



***EFFECT OF INFORMATION TECHNOLOGY SUCCESS FACTORS AND  
GOVERNANCE ON AUDIT TECHNOLOGY PERFORMANCE***

**FARIDA BINTI VEERANKUTTY**

**GSM 2019 8**



**EFFECT OF INFORMATION TECHNOLOGY SUCCESS FACTORS AND  
GOVERNANCE ON AUDIT TECHNOLOGY PERFORMANCE**

By

**FARIDA BINTI VEERANKUTTY**

**Thesis Submitted to the Putra Business School in Fulfilment of the Requirements  
for the Degree of Doctor of Philosophy**

**November 2018**

All material contained within the thesis, including without limitation text, logos, icons, photographs and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Degree of Doctor of Philosophy

**EFFECT OF INFORMATION TECHNOLOGY SUCCESS FACTORS AND GOVERNANCE ON AUDIT TECHNOLOGY PERFORMANCE**

By

**FARIDA BINTI VEERANKUTTY**

**November 2018**

**Chair: Associate Professor Dr. Noor Azman Bin Ali**

**Faculty: Putra Business School**

This study attempts to investigate issues faced by public sector auditors over under-utilisation of audit technology, which has resulted insufficient progress in technology enabled auditing by the auditors. The under-utilisation of audit technology was also due to ineffective technology related strategies and policies to support the efficient audit. This study has researched on how auditors would be able to enhance successful utilisation of audit technology (i.e., audit technology performance) by looking into the success factors (i.e., auditors attributes, auditor competencies, technology attribute, technology readiness, organisation readiness, professional conduct, client system, client readiness and institutional support). Importantly, this study examined the moderating role of IT Governance on audit technology performance. By drawing on IT Audit Quality Framework and further supported with Diffusion of Innovation Theory and IS Success Model, this study proposes a research framework for Audit Technology Performance. The research framework focuses on the relationship between (i) success factors and audit technology performance and (ii) IT Governance practices and audit technology performance. A survey was conducted among 309 public sector auditors from the National Audit Department of Malaysia who are the external auditors to the ministries, government departments and agencies at federal and state level. The data was analysed using PLS-SEM techniques and validation of measurement model and structural model were done. This study shows that IT Governance practices do not have any interaction effects on the relationship between success factors and audit technology performance. The results indicate that success factors namely auditors attributes and technology attributes directly influence the audit technology performance. However, technology readiness and organisation readiness have no significant influence on the audit technology performance. It shows that bureaucratic nature of public sector organisation

has affected differently on the audit technology performance due to the centralised and limited resources. Besides, client readiness and client system do not impact the audit technology performance owing to the mandate of the audit profession and the similar accounting system being implemented by the government agencies. Moreover, competencies of auditors do not play an important role in audit technology performance due to different types of IT control evaluation which requires different level of competencies. Institutional support and professional conduct do not influence the technology usage because Malaysian public sector auditors are mandated by the Audit Act and they are the statutory/external auditors for government agencies. Following to that, the study has successfully derived to the theoretical and professional implications of audit practices in public sector. This study provides some insights on the importance of organisation context (i.e., public sector and audit profession) towards the successful utilisation of technology among the auditors.

**Keywords: IT Governance Practices, Audit Technology Performance, Success Factor, Technology-enabled Auditing, Audit Tool, CAATs.**

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

## KESAN FAKTOR KEJAYAAN TEKNOLOGI MAKLUMAT DAN GOVERNAN TERHADAP PRESTASI TEKNOLOGI AUDIT

Oleh

FARIDA VEERANKUTTY

November 2018

**Pengerusi : Prof. Madya Dr. Noor Azman Ali**

**Fakulti : Putra Business School**

Kajian ini menyelidik permasalahan yang dihadapi oleh juruaudit sektor awam mengenai penggunaan teknologi audit yang rendah yang mengakibatkan perkembangan pengauditan berasaskan teknologi yang tidak pesat. Selain itu, penggunaan teknologi audit yang rendah adalah juga kerana ketidakberkesanan strategi dan polisi berkaitan teknologi untuk menyokong pengauditan yang lebih cekap. Kajian ini bertujuan untuk mengkaji bagaimana juruaudit dapat meningkatkan penggunaan teknologi audit (i.e., prestasi teknologi audit) dengan melihat kepada faktor kejayaan (i.e., atribut juruaudit, kemahiran juruaudit, atribut teknologi, kesediaan teknologi, kesediaan organisasi, kelakuan professional, sistem klien, kesediaan klien dan sokongan institusi). Terutamanya, kajian ini memeriksa peranan penyederhanaan (moderating role) faktor governan IT (IT Governance) terhadap prestasi teknologi audit. Dengan menggunakan *IT Audit Quality Framework* dan disokong oleh Teori *Diffusion of Innovation* serta Model *IS Success*, kajian ini mencadangkan satu kerangka kajian untuk Prestasi Audit Teknologi. Kerangka kajian ini tertumpu kepada hubungan antara (i) faktor kejayaan dan prestasi teknologi audit dan (ii) amalan *IT Governance* dan prestasi teknologi audit. Kaji selidik telah dilaksanakan melibatkan 309 orang juruaudit sektor awam daripada Jabatan Audit Negara, Malaysia yang merupakan juruaudit luar kepada kementerian, jabatan dan agensi di peringkat kerajaan persekutuan dan kerajaan negeri. Data kajian telah dianalisis menggunakan teknik perisian PLS-SEM serta pengesahan model pengukuran (measurement model) dan model struktur (structural model) telah dilaksanakan. Kajian ini menunjukkan amalan *IT Governance* tidak mempunyai interaksi terhadap hubungan di antara faktor kejayaan dan prestasi teknologi audit. Keputusan kajian juga menunjukkan bahawa faktor kejayaan iaitu atribut juruaudit dan atribut teknologi secara langsung mempengaruhi prestasi teknologi audit. Bagaimanapun, kesediaan teknologi, kesediaan organisasi tidak mempunyai pengaruh yang signifikan terhadap prestasi teknologi audit. Ini menunjukkan sifat birokrasi organisasi sektor awam memberi kesan yang berbeza terhadap prestasi teknologi audit disebabkan oleh pemusatan dan kekangan sumber. Selain itu, kesediaan klien dan sistem klien tidak memberi impak kepada prestasi teknologi audit adalah disebabkan oleh mandat profesion audit serta penggunaan sistem perakaunan yang serupa digunakan oleh badan

kerajaan. Tambahan pula, kemahiran juruaudit tidak memainkan peranan yang utama terhadap prestasi teknologi audit adalah kerana penilaian kawalan IT yang berbeza memerlukan tahap kemahiran yang berbeza. Sokongan institusi dan kelakuan profesional tidak mempengaruhi penggunaan teknologi kerana juruaudit sektor awam di Malaysia adalah dimandatkan oleh Akta Audit serta mereka merupakan juruaudit luar/statutori kepada badan kerajaan. Berdasarkan dapatan kajian, kajian ini telah merumuskan implikasi teoretikal dan profesional terhadap amalan pengauditan sektor awam. Kajian ini memberi persepsi akan kepentingan konteks organisasi (i.e., sektor awam dan profesion audit) terhadap kejayaan penggunaan teknologi dalam pengauditan di kalangan juruaudit sektor awam.

**Kata Kunci: Amalan *IT Governance*, Prestasi Teknologi Audit, Faktor Kejayaan, Pengauditan Berasaskan Teknologi, *Audit Tool*, *CAATs*.**

## ACKNOWLEDGEMENTS

Dengan nama Allah, Yang Maha Pemurah lagi Maha Penyayang, Selawat dan Salam kepada Junjungan Besar Nabi Muhammad SAW dan seluruh ahli keluarga Baginda. Alhamdulillah, segala pujian bagi Allah kerana lempah kurniaNya dapat saya menyiapkan tesis ini.

MY DEAREST HUBBY MR. MOHAMMAD KAMARUL SHAH

MY LOVELY CHILDREN

NURAQILA YUSRAH, SUZIYANAH NATASYAH,  
AAMAR RAZZIQ, AIMAN FIRDAUS, HAFFIZ RAFI

YOUR LOVES AND INSPIRATIONS SHOWED ME THE PATH  
WHICH MOTIVATES ME TO END THIS  
LONELY AND MEANINGFUL JOURNEY

DEAREST MOM AND MY LATE DAD  
MOTHER IN LAW AND FATHER IN LAW  
SIBLINGS

THANK YOU SO MUCH FOR YOUR CONTINUOUS  
UNDERSTANDING, SUPPORTS AND PRAYERS

SPECIAL THANKS TO PROFESSOR T.RAMAYAH  
FOR ALL THE KNOWLEDGE YOU SHARED WITH ME

THANK YOU TO MY EXAMINERS AND SUPERVISORS  
FOR THE ASSISTANCES AND GUIDANCES

THANK YOU TO MY DEAR FRIENDS

THANK YOU TO GOVERNMENT OF MALAYSIA

THANK YOU TO NATIONAL AUDIT DEPARTMENT OF MALAYSIA



I certify that a Thesis Examination Committee has met on 13 November 2018 to conduct the final examination of Farida Binti Veerankutty on her thesis entitled “Effect of Information Technology Success Factors and Governance on Audit Technology Performance” in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy (Management).

Members of the Thesis Examination Committee were as follows:

**Foong Soon Yau, PhD**

Professor  
Putra Business School  
Serdang, Selangor  
(Chairman)

**Mohd Fua’ad Said, PhD**

Associate Professor  
Faculty of Economics and Management  
Universiti Putra Malaysia  
Serdang, Selangor, Malaysia  
(Internal Examiner)

**Noor Ismawati Jaafar , PhD**

Associate Professor  
Faculty of Business and Accountancy  
Universiti Malaya, Kuala Lumpur, Malaysia  
(Internal Examiner)

**Rahat Munir, PhD**

Professor  
Faculty of Business and Economics  
Macquarie University  
NSW 2109, Australia  
(External Examiner)

---

**PROF. DR. M. IQBAL SARIPAN**

Deputy Vice Chancellor (Academic & International)  
Universiti Putra Malaysia

Date

On behalf of,  
Putra Business School

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

**Noor Azman Ali, PhD**

Associate Professor  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Chairman)

**Lau Yeng Wai, PhD**

Senior Lecturer  
Faculty of Economics and Management  
Universiti Putra Malaysia  
(Member)

**Ramayah Thurasamy**

Professor  
School of Management  
Universiti Sains Malaysia  
(Member)

---

**PROF. DR. M. IQBAL SARIPAN**

Deputy Vice Chancellor (Academic & International)  
Universiti Putra Malaysia

Date

On behalf of,  
Putra Business School

## Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name and Matric No.: Farida Binti Veerankutty (Matric No. PBS12241218)

## Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Chairman of Supervisory Committee :

Signature : \_\_\_\_\_

Name : Assoc. Prof. Dr. Noor Azman Ali  
Faculty : Faculty of Economics and Management, UPM

Member of Supervisory Committee ;

Signature : \_\_\_\_\_

Name : Dr Lau Yeng Wai  
Faculty : Faculty of Economics and Management, UPM

Signature : \_\_\_\_\_

Name : Professor T Ramayah  
Faculty : School of Management, USM

## TABLE OF CONTENTS

	<b>Page</b>
<b>ABSTRACT</b>	i
<b>ABSTRAK</b>	iii
<b>ACKNOWLEDGEMENTS</b>	v
<b>APPROVAL</b>	vi
<b>DECLARATION</b>	viii
<b>LIST OF TABLES</b>	xiv
<b>LIST OF FIGURES</b>	xvi
<b>LIST OF SYMBOLS AND ABBREVIATIONS</b>	xvii
<b>CHAPTER</b>	
<b>1 INTRODUCTION OF THE STUDY</b>	
1.0 Introduction	1
1.1 Background of the Study	1
1.1.1 Audit Professional Practices	2
1.1.2 Malaysian Public Sector Audit	17
1.1.3 Information Technology (IT) Governance Practices	20
1.2 Problem Statement	21
1.3 Research Questions	25
1.4 Research Objectives	25
1.5 The Scope of the Study	26
1.6 The Contribution of the Study	26
1.6.1 Theoretical Contributions	26
1.6.2 Methodological Contributions	27
1.6.3 Practical Contributions	27
1.7 Operational Definition of Keywords	28
1.8 Structure of Thesis	30
1.9 Summary	30
<b>2 LITERATURE REVIEW</b>	
2.0 Introduction	31
2.1 The Concept of Innovation Adoption	31
2.2 Theoretical Background	32
2.2.1 Technology Adoption at Individual Level	33
2.2.2 Diffusion of Innovation (DOI)	38
2.2.3 IS Success Model	39
2.3 Previous Research on Technology Adoption Factors	44
2.3.1 IS Success Factors	44
2.3.2 IT Adoption Success Factors	47
2.4 Technology Adoption Models in Public Sector Organisation	52
2.4.1 Characteristic of Public Sector Organisations	52
2.4.2 Technology Adoption Models in Public Sector Organisation	53
2.5 Previous Research on Audit Technology Adoption	56
2.5.1 Technology Adoption in Auditing	56

2.5.2	IT related Auditing	60
2.6	The Concepts of Governance in Information Technology	65
2.6.1	Definition of Governance	65
2.6.2	Electronic Governance (e-Governance)	66
2.6.3	IT Governance (ITG)	66
2.7	Summary	72
<b>3</b>	<b>THEORETICAL CONSTRUCTS AND HYPOTHESES DEVELOPMENT</b>	
3.0	Introduction	73
3.1	Theoretical Constructs	73
3.1.1	Selection of Independent Variables	90
3.1.2	Selection of Dependent Variables	93
3.2	Hypotheses Development	99
3.2.1	Auditors' Attributes and Audit Technology Performance	99
3.2.2	Auditors Competencies and Audit Technology Performance	100
3.2.3	Technology Attributes and Audit Technology Performance	100
3.2.4	Technology Readiness and Audit Technology Performance	101
3.2.5	Organisation Readiness and Audit Technology Performance	102
3.2.6	Professional Conduct and Audit Technology Performance	102
3.2.7	Client System and Audit Technology Performance	103
3.2.8	Client Readiness and Audit Technology Performance	103
3.2.9	Institutional Support and Audit Technology Performance	104
3.2.10	The Moderating Effect of IT Governance Practices	105
3.3	Summary	110
<b>4</b>	<b>RESEARCH METHODOLOGY</b>	
4.0	Introduction	111
4.1	Research Paradigm	112
4.2	Research Design	114
4.3	Research Process	116
4.4	Sampling Strategy	117
4.4.1	Population of Study	117
4.4.2	Sampling Frame	118
4.4.3	Sampling Size	119
4.4.4	Sampling Procedures	121
4.5	Data Collection Method	122
4.6	Research Instrument	123
4.6.1	Measurement of Variables	124
4.6.2	Constructs Measurement	125

	4.6.3	Descriptive Variable - Technology-Enabled Auditing	133
	4.6.4	Demographic Variables	136
	4.7	Questionnaire Administration	136
	4.8	Translation Process	137
	4.9	Pre-Testing and Pilot Testing	138
	4.10	Data Analysis Method	139
	4.10.1	Data Preparation	140
	4.10.2	Data Analysis Technique	146
	4.11	Partial Least Square (PLS)	146
	4.11.1	Reflective and Formative Constructs	148
	4.11.2	Higher-Order and Hierarchical Component Models	150
	4.12	Assessing Measurement and Structural Model	153
	4.12.1	Measurement Model	153
	4.12.2	Structural Model	155
	4.12.3	Moderating Relationship	156
	4.13	Summary	157
<b>5</b>		<b>DATA ANALYSIS AND RESULTS</b>	
	5.0	Introduction	158
	5.1	Demographic Analyses	158
	5.2	Descriptive Analyses	160
	5.3	Assessment of Measurement Model	161
	5.3.1	Construct Reliability	161
	5.3.2	Convergent Validity	164
	5.3.3	Discriminant Validity	164
	5.4	Assessment of Structural Model	167
	5.4.1	Procedure 1: Measuring the Collinearity Problems	167
	5.4.2	Procedure 2: Measuring the Path Co-Efficient	169
	5.4.3	Procedure 3: Measuring the Level of $R^2$	170
	5.4.4	Procedure 4: Measuring the Effect Size $f^2$	172
	5.4.5	Procedure 5: Assessing the Predictive Relevance $Q^2$	173
	5.5	Assessment of Moderation Effect	173
	5.6	Summary of Hypotheses Testing Results	175
	5.7	Summary	176
<b>6</b>		<b>DISCUSSION AND CONCLUSION</b>	
	6.0	Introduction	178
	6.1	Discussion of Findings	178
	6.1.1	Technology Enabled Auditing	179
	6.1.2	Success Factors and Audit Technology Performance	180
	6.1.3	IT Governance Practices as Moderator	183
	6.2	Implications of the Present Study	184
	6.2.1	Theoretical Implications	184
	6.2.2	Methodological Implications	184
	6.2.3	Managerial Implications	185
	6.2.4	Professional Implications	185
	6.3	Limitations of the Study	186
	6.4	Recommendations for Future Research	187
	6.5	Summary	188

<b>REFERENCES</b>	189
<b>APPENDICES</b>	218
<b>BIODATA OF STUDENTS</b>	219
<b>LIST OF PUBLICATIONS</b>	220





## LIST OF TABLES

Table	Table Title	Page
1.1.	Description of the Variables	28
2.1.	Models and Theories of User Technology Acceptance	34
2.2.	Description on UTAUT Variables in Auditing Context	36
2.3.	Types of System (McAfee, 2006)	40
2.4.	Factors Affecting the IT Audit (Stoel et al. 2012)	62
3.1.	List of Factors Influencing Technology Adoption in IS Literature	74
3.2.	List of Factors Influencing Technology Adoption in Auditing Literature	78
3.3.	Concept Matrix of Factors Influencing Audit Technology Usage	85
3.4.	Common Factors related to Technology Usage from IS Literatures and Auditing Literatures	86
3.5.	Structures, Processes and Relational Mechanisms for IT Governance	88
3.6.	List of Factors for IT Governance Practices	89
3.7.	The Information Technology (IT) Audit Quality Framework (Merhout and Havelka, 2008) modified into Success Factor for Audit Technology Performance	91
3.8.	DeLone and McLean IS Success Model Variables	95
3.9.	Summary of Hypothesis Statements	110
4.1.	Assumptions about the Nature of Social Science	113
4.2.	Characteristics of Quantitative and Qualitative Research Design	115
4.3.	Summary of Instruments for Each Construct of the Study	124
4.4.	Measurement Items for Auditor's Attributes and Auditors Competencies	126
4.5.	Measurement Items for Technology Attributes and Technology Readiness	128
4.6.	Measurement Items for Organisation Readiness	128
4.7.	Measurement Items for Professional Conduct	129
4.8.	Measurement Items for Client System and Client Readiness	130
4.9.	Measurement Items for Institutional Support	131
4.10.	Measurement Items for IT Governance Practices	132
4.11.	Measurement Items for Audit Technology Performance	133
4.12.	Measurement Items for Technology Enabled Auditing	137
4.13.	Reliability Scale of Constructs	138
4.14.	Results of Skewness and Kurtosis Analysis (N=309)	142
4.15.	Results of Harman's One Factor Test (N=309)	145
4.16.	Terms Used In PLS-SEM Analysis	147
4.17.	Guidelines for Choosing the Measurement Model	149
4.18.	Guidelines for Evaluating Reflective Measurement Model	155
5.1.	Demographic Profile	159
5.2.	Respondents Experience and Skills	159
5.3.	Descriptive Analysis - Technology Enabled Auditing	161
5.4.	Descriptive and Reliability Statistics	162

<b>Table</b>	<b>Table Title</b>	<b>Page</b>
5.5.	Reliability Statistics	164
5.6.	Discriminant Validity Using Fornell and Lacker (1981)	165
5.7.	Discriminant Validity Using Heterotrait- Monotrait (HTMT) Criterion (2015)	166
5.8.	Lateral Collinearity Analyses	168
5.9.	Path Coefficient Analyses (N=309)	169
5.10.	Coefficient Determination ( $R^2$ ) Analyses	171
5.11.	Effect Size ( $f^2$ ) Analyses on Set 1: Audit Technology Performance	172
5.12.	Predictive Relevance $Q^2$ Analysis	173
5.13.	Results of Moderation	175
5.14.	Summary of Hypotheses Testing	176

## LIST OF FIGURES

Figure	Title of Figure	Page
1.1.	Types of Audit Technology	16
2.1.	Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)	37
2.2.	Categories of IS Success	41
2.3.	IS Success Model (DeLone & McLean, 1992)	42
2.4.	Seddon's IS Success Model (1997)	43
2.5.	Updated IS Success Model (DeLone & McLean, 2003)	43
2.6.	Information System Success: Organisational and Individual Antecedents (Sabherwal et. al, 2006)	45
2.7.	Antecedents of IS Success (Petter et. al, 2013)	46
2.8.	IT Innovation Adoption in the Government Sector (Kamal, 2006)	55
2.9.	A Model of Information Technology Audit (Merhout & Havelka, 2007)	61
2.10.	Generalised Audit Software (GAS) Utilisation (Ahmi & Kent, 2013)	63
2.11.	Theoretical Framework for Internal IT Audit Process (Havelka & Merhout, 2013)	64
3.1	The Information Technology (IT) Audit Quality Framework (Merhout & Havelka, 2008)	90
3.2.	The Theoretical Framework of the Study	98
3.3.	Research Framework of the Study	109
4.1.	Dimension of a Research Process	111
4.2.	Research Process involving Social Research	116
4.3.	G*Power Test	120
4.4.	Summary of the Rules of Thumbs in Selecting PLS-SEM and CB-SEM	141
4.5.	Stages of PLS Algorithm	147
4.6.	The Diagram of Reflective and Formative Model	148
4.7.	Two-Stage Approach for HCM Analysis – Auditors' Attributes and IT Governance Practices	152
5.1.	Assessing Procedures for Structural Model	167
5.2.	The Structural Model of the Study	168
5.3.	Results of Coefficient Determination ( $R^2$ ) of the Structural Model	171
5.4.	Results of the Interaction Effect of the Structural Model	174
6.1.	Audit Technology Performance Model for Public Sector	178

## LIST OF SYMBOLS AND ABBREVIATIONS

<b>Acronym</b>	<b>Description</b>
ACL	Audit Command Language
AICPA	American Institute of Certified Public Accountants
CAATs	Computer Assisted Audit Tools
CobiT	Control Objectives for Information Related Technology
COSO	Committee of Sponsoring Organisation
D&M IS Success	DeLone and McLean IS Success
DOI	Diffusion of Innovation
EDI	Electronic Data Interchange
EDP	Electronic Data Processing
ERP	Enterprise Resource Planning
GAS	Generalized Audit Software
ICT	Information and Communication Technology
IFAC	International Federation of Accountant
INTOSAI	International Organisation of Supreme Audit Institution
IS	Information System
ISA	International Standards of Auditing
ISACA	Information System Auditing Control Association
ISSAI	International Standard of Supreme Audit Institutions
IT	Information Technology
ITG	Information Technology Governance
ITGI	IT Governance Institute
NADM	National Audit Department of Malaysia
PCAOB	Public Company Accounting Oversight Board
PSISP	Public Sector ICT Plan
SAI	Supreme Audit Institution
SAS	Statement of Auditing Standard
SOX	Sarbanes-Oxley Act
TAM	Technology Acceptance Model
TOE	Technological- Organisational- Environmental Framework
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTAUT	Unified Theory of Acceptance and Use of Technology
XBRL	EXtensible Business Reporting Language
CB-SEM	Covariance Based – Structural Equation Model
CR	Composite Reliability
CMV	Common Method Variance
$f^2$	Effect Size
PLS-SEM	Partial Least Square – Structural Equation Model
$Q^2$	Predictive Relevance
$R^2$	Co-efficient of Determination
SEM	Structural Equation Model
VIF	Variance Inflation Factor



## CHAPTER ONE

### INTRODUCTION OF THE STUDY

#### 1.0 Introduction

This chapter provides the background information on auditing professional practices and further explains the impact of technology on auditing practices as well as the effect of challenges has on technology enabled auditing. It also provides some insights into the public sector audit practices in Malaysia. Furthermore, this chapter also describes the problems that lead to the study initiation, the objectives and research questions related to the study as well as the significance of the study. This chapter finally ends with the description of the structure of the thesis.

