldwide and what is taught at the Jordanian universities. Therefore: (i) accounting and auditing curricula in the accounting schools at Jordanian universities should include courses in electronic data processing auditing, (ii) the accounting and auditing curricula should include *a specialized audit laboratory* for training in the use of the audit packages or other computerized audit techniques.

Third, the *high council* of accounting and auditing in Jordan and the Jordanian Association of Certified Public Accountant (JACPA), as the major auditing professional bodies in Jordan, should play a vital role in the enhancement of CAATs adoption by: (i) organizing EDP auditing training courses that enhance auditors familiarity with CAATs, and generally raise the information technology skills of auditors, (ii) encouraging auditors to utilize cutting-edge audit techniques by enhancing their awareness to the efficiency and effectiveness of CAATs: (iii) monitoring the compliance of the audit firms with the International Standards on Auditing regarding the auditing in computerized environments; (iv) considering the use of CAATs a major audit quality control criterion: and (v) including the examination of CAATs-related issues in the audit examination held as a prerequisite for practicing auditing in Jordan.

Fourth, with a view to obtaining high quality audit services supported by the state-of-the-art techniques, Jordan's public companies should take the initiative to raise audit

fees to a level that enables audit firms to fund their employees' training in appropriate state-of-the-art audit techniques.

Fifth, Jordanian audit firms should give CAATs usage high priority and should require EDP auditors to attend advanced IT training courses. Moreover, funding training courses should be a major item in the audit firms' yearly budget.

Sixth, international accounting firms operating in Jordan should be required to maintain the same quality through their international partners, and be required to support their partners in developing countries with the necessary information technology skills, training, and techniques.

As the International Standards on Auditing entail independent auditors to consider the procedures performed by internal auditors (IAASB, 2007), which in turn affect the nature, timing, and extent of independent auditors procedures (sect., 5.2.2), future research could usefully investigate the use of CAATs by the internal auditors of Jordanian public companies. Were it that the internal auditors utilize CAATs, there is the potential for a further gap between external auditors' understanding of the client's internal control procedures and those actually in place, entailing a potential breach of the international standards on auditing - to be closed or narrowed immediately.

9.6 Peroration

This study has enquired into the circumstances in which audit practices in Jordan do not accord with either the techniques likely necessary for undertaking the effective professional audits of public companies using computerized accounting systems or the technology in common usage in the western world. This is inconsistent with the current international focus on *audit* as a critical corporate governance mechanism. Curiously,

affiliation with international audit firms does not appear to have injected Jordan's audit profession with the expected and necessary elements of maturation. To the extent that this outcome is the consequence of the Jordanian audit profession not being proactive, it will have contributed to its own relative immaturity. To the extent that the international firms have not actively promoted the use of CAATs by their Jordan based affiliates, they might be considered to have done a considerable disservice to Jordan's commercial sector, and contributed to the professional immaturity of its auditing profession.

Bibliography of the Works Cited

Auditing and Assurance Standards Board (AuASB) (1995) *Auditing and Assurance Standard AUS 214: Auditing in a CIS Environment*, AuASB, Australian Accounting Research Foundation, Melbourne.

Auditing and Assurance Standards Board (AuASB) (2001) *Auditing Guidance Statement AGS 1060: Computer Assisted Audit Techniques*, AuASB, Australian Accounting Research Foundation, Melbourne.

Auditing and Assurance Standards Board (AuASB) (2002a) *Auditing and Assurance Standard AUS 202: Objective and General Principles Governing an Audit of a Financial Report*, AuASB, Australian Accounting Research Foundation, Melbourne.

Auditing and Assurance Standards Board (AuASB) (2002b) *Auditing and Assurance Standard AUS 206: Quality Control for Audit Work*, Australian Auditing and Assurance Standards Board, AuASB, Australian Research Foundation, Melbourne.

Abdel-khalik, A. R., Snowball, D. and Wragge, J. H. (1983) "The Effect of Certain Internal Audit Variables on the Planning of External Audit Programs", *The Accounting Review*, 58, 2, pp. 215-227.

Association of Certified Fraud Examiners (ACFE) (2002) Report to the Nation on Occupational Fraud and Abuse, *Association of Certified Fraud Examiners News and Facts 2002*, ACFE, Austin, Texas.

Adams, K., Grose, R. and Lesson, D. (2004) *Internal Controls and Corporate Governance*, 2nd ed., Pearson Education, Frenchs Forest, Sydney, N.S.W.

American Institute of Certified Public Accountants (AICPA) (1972) *Statements on Auditing Standards SAS No. 1, section AU.210.01: Training and Proficiency of the Independent Auditor*, AICPA, New York.

American Institute of Certified Public Accountants (AICPA) (1978) *Commission on Auditors' Responsibilities (Cohen Commission): Report, Conclusions and Recommendations*, AICPA, New York.

American Institute of Certified Public Accountants (AICPA) (1984) *Statements on Auditing Standards No 48: The Effect of Computer Processing on the Examination of Financial Statements*, AICPA, New York.

American Institute of Certified Public Accountants (AICPA) (1994) *Auditing Procedure Study: Auditing with Computers*, AICPA, New York.

American Institute of Certified Public Accountants (AICPA) (2001) *Statements on Auditing Standards No 94: The Effect of Information Technology on the Auditor's Consideration of Internal Control in a Financial Statement Audit*, AICPA, New York.

Al-Ashi, M. M. (1991) "An Analysis of Small Business Management Training Needs in Jordan", Ph.D. Thesis, University of Wales, Cardiff.

Al-Dahan, O. and Makamrah, M. (1990) "Impact of Computer Use on Work Activities of Banks in Jordan: Analytical Study", *Derassat, Business Administration, University of Jordan*, 17 A, 1, pp. 166-186 (in Arabic).

Al-Mekbel. (2004) "The Auditing Profession in Jordan during the Last Forty Years", *Al-Mudaqqaq (published by JACPA)*, 58, pp. 16-20 (in Arabic).