#### 1.1 Background of the Study

This study addresses the problems faced by auditors whose current audit practices being impacted by the use of accounting information system in business and has directed the audit function into a new path and auditors need to handle the changes caused by technologies (Coppers & Lybrand, 2002; Yen, Huang, Li, & Hsiah, 2006). As such, the traditional audit practices in the audit may not be appropriate for the e-business environment (Zhoa, Yen, & Chang, 2004) and has led to the necessity of new audit procedures, techniques and tool to evaluate the control in order to mitigate the new business risk (Masli, Peters, & Richardson, 2010; Pathak & Lind, 2003;). Thus, the requirement for technology-oriented audit method and procedure has increased (Coe, 2006; Du & Roohani, 2007) and many audit software/audit analytics tools being developed in order to enhance the audit assurance performance (Li, Dai, Gershberg, & Vasarhelyi, 2018).

Further, audit standards have clearly stated that the computer-based controls and computer-assisted techniques need to be conducted once audit clients have used advanced enterprise system and depend broadly on Information Technology (IT) (Abdolmohammadi & Boss, 2009). Auditing is one of the means to assure data from accounting records/accounting information system has been managed properly in order to produce financial statements that are clean from inaccuracy and misstatements and signify 'true and fair' opinion on the accounting records (Ahmi, 2012). The purpose of technology-enabled auditing is to scrutinize and validate IT controls within information systems and to assure it is functioning in line with policies, procedures, and rules (Majdalawieh & Zaghoul, 2009).

To be technically classified as technology-enabled auditing, the investigation needs to include information technology, as a specific emphasis of the examination (e.g. ICT system development audit) or as the way to finish the audit task (e.g. Financial statement audit) (Rosli et al., 2012). Additionally, in most cases, it involves both. External auditors

perform technology-related audit during the financial audit in order to examine the internal controls of the information system. Internal auditors were performing the technology related audit in order to assure the IT related controls are adequately safeguarded and fulfilling the management accountability.

Reviews indicated that there are no collective general description of technology-related audits. Weber (1999) explained, “IS audit as a process of collecting and evaluating evidence to determine whether a computer system safeguards asset, maintains data integrity, allows organizational goals to be achieved effectively, and uses resources efficiently”. Whereas, Wulandari (2003) in Majdalawieh & Zaghoul, (2009) has described IS audit as “the process of evaluating and reporting the adequacy of system controls, efficiency, economy, effectiveness, and security practices to assure that data integrity is protected, and that the system complies with applicable policies, procedures, standards, rules, laws, and regulations”.

The most important concept to be understood in the context of technology-enabled auditing is the execution of the computer-based audit procedures and computer-based control assessment using suitable audit technology/audit software/audit tools. This assessment has become a vital fragment of the audit process as it complements the auditor’s responsibilities and reinforces auditors’ judgment on the superiority of data generated by the information systems. In line with the necessity of performing an audit with new technology-driven audit tools, technology-enabled auditing has been given attention by the financial auditors to cope with current changes in the electronic environment.

### **1.1.1 Audit Professional Practises**

Auditing differs in terms of the subject under investigation (Moscové, Simkin, & Bagranoff, 2003). Many types of audits can be conducted by auditors and there is no specific term being used to explain the types of audit. However, there are three most frequently used the term for the types of auditing which are financial auditing, performance auditing, and compliance auditing. Basically, financial audit is focusing on the financial data integrity and its reliability which intend to assess the correctness of financial statement in providing a true and fair view of the organisation financial position (Ahmi, 2012). Performance audit assesses the extent to which the established criteria related to economics, efficiency and effectiveness of programmes or projects being met that may involve financial and non-financial information (ISSAI 100). Compliance auditing refers to attestation audit, which evaluates the activities and financial transactions are in accordance with established standards, rules and regulations (ISSAI 100).

Along with the technology advancement in conducting the business, Information System (IS) auditing has been given considerable attention by the auditors. IS Auditing refers as “a process which collects and evaluates evidence to determine the IS and related resources are adequate safeguard assets, maintain data and system integrity, provide relevant and reliable information, achieve organisational goals effectively and provide

reasonable assurance that objectives are met” (ISACA, 2009). As such, IS auditing or technology related auditing can be performed either during the financial statement audit, performance audit or compliance auditing when the auditing processes involve electronic data and information system. In order to perform technology enabled auditing, auditors need audit tools or audit technology to assess the electronic data or information system.

In the audit professional practices, auditors can be classified into two major groups which are (i) external auditors and (ii) internal auditors. These two groups of auditors may perform the audit in private or public sector organisation. Primarily the auditors who are conducting an audit of the public sector organisation were merely referred as public sector auditors. Internal auditors are employees of an organisation who are accountable directly to the organisation’s audit committee which involves broad types of attestation and non-attestation audits such as performance audit, fraud audit, financial management audit and ad-hoc audit (Ahmi & Kent, 2013). Whereas, the external auditors are responsible in performing the annual financial audit/statutory audit which is required by the law on the financial statement of the organisation to opine an opinion on the company’s financial information giving a true and fair view of the organisation’s financial position (Ahmi & Kent, 2013).

Public sector auditors under the Supreme Audit Institution (SAI) conduct “public sector audit function within a specific constitutional arrangement and by virtue of its office and mandate to ensure sufficient independence and power of discretion in performing their duties” as stipulated in ISSAI 100 (INTOSAI, 2013a, p. 3). SAIs are national entities responsible for auditing government activities (Hay & Cordrey, 2018). Public sector auditors mainly involved in all types of auditing in providing reasonable assurance on the financial position of the government accounting system, compliance towards rules and regulations as well as the effectiveness of government programmes and activities in achieving the national agenda. Thus, public sector auditors have a responsibility for value for money auditing as well as for financial statement auditing (Hay & Cordrey, 2018).

#### **1.1.1.1 Impact of Technology on Auditing Practice**

Literature advocates that organisation investments in IT able to improve performance, quality of financial reporting as well as internal controls (Ahuja, Kuhn & Mueller, 2013; Lai, Li, Lin & Wu, 2017; Masli et al. 2010). However, lack of management supports may create substantial harms than the expected benefit to the organisation (Kobelsky, Richardson, Smith, & Zmud, 2008). Evidence suggested that deficiencies in IT can contribute to significant weaknesses in internal controls (Bedard & Graham 2011; Canada et al. 2009).

Some studies also illustrate that various material inefficiencies in accounting related internal controls were caused by IT problems (Canada et al. 2009; Bedard & Graham 2011) and highly related to the account misstatements which impact the financial reporting (Klamm & Watson 2009; Klamm, Kobelsky, & Watson, 2012; Li et al. 2012a). A review conducted by Rubino and Vitolla (2014b) related to material weaknesses disclosed in financial statements were mainly due technology issues (Ge & McVay,



2005), information system related problems (Huang, 2009; Mitra, Jaggi, & Hossain, 2013; Raghunandan & Rama, 2006), issues related to software, security and access (Calderon, Wang & Conrad, 2012; Grant, Miller, & Alali, 2008; Gordon & Wilford, 2012), segregation of incompatible functions, staff adequacy and capability (Boritz, Hayes, & Lim, 2013). Undeniably, numerous financial reporting blunders were also related to the ineffective IT controls (Messier, Eilifsen, & Austen, 2004).

Thus, the main area of interest among auditors is technology related controls involving financial information. Traditionally, auditors choose to avoid testing controls unless required to do so as they believe doing substantive tests only are more effective and efficient (Messier et al. 2004). Briggs (2008) noted that this approach may be due to the inadequate understanding of technology and the limited role of technology in the accounting related activities. However, the new advancement of technologies changed the scope and audit methodology as well as the data analytics into more proactive than reactive way (Issa, Sun, & Vasarhelyi, 2016).

Public Company Accounting Oversight Board (PCAOB) through its auditing standards specifically states that auditors “should obtain an understanding of how IT affects the company’s flow of transactions” (PCAOB, Standard No. 12, 2010). Likewise, the American Institute of Certified Public Accountants (AICPA) suggested auditors should gain an understanding of IT before planning, evaluating risk, and performing audit procedures (AICPA 2006a; 2006b; 2006c). The PCAOB also recommends that auditors should “have an understanding of how the organization is dependent on or enabled by information technologies; and the manner in which information systems are used to record and maintain financial information” (PCAOB, QC Section 40, 2003). As such, when there are significant changes to the client information system, the auditors need to understand the new technologies and practices as well as its related new risks during the auditing.

Given the growing use of advanced technology, such as ERP, the assessment of internal control effectiveness requires an appropriate and adequate level of knowledge about IT audit techniques (Abdolmohammadi & Boss, 2009). Gelinias, Dull, & Wheeler (2011) assert that SOX has increased the importance of accounting information system-related knowledge for external auditors. Recent trends relying on IT and the preferences into the automation of management controls have significantly increased the importance of IT controls (Benaroch, Lichtenstein, & Robinson, 2006).

In this context, computer related audit procedures using audit technology have a vibrant effect on the audit reporting reliability and has increased the needs of the successful utilisation of audit technology during the audit task.

Although technology has resulted changes in the audit task, but there are only a few researchers who have investigated how the change in the environment (e.g., increased use of fair value accounting, introduction of principles-based standards) do influence the changes in the audit process as well as how technology and standardization impact the quality of the audit process (Knechel, Krishnan, Pevzner, Shefchik, & Velury, 2013).

The impact of electronic business on the audit function still remains an interesting area for examination (Kotb & Roberts, 2011; Kotb, Roberts, & Sian, 2012). Even though technology has been considered vital, knowledge on the usage in performing the job function in the digital environment seems to be limited. Therefore, research should explore the effect of IS on the capability of the auditor in conducting e-business audits (Kotb, Sangster, & Henderson, 2014). Besides, the study of how auditors perform the continuous auditing using information system and what are the challenges faced by the auditors may become an interesting researchable area (Vasarhelyi, Alles, Kuenkaikaw, & Littley, 2012).

The implementation of enterprise system within the client organisation has changed the audit process. Further research is needed concerning on the relation and interaction between auditing and enterprise system; the impact of enterprise system of the auditing procedures and on the auditor's role; as well as auditor's interactions with enterprise system (Kanellou & Spathis, 2011).

While academic scholars have shown the continuing importance of technology decision tools in audit practices, but only a few studies investigated the successful utilisation of such technology. Thus, it is very important to further inspect the impact of technology-related audit procedures on the auditor's job performance and the acceptance level of auditors towards the audit task in the computerised environment (Bedard, Deis, Curtis, & Jenkins, 2008).

Each audit process consists of control testing, which includes manual control and IT control, assessing audit evidence and judging the adequacy and sufficiency of audit evidence to express an audit opinion. Thus, more research is necessary to gain an understanding of auditor team characteristics that affect his/her ability to evaluate evidence; and whether the role of accountability can add more insight into the audit task (Hurt, Brown-Liburd, Earley, & Krishnamoorthy, 2013). Future research is needed to explore the effect of organisational resources on auditors' IT control evaluations which may provide a better understanding of the usage of technology toward audit performance (Asare et al., 2013).

#### **1.1.1.2 Technology-Enabled Auditing**

At the beginning of the technology era, Davis (1968) warned auditors not to ignore the 'electronic data processing' (EDP) in accounting systems when conducting audits. Although, auditor can conduct 'auditing around the computer' by verifying input and output as well as 'auditing with computer' by the automation of audit work, but 'auditing through the computer' must be conducted to evaluate the internal control on data processing and to assure the reliability, accuracy and adequacy of the system.

The scandal of the Equity Funding Corporation in 1973 on the falsification of the insurance policies worth of \$2 billion through the dummy account code created in the accounting system became jumping stone for the EDI audit. This fiasco was influential

in directing a swing from ‘auditing around the computer’ into ‘auditing through the computer’ which stimulated the appraisal of existing audit methods in a way to address issues related to IT related controls and computer-assisted audit procedures (Vasarhelyi & Lin, 1985).

From the perspective of auditing, the IT enabled audit can be performed in three ways: (i) ‘auditing with the computer’ which regularly perform in the less advanced accounting information system environment and involves mainly on validating the input data with the output report without evaluating the internal process of a system; (ii) ‘auditing through the computer’ involves the assessment of internal logic application of the system to assure internal control of the system is functioning as intended and being conducted using computer assisted audit tools and techniques; (iii) ‘auditing with the computer’ refers to the automation of audit process by which auditor use technology and expert system to manage their audit task.

Technology enabled audit can be explained in two main aspects involving IT control assessment and utilisation of audit technology during the audit task. IT control is defined as a control in an electronic environment which consists of structures, policies, methods, and practices aimed to give reasonable assurance that audit objectives related to IT can be realised.

Curtis and Payne (2014, p. 309) stated that “an auditor typically has many implementation-related duties when using audit technology, including gaining an understanding of each client’s database and the interrelationship of data components, identifying the data to be acquired from the client, loading the data from the client into the audit software, and then designing and executing the audit tests. The other possible problems, including gaining the knowledge required to utilize the technology and potential data problems, such as developing an erroneous or incomplete understanding of the client’s data, lack of availability on necessary data components, receipt of inaccurate or incomplete data, or receipt of data in a format difficult to work with”.

Further, literature indicated that technologies have impacted the scope of auditing and the evaluations of internal controls (Soral & Jain, 2011); evaluations of control over accounting information system (Brody & Kearns, 2008); increased auditors capability requirement related to technology (Brazel & Agoglia, 2007) and audit methodology (Bae & Ashcroft, 2004; Yang & Guan, 2004); and increased the necessity of gathering electronic evidence (Janvrin, Bierstaker, & Lowe, 2009).

Reliance of business on technology has increased the risk, particularly on system changes and application controls. In line with that, the usage of audit tools (e.g. CAATs), data mining tools and continuous auditing have been increasingly important. Further, the assessment of general and application controls in financial reporting has intensely enlarged. Auditors express their audit opinion on a financial statement based on the information provided to them. Therefore, it is crucial for auditors to assure the quality of information produced from accounting system is dependable (Alles, Kogan, & Vasarhelyi, 2002).

However, organisations which heavily depend on the digital environment are mostly being audited through process audit and review of control rather than evaluating the control and security (Wright & Wright, 2002). It has necessitated the auditors to test the irregularities and error in the system and examine the sufficiency of controls in the accounting system. In the traditional financial audit, auditors evaluate and test the control using a sample of transactions and vouching for the physical evidence manually, which may not be suitable in the complex accounting digital environment. In computerized and integrated processing environment, a single error may impact the reliability and accuracy of the information, thus the evaluation of IT control is crucial to the organisation performance (Abu Musa, 2008; Hermanson et al., 2000). A traditional control assessment which appropriates to the legacy environment possibly will not be suitable to present electronic business and actually can challenge the audit task itself (Nearon, 2005).

Given that financial reporting in many entities is based on information systems such as ERP systems, computer-related audit procedures help entities to achieve the objective of internal control. Controls related to technology can manage and secure data as well as systems from unapproved usage, access, leakage, disturbance, alteration, or destruction (Chang et al., 2014). System intrusion leads to the concealment of data, financial fraud, restricted web servers, and tainted data (Gordon, Loeb, Lucyshyn, & Richardson, 2005) as well as impact the reliability and validity of the data for reporting (Walters, 2007). If an organisation fails to develop suitable control related to its data security, the accuracy and reliability of financial data are questionable (Proctor & Vigantly, 2004).

In summary, a technology-enabled audit has been reflected to be critical to the process of attestation and compliance audit (Carlin & Gallegos, 2007; Vilsanoiu & Serban, 2010) however limited attention has been given to this area (Curtis et al., 2009; Maruping, Bala, Venkatesh, & Brown, 2017)

Further, IT has tremendously changed the way auditing being performed in an electronic environment, the stakeholders and auditors become more concern toward IT related controls assessment performed during the audit. Consequently, policy maker and standard setter emphasise the new requirement of performing IT control evaluation during the audit. Despite the above issues were related to the global concerns, there is a need to study technology enabled audit in Malaysian public sector audit organisation for the interest of the future generation in view of the increasing concern of Malaysian government improving the public service delivery through ICT and electronic environment.

An industry survey conducted in 2015 among 1,333 internal auditors indicated that the imperative issues need improvement was on technology-related audits. Past 10 years of the annual industry survey indicated that IT-related audit process, particularly related to data analysis, use of technology-enabled audit tools, computer-based audit procedures remain the main concern among the auditors. Surprisingly, the survey exposed that technology-related capabilities among the auditors were perceived to be lower and need much improvement which indicates the auditors are not attaining adequate progress on their competency and technology-enabled auditing (Protiviti, 2016d). Thus, audit

professional need to inverse this pattern particularly due to the growing significance of technology and its related risk to the audit performance specifically related to IT control assessment and electronic audit evidence. As such, demand for IT-based audit services receives substantial attention from the business entities, high-quality technology enabled auditing to need to be put in place (Havelka & Merhout, 2013).

Reviews indicated that most of the technology-related audit researchers were focusing on specific features of IT audit task. Some scholars have examined the auditor's capability and competency in IT-based auditing (Curtis et al., 2009; Carnaghan, 2004; Greenstein & McKee, 2004; Leader, 2004; Wilkinson, 2004). In addition, the effect of numerous information systems such as ERP, e-business, EDI, XBRL on the audit task have been investigated by some scholars (Brody & Kearns, 2009; Hunton, Wright & Wright, 2004; Kuhn & Sutton, 2010; O'Donnell, 2005, 2006; O'Donnell & Schultz, 2003; O'Leary, 2002) and the possible influence of support system also being studied (Leech, 2000; O'Donnell, Arnold, & Sutton, 2000a, 2000b). Even, Smith (2007) has suggested some strategies to enhance IT based auditing.

Subsequently, academicians have explored the implication of technology on the internal control, financial audit and project implementation. Some researchers have investigated the role of IT related audits in US audit firms (Vendrzyk & Bagranoff, 2003); impact of control reliability towards audit fees and hours (Daigle, Kizirian, & Sneathen, 2005); impact of IT on auditors' capabilities in uncovering misstatements (Messier et al., 2004); utilisation of computer based audit tools among different types of auditors (Abu Musa, 2008; Bierstaker, Burnaby, & Thibodeau, 2001; Burton, 2000; Hermanson et al., 2000; Janvrin et al., 2009) and utilisation of audit support system (Carson & Dowling, 2012; Dowling, 2009; Dowling, 2008). Although these researchers discussed the implication of auditor's attributes towards audit quality, but limited studies has been investigated on these drivers in holistically or theoretically.

Previous scholars have also examined factors impacting the use of technology during the audit task. Most of these studies have been focusing on the drivers that impact the intention to use the audit tools in performing the audit task, such as intention among small and medium firm external auditors to adopt and not adopting generalised audit software (GAS) in the UK (Ahmi & Kent, 2013); usage of CAATs among internal auditors in Malaysian audit firms (Rosli, Yeow, & Siew, 2012); and acceptance of CAATs among UK internal auditors (Mahzan & Lymer, 2014).

Only a few studies have conducted on identifying the quality attributes associated with IT-based Audit (Ahmi & Kent, 2013; Havelka & Merhout, 2008; Havelka & Merhout, 2013; Stoel et al., 2012). In order to perform quality audit task using technology, organizations need to determine the required internal contextual factors such as infrastructure, people, availability of policies and procedures, adequacy of technology-aided tools and related mandates, laws, and regulations. Besides, the external contextual factors associated with the organisation also impact the performance of the IT-related audit, for instance, client accessibility into client accounting system, clients' related documentation and clients collaborative during the audit task (Ahmi, 2012). Further,

utilisation of audit technology among the auditors may influenced by organisation resource availability and auditors' perceptions (Janvrin, Bierstaker, & Lowe, 2008).

Although public sector auditors embrace the importance of application controls in the financial audit, technology enabled audit was only considered when the financial auditor possess limitation in their capacity of performing the audit task and existence of a significant change in the accounting system. Frequently, the financial auditors rely on substantive testing by audit tool such as CAATs when they are unable to rely on IT control and surprisingly technology related audit was only focusing on the general controls rather than application control (Axelsen, Coram, Green, & Ridley, 2011).

Further, research findings indicated that the under-utilisation of audit technology (e.g. CAATs) among external auditors in private audit firms during audit substantive testing, was only intended to detect a misstatement and fraud (Janvrin et al., 2008; Rowe, 2008) as compared to audit technology usage during the audit planning and administration (Curtis & Payne, 2008).

The extent and appropriateness of technology usage among the auditors have received fairly limited focus from scholars (Curtis & Payne, 2014), which triggers the needs to understand the drivers that impact the utilisation of computer-related audit procedure by auditors (Curtis et al., 2009). This may imply that the technology-enabled audit performance may not lead to expected outcomes in achieving the effective, efficient and quality audit.

Additional research is necessary to comprehend the possible issues in executing technology enabled audits and important determinant which was anticipated to impact the performance and quality of audit task (Curtis et al., 2009; Weidenmier & Ramamoothi, 2006).

The way audit is being performed is based on its audit objectives and influenced by nature, timing, and scope of the audit. Thus, each audit may have its own unique antecedents that influence its performance. The audit setting and its related limitation may vary with the condition of the task which may result in the different level of importance on the audit antecedents that may affect the audit performance (Havelka & Merhout, 2013; Stoel et al, 2012). The discovery of a set of antecedents that affect the use of audit technology may highlight specific aspects that are challenging or resourceful which may become a significant antecedent for audit technology performance and effective technology-enabled audit performance.

Furthermore, most of the researches related to IT audit antecedents are conducted in private organisations as compared to public sector organisations. Several scholars have argued that differences between the public and private sectors may cause the proven approaches from the private sector cannot be easily transferred for into public sector setting (Nutt, 2006). In addition, the specific public sector characteristics of bureaucracy in which legislation and policies are changing regularly and complex network of

interdependent organisations with a variety of stakeholders (Boyne, 2002) obviously indicates that there are clear differences between these private and public sectors. Thus the present study attempts to enhance the existing knowledge by investigating the factors that influence the audit technology usage in the public sector, which may shed some light on the current knowledge of IS and auditing literature.

Reviews indicated presently, only a few studies being conducted in Malaysian public sector audit organisation on IT-related audit (Mahzan & Veerankutty 2011) which was focusing on the IT controls assessment performs during the audit task among the external and internal public sector auditors. Another study was conducted based on a case study on the inclusion of sustainability dimensions in the Information System Auditing process among public sector auditors in Malaysia (Rahman et al., 2014). However, this current study is concentrating on developing a conceptual framework for Audit Technology Performance Model and its' antecedents among external public sector auditors which are so far; to the researcher knowledge, the study on this issue is inadequate. This study also intends to get some understanding of the current state of technology-enabled auditing.

#### **1.1.1.3 IT Audit Professional Framework**

The recent attention by professional standard-setting organisations in the technology related control assessment has evidenced the significant role of IT-based audit. These professional bodies have highlighted the significance of IT control and IT related process during the assessment of client internal control environment and reassure the auditors to use technology in the process of auditing. The professional standard setting bodies/committees related to audit profession are : (i) International Federation of Accountant (IFAC); (ii) American Institute of Certified Public Accountant (AICPA); (iii) Information System Auditing Control Association (ISACA); (iv) Institute of Internal Auditor (IIA); (v) The Public Company Accounting Oversight Board (PCAOB); and (vi) Committee of Sponsoring Organisation (COSO); (vii) International Standard of Supreme Audit Institutions (ISSAI) (Colbert & Bowen, 1996; O'Donnell & Rechtman, 2005).

These respective professional bodies have published guidelines in assisting the audit task, particularly on control objectives and IT-related control assessment within the organisation. In 1996, Colbert and Bowen made a comparison among 5 standards and noted that although the user and focus of control assessment differ between the financial statement, information technology and overall entity, but the control objectives among the 5 standards are similar, namely focusing on the on the efficiency and effectiveness of operation, reliability, financial statement and compliance with the rules and regulation. However, literature indicated that audit academia and audit practitioners still have limited guidance available on the types of technology-related control to be performed (Janvrin et al., 2008).

### **a. Committee of Sponsoring Organisation (COSO) Framework**

According to the COSO report (1994), “internal controls consist of five interrelated components which are control environment, risk assessment, control activities, information and communication, and monitoring”.

Auditors need to attain enough understanding of the controls implemented by the client in order to plan the audit strategy. Assessing the control environment is vital whether manual systems or electronic systems. However, it is important to indicate that the controls in computerized information systems include manual controls and automated controls. Manual controls are not dependent on IS system and only utilised data and information from the IS or safeguard the effectiveness of the system (Munter, 2002; Pathak, 2004; Tucker, 2001).

Control risk assessment concludes the reliability of control to be used as the foundation in identifying the nature, scope and timing of substantive procedures need to be conducted during the audit to collect competent, adequate and sufficient evidence (Rezaee & Hoffman, 2001). Some researchers agreed that although advance information system has been catered for its' related control by their vendors, but this type of system still increases the overall control risk (Hunton et al., 2004; Wright & Wright, 2002). However, the designed control mechanisms will be effective only when the control is established at the beginning and adequately maintained throughout the usage but that is not the actual situation. The control risk of a system can be compromised when the control is adopted partially or being omitted (Hunton et al., 2004).

When information system was designed with a low priority for security control without proper information on system audit trail, some data can be deleted without trace. Consequently, it increases the risk and affects the reliability of information used in making business (Allinson, 2004).

Basically, there are two types of IT control (COSO, 1994) which are: “general controls are controls over the environment in which the entity operates and therefore it forms an extension of the control environment, organisational controls, system development and maintenance controls, access controls, backup and recovery controls” (COSO, 1994; Cosserat, 2000; Gray & Manson, 2005). When general controls are not functioning effectively as anticipated, it is possibly not meaningful to further access the application controls (Pathak & Lind, 2003). Once auditors opined the general controls are effectively and adequately managed, the auditors can evaluate the effectiveness and adequacy of application controls (Rezaee & Hoffman, 2001) to evaluate the data processing risk within the system (Bell, Knechel, & Payne, 1999). The auditor needs to conduct a respective test to assure the control functions effectively (Yang & Guan, 2004).

The strength of the COSO framework is to introduce the concept of internal control and to have helped companies to detect, as well as to avert substantial misstatements related to fraud and errors (Rubino & Vitola, 2014a). However, COSO also shows some



limitations. First of all, the framework focuses on high-level assistance on controls and does not offer a suitable mechanism to test the control objectives (Chang et al., 2014; Huang, Hung, Yen, Chang, & Jiang, 2011; O'Donnell & Rechtman, 2005; Tuttle & Vandervelde, 2007).

Moreover, the framework does not address the specific risks and complexities of IT (Colben & Bowen, 1996). Thus, auditors' require having an inclusive framework to rightly familiarise with the current technology related audits and its related regulations (Fox & Zonneveld, 2003; Tuttle & Vandervelde, 2007).

#### **b. Control Objectives for Information Related Technology (CobiT) Framework**

With the present electronic environment, control related to information system needs to give adequate attention to assure a sound framework exists in the system. In line with the current trend, Control Objectives for Information Related Technology (CobiT) has been broadly used as an alternative control framework which complements the internal control framework of COSO (IT Governance Institute, 2005; Netegrity, 2004; Ramos, 2004). CobiT was initially anticipated for management to use as a benchmarking tool related IT control. CobiT assists evaluation of controls related to IT environment and IT process which includes "planning and organization, acquisition and implementation, delivery and support, and monitoring" (Van Grembergen, De Haes & Guldentops, 2004). It also recognizes information attributes (e.g., confidentiality, availability, effectiveness, integrity, reliability, efficiency and compliance) and availability of IT resources (e.g., technology, data, people, facilities, and applications) as vital drivers to support the IT process in order to achieve the organisation goal (Bodnar, 2003).

In an audit environment, CobiT framework has been used as a monitoring mechanism for IT investment. The framework assists auditors to plan the audit of IT projects based on the control established through the CobiT framework (Abu Musa, 2009; Hardy 2006; Merhout & Havelka, 2008; Tuttle & Vandervelde, 2007). Besides, this framework was empirically tested and being confirmed its internal consistency in the audit setting (Tuttle & Vandervelde, 2007). Additionally, the utilisation of the CobiT framework by the managers has resulted in internal control over financial reporting effectiveness, which enhances the reliability of financial reporting and compliance to audit standard requirements (Rubino & Vitolla, 2014b).

Kerr and Murthy (2013) investigated the importance of IT control in attaining effective internal control over financial reporting using the CobiT framework. The results indicated that IT professionals perceived the most important IT controls related to financial reporting are system security, change management, risk assessment, data management and internal control adequacy. Technology related control process is significantly impacted by individual characteristics, type of organisation, and familiarity in assessing IT controls and the geographical location of the respondent.

### **c. International Federation of Accountant (IFAC) Framework**

International Federation Of Accountant (IFAC) in its statement on Information Technology in the Accounting Curriculum (IFAC 1995) has delineated 36 specific test to be performed in assessing the IT control which was classified into “(i) system development and acquisition; (ii) system implementation; (iii) system maintenance and program changes; (iv) IT asset safeguarding; (v) data integrity, privacy, and security; (vi) disaster-recovery planning; (vii) operating system; and (viii) application processing” (Abu Musa, 2008; Hermanson et al., 2000).

Auditors evaluate controls related to system development to assure the auditability of the system, the adequacy of controls in the system which has enabled the reduction of maintenance cost (Azaltun, Batibay, Calayoglu, Mert, & Tastan, 2013). During the IT control evaluation of system changes, auditors’ works have helped in the identification of the operational risks, control design flaws, and testing paucities (Havelka & Merhout, 2008). Controls related IT asset safeguarding is a key task of the auditor (Hermanson et al., 2000) which involves physical inspection, access to the data centre and data libraries (Buchwald, Urbach, & Ahlemann, 2014). Evaluation of disaster-recovery planning has enabled organisations to recommence their system's processes as fast as possible after a catastrophe (Havelka & Merhout, 2008). Assessment related to data integrity, security and privacy controls are important as weaknesses in this aspect may increase the risk related to information theft, data destruction, legal liability and network communication loss (Pathak & Lind, 2010).

#### **1.1.1.4 Assessment of IT Control**

IT control assessment is related to the evaluation of control in an electronic environment which encompasses the practices, procedures, policies, and structures that planned to offer reasonable assurance on the achievement of IT-related audit objectives. Controls in an information system are to assure the reliability of financial reporting, efficiency, and effectiveness of operations and compliance with the rules and regulations. IT controls can be classified into two main categories of application controls and general controls which are important to assure the accuracy of information processing and integrity of data required to govern, manage and support the organisation.

In the intensive IS atmosphere, ‘owning’ effective control structure enables auditors to assess IT control effectiveness and identify an appropriate audit strategy, audit plan and respective audit program (Chang et al., 2014) and improved the control assessment efficiency and alleviate the audit risk (Huang et al., 2011). Auditors are playing a significant role in detecting the risk and evaluating its impact toward IS related activities. Thus, an audit review program on an information system is a vital tool to provide “the closed-loop cycle of continuous improvement” (Pathak, 2000)

A study conducted among internal audit directors in the South Eastern U.S noted that auditor are focusing their assessment on traditional IT control such as data integrity,

privacy and security controls, asset safeguarding controls and application processing controls, whereas system development and acquisition control, system maintenance and program changes controls for advanced IT control were given less attention. Size of organisation, types of auditors and introduction of new information system do influence the assessment of control performed during the audit (Hermanson et al., 2000). The findings were also consistent with studies conducted among the internal auditor in Saudi Arabia (Abu Musa, 2008) and among the Malaysian public sector auditors (Mahzan & Veerankutty, 2011).

Chang et al. (2014) conducted a case study research verifying the feasibility of the established framework for evaluating IT control in ERP environment. The study integrates elements related to IT controls from company IT control framework, CobiT framework, and previous literature and requested 18 experts to evaluate the importance of the items in assessing the IT control in ERP environment. A total of 12 dimensions of technology related controls are identified to assist auditors to perform effectively IT based audit such as “(i) functions and responsibilities in the data processing department; (ii) system development and control over program modifications; (iii) control over the compilation of system documents; (iv) access control of program and data; (iv) control of data inputs and outputs; (v) control of data processing; (vi) security control of files and equipment; (vii) control over the procurement, use, and maintenance of hardware and system software; (viii) system recovery plans/systems and control of testing programs; (ix) control over the processes of information disclosure on the assigned websites; (xi) independent IT audit units; and (xii) control of outsourced operations” (Chang et al., 2014).

Besides, reviews indicated the assessment on controls related technology does improve operational performance specifically controls related to data integrity, security, and privacy which can explain 45 percent of the performance difference across the organisations (Phelps & Milne, 2008).

Management support, ICT skills, computer-assisted audit techniques and IT controls, IT auditing techniques, and the current trends in IT enrich the knowledge and effective deployment of audit resources (Hass, Abdolmohammadi & Burnaby, 2006; Pathak, 2004;). A better understanding of technology-related controls among the auditors may integrate the knowledge gap in providing work ‘blended audit’ processes that ensure risk is identified and mitigated appropriately (Chaney & Kim, 2007). Besides, greater IT expertise among the auditors improves the IT control weakness for their client (Haislip, Peters, & Richardson, 2016).

Stoel et al. (2012) classified and assessed the potential antecedents from the auditing (financial audit and IT audit) literature and designed an instrument to evaluate the impact of antecedents on IT audit quality. Results from the factor analysis indicated that new drivers such as “audit methodology; professional conduct; auditors’ IT competency; IT resource availability; and auditor-client relationship are vital for IT-based audit and the importance of drivers varies between financial auditors and IT auditors.

### 1.1.1.5 Audit Technology Tools

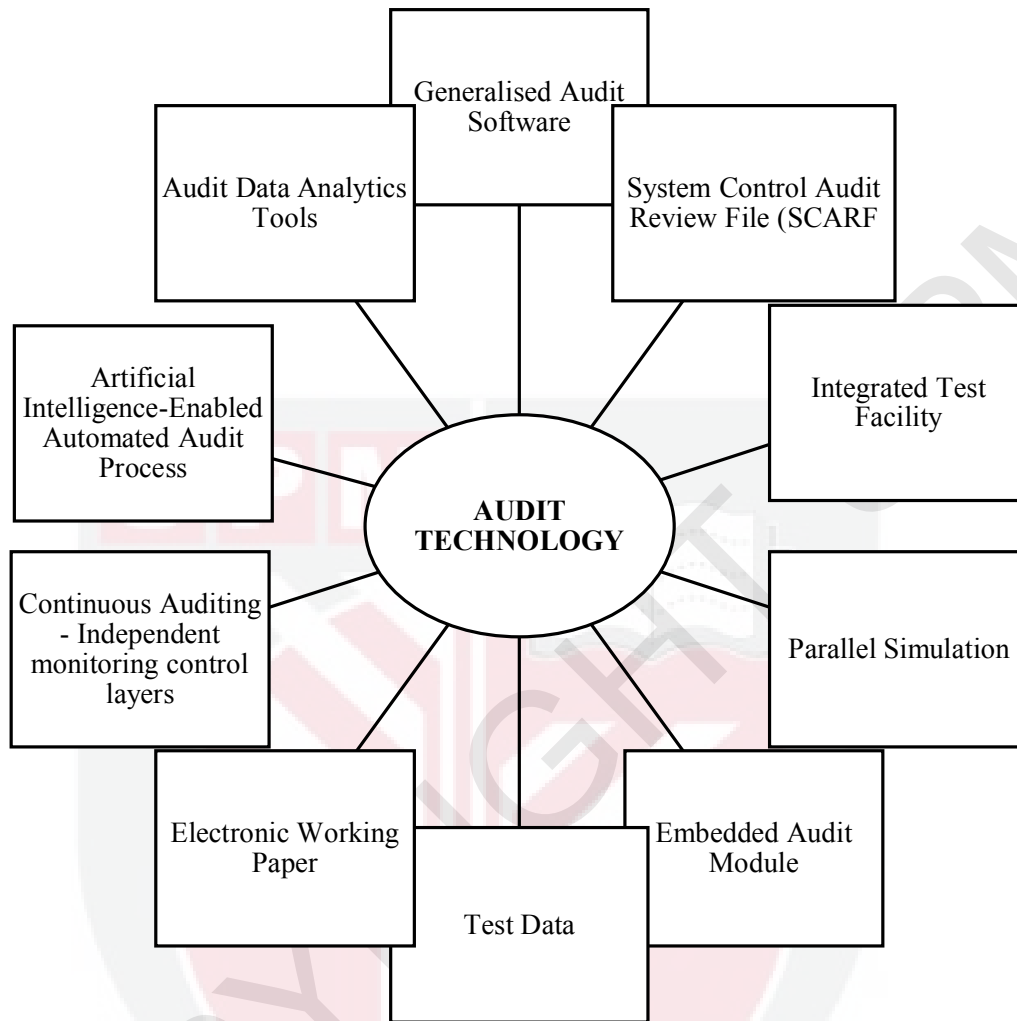
With the growing technology intensified economy and the emphasis on IT-related control by the regulation and standard, 'auditing around the computer' approach began to decline. The auditor needs to incorporate 'state-of-art' auditing application in the auditing process which encourages the auditors to conduct auditing in an electronic environment and permit more efficient and effective audit process through the enlargement on the scope of the transaction being examined at the minimum marginal cost (Braun & Davis, 2003).

The introduction of audit technology began with the utilisation of AUDITAPE – a computer-assisted audit tool (CAAT) by Haskins & Sells in 1967 to motivate auditors towards automated domain in performing audits through the computer. Further, within the year 1960 to late 1970s, Generalised Auditing Software (GAS) was introduced (Vasarhelyi & Lin, 1985).

The International Standard of Supreme Audit Institution (ISSAI), an auditing standard encourage the public sector auditor, encouraged the use of audit technology application and techniques to assess the risk related to fraud and data accuracy, verifies the journal entries and related adjustments, assists in sampling on related transaction, sorting the electronic data and testing the entire population. Some other standards related to audit professions are Statement of Auditing Standards (SAS) based on the US and International Standard on Auditing (ISA) based in the UK. These both standards can be adopted and adapted by the audit organisation in performing their audit functions.

Most frequently recommended audit technology and often promoted by professionals and standards is Computer Assisted Audit Tools (CAATs). Although "CAATs can be broadly defined to include any use of technology to assist in the completion of an audit, a more common definition is to restrict the use of the term to tools and techniques employed to audit computer applications and used to extract and analyse data" (Braun & Davis 2003).

The most widely used CAATs related audit technology namely are: (i) test data, parallel stimulation and integrated test facility assessing the internal logic of the financial application directly and to test the program is functioning as intended and correctly; (ii) generalised audit software being used to access client electronic files, extract related data, and conduct substantive test to examine the details of transaction and balances, perform analytical review to identify unusual transaction; (iii) system control audit review file (SCARF) and embedded audit modules being installed into the system to evaluate flows of transaction and identify exceptions transactions (Braun & Davis, 2003; Hall, 2015; Helms, 2002). The recent audit technologies are continuous auditing (Vasarhelyi & Halper, 2018), audit data analytics tools (Brown-Libur, Issa, & Lombardi 2015) and artificial intelligence-enabled automated audit (Issa, Sun, & Vasarhelyi, 2016). Figure 1.1 describes the types of audit technology, which commonly refers in the previous literature.



**Figure 1.1: Types of Audit Technology**

Audit tools enable auditors to perform audit task efficiently and quickly as well as effectively by analysing the whole population of electronic data based on established testing criteria (Braun & Davis 2003; Zhao, Yen & Chang, 2004). It was also noted that the usage of CAATS assists in the performance of IT related Audit (Abu Musa, 2008; Hermanson et al., 2000). Audit-related technology widely been applied in producing audit working papers audited financial statements as well as during the audit sampling (Mustapha & Lai, 2017). Audit analytics offer auditors to evaluate potential risk, operational inefficiency, detect anomalies (Li et al., 2018) and use of technology to enhance the audit process (Brown-Liburud et al. 2015; Rose, Rose, Sanderson & Thibodeu, 2017).

However, reviews indicated that audit technology application is not being used broadly in practice (Curtis & Payne 2008; Debreceny, Lee, Neo & Toh, 2005; Liang, Lin, &

Wu, 2001; Shaikh 2005) and it was noted that technology in audit practises was lagged behind compared to business (Oldhouser 2016).

IT allows auditors to attain a new level of testing assurance and technology audit application helps as a tool for automating auditors' works and auditing process in clients' system. Now auditors through IT can test the entire population of transaction and processes as well as latest software that enable to obtain information from a variety of database within the system and verify controls related to technology are operating efficiently and effectively. In an advanced audit context, technologies considered to be an important necessity and not a luxury as it continuously assesses and monitors the risk in an effective manner (Hespenheide, 2006). As such, audit technology is anticipated in assisting audit methodology effectiveness and efficiency, improving fraud detection and reducing the cost of litigation. However, the substantial benefit of audit technology is only able to materialise if the technology is applied and used in the conduct of audit task (Curtis & Payne, 2014). Further, it was featured that auditing profession would be the last to embrace new technologies (Appelbaum, Kogan, & Vasarhelyi, 2018).

### **1.1.2 Malaysian Public Sector Audit**

Auditor General Office of Malaysia was established during British Colonisation in the initial 20th century in order to reinforce the financial administration of the public sector organisation and to safeguard all public sector regulations and procedures were fulfilled and implemented. In 1906, W.J.P. Hume as the Director of Audit Malaya for the Federated Malay States systematically organised the structure and the scope of the audit function. The title of Director of Audit Malaya was replaced with the Auditor General once the Federation of Malaya obtained its independence in 1957. The Auditor General's appointment and accountabilities were clearly stated under Article 105 of the Federal Constitution and the Audit Act 1957. These laws require the Auditor General to inspect the programs and financial records of the government at federal and states, federal and state statutory bodies, local councils, Islamic religious councils and government-owned companies. Subsequently, the name of the institution was changed to Auditor General Office (AGO). Commonly in Malaysian public sector administration, the Auditor General Office of Malaysia was named as the National Audit Department of Malaysia (NADM). Internationally, the AGO office was also referred to Supreme Audit Institution (SAI).