Al-Omari, A. M., Jahmani, Y. F. and Salimi, A. Y. (1999) "Perceptions of Accounting Information Users about the Type of Audit Firm: The Case of Jordan", *International Journal of Commerce and Management*, 9, 1/2, pp. 20-35.

Al-Rai, Z. K. and Dahmash, N. (1998) "The Effect of Applying International Accounting and Auditing Standards to the Accounting Profession in Jordan", *Advances in International Accounting*, Supplement 1, pp. 179-193.

Al-Shammari, M. and Al-Shaikh, F. N. (1993) "Computer Utilization in Jordanian Industrial Companies", *International Journal of Information Management*, 13, 6, pp. 413-423.

Almaleky, A. (2000) "Auditing, New Responsibilities in the New Age", *Al-Mudaqqaq (published by JACPA)*, 41, pp. 6-7 (In Arabic).

Arens, A. A. and Loebbecke, J. K. (2000) *Auditing an Integrated Approach*, 8th ed., Prentice Hall, Upper Saddle River, NJ.

Amman Stock Exchange (ASE) (2004) *Companies Guide*, ASE, Amman, Jordan.

Amman Stock Exchange (ASE) (2005a) *Annual Report*, ASE, Amman, Jordan.

Amman Stock Exchange (ASE) (2005b) *Companies Guide*, ASE, Amman, Jordan.

Amman Stock Exchange (ASE) (2006) *Monthly Statistical Bulletin, January 2006*, ASE, Amman, Jordan.

- Ayyoub, T. (2002) "King Abdullah Satisfied with CBJ Measures in Addressing Loans Case", *Jordan Times*, February 18.
- Bakshi, S. (2001) Computer Assisted Audit Tools and Techniques (CAATs), in *IT Conference*. Pune, India, pp. 1-12.
- Balvers, R. J., McDonald, B. and Miller, R. E. (1988) "Underpricing of New Issues and the Choice of Auditor as a Signal of Investment Banker Reputation", *The Accounting Review*, 63, 4, pp. 605-622.
- Banker, R. D., Chang, H. and Kao, Y. (2002) "Impact of Information Technology on Public Accounting Firm Productivity", *Journal of Information Systems*, 16, 2, pp. 209-223.
- Banks Law (2000) "Law No. 28 for the Year 2000", published in the *Jordanian Official Gazette No. 4448*, page 2950, Amman, Jordan.
- Beck, G. W. (1973) "The Role of the Auditor in Modern Society: An Empirical Appraisal", *Accounting and Business Research*, Spring, pp. 117-122.
- Berg, A. and Nenova, T. (2004) *Report on the Observance of Standards and Codes Corporate Governance Country Assessment - Jordan*, Investment Climate Unit (CICIC) of the World Bank, Washington, DC.
- Best, P. J., Buckby, S. and Tan, C. (2001) "Evidence of the Audit Expectation Gap in Singapore", *Managerial Auditing Journal*, 16, 3, pp. 134 - 144.
- Bierstaker, J. L., Burnaby, P. and Thibodeau, J. (2001) "The Impact of Information Technology on the Audit Process: An Assessment of the State of the Art and Implications for the Future", *Managerial Auditing Journal*, 16, 3, pp. 159-164.
- Bodnar, G. H. (2000) "CAATS at the Millennium", *The Internal Auditor*, 15, 1, pp. 3-8.
- Bondar, G. H. and Hopwood, W. S. (2004) *Accounting Information Systems*, 9th ed., Pearson Prentice Hall, Upper Saddle River, N.J.
- Boritz, J. E. (1999) "The Accounting Curriculum and IT", *Working Paper*, School of Accountancy, University of Waterloo, Waterloo, Ontario.
- Boritz, J. E. (2002) Information Systems Assurance, In *Researching Accounting as an Information Systems Discipline*, (Eds. Arnold, V. and Sutton, S. G.), American Accounting Association, Sarasota, Florida, pp. 231-256.
- Boynton, W. C. and Johnson, R. N. (2005) *Modern Auditing: Assurance Services and the Integrity of Financial Reporting*, 8th ed., John Wiley, Hoboken, NJ.

- Braun, R. L. and Davis, H. E. (2003) "Computer-Assisted Audit Tools and Techniques: Analysis and Perspectives", *Managerial Auditing Journal*, 18, 9, pp. 725-731.
- Brazina, P. R. and Leauby, B. A. (2004) "To CAATTch a Thief: Use Technology to Fight Fraud", *Pennsylvania CPA Journal*, 75, 1, pp. 30-35.
- Cash, J. I., Baily, A. D. and Whinston, A. B. (1977) "A Survey of Techniques for Auditing EDP-Based Accounting Information Systems", *The Accounting Review*, 52, 4, pp. 813-832.
- Castner, G., Ferguson, C. and O'Keefe, T. (2001) "Use of Information Technology by Audit Firms: Research monograph", The University of Queensland and the Institute of Chartered Accountants in Australia, [Brisbane?], Queensland.
- Cavana, R. Y., Delahaye, B. L. and Sekaran, U. (2001) *Applied Business Research: Qualitative and Quantitative Methods*, John Wiley, Milton, Qld.
- Cerullo, M. V. and Cerullo, M. J. (2003) "Impact of SAS No. 94 on Computer Audit Technique", *Information Systems Control Journal*, 1, pp. 1-5.
- Canadian Institute of Chartered Accountants (CICA) (1994) *Application of Computer Assisted Audit Techniques Using Microcomputers*, CICA, Toronto.
- Clarke, F., Dean, G. and Oliver, K. (2003) *Corporate Collapse: Accounting, Regulatory and Ethical Failure*, 2nd ed., Cambridge: Cambridge University Press.
- Coderre, D. G. (2000) "Computer Assisted Fraud Detection", *The Internal Auditor*, 57, 4, pp. 25-27.
- Collis, J. and Hussy, R. (2003) *Business Research: A practical Guide for Undergraduate and Postgraduate Students*, 2nd ed., Palgrave Macmillan, New York.
- Companies Law (1997) "Law No. 22 for the Year 1997", published in the *Jordanian Official Gazette* No. 4204, page 2038, Amman, Jordan.
- Cooper, D. R. and Schindler, P. S. (2003) *Business Research Methods*, 8th ed., McGraw-Hill Irwin, New York.
- Cronbach, L. J. (1951) "Coefficient Alpha and the Internal Structure of Tests", *Psychometrika*, 16, pp. 297-334.
- Cushing, B. E. and Romney, M. B. (1994) *Accounting Information Systems*, 6th ed., Addison-Wesley, Reading, Mass.

Dascher, P., Fischetti, M., Giese, J. W., Kelley, R., McDonald, L., Schiff, F. and Zakin, N. (1974) "Including of EDP in an Undergraduate Auditing Curriculum: Some Possible Approaches", *The Accounting Review*, 49, 4, pp. 859-864.

Delaney, P. R. (1995) *Wiley CPA Examination Review*, Wiley, New York.

Dillman, D. A. (2000) *Mail and Internet Surveys: The Tailored Design Method*, 2nd ed., John Wiley, New York.

Dixon, R., Woodhead, A. D. and Sohliman, M. (2006) "An Investigation of the Expectation Gap in Egypt", *Managerial Auditing Journal*, 21, 3, pp. 293 - 302.

Department of Statistics (DOS) (2004) *Statistical Yearbook*, DOS, Amman, Jordan.

El-Issa, Y. A. M. (1984) "Financial Reporting Requirements and Practices in Jordan", MSc. Dissertation, University of Wales, UK.

El-Rajabi, M. T. A. and Gunasekaran, A. (2004) "Audit Professional Examination in Emerging Economy Jordan", *Managerial Auditing Journal*, 19, 8, pp. 1033 - 1047.

Elliott, R. K. and Jacobson, P. D. (1987) "Audit Technology: A Heritage and a Promise", *Journal of Accountancy*, 163, 5, pp. 198-218.

Engle, T. J. (1999) "Managing External Auditor Relationships", *The Internal Auditor*, 56, 4, pp. 65-71.

Francis, J. R. and Simon, D. T. (1987) "A Test of Audit Pricing in the Small-Client Segment of the U.S. Audit Market", *The Accounting Review*, 62, 1, pp. 145-157.

Frank, K. E., Lowe, D. J. and Smith, J. K. (2001) "The Expectation Gap: Perceptual Differences between Auditors, Jurors and Students", *Managerial Auditing Journal*, 16, 3, pp. 145 - 150.

Garsombke, H. P. and Tabor, R. H. (1986) "Factors Explaining the Use of EDP Audit Techniques", *Journal of Information Systems*, 1, 1, pp. 48-66.

Gay, G. E. and Schelluch, P. (1993) "The Impact of the Long-Form Audit Report on Users' Perceptions of the Auditor's Role", *Australian Accounting Review*, 3, 2, pp. 1-11.

Ghauri, P. N. and Gronhaug, K. (2005) *Research Methods in Business Studies: A Practical Guide*, 3rd ed., Prentice Hall, Harlow, England.

- Gill, G. S. and Cosserat, G. W. P. (1996) *Modern Auditing in Australia*, 4th ed., John Wiley and Sons, Brisbane, Qld.
- Glover, S. M., Prawitt, D. and Romney, M. B. (2000) "The Software Scene", *The Internal Auditor*, 57, 4, pp. 49-57.
- Goldsmith, J. (1999) "Using Audit Tools - Part 1, Audit Software Packages", *IT Audit Journal*, 2, pp. 1-4.
- Goossens, B. and Schouten, N. (1981) "Using the Computer for Audit", *Information and Management*, 4, 1, pp. 3-10.
- Gramling, A. A., Schatzberg, J. W. and Wallace, W. A. (1996) "The Role of Undergraduate Auditing Coursework in Reducing the Expectation Gap", *Issues in Accounting Education*, 11, 1, pp. 131-161.
- Haddad, H. (2003) "Al-Chalabi and the Law of Economic Crimes", *Addustour Newspaper*, 22 April.
- Hagg, S., Cummings, M. and McCubbrey, D. J. (1999) *Management Information Systems for the Information Age*, 2nd ed., McGraw Hill, New York.
- Hair, J. F., Babin, B., Money, A. H. and Samouel, P. (2003) *Essentials of Business Research Methods*, John Wiley, New York.
- Hall, J. A. (2001) *Accounting Information Systems*, 3rd ed., South-Western College, Cincinnati, Ohio.
- Hall, J. A. and Singleton, T. (2005) *Information Technology Auditing and Assurance*, 2nd ed., Thomson/South-Western, Mason, Ohio.
- Hansen, J. V. and Hill, N. C. (1989) "Control and Audit of Electronic Data Interchange", *MIS Quarterly*, 13, 4, pp. 403-413.
- Hayashi, Y., Mouashe, Y. and Thomas, W. (2003) *Analysis of Investment Opportunities in Jordan's Financial Services Sector*, Center for Information Technology and the Global Economy, American University, Washington, D.C.
- Hells, S. A. S. (1992) "The Evolution of Accounting in Developing Countries: the Study of Jordan", Ph.D Thesis, University of Hull, Hull, UK.
- Helms, G. L. (2002) "Traditional and Emerging Methods of Electronic Assurance", *The CPA Journal*, 72, 3, pp. 26-31.

Hoogvelt, A. M. (1997) *Globalization and the Postcolonial World: The New Political Economy of Development*, 2nd ed., Macmillan, Basingstoke, U.K.

Humphrey, C. (1997) Debating Audit Expectations, In *Current Issues in Auditing*, (Eds. Sherer, M. and Turley, S.) 3rd ed, Paul Chapman, London, pp. 3-30.