The Malaysian Government has actively embarked on digital government with the execution of the Multimedia Super Corridor (MSC) initiatives supporting the frameworks of the National IT Agenda in 1997 (Hussein, Karim, Mohamed, & Ahlan, 2007a). The execution of electronic government began through the public management reform in modernising and improving public service delivery. The main agenda related to technology reform was to escalate the quality, efficiency, and effectiveness of government-related services as well as allowing for prompt decision making which will enable the public sector organisations to be more receptive to the needs of its citizens (Siddiquee, 2007). Information Technology (IT) from this perspective may include IS, ICT, communication technology, e-government and info-structure and infrastructure,

technologies that manage and transmit the information to improve individuals and the organisation's performance (Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011).

In order to streamline its IT initiatives, the Malaysian government has initiated Public Sector ICT Plan (PSISP) which is “a blueprint that defines the vision, strategic direction and framework for the usage of IT; the objectives and strategic thrust areas of IT development; as well as the implementation strategies and activities, plans to be taken to realise the objectives of the plan” (Veerankutty, 2009, p. 11). Beginning with the first IT strategic blueprint in 2003 and subsequently, the government launched PSISP (2005 – 2010) and PSISP (2011 – 2015). The systematic way of incorporating technology into public service delivery can be seen through various electronic services offered by government agencies and some recent achievement of PSISP (2011-2015). The Government’s commitment in fulfilling the aspirations of the people is further reflected in the 11th Malaysia (2016 – 2020) to ensure that its citizens and economy keep pace with the digital global economy (NADM, 2015). As at to date, the Malaysian government has utilised more than 500 IT related system in numerous bureaus, divisions and agencies at the federal government level to escalate public service delivery (Buang, 2015).

Even though, the e-government initiatives have been fruitful, but the effect on the public service delivery and its inclusive impact has continued to be restricted owing to various limitations and slower adoption. The limited types of electronic services and the not materialised expectation are due to inadequate accessibility to resources, lack of technology awareness and e-readiness which has further weakened the achievement (Siddiquee, 2008).

Various studies relating to the new public management reform in Malaysia have stated that despite many reforms the Malaysian public sector continued to suffer from inefficiency, corruption, lack of financial discipline, ownership and accountability (Siddiquee, 2006; Siti Nabiha, 2008). Further literature recommended that strengthening accountability mechanism (Siddiquee, 2006) and closely monitoring the implementation of the system (Bakar, Salleh, & Mohamad, 2011) may help in achieving the desired outcome of the reforms. Besides, future research needs to focus on the implementation of the reform rather than focusing on the introduction of the reforms (Siddiquee, 2006). Thus, it is vital to understand the practices and adoption of IT within the public sector, particularly in the public sector audit organisation.

Additionally, the government financial accounting system has experienced a remarkable revolution in the year 2000 which resulted in modifications in the financial system of federal and state governments as well as and statutory bodies (Veerankutty, 2009). These transformations of the accounting system gave major impact to the public sector auditing practices. Subsequently, these developments have impacted the quality of auditing process in improving the accountability of public sector financial management.

In line with this change, NADM has restructured its organisation in 2008 to escalate NADM into a resourceful organisation that focusing its core activities and to perform specialised audits on water management, environment, and ICT. Malaysian public sector

audit organisations under the scrutiny of NADM can be divided into three main division of (i) Federal audit division is accountable for the audit of the federal ministries, departments and government-linked companies (GLC) ; (ii) State audit division is in charge of conducting audit on accounts of state departments, respective Islamic religious councils, and state statutory bodies; (iii) Federal statutory bodies division is responsible in performing auditing on accounts related to statutory bodies at federal level.

Further, the new Government Transformation Program (GTP) has imposed fresh challenges and has a substantial impact on the public sector auditing to continuously servicing high-quality audit.

#### **1.1.2.1 Technology Enabled-Auditing in Malaysian Public Sector**

The implementation of technology-related initiatives in Malaysian public sector audit organisations began as early as 1980's with the introduction of technology audit software in performing the financial audit task. Further, the initiatives took a remarkable turn in 1997 after the beginning of e-government into 5 phases: Phase I (1996); Phase II (1997 -1998); Phase III (1999 -2000), Phase IV (2001 – 2002) and Phase V (in year 2003) which mainly involved in the procurement of infrastructure and info-structure as well as human capability development (Buang, 2015).

In 1992, Malaysian public sector audit organisations commenced performing the attestation audit using computer-assisted audit tools and techniques. Primarily, the data were transferred and downloaded from Accountant General Office accounting database using round tape and cartridge platform. With the recent significant advancement in information technology, data downloading is conducted using an infra - network, which directly connected to the client information system. Public sector audit organizations use the Audit Command Language (ACL), an audit tool, application that intensely enhances the audit processes.

With regards to system development, IT audit team execute concurrent audit during development as well as at the pre and post implementation to evaluate the effectiveness of these IT projects management, planning, implementations and monitoring practices which involved system performance and an assessment of the business process with IT process (NADM, 2015). In approaching the capacity development of auditors, public sector audit organisation is continuously formulating the ICT related training for their workforce and issues Audit Manual related to IT audit (Buang 2015).

The remarkable commitment of Malaysian public sector audit organisations using technology in carrying out the audit task to escalate audit quality has resulted in the investment in technology-based audit approach in this area and became an important agenda to assure public sector audit remains relevant and effective.



Technology enabled auditing conducted by Malaysian public sector auditors comprises “General ICT Audit; System Development Audit; Performance Audit in ICT environment” and usage of audit technology during the audit task (Veerankutty, 2009, p. 14). Auditors are required to assess the client computerised accounting system/information system to assure the system is producing accurate, complete, reliable and timely information in line with management's intention.

Most public sector auditors in Malaysia performed their financial and compliance audit by incorporating evaluation of general technology-related audit as postulated in the IT Audit Manual of NADM that comprises generally IT controls and application IT controls of the government financial accounting system. Further, each division of public sector audit organisation is being supported by IT audit team who conducts a more specialised audit on IT project implementation and system development which focuses on performance audit and system development audit.

The current transformations in the public sector have implicated the way audit process being carried out. Accordingly, auditors should be well-informed about the clients' technology advancement with regards to audit methodology, tools, and techniques (Buang, 2015). Hay (2017) highlighted that auditing research is largely centred on practical issues and it can be investigated using qualitative, quantitative, mixed methods or be interdisciplinary.

### **1.1.3 Information Technology (IT) Governance Practices**

As organizations rely on IT to some degree to conduct their business, IT governance (ITG) has gained importance in recent years as a key aspect of governance (Bhattacharjya & Chang 2007). IT governance is important for an organization to attain its organizational objectives. ITG is defined as a framework that determines the decisions rights and accountability to stimulate anticipated behaviour in the use of technology. Effective ITG stimulates and influences the workforces in technology usage and warrants compliance with the business vision, norms and beliefs (Weill & Ross, 2004). The governance mechanism acts as the mechanism on behalf of principals (*i.e.*, government, stakeholders) in monitoring the behaviour of management (*i.e.*, agent).

In order to employ an effective IT governance, a set of ITG mechanisms is compulsory (e.g., IT steering committee, IT organizational structure; Management support) that able to boost actions consistent with the organization's mission, standards, rules and values (Vaswani, 2003; Weill, 2004). Recent concern towards IT Governance was mainly due to the advancement in information systems, legal requirements as well as social actors' defective actions towards technology (Novotny, Bernroider, & Koch, 2012). Besides, ITG becomes important to effectively manage the internal control frameworks in mitigating compliance and financial risks (Rubino & Vitolla, 2014a). Thus, governance is imperative to warrant the successful implementation of public service delivery to accomplish the corporate goals, whereby the decision-making process and monitoring system are aligned with the organisational goals and citizen expectation (Mukhtar & Ali, 2011).

Organisations' that have implemented ITG noticeably enhanced their performance specifically in terms of profitability by increasing the operation thru the effective use of technology and cost minimisation. As such, adoption of IT governance practices is associated with improvements in different financial metrics, thus, the maturity of IT governance initiatives can affect the governance performance and, consequently, the organisation performance (Lunardi, Becker, Macada & Dolci, 2014). Besides, a study conducted to understand the perceived level of IT Governance implementation among different stakeholders revealed that the understanding among the different group can be improved further when the organisation identifies what are the issues and take necessary action in order to enhance the benefit from IT investments (Joshi, Huygh, De Haes & Van Grembergen, 2017).

In Malaysia, basically the implementation of IT Governance practises was led by the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU). The Public Sector ICT Strategic Plan (PSISP) sketches the strategic path of ICT implementation that aimed to supports the technology usage with the organisational direction of the public sector, to assure return of investment through exploitation of technology and a well-structured ICT execution (MAMPU, 2016). Government IT and Internet Committee (GITIC) is a high-level governance structure that was established on 6 February 1998 to set the mission and strategy direction of ICT expansion and oversee the Public Sector ICT program. Whereas, Public Sector ICT Technical Committee (JTISA) is responsible to assess and approve the technical aspect of ICT initiatives centred on PSISP of respective agencies. In addition, Public Sector ICT Project Monitoring Committee (JPPI) is responsible to reinforce the governance structure of the implementation of the existing ICT initiatives.

Specifically, the implementation of IT related initiatives in NADM are stipulated in the ICT Strategic Plan of NADM (i.e. Pelan Strategik Teknologi Maklumat Jabatan Audit Negara) monitored through the ICT Steering Committee. Implementation of IT Governance practices across NADM involving the various branches and state offices. The policy on IT Governance practices were developed at strategic level in headquarters of Putrajaya and the implementation of such policies and procedures were at tactical level involving numerous audit branches and state offices across Malaysia. Each implementation at tactical level differs according the respective individuals and offices. NADM has actively engaged in these ICT initiatives formally since in year 2012 by developing its own PSISP as required by the circulars.

## **1.2 Problem Statement**

Information Technology (IT) has been considered as one of the impactful factors which have changed the way organisations and government doing their business. Recent industry surveys showed that 60 percent of organisations globally were undergoing IT transformations and 54 percent believed the transformation may take longer time than expected and may significantly disrupt the organisation performance (Protiviti, 2016a). In addition, board directors, executive management and financial executives perceived IT risk and technology advancement may significantly impact the performance (Protiviti, 2016b; Protiviti, 2016c; Protiviti 2018).

Specifically, in Malaysia, the total budget for ICT related project in the 9<sup>th</sup> Malaysian Plan (2006 – 2010) has increased to more than 180% as compared with the previous Malaysian Plan. This has triggered the significance of IT investment in the Malaysian public service delivery and the expected return from these investments also being an important concern among government agencies and citizen. However, in most of the ICT project being audited, the major issue was under-utilisation of the system in terms of functionality particularly due to lack of knowledge, system specifications were not clearly defined, as well as the database was not updated and mostly attributable to inadequate governance measures as stipulated in the circulars (NADM, 2015). The Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) circulars have required all government agencies should have committees to deal with ICT related issues such as Steering Committee, Technical Committee, and Project Management Team. Nevertheless, in many cases, the agencies do not set up these committees because project owners assumed that the project implementation team is sufficient to manage the projects, and in cases where the committees are set up, their roles are uninformed (NADM, 2015). Thus, the under-utilization of technology is still a key issue in practice (Maruping et al., 2017).

Additionally, technology has affected the accounting system of the government and most of the Malaysian government financial system has been computerised. In 2012 alone, public sector auditors have verified transactions worth RM475 billion and RM488.2 billion for Financial Year 2013 through concurrent audit processes. A recent study shows a growing concern among the public audit profession on the rise of big data and the use of data analytics among the audit clients which has triggered new risk as well as opportunities (Appelbaum, Kogan, and Vasarhelyi, 2017). This computerised accounting system has largely impacted the way the auditors performing their audit tasks and has implicated the current audit practices into new path which led into the necessity of new audit procedures, techniques, and tools to evaluate the control in order to mitigate the new business risk (Masli et al., 2010; Pathak & Lind, 2003). The new requirements of audit guidelines and law have given rise to the significant role for technology-enabled audit involving attestation and compliance audit (Carlin & Gallegos, 2007).

Although the use of technology by public sector auditors during audit task has begun since 1980 most recently the head of the public sector audit organisation, Auditor General of Malaysia has expressed his concern over the under-utilisation of technology among the auditors (Buang, 2015). Despite the usage of technology in auditing, public sector auditors still fall apart from what's being expected by the management and the professional standard. Auditor General of Malaysia has recently quoted that “ public sector auditors do not use analytics on unstructured data in performing data mining and collecting of audit evidence due to limitation of technical expertise and facing problems related to system complexities, data from different sources and platform, human resource capacity and capabilities, liability and compatibility issues” (Buang, 2015). A study conducted in Malaysia indicated that only 47 percent of private statutory auditors were using audit technology such as GAS and e-working paper (Rosli et al., 2013). Additionally, prior studies indicated that IT controls evaluated during the audit were merely on the traditional control (application processing control and data integrity, privacy and security control) rather than advanced IT control such as system maintenance and program change control and system implementation control (Mahzan & Veerankutty, 2011).

The utilisation of audit tools/technology during the substantive testing was also facing slower adoption instead of its introduction to audit work were more than 20 years (Ahmi & Kent, 2013; Braun & Davis, 2003; Debreceeny et al., 2005; Janvrin, Bierstaker, & Lowe, 2008). Additionally, industry surveys suggesting that over a decade audit function are not attaining sufficient progress in their competency and use of technology during auditing (Protiviti, 2016d). Some of the challenges faced by public sector external auditors in digital environments are limited knowledge on emerging risks such as technology, weak auditor-client relationship and limited accessibility to audit evidence (Al-Omari, Barnes, & Pitman, 2012).

Thus, these significant issues need to be further explored as the inefficient and ineffective utilisation of audit technology during the audit task may impact the quality of audit work and indirectly on the quality of the audit report. Deficiencies in IT can lead to material weaknesses in internal controls (Bedard & Graham 2011). IT related material weaknesses are more likely to be associated with misstatements which can negatively affect financial information (Klamm et al., 2012; Li, Peters, Richardson, & Watson, 2012). As such, it raised the concern of government and public on the reliability of financial information used in preparing the audited financial statement.

Reviews indicated that the reason for the slower adoption of audit technology have yet to be raised despite the importance of technology-enabled auditing in improving the auditor's task in the electronic environment has been recognised widely. Only few studies have investigated the antecedents of quality IT audit and exploratory in nature (Merhout & Havelka, 2008; Stoel, Havelka, & Merhout, 2012) but limited studies (Ahmi, 2012) have tested the factors in a collective manner. Though many studies have investigated factors influencing audit technology, but they have been many inconsistent and inconclusive findings (e.g. Ahmi & Kent, 2013; Axelsen, Green, & Ridley, 2017; Curtis & Payne, 2014; Gonzalez, Sharma, & Galletta, 2012b; Li et al., 2018; Mahzan & Lymer, 2014; Pedrosa et al., 2015; Razi & Madani, 2013; Vasarhelyi & Romero, 2014; Zainol et al., 2017).

Despite, multiple initiatives have been taken to improve the use of technology among the auditors, IT utilisation among the auditors are still low. It may also indicate that the current strategies and policy may not effectively support the technology implementation. Reviews showed that major factors related to IT project failure were lack of governance, specifically no clear direction of IT with business performance, inadequate management supports, improper IT plan and insufficient IT support services (Amid, Morteza, & Ravasan, 2012; Nawi, Rahman, & Ibrahim, 2011). Significantly, the major challenges faced by the audit function were the evolving technologies and risk related to information security, limited qualified human resource capabilities and skills, inadequate reporting structures for IT audit function and IT infrastructure, misalignment between technology and organisation performance, and insufficient audit methodology related to IT risk assessment as well as limited usage of technology in data analytics (Protiviti, 2016e).

Moreover, Governments with ineffective ITG may cause in low performance of technology assets such as vague information quality, unproductive operational costs, delay in IT project and the close down of its IT department (Nfuka & Rusu, 2011). Thus,

effective IT governance is anticipated to display a role in improving the successful utilisation of audit technology through the effective management of organisation resources. Therefore, an effective role of governance may improve the implementation of IT related activities which further empower the individual and organisational performance.

Additionally, reviews indicated that public sector auditing is a huge segment of auditing practice that is multifaceted and relatively unexplored (Hay & Cordery, 2018). Furthermore, reviews showed that most of the research respondents were the auditors in a private setting and limited studies have discussed the performance of technology-enabled auditing among public sector auditors. Although the usage of some IT controls will be very similar to both the private and the public sector, many differences can be expected due to specific public sector characteristics (Bolscher, 2014).

Few scholars have highlighted that developing economies such as Malaysia has significant dissimilarities in IS implementation, particularly in term of social, economic, legal, cultural and political context as compared to developed countries (Gonzalez, Sharma, & Galletta, 2012a; Venkatesh, Sykes, & Venkatraman, 2014). Thus, having established an approach in measuring the success factors that influence the audit technology performance in Malaysian public sector audit, it is possible to test what types of success factors have an impact on individual job performance (audit task) in a developing country like Malaysia.

Thus, this study intends to supplement the present knowledge by understanding the audit technology performance and identify the drivers that influence the successful utilisation of audit technology during the audit task among the external public sector auditors in developing country like Malaysia. The under-utilisation of audit technology during the audit task among the auditors can be induced by stimulating the factors that influence the technology usage behaviours which expected to improve the audit technology performance. Besides, literature also indicates the lower adoption of technology may directly relate to the users' defective actions towards technology (Novotny et al., 2012), thus, IT governance needs to be put in place to enhance the audit technology performance.

### 1.3 Research Questions

This research intends to investigate the following research questions (RQ):-

#### **Research Question One (RQ1):**

What is the level of technology enabled auditing (IT control evaluation) among public sector auditors in Malaysia?

#### **Research Question Two (RQ2):**

What is the extent of influence that the success factors namely auditors attributes, auditor competencies, technology attributes, technology readiness, organisation readiness, professional conduct, client system, client readiness and institutional support have on the audit technology performance among Malaysian public sector auditors?

#### **Research Question Three (RQ3):**

Does IT Governance moderate the relationship between success factors and audit technology performance?

### 1.4 Research Objectives

The main purpose of this study is to enhance the understanding of audit technology usage during the audit task by Malaysian public sector auditors. Exploring the current research question permits the enhancement of the understanding of the factors influence the audit technology performance which in turn improves the implementation of computer-based audit procedures involving testing of IT control and substantive test. Specifically, the current study is intended to achieve the following research objectives (RO):

#### **Research Objective One (RO1):**

- To determine the level of frequency that Malaysian public sector auditors placed on the type of IT control evaluation (technology enabled auditing);

#### **Research Objective Two (RO2):**

- To identify the success factors namely auditors attributes, auditor competencies, technology attributes, technology readiness, organisation readiness, professional conduct, client system, client readiness and institutional support that have an impact on audit technology performance among Malaysian public sector auditors;
- To examine the relationship between the success factors namely audit auditors' attributes, auditor competencies, technology attributes, technology readiness, organisation readiness, professional conduct, client system, client readiness,

and institutional support and audit technology performance among Malaysian public sector auditors; and

**Research Objective Three (RO3):**

- To test the moderation effect of IT Governance practices on the relationship between success factors and audit technology performance among Malaysia public sector auditors.

## **1.5 The Scope of the Study**

This study focuses on the current state of technology-enabled auditing performance and the factors influencing the successful application of audit technology during the technology-enabled auditing among Malaysia public sector auditors as well as the effect of IT Governance practices on the audit technology performance specifically in the National Audit Department of Malaysia. The scope of the study are auditors who are using audit technology during the audit; represented by the auditors in the National Audit Department of Malaysia who are conducting the external audit function on federal, state and statutory bodies which were under the administration of the National Audit Department of Malaysia.

## **1.6 The Contribution of the Study**

This thesis is intent to investigate technology-enabled auditing in Malaysia which is being under-researched. This research is anticipated to improve the awareness of IT control assessment and audit technology usage among the public sector auditors in Malaysia. The current study is expected to contribute to the current literature at different levels.

### **1.6.1 Theoretical Contributions**

In terms of theoretical contribution, firstly, this study develops a conceptual framework which covers different streams of literature which are auditing literature, accounting information system literature, information system literature and governance literature. By combining the perspective of auditing and information system, the model is expected to create a synergistic effect of key success factors for successful utilisation of audit technology (audit technology performance). Technology enabled auditing also involves in information system management which implies a rethinking of all audit processes and methodologies from a new perspective involving IT (Masli et al., 2010; Chen, Smith, Cao & Xia, 2014). Empirical evidence reported that technology-enabled auditing has been reflected to be critical to the process of financial and compliance auditing (Axelsen, et al., 2011; Carlin & Gallegos, 2007; Vilsanoiu & Serban, 2010).

Secondly, the originality of this research lies in the new aspect of IT governance practices being introduced as a moderator that may stimulate the audit technology performance which have yet to be investigated particularly involving technology enabled auditing from the context of public sector auditing. The finding of the study expected to enrich the existing body of knowledge on the significant role of IT governance in assuring the successful utilisation of audit technology.

Thirdly, this study theoretically has contributed in supporting the associations between the success factors and audit technology performance. This study integrates audit antecedents into audit technology performance which is expected to provide fresh insight into the current literature. Further, the adaptation of audit quality attributes from auditing literature into the IT adoption theoretical framework from IS literature in developing a conceptual framework of an Audit Technology Performance Model for the public sector will deepen the current knowledge.

### **1.6.2 Methodological Contributions**

This study utilise the measures from IS Success Model (DeLone & McLean, 1992) in assessing the audit technology performance as the predictor for successful utilisation of audit technology which is anticipated to provides fresh insight in auditing and IS literature on the audit technology performance.

Notably, in this study, the current state of technology-enabled audit performance is measured using computer-related audit procedures/evaluations stipulated in public sector auditing standard (e.g. ISSAI) and further supplemented with the specific IT control test delineated from Information Technology in Accounting Curriculum, education guidelines (IFAC, 1995). Attributes from the Control Objectives for Information Related Technology (CobiT) framework also being integrated into the measure as its application and suitability have been validated by previous studies in information system literature (Chang, Yen, Chang, & Jan, 2014; Kerr & Murthy, 2013; Tuttle & Vandervelde, 2007). Thus, the application of IFAC and CobiT framework attribute in audit standard attributes in measuring the technology-enabled auditing may give new insight into the auditing literature.