Humphrey, C., Moizer, P. and Turley, S. (1992) "The Audit Expectations Gap - plus ça change, plus c'est la même chose?", *Critical Perspectives on Accounting*, 3, 2, pp. 137-161.

Humphrey, C., Moizer, P. and Turley, S. (1993) "The Audit Expectation Gap in Britain: An Empirical Investigation", *Accounting and Business Research*, 23, 91A, pp. 359-411.

Hunton, J. E., Bryant, S. M. and Bagranoff, N. A. (2004) *Core Concepts of Information Technology Auditing*, John Wiley, Hoboken, NJ.

International Auditing and Assurance Standards Board (IAASB) (2004a) International Auditing Practice Statement IAPS 1009: Computer Assisted Audit Techniques, In *Handbook of International Auditing, Assurance, and Ethics Pronouncements*, IAASB, International Federation of Accountants (IFAC), New York, pp. 761-770.

International Auditing and Assurance Standards Board (IAASB) (2004b) International Standard on Auditing ISA 200: Objectives and General Principles Governing an Audit of Financial Statements, In *Handbook of International Auditing, Assurance, and Ethics Pronouncements*, IAASB, International Federation of Accountants (IFAC), New York, pp. 178-188.

International Auditing and Assurance Standards Board (IAASB) (2004c) International Standard on Auditing ISA 220: Quality Control for Audit Work, In *Handbook of International Auditing, Assurance, and Ethics Pronouncements*, IAASB, International Federation of Accountants (IFAC), New York, pp. 196-215.

International Auditing and Assurance Standards Board (IAASB) (2004d) International Standard on Auditing ISA 330: Auditor's Procedures in Response to Assessed Risks, In *Handbook of International Auditing, Assurance, and Ethics Pronouncements*, IAASB, International Federation of Accountants (IFAC), New York, pp. 335-356.

International Auditing and Assurance Standards Board (IAASB) (2007) International Standards on Auditing ISA 610: Considering the Work of Internal Audit, In *Handbook of International Auditing, Assurance, and Ethics Pronouncements*, IAASB, International Federation of Accountants (IFAC), New York, pp. 551-555.

International Accounting Education Standards Board (IAESB) (2003) *International Education Guideline IEG 11: Information Technology for Professional Accountants*, IAESB, New York.

The Institute of Internal Auditors (IIA) (2004) *10th Annual Software Survey*, IIA, Altamonte Springs, Florida.

Insurance Regulatory Law. (1999) "Law No. 33 for the Year 1999", published in the *Jordanian Official Gazette* page No. 4389, page 4271, Amman, Jordan.

Information Technology Association - Jordan (INTAJ) (2003) *ICT Industry Statistics Fiscal Year 2002*, INTAJ, Amman, Jordan.

Information Systems Audit and Control Association (ISACA) (1998) *Information Systems Auditing Guideline ISG 1: Use of Computer Assisted Audit Techniques (CAATs)*, ISACA, Rolling Meadows, Illinois.

Jackson, R. A. (2004) "Get the Most out of Audit Tools", *The Internal Auditor*, 61, 4, pp. 36-47.

Jaghoub, S. H. (1993) "The Pros and Cons of the Audit Profession in Jordan", *Al-Mudaqqaq* (published by JACPA), 21, pp. 15-15 (in Arabic).

Jordanian Association of Certified Public Accountants (JACPA) (1999) *The Auditor Guide*, JACPA, Amman, Jordan.

Johnson, W. B. and Lys, T. (1990) "The Market for Audit Services: Evidence from Voluntary Auditor Changes", *Journal of Accounting and Economics*, 12, pp. 281-308.

Jones, F. L. and Rama, D. V. (2006) *Accounting Information Systems: A Business Process Approach*, 2nd ed., Thomson South-Western, Toronto.

Kamla, R. (2004) "Critically Appreciating Social Accounting and Reporting in the Arab Middle East: A Postcolonial Perspective: Working Paper", University of Aberdeen Business School, Aberdeen, Scotland.

Kanter, H. A. (2001) "Systems Auditing in a Paperless Environment", *The Ohio CPA Journal*, 60, 1, pp. 43-47.

Kervin, J. B. (1992) *Methods for Business Research*, Harper Collins, New York.

Khaddash, H. and Siam, W. (2003) "The Extent of Auditors' Acceptance to the Use of Information Technology in Auditing", *Derassat, Business Administration, University of Jordan*, 30, 2, pp. 279-290 (in Arabic).

Kulchitsky, R. (2004) "Computerization, Knowledge, and Information Technology Initiatives in Jordan", *Administration and Society*, 36, 1, pp. 3-37.

Lanza, R. B. (1998) "Take My Manual Audit, Please", *Journal of Accountancy*, 185, 6, pp. 33-36.

Law of Organizing the Practice of the Public Accounting Profession. (2003) "Law No. 73 for the Year 2003", published in the *Jordanian Official Gazette No. 4606*, page 3292, Amman, Jordan.

Law of the Practice of the Auditing Profession. (1961) "Law No. 10 for the Year 1961", published in the *Jordanian Official Gazette No. 1539*, page 362, Amman, Jordan.

Law of the Practice of the Auditing Profession. (1985) "Law No. 32 for the Year 1985", published in the *Jordanian Official Gazette No. 3323*, page 870, Amman, Jordan.

Lee, M. M. (1988) "The Challenge of EDP Auditing", *Management Accounting*, 69, 9, pp. 52-53.

Lee, T. A. (1970) "The Nature of Auditing and its Objectives", *Accountancy*, 81, 920, pp. 292-296.

Leigh, D. and Whitaker, B. (2003) "Financial Scandal Claims Hang Over Leader in Waiting", *The Guardian*, 14 April, 2003. Accessed: 8 November 2006, http://www.guardian.co.uk/international/story/0,,936196,00.html#article_continue

Liang, D. L., Lin, F. and Wu, S. (2001) "Electronically Auditing EDP Systems with the Support of Emerging Information Technologies", *International Journal of Accounting Information Systems*, 2, 2, pp. 130-147.

Liggio, C. D. (1974) "The Expectation Gap: The Accountant's Waterloo", *Journal of Contemporary Business*, 3, Spring, pp. 27-44.

Loebbecke, J. K., Mullarkey, J. F. and Zuber, G. R. (1983) "Auditing in a computer Environment", *Journal of Accountancy*, 155, 1, pp. 68-78.

Lovata, L. M. (1988) "The Utilization of Generalized Audit Software", *Auditing: a Journal of Practice and Theory*, 8, 1, pp. 72-86.

Lovata, L. M. (1990) "Audit Technology and the use of Computer Assisted Audit Techniques", *Journal of Information Systems*, 4, 2, pp. 60-68.

Malhas, E., Attyeh, A., Khasseb, S. A., Saydem, M., Diab, A. and Hindawy, S. (2003) *To What Extent the Amman Commercial Companies use the Communication and Information Technology*, Studies and Training Administration, Amman Chamber of Commerce, Amman.

- Manson, S., McCartney, S., Sherer, M. and Wallace, W. A. (1998) "Audit Automation in the UK and the US: A Comparative Study", *International Journal of Auditing*, 2, 3, pp. 233-246.
- Manson, S., McCartney, S. and Sherer, M. (2001) "Audit Automation as Control within Audit Firms", *Accounting, Auditing and Accountability Journal*, 14, 1, pp. 109-130.
- Martin, J. (1998) "Dissecting the Books", *Management Review*, 87, 6, pp. 47-51.
- Matar, M. (1994) "The Approaches to Enhance the Accounting Profession in Jordan", *Al-Mudaqqaq (published by JACPA)*, 24, pp. 3-5 (in Arabic).
- Mayer, J. (2004) "The Manipulator", *The New Yorker*, 80, 15, p.58-.
- Mednick, R. (1986) "The Auditor's Role in Society: A new Approach to Solving the Perception Gap", *Journal of Accountancy*, 161, 2, pp. 70-74.
- Ministry of Higher Education (MoHE) (2004) *Public and Private Universities in Jordan* (online), Accessed: 12/May/2005, <http://www.mohe.gov.jod>.
- Ministry of Information and Communications Technology (MoICT) (2005) *Invest in ICT in Jordan*, MoICT, Amman, Jordan.
- Monroe, G. S. and Woodliff, D. R. (1993) "The Effect of Education on the Audit Expectation Gap", *Accounting and Finance*, 33, 1, pp. 61-78.
- Moscove, S. A., Simkin, M. G. and Bagranoff, N. A. (2003) *Core Concepts of Accounting Information Systems*, 8th ed., John Wiley, New York.
- Naser, K. (1998) "Comprehensiveness of Disclosure of Non-Financial Companies Listed on the Amman Financial Market", *International Journal of Commerce and Management*, 2, 8, pp. 88-119.
- Naser, K. and Al-Khatib, K. (2000) "Determinants of the Depth of Information Disclosure in the Board of Directors Statements of a Sample of Jordanian Listed Companies", *Advances in International Accounting*, 13, pp. 99-118.
- Naser, K., Al-Khatib, K. and Karbhari, Y. (2002) "Empirical Evidence on the Depth of Corporate Information Disclosure in Developing Countries: The Case of Jordan", *International Journal of Commerce and Management*, 12, 3and4, pp. 122-155.
- Nasser, Y. (1987) "Status and Capabilities of Management Information Systems in Jordan", *Royal Scientific Society Newsletter*, 15 August, pp. 3-6 (in Arabic).

- Nearon, B. H. (2005) "Foundations in Auditing and Digital Evidence", *The CPA Journal*, 75, 1, pp. 32-34.
- Neuman, W. L. (2003) *Social Research Methods: Qualitative and Quantitative Approaches*, 5th ed., Allyn and Bacon, New York.
- Nieschwietz, R., Pany, K. and Zhang, J. (2002) "Auditing with Technology: Using Generalized Audit Software in the Classroom", *Journal of Accounting Education*, 20, 4, pp. 307-329.
- O'Brien, J. A. (1999) *Management Information Systems: Managing Information Technology in the Internet worked Enterprise*, 4th ed., McGraw Hill, New York.
- Page, C. and Meyer, D. (2003) *Applied Research Design for Business and Management*, McGraw-Hill, Sydney, NSW.
- Perry, W. E. (1977) "Internal Auditing of DP", *Infosystems*, 24, 8, pp. 44-49.
- Perry, W. E. (1978) "Selecting Computer Audit Practices", *EDPACS: the EDP audit, control and security newsletter*, 5, 9, pp. 1-11.
- Pierce, B. and Kilcommins, M. (1996) "The Audit Expectations Gap: The Role of Auditing Education", *Business School Research Paper 1995-1996, No. 13*, Dublin City University, Dublin.
- Porter, B. (1993) "An Empirical Study of the Audit Expectation-Performance Gap", *Accounting and Business Research*, 24, 93, pp. 49-68.
- REACH. (2003) *Launching Jordan's Software and ICT Services An Updated Strategy and Action Plan For H.M. King Abdullah II*, September 2002, Amman, Jordan.
- Remenyi, D., Williams, B., Money, A. and Swartz, E. (1998) *Doing Research in Business and Management: An Introduction to Process and Method*, SAGE, London, England.
- Reneau, J. H. (1977) "Auditing in a Data Base Environment", *Journal of Accountancy*, 144, 6, pp. 59-65.
- Rezaee, Z., Sharbatoghlie, A., Elam, R. and McMickle, P. L. (2002) "Continuous Auditing: Building Automated Auditing Capability", *Auditing: A Journal of Practice and Theory*, 21, 1, pp. 147-163.
- Riccio, E. L. and Sakata, M. C. G. (2002) "Information Systems and Technology in Accounting Education: A Web-Based Study Comparing Portuguese and Brazilian Universities' Accounting Curricula: Working Paper", University of São Paulo, São Paulo.