### **1.6.3 Practical Contributions**

From the practical perspectives, this study is to give an insight and assessing the IT control evaluations performed by the public sector auditors during the technology-enabled auditing which are often being recognised as one of the important risk elements to the organisations involved in the e-business environment. The intention of the study is to help the public sector auditors in Malaysia to assess the extent to which auditors performed a technology-enabled audit in public sector organizations as well to analyse the area where IT control assessments are not currently being performed.



Besides this study is intended to identify the success factors that influence the audit technology performance and the moderating role of IT governance in the successful utilisation of audit technology, which may help to improve the performance and adoption of technology-enabled auditing among Malaysian public sector auditors specifically and among public sector auditors globally.

Although considerable research exists in the technology-related audit from the context of internal auditing, there is a limited study that has explored technology control assessment and audit technology usage in public sector auditing. Thus, the results may breed new insights to augment the current knowledge of technology-enabled auditing specifically on IT control assessment activities. The results of the study enable the auditors to better understand the internal control assessment activities in the computerised information system and confer more attention to the factors which influence the use of audit technology in order to improve the performance of technology-enabled auditing.

Further, this study may provide insights for standard setters regarding the usage of audit technology and the types of IT control have been performed by public sector auditors as well as whether or not auditors in compliance with audit standards. The findings may help the standard setters to develop appropriate policy to enhance the audit technology usage and IT controls assessment which is being less emphasised by public sector auditors

### 1.7 Operational Definition of Keywords

There are 13 main terms being used throughout this thesis, which are important to this current study. The detailed descriptions are summarised in Table 1.1.

**Table 1.1: Description of Keywords**

No.	Construct	Description
1	Technology Enabled Auditing	<p>refers as “a process which collects and evaluates evidence to determine the IS and related resources are adequate safeguard assets, maintain data and system integrity, provide relevant and reliable information, achieve organisational goals effectively and provide reasonable assurance that objectives are met”(ISACA, 2009).</p> <p>Specifically it related to evaluation performed on the types of IT related controls during the audit task in the electronic environment whereby most of the audit evidences were kept in digital forms and most of the internal controls are embedded in the system being audited.</p>

**Table 1.1: Description of Keywords**

No.	Construct	Description
2	Audit Technology Performance	measures effectiveness/success of IS and it is the influence of the system and information on the users' task specifically refers to the aspect of user satisfaction and the impact of the system/technology on the individual job performance (DeLone and McLean,2003)
3	Success Factors	refer to important independent variables related to IS success (i.e., success factors) (Petter et al., 2013)
4	Auditors Attributes	explain the influence of individual character and attitude toward the adoption of innovation and new technology (Rogers, 1995) specially on innovativeness, experience and job relevance.
5	Auditors Competencies	refer to their skills and knowledge in conducting the task (Tornatzky & Fleischer, 1990) particularly related to auditing, IT and industry knowledge.
6	Technology Attributes	refer to the characteristics of the technology innovation being used in performing the task (Roger, 1995) mainly on relative advantage, compatibility, complexity and flexibility of the technology.
7	Technology Readiness	refers perceived availability of technological infrastructure that is important to technology utilisation (Oliveira, Thomas & Espadanal, 2014) mainly related to audit tools, data accessibility and ICT facilities.
8	Organisation Readiness	refers to the perceived availability of resources within the audit organisation (Ahmi & Kent, 2013) particularly related to financial budget, training, maintenance cost, time and staff .
9	Professional Conduct	signifies aspect related to audit profession (Ahmi & Kent, 2013). It refers perceived requirement of audit profession which related to audit procedures and techniques applied during the audit tasks.
10	Client System	signifies the perceived attributes and nature of the client system being audited which is not within the control of the audit organisation (Havelka & Merhout, 2008). It refers to the quality of the system design and the information of the system (DeLone & McLean, 1992).
11	Client Readiness	denotes perceived aspect relating to the client being audited (Ahmi & Kent, 2013) specifically on the level of automation, audit trail and client data.
12	Institutional Support	denotes the perceived support/pressure come from the competitors, regulators, professional bodies, partners, and government (DiMaggio & Powell, 1983).

**Table 1.1: Description of Keywords**

No.	Construct	Description
13	IT Governance Practices	refer to perceived availability of practices that determines the decisions rights and accountability to stimulate anticipated behaviour in the use of technology (Weill & Ross, 2004). IT governance can be deployed using a mixture of various structures, processes and relational mechanisms (DeHaes & Van Grembergen, 2008).

### **1.8 Structure of the Thesis**

The chapters in this thesis are organised to facilitate the readers to clearly understand the subject matter under investigation. Chapter Two is focusing on literatures reviews which describe on the concepts and theory related to technology adoption, concepts on technology enabled auditing as well as IT governance practices. Chapter Three is discussing on the selection of theoretical constructs and its framework as well as hypotheses development while Chapter Four is regarding research methodology and data analysis tool. Chapter Five is displaying the results from the data analysis using SPSS v.23 and PLS-SEM v3.0. Finally, Chapter Six is on discussion and conclusion of the study.

### **1.9 Summary**

This chapter signifies a synopsis about the current research, particularly on the background of the study, highlighting the problem statement, related research questions and research objectives of the study as well as the significance of the study. The next chapter (Chapter 2) is focusing on literatures reviews on the concepts and theory related to this study.

## REFERENCES

- Abdollahzadehgan, A., Che Hussin, A. R., Gohary, M. M., & Amini, M. (2013). The organizational critical success factors for adopting cloud computing in SMEs. *Journal of Information Systems Research and Innovation*, 4(1), 67–74.
- Abdolmohammadi, M. J., & Boss, S. R. (2009). Factors associated with IT audits by internal audit function. *International Journal of Accounting Information Systems*, 11(3), 140 – 151.
- Abu Musa, A. (2009). Exploring the importance and implementation of CobiT processes in Saudi organizations: An empirical study. *Information Management & Computer Security*, 17(2), 73-95.
- Abu Musa, A. A. (2008). Information technology and its implications for internal auditing: An empirical study of Saudi organizations. *Managerial Auditing Journal*, 23(5), 438-466.
- Adebayo, A. O., Lee, A. S., & Epps, R. W. (2008). Developing a theory of auditing behavior in the Electronic Business Environment. *Journal of Theoretical Accounting Research*, 4(1).
- Agarwal, R., & Prasad, J. (1998). The antecedents and consequents of user perceptions in information technology adoption. *Decision Support Systems*, 22(1), 15-29.
- Agarwal, R., & Prasad, J. (1999). Are individual differences germane to the acceptance of new information technologies?. *Decision Sciences*, 30(2), 361-391.
- Ahmi, A. (2012). *The Use of Generalised Audit Software (Gas) By External Auditor in the UK*. Unpublished thesis. Brunel University, London, United Kingdom.
- Ahmi, A., & Kent, S. (2013). The utilisation of generalized audit software (GAS) by external auditors. *Managerial Auditing Journal*, 28(2), 88–113.
- Ahmi, A., Saidin, S. Z., & Abdullah, A. (2014). IT Adoption by internal auditors in public sector: a conceptual study. In *Proceeding Social and Behavioral Sciences* (Vol. 164, pp. 591–599).
- Ahuja, M., Kuhn, R. & Mueller, J. M. (2013). An examination of the relationship of IT control weakness to company financial performance and health. *International Journal of Accounting and Information Management*, 21, 227-240.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Akter, S., D'Ambra, J., & Ray, P. (2011). An evaluation of PLS based complex models: the roles of power analysis, predictive relevance and GoF index. *AMCIS 2011 Proceedings - All Submissions*. 151.
- Alam, S. S., & Noor, M. K. M. (2009). ICT Adoption in Small and Medium Enterprises : an Empirical Evidence of Service Sectors in Malaysia. *International Journal of Business and Management*, 4(2), 112–125. doi:10.5539/ijbm.v4n2p112
- Alam, S. S., Ali, M. Y., & Mohd. Jani, M. (2011). An Empirical Study of Factors Affecting Electronic Commerce Adoption among SMEs in Malaysia. *Journal of Business Economics and Management*, 12(2), 375–399. doi:10.3846/16111699.2011.576749
- Alawneh, A., & Hattab, E. (2009). An Empirical Study of Sources Affecting E-Business Value Creation in Jordanian Banking Services Sector. *International Arab Journal E-Technology*, 1(2), 1–8.
- Ali, S., & Green, P. (2005). Determinants of effective information technology governance: a study of IT intensity. In *Proceedings of the International IT Governance Conference, Auckland, New Zealand*.

- Ali, S., & Green, P. (2007). Effective IT Governance Mechanisms in Public Sectors: An Australian Context. *International Journal of Global Information Management (JGIM)*, 15(4), 41–63.
- Ali, S., & Green, P. (2012). Effective information technology (IT) governance mechanisms: An IT outsourcing perspective. *Information Systems Frontiers*, 14(2), 179–193.
- Ali, S., Green, P., & Robb, A. (2015). Information technology investment governance : What is it and does it matter ? *International Journal of Accounting Information Systems*, 18, 1–25.
- Alles, M. G., Kogan, A., & Vasarhelyi, M. A. (2002). Feasibility and economics of continuous assurance. *Auditing: A Journal of Practice & Theory*, 21(1), 125-138.
- Allinson, C. (2004). The process of audit and control-a comparison of manual and electronic information systems. *Policing: An International Journal of Police Strategies & Management*, 27(2), 183-205.
- Al-Omari, L., & Barnes, P. (2014). IT Governance Stability in a Political Changing Environment : Exploring Potential Impacts in the Public Sector. *Journal of Information Technology Management*, 25(3), 41–53.
- Al-Omari, L., Barnes, P.H., & Pitman, G. (2012). An exploratory study into audit challenges in IT Governance: a Delphi approach. In *Symposium on IT Governance, Management and Audit (SIGMA2012)*, Universiti Tenaga Nasional, Malaysia, University of Tenaga Nasional, Kuala Lumpur.
- American Institute of Certified Public Accountants (AICPA). 2006a. Planning and Supervision. *Statement of Auditing Standards No. 108*. New York, NY: AICPA.
- American Institute of Certified Public Accountants (AICPA). 2006b. Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement. *Statement of Auditing Standards No. 109*. New York, NY: AICPA.
- American Institute of Certified Public Accountants (AICPA). 2006c. Performing Audit Procedures in Response to Assessed Risks and Evaluating the Audit Evidence Obtained. *Statement of Auditing Standards No. 110*. New York, NY: AICPA.
- Amid, A., Morteza, M., Ravasan, A.Z. (2012). Identification and classification of ERP critical failure factors in Iranian industries. *Information Systems* 37(3), 227-237.
- Appelbaum, D. A., Kogan, A., & Vasarhelyi, M. A. (2018). Analytical procedures in external auditing: A comprehensive literature survey and framework for external audit analytics. *Journal of Accounting Literature*, 40, 83-101.
- Appelbaum, D., Kogan, A., & Vasarhelyi, M. A. (2017). Big Data and analytics in the modern audit engagement: Research needs. *Auditing: A Journal of Practice & Theory*, 36(4), 1-27.
- Aras, G., & Crowther, D. (2010). Sustaining business excellence. *Total Quality Management*, 21(5), 565-576.
- Asare, S. K., Fitzgerald, B. C., Graham, L. E., Joe, J. R., Negangard, E. M., & Wolfe, C. J. (2013). Auditors' internal control over financial reporting decisions: Analysis, synthesis, and research directions. *Auditing: A Journal of Practice & Theory*, 32(sp1), 131-166.
- Axelsen, M., Coram, P., Green, P., & Ridley, G. (2011, July). Examining The Role Of IS Audit In The Public Sector. In *PACIS* (p. 23).
- Axelsen, M., Green, P., & Ridley, G. (2017). Explaining the information systems auditor role in the public sector financial audit. *International Journal of Accounting Information Systems*, 24, 15-31.
- Azaltun, M., Batibay, İ., Calayoglu, I., Mert, H., & Tastan, H. (2013). The Impact of Enterprise Resource Planning (ERP) System on the Cost and Price of Auditing:

- Auditor's Perspective. *Journal of Modern Accounting and Auditing*, 9(4), 497-504.
- Bae, B., & Ashcroft, P. (2004). Implementation of ERP systems: Accounting and auditing implications. *Academy of Management Meeting*, Chicago, p. 21.
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74-94.
- Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing construct validity in organizational research. *Administrative Science Quarterly*, 421-458.
- Bakar, N. B. A., Saleh, Z., & Mohamad, M. H. S. (2011). Enhancing Malaysian public sector transparency and accountability: Lessons and issues. *European Journal of Economics, Finance and Administrative Sciences*, 31, 133-145.
- Barton, A. (1999). Public and Private Sector Accounting- The Non- identical Twins. *Australian Accounting Review*, 9(18), 22-31.
- Bebchuk, L., Cohen, A., & Ferrell, A. (2009). What matters in corporate governance?. *Review of Financial studies*, 22(2), 783-827.
- Bedard, J. C., & Graham, L. (2011). Detection and severity classifications of Sarbanes-Oxley Section 404 internal control deficiencies. *The Accounting Review*, 86(3), 825-855.
- Bedard, J. C., Deis, D. R., Curtis, M. B., & Jenkins, J. G. (2008). Risk monitoring and control in audit firms: A research synthesis. *Auditing: A Journal of Practice & Theory*, 27(1), 187-218.
- Bedard, J. C., Jackson, C., Ettredge, M. L., & Johnstone, K. M. (2003). The effect of training on auditors' acceptance of an electronic work system. *International Journal of Accounting Information Systems*, 4(4), 227-250. doi:10.1016/j.accinf.2003.05.001
- Bedard, J., Ettredge, M., Jackson, C. and Johnstone, M. (2002). The effect of technological knowledge and task knowledge on professional user acceptance of an electronic work system, working paper, Northeastern University, Boston, MA
- Behn, B. K., Carcello, J. V., Hermanson, D. R., & Hermanson, R. H. (1997). The determinants of audit client satisfaction among clients of big 6 firms. *Accounting Horizons*, 11(1), 7-24.
- Belcher, L. W., & Watson, H. J. (1993). Assessing the value of Conoco's EIS. *MIS Quarterly*, 239-253.
- Bell, T. B., Knechel, W. R., & Payne, J. L. (1999). Audit risk attributes in computerized environments. *Review of Business Information Systems (RBIS)*, 3(2), 27-40.
- Benaroch, M., Y. Lichtenstein, & K. Robinson. (2006). Real options in information technology risk management: An empirical validation of risk-option relationships. *Management Information Systems Quarterly* 30 (4): 827-864.
- Bentler, P. M., & Huang, W. (2014). On components, latent variables, PLS and simple methods: Reactions to Rigdon's rethinking of PLS. *Long Range Planning*, 47(3), 138-145.
- Bhattacharjya, J., & Chang, V. (2007). Evolving IT governance practices for aligning IT with business—A case study in an Australian institution of higher education. *Journal of Information Science and Technology*, 4(1), 24-46.
- Bhattacharjee, A. (2001). Understanding information systems continuance: an expectation-confirmation model. *MIS Quarterly*, 351-370.
- Bierstaker J., Burnaby P., & Thibodeau J. (2001). The impact of information technology of the audit process: an assessment of the state of the art and implications for the future. *Managerial Auditing Journal*, 16(6), 159-164.

- Bierstaker, J., Janvrin, D., & Lowe, D. J. (2014). What factors influence auditors' use of computer-assisted audit techniques? *Advances in Accounting*, 30(1), 67–74. doi:10.1016/j.adiac.2013.12.005
- Blackmer, G. (2005). Best Practices for Information Technology Governance. *A Report from the City Auditor, Report B*, 314.
- Bodnar, G.H. (2003). IT Governance. *Internal Auditing* 18(3), 27–32.
- Bollen, K., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin*, 110(2), 305.
- Bolscher, P. (2014). *Automated external fraud prevention in the public sector*. Unpublished thesis. University of Twente, Enschede, The Netherlands.
- Boritz, J. E., Hayes, L., & Lim, J. H. (2013). A content analysis of auditors' reports on IT internal control weaknesses: The comparative advantages of an automated approach to control weakness identification. *International Journal of Accounting Information Systems*, 14(2), 138-163.
- Bovaird, T., & Löffler, E. (2003). Evaluating the quality of public governance: indicators, models and methodologies. *International Review of Administrative Sciences*, 69(3), 313-328.
- Bowen, P. L., Cheung, M. Y. D., & Rohde, F. H. (2007). Enhancing IT governance practices: A model and case study of an organization's efforts. *International Journal of Accounting Information Systems*, 8(3), 191-221.
- Bowen, P. L., M.-Y. D. Cheung, and F. H. Rohde. 2007. Enhancing IT governance practices: A model and case study of an organization's efforts. *International Journal of Accounting Systems* 8: 191–221.
- Bowrin, A. R. (1998). Review and synthesis of audit structure literature. *Journal of Accounting Literature*, 17, 40.
- Boyne, G. A. (2002). Public and private management: what's the difference?. *Journal of Management Studies*, 39(1), 97-122.
- Bradley, R. V., Pridmore, J. L., Byrd, T. A. (2006). Information System Success in the Context of Different Corporate Cultural Types: An Empirical Investigation. *Journal of Management Information*, 23(2), 267 – 294. doi:10.2753/MIS0742-1222230211
- Braun, R.L., & Davis, H.E. (2003). Computer–assisted audit tools and techniques: Analysis and perspectives. *Managerial Auditing Journal*, 18 (9), 725-731.
- Brazel J. A. (2005). Measure of perceived auditor ERP systems expertise. *Managerial Auditing Journal*, 20(6), 619–31.
- Briers, M., & Chua, W. F. (2001). The role of actor-networks and boundary objects in management accounting change: a field study of an implementation of activity-based costing. *Accounting, Organizations and Society*, 26(3), 237-269.
- Briggs, L. (2008). Best practices. CPAs in coders' clothing: Auditors breach IT's inner sanctum. *IT Compliance Institute*. Available from <http://www.itcinstitute.com>.
- Briggs, R., Devreede, G., Nufakar, F., & Sprauge, R. (2003). Special Issue : Information Systems Success. *Journal of Management Information System*, 19(4), 5–8.
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of CrossCultural Psychology* 1: 185-216.
- Brislin, R. W., Lonner, W. J., and Thondike, R. M.. (1973). *Cross-cultural Research Methods*. New York: John Wiley & Sons.
- Brody, R. G., & Kearns, G. (2008). IT audit approaches for enterprise resource planning systems. *Proceedings of American Society of Business and Behavioral Sciences (ASBBS)*, 15(1), 375-389.
- Brody, R. G., & Kearns, G. S. (2009). IT audit approaches for enterprise resource planning systems. *Journal of Audit Practice*, 6(2), 7– 26.

- Brown, A. E., & Grant, G. G. (2005). Framing the frameworks: A review of IT governance research. *Communications of the Association for Information Systems*, 15(1), 38.
- Brown, C. V. (1997). Examining the emergence of hybrid IS governance solutions: Evidence from a single case site. *Information Systems Research*, 8(1), 69-94.
- Brown-Liburd, H., Issa, H., & Lombardi, D. (2015). Behavioral implications of Big Data's impact on audit judgment and decision making and future research directions. *Accounting Horizons*, 29(2), 451-468.
- Brudney, J. L., & Selden, S. C. (1995). The adoption of innovation by smaller local governments: The case of computer technology. *The American Review of Public Administration*, 25(1), 71-86.
- Bryman, A., & Bell, E. (2007). *Business Research Methods*. New York: Oxford University Press.
- Buang, A. (2015). 6th ASOSAI Symposium - Country Paper: *Leveraging Technology to Enhance Audit Quality and Effectiveness*. Kuala Lumpur, Malaysia.
- Buchwald, A., Urbach, N., & Ahlemann, F. (2014). Business value through controlled IT: Toward an integrated model of IT governance success and its impact. *Journal of Information Technology*, 29(2), 128-147. doi:10.1057/jit.2014.3
- Burns, A. C., and Bush, R. F. (2000). *Marketing Research*. Third ed. New Jersey: Prentice Hall.
- Burr, T., Gandara, M., & Robinson, K. (2002). E-business: Auditing the rage. *Internal Auditor*, 59(5), 49-55.
- Burrell, G. and Morgan, G. (1979) *Sociological Paradigms and Organizational Analysis*. Portsmouth, NH: Heinemann
- Burton RN. (2000). Discussion of information technology-related activities of internal auditors. *Journal Information System*, 14(4).
- Byrd, T. A., Thrasher, E. H., Lang, T., & Davidson, N. W. (2006). A process-oriented perspective of IS success: Examining the impact of IS on operational cost. *Omega*, 34, 448-460. doi:10.1016/j.omega.2005.01.012
- Caldeira, M. M., & Ward, J. M. (2003). Using resource-based theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises. *European Journal of Information Systems*, 12(2), 127-141.
- Calderon, T.G., Wang, L. & Conrad, E.J. (2012). Material internal control weakness reporting since the Sarbanes-Oxley Act. *Accounting & Auditing - The CPA Journal*, pp. 19-25.
- Campbell, P., & Hushagen, J. (2002). The governance of inter-governmental organisations. *Corporate Governance: The International Journal of Business in Society*, 2(1), 21-26.
- Canada, J., Sutton, S. G., & Kuhn, J. R. (2009). The pervasive nature of IT controls: An examination of material weaknesses in IT controls and audit fees. *International Journal of Accounting and Information Management*, 17 (1), 106-119.
- Cao, G. (2010). A four- dimensional view of IT business value. *Systems Research and Behavioral Science*, 27(3), 267-284.
- Carcello, J. V., Hermanson, R. H., & McGrath, N. T. (1992). Audit quality attributes: The perceptions of audit partners, preparers, and financial statement users. *Auditing*, 11(1), 1.
- Carlin, A., & Gallegos, F. (2007). IT audit: A critical business process. *Computer*, 40(7), 87-89.
- Carnaghan, C. (2004). Discussion of IT assurance competencies. *International Journal of Accounting Information Systems*, 5(2), 267-273.