- Rittenberg, L. E. and Davis, G. B. (1977) "The Roles of Internal and External Auditors in Auditing EDP Systems", *Journal of Accountancy*, 144, 6, pp. 51-58.
- Rittenberg, L. E. and Schwieger, B. J. (1997) *Auditing: Concepts for a Changing Environment*, 2nd ed., Harcourt Brace and Company, New York.
- Romney, M. B. and Steinbart, P. J. (2003) *Accounting Information Systems*, 9th ed., Prentice Hall, Upper Saddle River, NJ
- Rushinek, A. and Rushinek, S. F. (1984) "Auditing Accounting Systems Around, Through and With the Computer", *The Ohio CPA Journal*, Spring, pp. 73-77.
- Salierno, D. (2001) "Tools of the Trade", *The Internal Auditor*, 58, 4, pp. 32-42.
- Sayana, A., S. (2002) "Auditing General and Application Controls", *Information Systems Control Journal*, 5, pp. 1-3.
- Securities Law (1997) "Law No. 23 for the Year 1997", published in the *Jordanian Official Gazette No. 4204*, page 2185, Amman, Jordan.
- Securities Law (2002) "Law No. 76 for the Year 2002", published in the *Jordanian Official Gazette No. 4579*, page 6218, Amman, Jordan.
- Sekaran, U. (1999) *Research Methods for Business: A Skill-Building Approach*, 3rd ed., John Wiley, New York.
- Sekaran, U. (2003) *Research Methods for Business: A Skill-Building Approach*, 4th ed., John Wiley, New York.
- Sheskin, D. J. (2004) *Handbook of Parametric and Non-Parametric Statistical Procedures*, 3rd ed., Chapman and Hall/CRC, New York.
- Siam, W. (1999) "The Reality of Academic Qualification for the Jordanian Auditors", *Al-Mudaqqaq (published by JACPA)*, 40, pp. 12-13 (in Arabic).
- Singleton, T. (2006) "Generalized Audit Software: Effective and Efficient Tools for Today's IT Audits", *Information Systems Control Journal*, 2, pp. 1-3.
- Singleton, T. and Flesher, D. L. (2003) "A 25-Year Retrospective on The IIA'S SAC Projects", *Managerial Auditing Journal*, 18, 1, pp. 39-53.

Stanford Research Institute (SRI) (1977) "System Auditability and Control Study: Data Processing Audit Practice Report", Institute of Internal Auditors, Altamonte Spring, Florida.

Tabari, M. O. (2000) "Computerized Accounting in Jordan: Critical Analysis and Comparative Study of Applications for Teaching Accountancy Student", *Un-* Ph.D. Thesis, Liverpool John Moores University, Liverpool.

Taylor, D. H. and Glezen, G. W. (1997) *Auditing: An Assertions Approach*, 7th ed., John Wiley, New York.

Thnaibat, A. (2003) "Use and Usefulness of Information Technology in the Audit Process in Jordan", *Derassat, Business Administration, University of Jordan*, 30, 2, pp. 253-268 (in Arabic).

Tobison, G. L. and Davis, G. B. (1981) "Actual Use and Perceived Utility of EDP Auditing Techniques", *The EDP Auditor*, 1, Spring, pp. 1-22.

Trute, P. (2005) *Australia's Biggest Corporate Collapse*, News Digital Media Accessed: 5/November/2005, www.news.com.au/story/print/0,10119,12854437,00.html

Tucker, G. H. (2001) "IT and the Audit", *Journal of Accountancy*, 192, 3, pp. 41-43.

Vasarhelyi, M. A. and Lin, W. T. (1985) "EDP Auditing Instruction Using an Interactive Generalized Audit Software", *Journal of Accounting Education*, 3, 2, pp. 79-89.

Vasarhelyi, M. A. and Lin, T. W. (1988) *Advanced Auditing: Fundamentals of EDP and Statistical Audit Technology*, Addison-Wesley, Reading, Mass.

Wagner, J. W. (1969) "EDP and the Auditor of the 1970's", *The Accounting Review*, 44, 3, pp. 600-604.

Wallace, E. P. (2002) "The Influence of Technology on Auditing", *Pennsylvania CPA Journal*, 72, 4, pp. 36-39.

Wallace, R. S. O., Naser, K. and Mora, A. (1994) "The Relationship between the Comprehensiveness of Corporate Annual Reports and Firm Characteristics in Spain", *Accounting and Business Research*, 25, 97, pp. 41-53.

Warren, J. D., Edelson, L. W. and Parker, X. L. (1994) *Handbook of IT Auditing*, 3rd ed., Warren, Gorham and Lamont, Boston.

Watne, D. A. and Turney, P. B. B. (1990) *Auditing EDP systems*, Prentice-Hall, Englewood Cliffs, N.J.

Weber, R. (1999) *Information Systems Control and Audit*, Prentice Hall, Upper Saddle River, NJ.

Weber, R. A. (2004) *Information Systems Control and Audit*, Prentice Hall, Englewood Cliffs, New Jersey.

Weiss, I. R. (1980) "Auditability of Software: A Survey of Techniques and Cost", *MIS Quarterly*, 4, 4, pp. 39-50.

Wilkinson, J. W., Cerullo, M. J., Raval, V. and Wong-On-Wong, B. (2000) *Accounting Information Systems: Essential Concept and Application*, 4th ed., John Wiley, New York.

Yang, D. C. and Guan, L. (2004) "The Evolution of IT Auditing and Internal Control Standards in Financial Statement Audits: The Case of The United States", *Managerial Auditing Journal*, 19, 4, pp. 544-555.

Zikmund, W. G. (2003) *Business Research Methods*, 7th ed., Thomson/South-Western, Cincinnati, Ohio.

Appendix A

Survey Information Sheet (Sample)

University of Newcastle
Central Coast School of Business

<<Company>>

<<Address>>

<<City>> <<Postal Code>>

Jordan

Date.....

Dear [EDP Audit Manager],

I am Abdel Razaq Al-Farah, a Jordanian PhD candidate in Accounting at the University of Newcastle, Australia. As part of my PhD program, I am undertaking research into the usage of computer assisted audit techniques (CAATs) by Jordanian audit firms. This research is being undertaken under the supervision of Emeritus Professor Frank Clarke, from the Central Coast School of Business in the University of Newcastle.

The aim of the research is to investigate the usage of CAATs by Jordanian audit firms, and their awareness to the potential benefits of these techniques. Moreover it will shed light on the main obstacles constraining Jordanian audit firms to engage fully in the new computerized technology. Since your firm undertakes the audit of publicly listed companies on Amman Stock Exchange, you are invited to participate in this study. Your participation would be greatly appreciated.

Your participation in this study is voluntary and entirely your choice. That participation would entail your completion of a questionnaire (taking about 10 minutes) regarding your firm's usage of Computer Assisted Audit Techniques.

I would like to assure you that all information collected in the attached questionnaire will be used for the purposes of the research only, and will be kept strictly confidential. All raw data elicited from the questionnaire will be maintained until the thesis has been accepted. A verified electronic version of the data will be stored securely for a minimum of five (5) years. Thereafter hard-copy data will be shredded in accord with University protocols. Upon the completion of the study, the results of the questionnaire will be mailed to those invited to participate.

If you have any concerns or enquiries about the questionnaire, please do not hesitate to contact me or my supervisor on the following telephone numbers:

Mobile: + 61 2 0404553810
Fax: + 61 2 4348 4101
Mobile: + 962 796124753 (Jordan) or,
[E-mail: abdel.alfarah@studentmail.newcastle.edu.au](mailto:abdel.alfarah@studentmail.newcastle.edu.au)

Supervisor: Prof. Frank Clarke
Professor of Accounting
Tel: +6124348 4136
Fax: +6124348 4101

Yours sincerely
(Signed)

(Signed)

Ph.D student: Abdel Razaq Al-Farah

Supervisor: Professor Frank Clarke

-This project has been approved by the University's Human Research Ethics Committee, Approval No. H -140 – 1105.

* if you have any complaint concerning the manner in which a research is conducted it may be given to the researcher or if an independent person is preferred, to the University's Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, tel: +61 249216333, email Human-Ethics@newcastle.edu.au.

Appendix B

Questionnaire

The Use of Computer Assisted Audit Techniques by Audit Firms in Jordan

Dear [EDP Audit Manager]

I would appreciate it if you would spend a few minutes of your valuable time to complete the attached questionnaire and return it to the following address.

Abdel Razaq Al-Farah
Central Coast Campus, Business Offices
The University of Newcastle
P. O. Box 127
Ourimbah NSW 2258
Australia

Yours sincerely

(Signed)

Ph.D student: Abdel Razaq Al Farah

Part (1) Demographic Data

- Please circle the response that most closely corresponds to your evaluation of the question:

1- Your gender:

a- Male

b- Female

2- Your Age category:

a- 20 years or less

b- 21-30 years

c- 31-40 years

d- 41-50 years

e- 51 years or more

3- Your years of professional experience on Electronic Data Processing EDP Auditing:

a- 4 years or less

b- 5-9 years

c- 10-14 years

d- 15-19 years

e- 20 years and more

4- In which country did you get your last degree?

a- Jordan

b- Other Arab Country

c- Australia

d- USA

e- Uk

f- Other (Please Specify)

5- Your last degree study area:

a- Accounting

b- Business (other than accounting)

c- Information systems

d- Other (Please Specify)

Part (2): The use of Computer Assisted Audit Techniques

- Please indicate how often you use the following Computer Assisted Audit Techniques in your daily audit work (please tick the boxes):**

	<i>Computer Assisted Audit Techniques</i>	<i>Very Often</i>	<i>Often</i>	<i>Sometimes</i>	<i>Rarely</i>	<i>Never</i>
1	The Test Data					
2	Base Case System Evaluation (BCSE)					
3	Integrated Test Facility (ITF)					
4	Parallel Simulation (PS)					
5	Source Code Comparison					
6	Flow Charting Program					
7	Reprocessing					
8	Tracing					
9	Mapping					
10	Snapshot					
11	Embedded Audit Module (EAM)					
12	System Control Audit Review File (SCARF)					
13	Audit Hooks					
14	Generalized Audit Software (GAS)					
15	Utility Programs					
16	Custom Design Software					

Part (3): The Potential Benefits of Using CAATs

- Please indicate the extent to which you agree or disagree with each of the following statements (please tick the boxes):

	<i>Statements</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1	The use of Computer Assisted Audit Techniques leads to more accurate and precise auditing.					
2	The use of Computer Assisted Audit Techniques saves the time required to achieve the overall audit procedures compared to the time taken by manual auditing.					
3	The use of Computer Assisted Audit Techniques saves the effort required to achieve the overall audit procedures compared to the effort taken by manual auditing.					
4	The use of Computer Assisted Audit Techniques will accelerate the overall audit process leading to issue the financial statements in less time.					
5	The use of Computer Assisted Audit Techniques will reduce the overall audit costs.					
6	The use of Computer Assisted Audit Techniques will inject the overall audit process with the auditor's self-confidence.					
7	The use of Computer Assisted Audit Techniques will allow the auditor to concentrate on the client's highest audit risk areas.					