- Carnegie, G. D., & West, B. P. (2005). Making accounting accountable in the public sector. *Critical Perspectives on Accounting*, 16(7), 905-928.
- Carpenter, B., & Dirsmith, M. (1993). Sampling and the abstraction of knowledge in the auditing profession: An extended institutional theory perspective. *Accounting, Organizations and Society*, 18(1), 41-63.
- Carson, E., & Dowling, C. (2012). The competitive advantage of audit support systems: The relationship between extent of structure and audit pricing. *Journal of Information Systems* 26(1): 35–49.
- Cartman, C., & Salazar, A. (2011). The influence of organisational size, internal IT capabilities, and competitive and vendor pressures on ERP adoption in SMEs. *International Journal of Enterprise Information Systems (IJEIS)*, 7(3), 68-92.
- Chaney, C., & Kim, G. (2007). The integrated auditor: all internal auditors need to understand core IT control concepts and risks to provide assurance in today's technology-based business world. *Internal Auditor*, 64(4), 46-52.
- Chang, S. I., Yen, D. C., Chang, I. C., & Jan, D. (2014). Internal control framework for a compliant ERP system. *Information & Management*, 51(2), 187-205.
- Chang, T., Liao, L., & Hsiao, W. (2005). An empirical study on the e-CRM performance influence model for service sectors in Taiwan. In 2005 *IEEE International Conference on e-Technology, e-Commerce and e-Service* (pp. 240 – 245). doi:10.1109/EEE.2005.33
- Chang, W., Franke, G. R., & Lee, N. (2016). Comparing reflective and formative measures: New insights from relevant simulations. *Journal of Business Research*, 69(8), 3177-3185.
- Chau, P. Y., & Tam, K. Y. (1997). Factors affecting the adoption of open systems: an exploratory study. *MIS Quarterly*, 1-24.
- Chen, J. V., Jubilado, R. J. M., Capistrano, E. P. S., & Yen, D. C. (2015). Factors affecting online tax filing—An application of the IS Success Model and trust theory. *Computers in Human Behavior*, 43, 251-262.
- Chen, Y., Smith, A. L., Cao, J., & Xia, W. (2014). Information Technology Capability, Internal Control Effectiveness, and Audit Fees and Delays. *Journal of Information Systems*, 28(2), 149–180.
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, 295(2), 295-336.
- Chin, W. W., & Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares. In R. H. Hoyle (Ed.), *Statistical Strategies for Small Sample Research* (pp. 307-341). Thousand Oaks: CA: Sage Publications
- Chong, A. Y. L., Lin, B., Ooi, K. B., & Raman, M. (2009). Factors affecting the adoption level of e-commerce: An empirical study. *Journal of Computer Information Systems*, 50(2), 13-22.
- Chua, W. F. (1995). Experts, networks and inscriptions in the fabrication of accounting images: a story of the representation of three public hospitals. *Accounting, Organizations and Society*, 20(2), 111-145.
- Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 64-73.
- Clark, V. L. P., & Creswell, J. W. (2015). *Understanding Research: A Consumer's Guide*. Pearson Higher Ed.
- Clegg, S. (1994). Weber and Foucault: Society theory for the study of organisations. *Organization*, 1(1) ; 148 -178.

- Coakes, S. J., Steed, L. G., Coakes, S. J., & Steed, L. G. (2003). Multiple response and multiple dichotomy analysis. *SPSS: Analysis without Anguish: Version 11.0 for Windows*, 215-224.
- Coe, M. J. (2006). Integrating IT audit into the AIS course. *Review of Business Information Systems (RBIS)*, 10(1), 105-120.
- Cohen, J. (1988). *Statistical Power Analyses for the Social Sciences*. (2<sup>nd</sup> ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155.
- Cohen, J. F. (2008). Contextual determinants and performance implications of information systems strategy planning within South African firms. *Information & Management*, 45(8), 547-555.
- Colbert, J. L., & Bowen, P. L. (1996). A Comparison of Internal Controls: CobiT, SAC, COSO and SAS 55/78. *IS Audit and Control Journal*, 4(November), 26-35.
- Colton, D., & Covert, R. W. (2007). *Designing and Constructing Instruments for Social Research and Evaluation*. John Wiley & Sons.
- Cooper, R. D. & Schindler, S. P. (2008). *Business Research Methods*. Boston: Irwin McGraw Hill.
- Coppers, C. & Lybrand, L.L.P. (2002), Security, Audit and Control Features SAP R/3: A Technical and Risk Management Reference Guide, *IT Governance Institute*, Rolling Meadows, IL.
- Cordery, C. J., Fowler, C. J., & Mustafa, K. (2011). A solution looking for a problem: factors associated with the non-adoption of XBRL. *Pacific Accounting Review*, 23(1), 69-88.
- COSO (1994). Internal Control-Integrated Framework, Committee of Sponsoring Organizations of the Treadway Commission.
- Cosserat, G. (2000). *Modern Auditing*. West Sussex, John Wiley & Sons.
- Creswell, J. W. (2009). Mapping the field of mixed methods research. *Journal of Mixed Methods Research*, 3(2), 95-108.
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*. Boston: Pearson.
- Curtis, M. B., & Payne, E. A. (2008). An examination of contextual factors and individual characteristics affecting technology implementation decisions in auditing. *International Journal of Accounting Information Systems*, 9(2), 104-121.
- Curtis, M. B., & Payne, E. A. (2014). Modeling voluntary CAAT utilization decisions in auditing. *Managerial Auditing Journal*, 29(4), 304-326. doi:10.1108/MAJ-07-2013-0903
- Curtis, M. B., Jenkins, J. G., Bedard, J. C., & Deis, D. R. (2009). Auditors' training and proficiency in information systems: a research synthesis. *Journal of information systems*, 23(1), 79-96.
- Dada, D. (2006). The failure of e-government in developing countries: A literature review. *The Electronic Journal of Information Systems in Developing Countries*, 26.
- Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*, 21(2), 193-210.
- Daigle, R. J., Kizirian, T., & Sneathen, L. D. J. (2005). Systems controls reliability and assessment effort. *International Journal of Auditing*, 9, 79-90.
- Damanpour, F., & Schneider, M. (2006). Phases of the adoption of innovation in organizations: Effects of environment, organization and top managers. *British Journal of Management*, 17(3), 215-236. doi:10.1111/j.1467-8551.2006.00498.x

- Damanpour, F., & Schneider, M. (2009). Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory*, 19(3), 495-522.
- Damanpour, F., & Wischnevsky, J. D. (2006). Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. *Journal of Engineering and Technology Management*, 23(4), 269-291.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.
- Davis, G. B. (1968). The auditor and the computer. *Journal of Accountancy (pre-1986)*, 125(000003), 44.
- Dawes, S. S. (2004). Training the IT-savvy public manager: Priorities and strategies for public management education. *Journal of Public Affairs Education*, 5-17.
- De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management*, 26(2), 123-137.
- Debreceeny, R., Lee, S.L., Neo, W., & Toh, J. S. (2005). Employing generalized audit software in the financial services sector: Challenges and opportunities. *Managerial Auditing Journal*, 20(6), 605-618. doi:10.1108/02686900510606092
- Dedrick, J., & West, J. (2003, December). Why firms adopt open source platforms: a grounded theory of innovation and standards adoption. In *Proceedings of the workshop on standard making: A critical research frontier for information systems* (pp. 236-257). Seattle, WA.
- DeFond, M. L., & Francis, J. R. (2005). Audit research after sarbanes-oxley. *Auditing: A Journal of Practice & Theory*, 24(s-1), 5-30.
- Dehning, B., & Richardson, V. J. (2002). Returns on investments in information technology: A research synthesis. *Journal of Information Systems* 16 (1): 7-30.
- DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60-95.
- Delone, W.H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information*, 19(4), 9-30. doi:10.1073/pnas.0914199107
- Diaz, M. C., & Loraas, T. (2010). Learning new uses of technology while on an audit engagement: Contextualizing general models to advance pragmatic understanding. *International Journal of Accounting Information Systems*, 11(1), 61-77. doi:10.1016/j.accinf.2009.05.001
- Dijkstra, T. K., & Henseler, J. (2015a). Consistent Partial Least Squares Path Modeling. *MIS quarterly*, 39(2).
- Dijkstra, T. K., & Henseler, J. (2015b). Consistent and asymptotically normal PLS estimators for linear structural equations. *Computational Statistics & Data Analysis*, 81, 10-23.
- DiMaggio, P., & Powell, W. W. (1983). The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields. *American Sociological Review*, 48(2), 147-160.
- Dowling C. (2008). Discussion of An examination of contextual factors and individual characteristics affecting technology implementation decisions in auditing. *International Journal of Accounting Information Systems*, 9, 122-6.
- Dowling, C. (2009). Appropriate audit support system use: The influence of auditor, audit team, and firm factors. *The Accounting Review*, 84(3), 771-810.
- Dowling, C., & Leech, S. A. (2007). Audit support systems and decision aids: Current practice and opportunities for future research. *International Journal of*

- Accounting Information Systems*, 8(2), 92–116.  
doi:10.1016/j.accinf.2007.04.001
- Dowling, C., & Leech, S. A. (2014). A big 4 firm's use of information technology to control the audit process: How an audit support system is changing auditor behavior. *Contemporary Accounting Research*, 31(1), 230–252. doi:10.1111/1911-3846.12010
- Du, H., & Roohani, S. (2007). Meeting challenges and expectations of continuous auditing in the context of independent audits of financial statements. *International Journal of Auditing*, 11(2), 133-146.
- Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological Methods*, 5(2), 155.
- Ezzamel, M., Hyndman, N., Johnsen, A., & Lapsley, I. (2014). Reforming central government: An evaluation of an accounting innovation. *Critical Perspectives on Accounting*, 25(4-5), 409–422. doi:10.1016/j.cpa.2013.05.006
- Fathian, M., Akhavan, P., & Hoorali, M. (2008). E-readiness assessment of non-profit ICT SMEs in a developing country: The case of Iran. *Technovation*, 28(9), 578-590.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G\* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175-191.
- Ferguson, C., Green, P., Vaswani, R., & Wu, G. (2013). Determinants of Effective Information Technology Governance. *International Journal of Auditing*, 17(1), 75–99. doi:10.1111/j.1099-1123.2012.00458.x
- Fishbein, M., & Ajzen, I. (1975). Belief, attitudes, intention, and behavior. *An introduction to theory and research*. Massachusetts: Addison-Wesley.
- Fitzgerald, G., & Russo, N. L. (2005). The turnaround of the London ambulance service computer-aided despatch system (LASCAD). *European Journal of Information Systems*, 14(3), 244-257.
- Floropoulos, J., Spathis, C., Halvatzis, D., & Tsipaouridou, M. (2010). Measuring the success of the Greek Taxation Information System Measuring the success of the Greek Taxation Information System. *International Journal of Information Management*, 30, 47 – 56. doi:10.1016/j.ijinfomgt.2009.03.013
- Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research*, 440-452.
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 382-388.
- Fornell, C., & Larcker, D. F. (1982). Evaluation of structural equation models with unobservable variables and measurement error: Algebra and statistics. *A Second Generation of Multivariate Analysis*, 2.
- Foucault, M. (1980). *Power/Knowledge: Selected Interviews and Other Writings, 1972–1977*. Random House LLC, New York.
- Fox, C., & Zonneveld, P. (2003). IT control objectives for Sarbanes-Oxley: The importance of IT in the design, implementation and sustainability of internal control over disclosure and financial reporting. *IT Governance Institute, Illinois*.
- Francis, J. R. (1994). Auditing, hermeneutics, and subjectivity. *Accounting, Organizations and Society*, 19(3), 235-269.
- Francis, J. R. (2004). What do we know about audit quality?. *The British Accounting Review*, 36(4), 345-368.

- Francis, J. R. (2011). A framework for understanding and researching audit quality. *Auditing: A Journal of Practice & Theory*, 30(2), 125-152.
- Frazer, L., & Lawley, M. (2000). *Questionnaire Design and Administration: A Practical Guide*. Brisbane: Wiley.
- Gable, G. G., Sedera, D., & Chan, T. (2008). Re-conceptualizing information system success: the IS-impact measurement model\*. *Journal of the Association for Information Systems*, 9(7), 377.
- Galliers, R. (1992). *Information Systems Research: Issues, Methods and Practical Guidelines*. Blackwell Scientific.
- Ge, W., & McVay, S. 2005. The disclosure of material weaknesses in internal control after the Sarbanes-Oxley Act. *Accounting Horizons*, 19 (3), 137-158.
- Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems*, 4(1), 7.
- Geisser, S. (1974). A predictive approach to the random effect model. *Biometrika*, 61(1), 101-107.
- Gelinas, U., Dull, R., & Wheeler, P. (2011). *Accounting Information Systems*. Cengage learning.
- Ghobakhloo, M., & Tang, S. H. (2015). Information Technology for Development Information system success among manufacturing SMEs : case of developing countries. *Information Technology for Development*, 21(4), 573 – 600. doi:10.1080/02681102.2014.996201
- Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management & Data Systems* (Vol. 111). doi:10.1108/02635571111170785
- Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*, 18(1), 185-214.
- Gonzalez, G. C., Sharma, P. N., & Galletta, D. (2012a). Factors Influencing the Planned Adoption of Continuous Monitoring Technology. *Journal of Information Systems*, 26(2), 120717110733006. doi:10.2308/isys-50259
- Gonzalez, G. C., Sharma, P. N., & Galletta, D. F. (2012b). The antecedents of the use of continuous auditing in the internal auditing context. *International Journal of Accounting Information Systems*, 13(3), 248–262. doi:10.1016/j.accinf.2012.06.009
- Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, 213-236.
- Gordon, L. A., Loeb, M. P., Lucyshyn, W., & Richardson, R. (2005). CSI/FBI Computer Crime and Security Survey, Computer Security Institute. Available at: [www.gocsi.com](http://www.gocsi.com).
- Gordon, L.A. & Wilford, A.L. (2012). An analysis of multiple consecutive years of material weaknesses in internal control. *The Accounting Review*, 87(6), pp. 2027-2060.
- Gorla, N., Somers, T. M., & Wong, B. (2010). Organizational impact of system quality , information quality , and service quality. *Journal of Strategic Information Systems*, 9(3), 207 – 228. doi:10.1016/j.jsis.2010.05.001
- Grant, G.H., Miller, K.C. & Alali, F. (2008). The effect of IT controls on financial reporting. *Managerial Auditing Journal*, Vol. 23 No. 8, pp. 803-823.
- Gray, I., & Manson, S. (2005). *The Audit Process: Principles, Practices and Cases*. London, Thomson.

- Greenhalgh, T., Robert, G., Bate, P., Macfarlane, F., & Kyriakidou, O. (2008). *Diffusion of innovations in health service organisations: a systematic literature review*. John Wiley & Sons.
- Greenstein, M., & Mckee, T. E. (2004). Assurance practitioners' and educators' self-perceived IT knowledge level: an empirical assessment. *International Journal of Accounting Information System*, 5, 213–43.
- Grove, H., Patelli, L., Victoravich, L. M., & Xu, P. T. (2011). Corporate governance and performance in the wake of the financial crisis: Evidence from US commercial banks. *Corporate Governance: An International Review*, 19(5), 418-436.
- Grover, V., & Kohli, R. (2012). New RF Metrics for the Smartphone - centered World. *MIS Quarterly*, 36(1), 225–232.
- Guba, E.G., & Lincoln, Y.S. (2005). Paradigmatic Controversies, Contradictions, and Emerging Confluences. In: Denzin, N.K. and Lincoln, Y.S., Eds., *The Sage Handbook of Qualitative Research*, 3rd Edition, Sage, Thousand Oaks, 191-215
- Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage Publications.
- Hair Jr, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. *European Business Review*, 26(2), 106-121.
- Hair, J. F., Black, WC, Babin, BJ, & Anderson, R.E. & Tatham, R. L. (2010). *Multivariate Data Analysis*. New York. Prentice Hall.
- Hair, J. F., Bush, R. P., & Ortinau, D. J. (2009). *Marketing Research: In a Digital Information Environment*. Boston: McGraw-Hill Irwin.
- Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black. (1998). *Multivariate Data Analysis*. 5th ed. New Jersey: Prentice-Hall International, Inc.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139-152.
- Haislip, J. Z., Peters, G. F., & Richardson, V. J. (2016). The effect of auditor IT expertise on internal controls. *International Journal of Accounting Information Systems*, 20, 1-15.
- Hall, J. (2015). *Information Technology Auditing*. Cengage Learning.
- Hardy, G. (2006). Using IT governance and CobiT to deliver value with IT and respond to legal, regulatory and compliance challenges. *Information Security technical report*, 11(1), 55-61.
- Hass, S., Abdolmohammadi, M.J. & Burnaby, P. (2006). The Americas literature review on internal auditing. *Managerial Auditing Journal*, 21(8), 835-844
- Havelka, D., & Merhout, J. W. (2007). Development of an Information Technology Audit Process Quality Framework. In *America Conference on Information System* (p. 61).
- Havelka, D., & Merhout, J. W. (2013). Internal information technology audit process quality: Theory development using structured group processes. *International Journal of Accounting Information Systems*, 14(3), 165–192. doi:10.1016/j.accinf.2012.12.001
- Hay, D. (2017). Opportunities for auditing research: back to our interdisciplinary roots. *Meditari Accountancy Research*, 25(3), 336-350.
- Hay, D., & Cordery, C. (2018). The value of public sector audit: Literature and history. *Journal of Accounting Literature*, 40, 1-15.
- Heart, T., Maoz, H., & Pliskin, N. (2010). From governance to adaptability: The mediating effect of IT executives' managerial capabilities. *Information Systems Management*, 27(1), 42-60.

- Heatley, L. (2009). Quality governance: Helping to minimise the risks of IT project failure. *Accountancy Ireland*, 41(4), 34–34.
- Heeks, R. (2003). *Most e-Government-for-development projects fail: how can risks be reduced?* (Vol. 14). Manchester: Institute for Development Policy and Management, University of Manchester.
- Helms, G.L. (2002). Traditional and emerging methods of electronic assurance, *The CPA Journal*, 72(3):26-31.
- Henderson, D., Sheetz, S. D., & Trinkle, B. S. (2012). The determinants of inter-organizational and internal in-house adoption of XBRL: A structural equation model. *International Journal of Accounting Information Systems*, 13(2), 109–140. doi:10.1016/j.accinf.2012.02.001
- Henderson, J. C., & Venkatraman, H. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, 38(2/3), 472.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In *New Challenges to International Marketing* (pp. 277-319). Emerald Group Publishing Limited.
- Hermanson, D.R., Hill, M.C. and Ivancevich, D.M. (2000). Information technology-related activities of internal auditors. *Journal of Information Systems*, 14 (1), Supplement, pp. 39-53.
- Heroux, S., & Fortin, A. (2013). The internal audit function in information technology governance: A holistic perspective. *Journal of Information Systems*, 27(1), 189 – 217. doi:10.2308/isys-50331
- Hertzog, C. (2008). Theoretical approaches to the study of cognitive aging. *Handbook of Cognitive Aging: Interdisciplinary Perspectives*, 34.
- Hespenheide, E. (2006). Optimizing the role of internal audit in the Sarbanes-Oxley era. *Corporate Finance Review*, 10(4), 27.
- Hovav, A., Patnayakuni, R., & Schuff, D. (2004). A model of Internet standards adoption: the case of IPv6. *Information Systems Journal*, 14(3), 265-294.
- Hsu, F. M., & Chen, T. Y. (2007). Understanding information systems usage behavior in E-Government: The role of context and perceived value. *PACIS 2007 Proceedings*, 41.
- Huang, H.W. (2009). Sarbanes-Oxley section 404 compliance: Recent changes in US-traded foreign firms' internal control reporting. *Managerial Auditing Journal* (24)6, pp. 584-598.
- Huang, R., Zmud, R. W., & Price, R. L. (2010). Influencing the effectiveness of IT governance practices through steering committees and communication policies. *European Journal of Information Systems*, 19(3), 288-302.
- Huang, S. M., Hung, W. H., Yen, D. C., Chang, I. C., & Jiang, D. (2011). Building the evaluation model of the IT general control for CPAs under enterprise risk management. *Decision Support Systems*, 50(4), 692–701. doi:10.1016/j.dss.2010.08.015
- Hui, B. S., & Wold, H. (1982). Consistency and consistency at large of partial least squares estimates. *Systems U indirect Observation, Part II*, 119-130.
- Hunton, J. E., Wright, A. M., & Wright, S. (2004). Are Financial Auditors Overconfident in Their Ability to Assess Risks Associated with Enterprise Resource Planning Systems?(Retracted). *Journal of Information Systems*, 18(2), 7-28
- Hurt, R. K., Brown-Liburd, H., Earley, C. E., & Krishnamoorthy, G. (2013). Research

- on auditor professional skepticism: Literature synthesis and opportunities for future research. *Auditing: A Journal of Practice & Theory*, 32(sp1), 45-97.
- Hussein, R., Karim, N. S. A., & Selamat, M. H. (2007a). The impact of technological factors on information systems success in the electronic-government context. *Business Process Management Journal*, 13(5), 613 – 627. Retrieved from <http://www.emeraldinsight.com/doi/pdf/10.1108/14637150710823110>
- Hussein, R., Karim, N. S. A., Mohamed, N., & Ahlan, A. R. (2007b). The influence of Organizational Factors on Information Systems Success in E-Government Agencies in Malaysia. *The Electronic Journal on Information Systems in Developing Countries*, 29(1), 1–17.
- Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology. *MIS Quarterly*, 19(4), 465-485.
- IFAC (1995), Information Technology in the Accounting Curriculum, Education Guideline No. 11, International Federation of Accountants, New York, NY.
- Ifinedo, P. (2011). Examining the influences of external expertise and in-house computer/IT knowledge on ERP system success. *Journal of Systems and Software*, 84(12), 2065-2078.
- Iivari, J. (2005). An empirical test of the DeLone-McLean model of information system success. *ACM SIGMIS Database*, 36(2), 8–27. doi:10.1145/1066149.1066152
- Ilebrand, N., Mesoy, T., & Vlemmix, R. (2010). Using IT to enable a lean transformation. *McKinsey on Business Technology*, 18, 1-3.
- Information System Audit and Controls Association (ISACA). (2008). *IS Auditing Guideline: G3 Use of Computer-Assisted Audit Techniques (CAATs)*. Illinois.
- Information System Audit and Controls Association (ISACA). (2009). In Summary: The Taking Governance Forward Mapping Initiative, *ISACA Journal (1)*. Retrieved from: <http://www.isaca.org/Template.cfm?Section=Home&CONTENTID=54596&TEMPLATE=/ContentManagement/ContentDisplay.cfm>
- Intan Salwani, M., Marthandan, G., Daud Norzaidi, M., & Choy Chong, S. (2009). E-commerce usage and business performance in the Malaysian tourism sector: empirical analysis. *Information Management & Computer Security*, 17(2), 166-185.
- International Organisation of Supreme Audit Institutions (INTOSAI). (2013a). *International Standards of Supreme Audit Institutions (ISSAI) 100 - Fundamental Principles of Public-Sector Auditing*. Retrieved from: <http://www.issai.org/media/69909/issai-100-english.pdf>
- International Organisation of Supreme Audit Institutions (INTOSAI). (2004). *INTOSAI GOV 9100 – Guidelines for Internal Control Standards for the Public Sector*. Retrieved from: <http://www.intosai.org/issai-executive-summaries/view/article/intosai-gov-9100-guidelines-for-internal-control-standards-for-the-public-sector.html>
- Ismail, N. A., & Abidin, A. Z. (2009). Perception towards the importance and knowledge of information technology among auditors in Malaysia. *Journal of Accounting and Taxation*, 1(4), 61.
- Ismail, T. H., & Sobhy, N. M. (2009). Determinants of auditors' perceptions of the work needed in the audit of internet-based financial reports in Egypt. *Journal of Applied Accounting Research*, 10(2), 132–150. doi:10.1108/09675420910984691