	<i>Statements</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
8	The use of Computer Assisted Audit Techniques will improve the quality of the overall audit work.					
9	The use of Computer Assisted Audit Techniques will improve the quality of the audit clients' financial reporting.					
10	The use of Computer Assisted Audit Techniques facilitates the process of detecting financial errors.					
11	The use of Computer Assisted Audit Techniques provides auditors with powerful audit tools to detect frauds.					
12	The use of Computer Assisted Audit Techniques will increase the auditor's credibility.					
13	The use of Computer Assisted Audit Techniques will enhance stakeholders' trust in the auditors.					
14	The use of Computer Assisted Audit Techniques will help clients distinguish the most skilled auditors.					
15	The use of Computer Assisted Audit Techniques will assist the auditing firms to obtain more clients.					
16	The use of Computer Assisted Audit Techniques will improve decision- making in the different stages of the overall audit process.					

	<i>Statements</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
17	The use of Computer Assisted Audit Techniques will improve auditor productivity.					
18	The use of Computer Assisted Audit Techniques will improve the overall efficiency of the audit firm.					
19	The use of Computer Assisted Audit Techniques is an essential aspect of any audit work.					

Part (4): Obstacles to using CAATs

-Please indicate the extent to which you agree or disagree with each of the following statements describe obstacles to use the Computer Assisted Audit Techniques by the Jordanian audit firms (please tick the boxes):

	<i>Statements</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1	Unfamiliarity with Computer Assisted Audit Techniques					
2	The accounting and auditing curricula at Jordanian universities do not include courses in electronic data processing auditing.					
3	The lack of technical audit training courses related to the Computer Assisted Audit Techniques.					
4	The lack of the information technology skills needed to use Computer Assisted Audit Techniques.					

	<i>Statements</i>	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
5	The difficulty in using the Computer Assisted Audit Techniques.					
6	The use of manual accounting information systems by the Jordanian public companies.					
7	The lack of encouragement and support by the Jordanian auditing professional bodies and the government.					
8	The lack of laws and regulations regulating the use of Computer Assisted Audit Techniques by auditing firms.					
9	The low fees for the audit of public companies in Jordan					
10	The high cost of Computer Assisted Audit Techniques					
11	The small size of the Jordanian audit firms.					
12	The lack of competition between Jordanian audit firms to obtain clients.					
13	The resistance inside Jordanian audit firms to change from manual auditing to computerized auditing.					

Thank You for Your Time and Help

Appendix C

First Reminder Letter (Sample)

**University of Newcastle
Central Coast School of Business**

<<Company>>

<<Address>>

<<City>> <<Postal Code>>

Jordan

Date.....

The Use of Computer Assisted Audit Techniques by Audit Firms in Jordan

Dear [EDP Audit Manager]

We refer to our previous letter on (enclosed) requesting a completion of a questionnaire. We are sending this follow-up invitation and attaching the questionnaire. If you have not yet responded, we invite you again to do so. If you have responded thank you, and please ignore this request.

We would like to confirm again that your participation in this study is extremely important to the successful completion of the above study, and if you have not already done so, would appreciate it if you would spend a few minutes to complete the attached questionnaire and return it to the following address.

Abdel Razaq Al-Farah
Central Coast Campus, Business Offices
The University of Newcastle
P. O. Box 127, Ourimbah NSW 2258, Australia

If you have any concerns or enquiries about the questionnaire, please do not hesitate to contact me or my supervisor on the following telephone numbers:

Mobile: + 61 2 0404553810
Fax: + 61 2 4348 4101
Mobile: + 962 796124753 (Jordan) or,
[E-mail: abdel.alfarah@studentmail.newcastle.edu.au](mailto:abdel.alfarah@studentmail.newcastle.edu.au)

Supervisor: Prof. Frank Clarke
Professor of Accounting
Tel: +6124348 4136
Fax: +6124348 4101

Yours sincerely
(Signed)

(Signed)

Ph.D student: Abdel Razaq Al-Farah

Supervisor: Professor Frank Clarke

*This project has been approved by the University's Human Research Ethics Committee, Approval No. H-140-1105.

* if you have any complaint concerning the manner in which a research is conducted it may be given to the researcher or if an independent person is preferred, to the University's Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, tel: +61 249216333, email Human-Ethics@newcastle.edu.au.

Appendix D

Second Reminder Letter (Sample)

**University of Newcastle
Central Coast School of Business**

<<Company>>

<<Address>>

<<City>> <<Postal Code>>

Jordan

Date.....

The Use of Computer Assisted Audit Techniques by Audit Firms in Jordan

Dear [EDP Audit Manager]

We refer to our previous letters onand..... (enclosed) requesting a completion of a questionnaire. We are sending this follow-up invitation and attaching the questionnaire. If you have not yet responded, we invite you again to do so. If you have responded thank you, and please ignore this request.

We would like to confirm again that your participation in this study is extremely important to the successful completion of the above study, and if you have not already done so, would appreciate it if you would spend a few minutes to complete the attached questionnaire and return it to the following address.

Abdel Razaq Al-Farah
Central Coast Campus, Business Offices
The University of Newcastle
P. O. Box 127, Ourimbah NSW 2258, Australia

If you have any concerns or enquiries about the questionnaire, please do not hesitate to contact me or my supervisor on the following telephone numbers:

Mobile: + 61 2 0404553810
Fax: + 61 2 4348 4101
Mobile: + 962 796124753 (Jordan) or,
[E-mail: abdel.alfarah@studentmail.newcastle.edu.au](mailto:abdel.alfarah@studentmail.newcastle.edu.au)

Supervisor: Prof. Frank Clarke
Professor of Accounting
Tel: +6124348 4136
Fax: +6124348 4101

Yours sincerely
(Signed)

(Signed)

Ph.D student: Abdel Razaq Al-Farah

Supervisor: Professor Frank Clarke

*This project has been approved by the University's Human Research Ethics Committee, Approval No. H-140-1105.

* if you have any complaint concerning the manner in which a research is conducted it may be given to the researcher or if an independent person is preferred, to the University's Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, tel: +61 249216333, email Human-Ethics@newcastle.edu.au.