- Issa, H., Sun, T., & Vasarhelyi, M. A. (2016). Research ideas for artificial intelligence in auditing: The formalization of audit and workforce supplementation. *Journal of Emerging Technologies in Accounting*, 13(2), 1-20.
- IT Governance Institute (ITGI). (2003). *Board briefing on IT governance, 2nd edition*. Information Systems Assurance and Control Association (ISACA) Rolling Meadows, IL. Retrieved from: [http://www.isaca.org/restricted/Documents/26904\\_Board\\_Briefing\\_final.pdf](http://www.isaca.org/restricted/Documents/26904_Board_Briefing_final.pdf)
- IT Governance Institute (ITGI). (2007). *CobiT 4.1*. Information Systems Assurance and Control Association (ISACA). Rolling Meadows, IL. Retrieved from: <http://www.isaca.org/Knowledge-Center/cobit/Documents/COBIT4.pdf>
- Janvrin, D., Bierstaker, J., & Lowe, D. J. (2008). An Examination of Audit Information Technology Usage and Perceived Importance. *Accounting Horizons*, 22(1), 1 – 21. doi:<http://dx.doi.org/10.2308/acch.2008.22.1.1>
- Janvrin, D., Bierstaker, J., & Lowe, D. J. (2009). An Investigation of Factors Influencing the Use of Computer- Related Audit Procedures. *Journal of Information Systems*, 23(1), 97–118. doi:10.2308/jis.2009.23.1.97
- Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research*, 30(2), 199-218.
- Jinarat, V., & Quang, T. (2003). The impact of good governance on organization performance after the Asian crisis in Thailand. *Asia Pacific Business Review*, 10(1), 21-42.
- Joshi, A., Huygh, T., & De Haes, S. (2017). Examining the Association Between Industry IT Strategic Role and IT Governance Implementation.
- Kamal, M. M. (2006). IT innovation adoption in the government sector: identifying the critical success factors. *Journal of Enterprise Information Management*, 19. doi:10.1108/17410390610645085
- Kanellou, A., & Spathis, C. (2011). Auditing in enterprise system environment: a synthesis. *Journal of Enterprise Information Management*, 24(6), 494–519. doi:10.1108/17410391111166549
- Karahanna, E., & Straub, D. W. (1999). The psychological origins of perceived usefulness and ease-of-use. *Information & Management*, 35(4), 237-250.
- Katamba, A. B., Voon, A. Y. S., Min, H. S., & Seow, H. V. (2017). Information systems utilisation by external auditors in Tanzania. *Review of Integrative Business and Economics Research*, 6(4), 377-388.
- Katsumata, H. (2011). Mimetic adoption and norm diffusion: ‘Western’ security cooperation in Southeast Asia?. *Review of International Studies*, 37(02), 557-576.
- Kearns, G. S., & Lederer, A. L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. *The Journal of Strategic Information Systems*, 9(4), 265-293.
- Kerlinger, F. N. (1992). *Foundations of Behavioral Research*. Fort Worth, Tex: Harcourt Brace College.
- Kerr, D. S., & Murthy, U. S. (2013). The importance of the CobiT framework IT processes for effective internal control over financial reporting in organizations: An international survey. *Information and Management*, 50(7), 590–597. doi:10.1016/j.im.2013.07.012
- Kettani, D., Moulin, B., Gurstein, M., & El Mahdi, A. (2008). E-government and local good governance: a pilot project in Fez, Morocco. *The Electronic Journal of Information Systems in Developing Countries*, 35.

- Kim, H. J., Kotb, A., & Eldaly, M. K. (2016). The use of generalized audit software by Egyptian external auditors: the effect of audit software features. *Journal of Applied Accounting Research*, 17(4), 456-478.
- Kim, H. J., Mannino, M., & Nieschwietz, R. J. (2009). Information technology acceptance in the internal audit profession: Impact of technology features and complexity. *International Journal of Accounting Information Systems*, 10(4), 214-228. doi:10.1016/j.accinf.2009.09.001
- Kim, M. T., and Han, H. R.. (2004). Cultural considerations in research instrument development. In *Instruments for Clinical Health Care Research*, ed. M. Frank- Stromborg and S. J. Olsen, 73-81. Boston: Jones & Bartlett.
- Kimberly, J. R., & Evanisko, M. J. (1981). Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(4), 689-713.
- Klakegg, O. J., Williams, T., Magnussen, O. M., & Glasspool, H. (2008). Governance frameworks for public project development and estimation. *Project Management Journal*, 39(1\_suppl), S27-S42.
- Klamm, B. K., Kobelsky, K. W., & Watson, M. W. (2012). Determinants of the persistence of internal control weaknesses. *Accounting Horizons*, 26(2), 307-333.
- Klamm, B.K., & M. W. Watson. (2009). SOX 404 reported internal control weaknesses: A test of COSO framework components and information technology. *Journal of Information Systems* 23 (2) Fall: 1-23.
- Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling*, 3rd ed. New York. Guilford Press.
- Knechel, W. R., Krishnan, G. V., Pevzner, M., Shefchik, L. B., & Velury, U. K. (2013). Audit quality: Insights from the academic literature. *Auditing: A Journal of Practice & Theory*, 32(suppl. 1), 385-421.
- Kobelsky, K. W., Richardson, V. J., Smith, R. E., & Zmud, R. W. (2008). Determinants and consequences of firm information technology budgets. *The Accounting Review*, 83(4), 957-995.
- Kock, N., & Lynn, G. S. (2012). Lateral Collinearity and Misleading Results in Variance-Based SEM: An Illustration and Recommendations. *Journal of the Association for Information Systems*, 13(7), 546-580.
- Konteh, F. H., Mannion, R., & Davies, H. T. (2008). Clinical governance views on culture and quality improvement. *Clinical Governance: An International Journal*, 13(3), 200-207.
- Kotb, A., & Roberts, C. (2011). The Impact of E- Business on the Audit Process: An Investigation of the Factors Leading to Change. *International Journal of Auditing*, 15(2), 150-175.
- Kotb, A., Roberts, C., & Sian, S. (2012). E-business audit: Advisory jurisdiction or occupational invasion?. *Critical Perspectives on Accounting*, 23(6), 468-482.
- Kotb, A., Sangster, A., & Henderson, D. (2014). E-business internal audit: the elephant is still in the room!. *Journal of Applied Accounting Research*, 15(1), 43-63.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607-610.
- Kuan, K. K., & Chau, P. Y. (2001). A perception-based model for EDI adoption in small businesses using a technology-organization-environment framework. *Information & Management*, 38(8), 507-521.

- Kuhn, J. R., & Sutton, S. G. (2010). Continuous Auditing in ERP System Environments: The Current State and Future Directions. *Journal of Information Systems*, 24(1), 91–112. doi:10.2308/jis.2010.24.1.91
- L'Abate, L. (2009). The drama triangle: An attempt to resurrect a neglected pathogenic model in family therapy theory and practice. *The American Journal of Family Therapy*, 37(1), 1-11.
- Lai, S. C., Li, H., Lin, H., & Wu, F. (2017). The Influence of Internal Control Weaknesses on Firm Performance. *Journal of Accounting and Finance*, 17(6), 82-95.
- Lapsley, I., & Wright, E. (2004). The diffusion of management accounting innovations in the public sector: a research agenda. *Management Accounting Research*, 15(3), 355-374.
- Larsen, K. R. (2003). A taxonomy of antecedents of information systems success: variable analysis studies. *Journal of Management Information Systems*, 20(2), 169-246.
- Law, C. C., & Ngai, E. W. (2007). ERP systems adoption: An exploratory study of the organizational factors and impacts of ERP success. *Information & Management*, 44(4), 418-432.
- Lazic, M., Heinzl, A., & Neff, A. (2011). IT Governance Impact Model: How mature IT governance affects business performance. In *Proceedings of JAIS Theory Development Workshop. Sprouts: Working Papers on Information Systems*, 11 (147) (pp. 11-1).
- Lee, G., & Xia, W. (2006). Organizational size and IT innovation adoption: A meta-analysis. *Information and Management*, 43(8), 975–985. doi:10.1016/j.im.2006.09.003
- Leech, T. J. (2000). Discussion of an analysis of the group dynamics surrounding internal control assessment in information systems audit and assurance domains. *Journal of Information System*, 14:3.
- Legris, P., Ingham, J., & Collette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management* 40(3), 191–204.
- Li, C., Peters, G. F., Richardson, V. J., & Watson, M. W. (2012). The Consequences of Information Technology Control Weaknesses on Management Information Systems: the Case of Sarbanes – Oxley Internal. *MIS Quarterly*, 36(1), 179–203.
- Li, H., Dai, J., Gershberg, T., & Vasarhelyi, M. A. (2018). Understanding usage and value of audit analytics for internal auditors: An organizational approach. *International Journal of Accounting Information Systems*, 28, 59-76.
- Li, X., Pillutla, S., Zhou, H., & Yao, D. Q. (2015). Drivers of Adoption and Continued Use of E-Procurement Systems: Empirical Evidence from China. *Journal of Organizational Computing and Electronic Commerce*, 25(3), 262-288.
- Liang, D., Lin, F. & 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.
- Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 59-87.
- Liang, T. P., Chiu, Y. C., Wu, S. P., & Straub, D. (2011). The Impact of IT Governance on Organizational Performance. In *AMCIS*.

- Lin, H. F., & Lee, G. G. (2005). Impact of organizational learning and knowledge management factors on e-business adoption. *Management Decision*, 43(2), 171-188.
- Lin, H. F., & Lin, S. M. (2008). Determinants of e-business diffusion: A test of the technology diffusion perspective. *Technovation*, 28(3), 135-145.
- Lincoln, Y. S., & Denzin, N. K. (2000). The seventh moment: Out of the past. *Handbook of Qualitative Research*, 2, 1047-1065.
- Lins, S., Schneider, S., & Sunyaev, A. (2016). Trust is good, control is better: Creating secure clouds by continuous auditing. *IEEE Transactions on Cloud Computing*.
- Lippert, S. K., & Govindrajulu, C. (2006). Technological, Organizational, and Environmental Antecedents to Web Services Adoption. *Communications of the IIMA*, 6(1), 146-158.
- Liu, Q., & Ridley, G. (2005, May). IT Control in the Australian public sector: an international comparison. In *Proceedings of the 13th European Conference of Information Systems*.
- Loh, L., & Venkatraman, N. (1992). Diffusion of information technology outsourcing: influence sources and the Kodak effect. *Information Systems Research*, 3(4), 334-358.
- Lohmoller, J. B. (1989). Predictive vs. structural modeling: PLS vs. ML. In *Latent Variable Path Modeling with Partial Least Squares* (pp. 199-226). Physica, Heidelberg.
- Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems*, 111(7), 1006-1023. doi:10.1108/02635571111161262
- Lowe, D. J., Reckers, P. M., & Whitecotton, S. M. (2002). The effects of decision-aid use and reliability on jurors' evaluations of auditor liability. *The Accounting Review*, 77(1), 185-202.
- Lucas, H. C., & Spitler, V. K. (1999). Technology use and performance: A field study of Broker Workstations. *Decision Sciences*, 30(2), 291-311.
- Lunardi, G. L., Becker, J. L., Maçada, A. C. G., & Dolci, P. C. (2014). The impact of adopting IT governance on financial performance: An empirical analysis among Brazilian firms. *International Journal of Accounting Information Systems*, 15(1), 66-81. doi:10.1016/j.accinf.2013.02.001
- Lunardi, G. L., Maçada, A. C. G., Becker, J. L., & Van Grembergen, W. (2017). Antecedents of IT governance effectiveness: An empirical examination in Brazilian firms. *Journal of Information Systems*, 31(1), 41-57.
- Lyytinen, K., & Damsgaard, J. (2001). *What's wrong with the diffusion of innovation theory?* (pp. 173-190). Springer US.
- MacCallum, R. C., & Browne, M. W. (1993). The use of causal indicators in covariance structure models: Some practical issues. *Psychological Bulletin*, 114(3), 533.
- MacKenzie, S. B., Podsakoff, P. M., & Jarvis, C. B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology*, 90(4), 710.
- Mahzan, N., & Lymer, A. (2014). Examining the adoption of computer-assisted audit tools and techniques: Cases of generalized audit software use by internal auditors. *Managerial Auditing Journal*, 29(4), 327-349. doi:10.1108/MAJ-05-2013-0877
- Mahzan, N., & Veerankutty, F. (2011). IT auditing activities of public sector auditors in Malaysia. *African Journal of Business Management*, 5(5), 1551-1563. doi:10.5897/AJBM09.423

- Majdalawieh, M., & Zaghoul, I. (2009). Paradigm shift in information systems auditing. *Managerial Auditing Journal*, 24(4), 352–367. doi:10.1108/02686900910948198
- Malhotra, Y. (1998). Business process redesign: an overview. *IEEE Engineering Management Review*, 26, 27-31.
- Malmi, T. (1999). Activity-based costing diffusion across organizations: an exploratory empirical analysis of Finnish firms. *Accounting, Organizations and Society*, 24(8), 649-672.
- Mansour, E. M. (2016). Factors Affecting the Adoption of Computer Assisted Audit Techniques in Audit Process: Findings from Jordan. *Business and Economic Research*, 6(1), 248-271.
- Marcoulides, G. A., & Saunders, C. (2006). Editor's comments: PLS: a silver bullet?. *MIS quarterly*, iii-ix.
- Markus, M. L., Axline, S., Petrie, D., & Tanis, S. C. (2000). Learning from adopters' experiences with ERP: problems encountered and success achieved. *Journal of Information Technology*, 15(4), 245-265.
- Maruping, L. M., Bala, H., Venkatesh, V., & Brown, S. A. (2017). Going beyond intention: Integrating behavioral expectation into the unified theory of acceptance and use of technology. *Journal of the Association for Information Science and Technology*, 68(3), 623-637.
- Masli, A., Peters, G. F., Richardson, V. J., & Sanchez, J. M. (2010). Examining the potential benefits of internal control monitoring technology. *The Accounting Review*, 85(3), 1001-1034.
- Mason, R. O. (1978). Measuring information output: A communication systems approach. *Information & Management*, 1(4), 219-234.
- Masrek, M. N., Jamaludin, A., & Hashim, D. M. (2009). Determinants of strategic utilization of information systems: A conceptual framework. *Journal of Software*, 4(6), 591–598. doi:10.4304/jsw.4.6.591-598
- Mc Lennan, A., & Ngoma, W. Y. (2004). Quality governance for sustainable development?. *Progress in Development Studies*, 4(4), 279-293.
- McAfee, A. (2006). Mastering the three worlds of information technology. *Harvard Business Review*, 84(11), 141.
- Memon, M. A., Cheah, J., Ramayah, T., Ting, H., Chuah, F & Cham, T.H. (2019). Moderation Analysis : Issues and Guidelines. *Journal of Applied Structural Equation Modeling*, 3(1): 1-9.
- Merhout, J. W., & Havelka, D. (2008). Information Technology Auditing: A Value-Added IT Governance Partnership between IT Management and Audit. *Communications of the Association for Information Systems*, 23(1), 463–482.
- Messier, W. F., Eilifsen, A. & Austen, L. A. (2004). Auditor detected misstatements and the effect of information technology. *International Journal of Auditing*, 8(3), 223-235.
- Messier, W., Glover, S., & Prawitt, D. (2013). *Auditing & assurance services: A systematic approach*. McGraw-Hill Higher Education.
- Meyer, M., Zarnekow, R., & Kolbe, L. M. (2003). IT-Governance. *Wirtschaftsinformatik*, 45(4), 445-448.
- Mithas, S., Tafti, A. R., Bardhan, I., & Goh, J. M. (2012). Information technology and firm profitability: mechanisms and empirical evidence. *MIS Quarterly*, 36(1), 205-224.
- Mitra, S., Jaggi, B. & Hossain, M. (2013). Internal control weaknesses and accounting conservatism: evidence from the post–Sarbanes–Oxley period. *Journal of Accounting, Auditing & Finance*, 28(2), 152-191.

- Mohamed, N., Hussin, H., & Hussein, R. (2006). Enabling change factors and IT success in the Malaysian e-government implementation. In *Pacific Asia Conference on Information Systems* (pp. 1107–1125).
- Molla, A., & Licker, P. S. (2005). Perceived e-readiness factors in e-commerce adoption: An empirical investigation in a developing country. *International Journal of Electronic Commerce*, 10(1), 83-110.
- Moscove, S.A., Simkin, M.G. & Bagranoff, N.A. (2003) Core Concepts of Accounting Information Systems. 8th ed. New York, Wiley.
- Mukhtar, R., & Ali, N. A. (2011). Quality governance of human aspects of quality initiatives in the public service sector. *Current Issues of Business & Law*, 6(1).
- Munter, P. (2002). Will technology defeat your auditor? *The Journal of Corporate Accounting and Finance*, 13(4), 17-22.
- Mustapha, M., & Lai, S. J. (2017). Information technology in audit processes: an empirical evidence from Malaysian audit firms. *International Review of Management and Marketing*, 7(2), 53-59.
- National Association of State Chief Information Officers (NASCIO). (2008). *IT Governance and Business Outcomes – A Shared Responsibility between IT and Business Leadership*. Retrieved from: <http://www.nascio.org/Portals/0/Publications/Documents/NASCIO-ITGovernanceBusinessOutcomes.pdf>
- National Audit Department of Malaysia (NADM). (2015). IT Audit- Issues, Lesson Learnt and Actions for A Successful IT System Implementation. In *24th Meeting of the INTOSAI Working Group on IT Audit*. Poland.
- Nawi, H. S. A., Rahman, A. A., & Ibrahim, O. (2011). Government's ICT project failure factors: A revisit. In *Research and Innovation in Information Systems (ICRIIS), 2011 International Conference on* November (pp. 1-6). IEEE.
- Nearon, B. H. (2005). Foundations in auditing and digital evidence. *The CPA Journal*, 75(1), 32.
- Netegrity. (2004). *Sarbanes–Oxley*. Regulatory compliance handbook. <http://www.netegrity.com/PDFS/REGULATORY/SOA%20Handbook%20Sheet.PDF>
- Nfuka, E. N., & Rusu, L. (2010). Critical Success Factors for Effective It Governance in the Public Sector Organizations in a Developing Country. The Case of Tanzania, In *Proceedings of the European Conference on Information Systems, Pretoria, South Africa*.
- Nfuka, E. N., & Rusu, L. (2011). The effect of critical success factors on IT governance performance. *Industrial Management & Data Systems*, 111, doi:10.1108/02635571111182773
- Nkhoma, M. Z., & Dang, D. P. T. (2013). Contributing Factors of Cloud Computing Adoption : a Technology - Organisation - Environment Framework Approach. *International Journal of Information Systems and Engineering*, 1(1), 38–49.
- Novotny, A., Bernroider, E. W. N., & Koch, S. (2012). Dimensions and Operationalisations of IT Governance: A Literature Review and Meta-Case Study. In *CONF-IRM 2012 Proceedings*. (Paper 23). Retrieved from <http://aisel.aisnet.org/confirm2012/23>.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychological Theory*. New York, NY: MacGraw-Hill.
- Nystrom, P. C., Ramamurthy, K., & Wilson, A. L. (2002). Organizational context, climate and innovativeness: adoption of imaging technology. *Journal of Engineering and Technology Management*, 19(3), 221-247.
- O'Donnell, E., & Schultz, Jr. J. J. (2003). The influence of business-process-focused

- audit support software on analytical procedures judgments. *Auditing Journal Practice Theory*, 22, 265–79.
- O'Donnell, E., (2005). Enterprise risk management: a systems-thinking framework for the event identification phase. *International Journal of Accounting Information System*, 6(19).
- O'Donnell, E., (2006). Discussion of the influence of scope and timing of reliability assurance in B2B E-commerce. *International Journal of Accounting Information System*, 7(4).
- O'Donnell, E., Arnold, V., & Sutton, S.G. (2000a). An analysis of the group dynamics surrounding internal control assessment in information systems audit and assurance domains. *Journal of Information System*, 14, 97.
- O'Donnell, E., Arnold, V., & Sutton, S.G. (2000b). Reply to discussions of an analysis of the group dynamics surrounding internal control assessment in information systems audit and assurance domains. *Journal of Information System*, 14, 5.
- O'Donnell, J. B., & Rechtman, Y. (2005). Navigating the standards for information technology controls. *The CPA Journal*, 75(7), 64.
- Oldhouser, M. (2016). *The Effects of Emerging Technologies on Data in Auditing* Unpublished thesis, University of South Carolina.
- O'Leary, D. (2002). Discussion of information system assurance for enterprise resource planning systems: unique risk considerations. *Journal of Information System*, 12.
- Oliveira, T., & Martins, M. (2011). Literature Review of Information Technology Adoption Models at Firm Level. *Electronic Journal of Information*, 14(1), 110–121. Retrieved from
- Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems*, 110(9), 1337-1354.
- Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, 51(5), 497–510. doi:10.1016/j.im.2014.03.006
- Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, 460-469.
- Pallant, J. (2013). *SPSS Survival Manual*. McGraw-Hill Education (UK).
- Pan, M. J., & Jang, W. Y. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications industry. *Journal of Computer information systems*, 48(3), 94-102.
- Parasuraman, A., & Colby, C. L. (2001). Techno-Ready Marketing: How and why consumers adopt technology.
- Pathak, J. (2000). E-Commerce Website Audit Review. *Chartered Accountant*, 25-29.
- Pathak, J. (2004). A conceptual risk framework for internal auditing in e-commerce. *Managerial Auditing Journal*, 19(4), 556–564. doi:10.1108/02686900410530556
- Pathak, J., & Lind, M. R. (2003). Audit Risk, Complex Technology, and Auditing Processes. *EDPACS: The EDP Audit, Control, and Security Newsletter*, 31(5), 1–9. doi:10.1201/1079/43853.31.5.20031101/78844.1
- Pathak, J., & Lind, M. R. (2010). An E-Business Audit Service Model in the B2B Context. *Information Systems Management*, 27(2), 146–155. doi:10.1080/10580531003685204
- Pedrosa, I., & Costa, C. J. (2014). Statutory auditor's profile and computer assisted audit tools and techniques' acceptance. *In Proceedings of the International*

*Conference on Information Systems and Design of Communication* (pp. 20–26).  
doi:10.1145/2618168.2618172

- Pedrosa, I., Costa, C. J., & Laureano, R. M. (2015). Motivations and limitations on the use of information technology on statutory auditors' work: An exploratory study. In *Information Systems and Technologies (CISTI), 2015 10th Iberian Conference on* (pp. 1-6). IEEE.
- Perry, J. L., & Kraemer, K. L. (1978). Innovation attributes, policy intervention, and the diffusion of computer applications among local governments. *Policy Sciences*, 9(2), 179-205.
- Peterson, R. R. (2004). Integration strategies and tactics for information technology governance. *Strategies for Information Technology Governance*, 37-80.
- Petter, S., DeLone, W., & McLean, E. R. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, 17(3), 236–263. doi:10.1057/ejis.2008.15
- Petter, S., DeLone, W., & McLean, E. R. (2013). Information systems success: The quest for the independent variables. *Journal of Management Information Systems*, 29(4), 7–62. doi:10.2753/MIS0742-1222290401
- Petter, S., Straub, D., & Rai, A. (2007). Specifying formative constructs in information systems research. *MIS Quarterly*, 623-656.
- Phelps, D., & Milne, K. (2008). Leveraging IT controls to improve IT operating performance. *The Institute of Internal Auditors Research Foundation*.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879.
- Preacher, K. J., & Hayes, A. F. (2008). Assessing mediation in communication research. *The Sage Sourcebook of Advanced Data Analysis Methods for Communication Research*, 13-54.
- Premkumar, G., & King, W. R. (1994). Organizational characteristics and information systems planning: An empirical study. *Information Systems Research*, 5(2), 75-109.
- Proctor, P., & Viganly, J. (2004). The security implications of Sarbanes-Oxley. *Symantec Enterprise Solutions Webcast*. Available at: [www.symantec.com/press/2004/n040218c.html](http://www.symantec.com/press/2004/n040218c.html).
- Protiviti®. 2016a. Cyberthreats lurk amid major transformation: Assessing the result of Protiviti's 2015 IT priorities survey. Retrieved from <http://www.protiviti.com/en-US/Documents/Surveys/NC-State-Protiviti-Survey-Top-Risks-2016.pdf>
- Protiviti®. 2016b. Executive perspectives on top risk for 2016. Retrieved from <http://www.protiviti.com/en-US/Documents/Surveys/NC-State-Protiviti-Survey-Top-Risks-2016.pdf>
- Protiviti®. 2016c. Maintaining margins while staying vigilant: Assessing the results of the Financial Executives Research Foundation / Protiviti 2016 finance priorities survey. Retrieved from <http://www.protiviti.com/en-US/Documents/Surveys/2016-Finance-Priorities-Survey-FERF-Protiviti.pdf>
- Protiviti®. 2016d. Arriving at internal audit's tipping point amid business transformation: Assessing the results of the 2016 internal audit capabilities and needs survey – and a look at key trends over the past decade. Retrieved from <http://www.protiviti.com/en-US/Documents/Surveys/2016-Internal-Audit-Capabilities-and-Needs-Survey-Protiviti.pdf>
- Protiviti®. 2016e. A global look at IT audit best practices: Assessing the international leaders in an annual ISACA / Protiviti survey. Retrieved from



- <http://www.protiviti.com/en-US/Documents/Surveys/5th-Annual-IT-Audit-Benchmarking-Survey-ISACA-Protiviti.pdf>
- Public Company Accounting Oversight Board (PCAOB). (2003). *The Personnel Management Element of a Firm's System of Quality Control- Competencies Required by a Practitioner-in-Charge of an Attest Engagement*. Quality Control Standards Section No. 40. Washington, D.C.
- Public Company Accounting Oversight Board (PCAOB). (2010). *Identifying and Assessing Risks of Material Misstatement*. Auditing Standard No. 12. Washington, DC
- Pudjianto, B. W., & Hangjung, Z. (2009). Factors affecting e-government assimilation in developing countries. In *4th Communication Policy Research, South Conference, Negombo, Sri Lanka*.
- Ragunandan, K., & Rama., D. V. (2006). SOX Section 404 material weakness disclosures and audit fees. *Auditing: A Journal of Practice & Theory* 25 (1): 99–104.
- Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*, 13(1), 50-69.
- Ramamurthy, K., Premkumar, G., & Crum, M. R. (1999). Organizational and interorganizational determinants of EDI diffusion and organizational performance: A causal model. *Journal of Organizational Computing and Electronic Commerce*, 9(4), 253-285.
- Ramayah, T., Ling, N. S., Taghizadeh, S. K., & Rahman, S. A. (2016). Factors influencing SMEs website continuance intention in Malaysia. *Telematics and Informatics*, 33(1), 150-164.
- Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management*, 22(1/2), 10-24.
- Ramos, M. (2004). Evaluate the control environment. *Journal of Accountancy*, 197(5), 75.
- Ravichandran, T., & Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. *Journal of Management Information Systems*, 21(4), 237-276.
- Razi, M. A., & Madani, H. H. (2013). An analysis of attributes that impact adoption of audit software: An empirical study in Saudi Arabia. *International Journal of Accounting and Information Management*, 21(2), 170–188. doi:10.1108/18347641311312320
- Read, T. J. (2004). Discussion of director responsibility for IT governance. *International Journal of Accounting Information Systems*, 5(2), 105-107.
- Rezaee, Z., & Hoffman, C. (2001). XBRL: Standardized electronic financial reporting. *Internal Auditor*, 58(4), 46-46.
- Ribbers, P., Peterson, R. R., & Parker, M. M. (2002). Designing information technology governance processes: diagnosing contemporary practices and competing theories. In *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on* (pp. 3143-3154). IEEE.
- Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's Comments: A Critical Look at the Use of PLS-SEM in MIS Quarterly. *MIS Quarterly*, iii-xiv.
- Rogers, E.M. (1995). *Diffusion of innovations*. Fourth Edition, New York: Free Press.
- Rogers, E.M. (2003). *Diffusion of innovations*. Fifth Edition, New York: Free Press.

- Rose, A. M., Rose, J. M., Sanderson, K. A., & Thibodeau, J. C. (2017). When should audit firms introduce analyses of Big Data into the audit process?. *Journal of Information Systems*, 31(3), 81-99.
- Rosli, K., Yeow, P. H., & Siew, E. G. (2012). Computer-Assisted Auditing Tools Acceptance Using I-Toe : A New Paradigm. In *Pacific Asia Conference on Information Systems (PACIS)* (p. 195).
- Rosli, K., Yeow, P.H., & Eu-Gene, S. (2013). Adoption of audit technology in audit firms. In *24th Australasian Conference on Information Systems (ACIS)* (pp. 1-12).
- Rowe, R. (2008). An examination of contextual factors and individual characteristics affecting technology implementation decisions in auditing. *International Journal of Accounting Information Systems*, 9(2), 104–121. doi:10.1016/j.accinf.2007.10.002
- Rubino, M., & Vitolla, F. (2014a). Corporate governance and the information system: how a framework for IT governance supports ERM. *Corporate Governance*, 14(3), 320–338. doi:10.1108/CG-06-2013-0067
- Rubino, M., & Vitolla, F. (2014b). Internal control over financial reporting: opportunities using the CobiT framework. *Managerial Auditing Journal*, 29. doi:10.1108/MAJ-03-2014-1016
- Sabherwal, R., Jeyaraj, A., & Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management Science*, 52(12), 1849-1864.
- Salant, P., Dillman, I., & Don, A. (1994). *How to Conduct your Own Survey*. John Wiley & Sons.
- Sambamurthy, V., & Zmud, R.W. (1999). Arrangements for Information Technology Governance: A Theory of Multiple Contingencies. *MIS Quarterly*, 23 (2), 261-291.
- Sarstedt, M., & Mooi, E. (2014). *A Concise Guide to Market Research: The Process, Data, and Methods Using IBM SPSS Statistics*. New York: Springer.
- Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research Methods for Business Students*, 5<sup>th</sup> ed., Harlow: Prentice Hall.
- Scandura, T. A., & Williams, E. A. (2000). Research methodology in management: Current practices, trends, and implications for future research. *Academy of Management Journal*, 43(6), 1248-1264.
- Scavo, C., & Shi, Y. (2000). Public Administration The Role of Information Technology in the Reinventing Government Paradigm—Normative Predicates and Practical Challenges. *Social Science Computer Review*, 18(2), 166-178.
- Schafer, B. A. & Eining, M. M. (2002). Auditor's Adoption of Technology: A Study of Domain Experts. In *American Accounting Association Meeting*. San Diego.
- Schroeder, M. S., Solomon, I., & Vickrey, D. (1986). Audit Quality-The Perceptions of Audit-Committee Chairpersons And Audit Partners. *Auditing: A Journal of Practice & Theory*, 5(2), 86-94.
- Scott, J. E. (2007). An e-transformation study using the technology-organization-environment framework. *BLED 2007 Proceedings*, 55.
- Scott, W. R. (2001). *Institutions and Organizations*. 2nd Eds. Thousand Oaks. Sage.
- Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, 8(3), 240-253.
- Seddon, P. B., & Kiew, M. (1996). A partial test and development of delone and mclean's model of is success 3. *Australasian Journal of Information Systems*, 4(1), 90–109.

- Seethamraju, R. (2015). Adoption of software as a service (SaaS) enterprise resource planning (ERP) systems in small and medium sized enterprises (SMEs). *Information Systems Frontiers*, 17(3), 475-492.
- Sekaran, U., & Bougie, R. (2003). *Research Methods for Business: A Skill Building Approach*. John Wiley & Sons.
- Sethibe, T., Campbell, J., & McDonald, C. (2007). IT governance in public and private sector organisations: examining the differences and defining future research directions. *ACIS 2007 Proceedings*, 118.
- Shaikh, J.M. (2005). E-commerce Impact: Emerging Technology – Electronic Auditing. *Managerial Auditing Journal*, 20 (4), pp.408–421.
- Shannon, C. E., & Weaver, W. (1949). *The mathematical theory of communication*, University of Illinois Press, Urbana, IL.
- Siddiquee, N. A. (2006). Public management reform in Malaysia: Recent initiatives and experiences. *International Journal of Public Sector Management*, 19(4), 339-358.
- Siddiquee, N. A. (2007). Public service innovations policy transfer and governance in the Asia-Pacific region: The Malaysian experience. *JOAAG*, 2(1), 81-91.
- Siddiquee, N. A. (2008). E-government and innovations in service delivery: the Malaysian experience. *International Journal of Public Administration*, 31(7), 797-815.
- Siti Nabiha, A. K. (2008). New Public Management in Malaysia: in search of an efficient and effective service delivery, *International Journal of Management Sciences* 15: 69–90.
- Smith G. (2007). I.T. greatest audit and security risks of 2006. *Journal of Accounting Finance*, 18, 43–8.
- Snead Jr, K. C., Magal, S. R., Christensen, L. F., & Ndede-Amadi, A. A. (2015). Attribution theory: a theoretical framework for understanding information systems success. *Systemic Practice and Action Research*, 28(3), 273-288.
- Soares-Aguiar, A., & Palma-dos-Reis, A. (2008). Why do firms adopt e-procurement systems? Using logistic regression to empirically test a conceptual model. *Engineering Management, IEEE Transactions on*, 55(1), 120-133.
- Soral, G., & Jain, M. (2011). Impact of ERP system on auditing and internal control. *The international Journal's Research: Journal of Social Sciences and Management*, 1(4), 16-23
- Stoel, D., Havelka, D., & Merhout, J. W. (2012). An analysis of attributes that impact information technology audit quality: A study of IT and financial audit practitioners. *International Journal of Accounting Information Systems*, 13(1), 60–79. doi:10.1016/j.accinf.2011.11.001
- Stone, M. (1974). Cross-validators choice and assessment of statistical predictions. *Journal of the Royal Statistical Society. Series B (Methodological)*, 111-147.
- Sullivan, G. M., & Feinn, R. (2012). Using effect size—or why the P value is not enough. *Journal of Graduate Medical Education*, 4(3), 279-282.
- Sun, T., Alles, M., & Vasarhelyi, M. A. (2015). Adopting continuous auditing : A cross-sectional comparison between China and United States. *Managerial Auditing Journal*, 30(2), 176 – 204.
- Sykes, T. A., & Venkatesh, V. (2017). Explaining post-implementation employee system use and job performance: impacts of the content and source of social network ties. *MIS quarterly*, 41(3), 917-936.

- Sykes, T. A., Venkatesh, V., & Gosain, S. (2009). Model of acceptance with peer support: A social network perspective to understand employees' system use. *MIS Quarterly*, 371-393.
- Tanriverdi, H. (2005). Information technology relatedness, knowledge management capability, and performance of multi-business firms. *MIS Quarterly*, 311-334.
- Tate, M., Sedera, D., McLean, E. R., & Burton-Jones, A. (2014). Information systems success research: the “Twenty Year Update?” panel report from PACIS, 2011. *Communications of the Association for Information Systems*, 34(64), 1235–1246.
- Teo, H. H., Wei, K. K., & Benbasat, I. (2003). Predicting intention to adopt interorganizational linkages: An institutional perspective. *MIS Quarterly*, 19-49.
- Teo, T. S., Lin, S., & Lai, K. H. (2009). Adopters and non-adopters of e-procurement in Singapore: An empirical study. *Omega*, 37(5), 972-987.
- Thompson, J.D. (1967). *Organizations in action*. New York, McGraw-Hill.
- Thong, J. Y., Yap, C. S., & Raman, K. S. (1996). Top management support, external expertise and information systems implementation in small businesses. *Information Systems Research*, 7(2), 248-267.
- Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *Engineering Management, IEEE Transactions on*, (1), 28-45.
- Tornatzky, L.G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington, MA: Lexington Books.
- Troshani, I., Jerram, C., & Hill, S. R. (2011). Exploring the public sector adoption of HRIS. *Industrial Management & Data Systems*, 111(3), 470–488. doi:10.1108/02635571111118314
- Tsai, M. C., Lee, W., & Wu, H. C. (2010). Determinants of RFID adoption intention: Evidence from Taiwanese retail chains. *Information & Management*, 47(5), 255-261.
- Tsai, W.-H., Chou, Y.-W., Leu, J.-D., Chen, D. C., & Tsaur, T.-S. (2015). Investigation of the mediating effects of IT governance-value delivery on service quality and ERP performance. *Enterprise Information Systems*, 9(2), 139 – 160. doi:10.1080/17517575.2013.804952
- Tucker, G.H. (2001). IT and the audit database. *Journal of Accountancy*, 192(3), 41.
- Turner, J. R. (2006). Towards a theory of project management: The nature of the project governance and project management. *International Journal of Project Management*, 2(24), 93-95.
- Tuttle, B., & Vandervelde, S. D. (2007). An empirical examination of CobiT as an internal control framework for information technology. *International Journal of Accounting Information Systems*, 8(4), 240–263. doi:10.1016/j.accinf.2007.09.001
- Umashev, C., & Willett, R. (2008). Challenges to Implementing Strategic Performance Measurement Systems in Multi- Objective Organizations: The Case of a Large Local Government Authority. *Abacus*, 44(4), 377-398.
- United Nations Development Programme (UNDP). (1997). *Governance for Sustainable Human Development: A Policy Document*. United Nations, New York. Available at <http://pogar.org/publications/other/undp/governance/undppolicydoc97-e.pdf>
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). (2003). What is good governance? Available at <http://www.unescap.org/sites/default/files/good-governance.pdf>

- United Nations Educational, Scientific and Cultural Organization (UNESCO). (2009). e-Governance. Available at [http://portal.unesco.org/ci/en/ev.php-URL\\_ID=2179&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=2179&URL_DO=DO_TOPIC&URL_SECTION=201.html)
- Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application*, 11(2), 5.
- Urbach, N., Smolnik, S., & Riempp, G. (2010). An empirical investigation of employee portal success An empirical investigation of employee portal success. *Journal of Strategic Information Systems*, 19, 184 – 206. doi:10.1016/j.jsis.2010.06.002
- Van Grembergen, W. (2002). Introduction to the Minitrack IT Governance and Its Mechanisms. In *Proceedings of the 35th Hawaii International Conference on System Sciences, Big Island, Hawaii, USA*.
- Van Grembergen, W., and S. De Haes. 2009. *Enterprise Governance of Information Technology*. New York, NY: Springer.
- Van Grembergen, W., De Haes, S., & Guldentops, E. (2004). Structures, processes and relational mechanisms for IT governance. *Strategies for information technology governance*, 2(4), 1-36.
- Vasarhelyi, M. A., & Halper, F. B. (2018). The continuous audit of online systems. In *Continuous Auditing: Theory and Application* (pp. 87-104). Emerald Publishing Limited.
- Vasarhelyi, M. A., & Lin, W. T. (1985). EDP auditing instruction using an interactive generalized audit software. *Journal of Accounting Education*, 3(2), 79-89.
- Vasarhelyi, M. A., & Romero, S. (2014). Technology in audit engagements: a case study. *Managerial Auditing Journal*, 29(4), 350–365. doi:10.1108/MAJ-06-2013-0881
- Vasarhelyi, M. A., Alles, M., Kuenkaikaew, S., & Littley, J. (2012). The acceptance and adoption of continuous auditing by internal auditors: A micro analysis. *International Journal of Accounting Information Systems*, 13(3), 267–281. doi:10.1016/j.accinf.2012.06.011
- Vaswani, R. (2003). *Determinants of Effective Information Technology (IT) Governance*. Unpublished thesis, School of Business, University of Queensland, Australia.
- Veerankutty, F. (2009). *Information technology (IT) related auditing in Malaysian public sector: an empirical study of national audit department of Malaysia*. Unpublished thesis, University Malaya, Kuala Lumpur, Malaysia.
- Ven, K., & Verelst, J. (2012). Determinants of the use of knowledge sources in the adoption of open source server software. *International Journal of Technology Diffusion*, 1(4), 53–70. doi:10.4018/jtd.2010100105
- Vendrzyk, V. P., & Bagranoff, N. A. (2003). The evolving role of IS audit: A field study comparing the perceptions of IS and financial auditors. *Advances in Accounting*, 20, 141-163.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204.
- Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 115-139.
- Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. *MIS quarterly*, 483-502.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

- Venkatesh, V., Sykes, T. A., & Venkatraman, S. (2014). Understanding e-Government portal use in rural India: Role of demographic and personality characteristics. *Information Systems Journal*, 24(3), 249–269. doi:10.1111/isj.12008
- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157-178.
- Vilsanoiu, D., & Serban, M. (2010). Changing methodologies in financial audit and their impact on information systems audit. *Informatica Economica*, 14(1), 57-65
- Walters, L. M. (2007). A draft of an information systems security and control course. *Journal of Information Systems*, 21(1), 123-148.
- Wang, Y. M., Wang, Y. S., & Yang, Y. F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change*, 77(5), 803-815.
- Webb, P., Pollard, C., & Ridley, G. (2006, January). Attempting to define IT governance: wisdom or folly?. In *System Sciences, 2006. HICSS'06. Proceedings of the 39th Annual Hawaii International Conference on* (Vol. 8, pp. 194a-194a). IEEE.
- Weber, R. (1999). *Information Systems Control and Audit*. Prentice Hall.
- Weber, S. (2004). *The Success of Open Source*. Harvard University Press.
- Wehner, D., & Jessup, C. M. (2005). Factors Affecting Generalized Audit Software Usage. In *AAA Midwest Accounting Meeting*.
- Weidenmier, M. L., & Ramamoorti, S. (2006). Research opportunities in information technology and internal auditing. *Journal of Information Systems*, 20 (1), 205–219.
- Weill, P. (2004). Don't just lead, govern: How top-performing firms govern IT, CISR Working Paper: CISR MIT.
- Weill, P. and Ross, J.W. (2004). *IT Governance - How Top Performers Manage It Decision Rights for Superior Results*. Harvard Business School Press, Boston.
- Weill, P., & Ross, J. (2005). Designing IT governance. *MIT Sloan Management Review*, 46(2).
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 177-195.
- Widuri, R. (2014). *Adoption and use of generalized audit software by Indonesian audit firms*. Unpublished thesis. RMIT University, Australia.
- Widuri, R., O'Connell, B. & Yapa, P. (2014). Adoption and use of generalized audit software by Indonesian audit firms: Some preliminary findings, in Rickards, R. and Kee, H.Y. (ed.) *Proceedings of the 4th Annual International Conference on Accounting and Finance (AF 2014)*, Singapore, 28 - 29 April 2014, pp. 173-188.
- Widuri, R., O'Connell, B. & Yapa, P. (2016). Adopting generalized audit software: an Indonesian perspective. *Managerial Auditing Journal*, 31, 821-847.
- Widuri, R., Sari, N., Wicaksono, A., Sun, Y., & Sari, S. A. (2017). Perception of internal auditor on the use of Generalized Audit Software. In *Research and Innovation in Information Systems (ICRIIS), 2017 International Conference on* July (pp. 1-6). IEEE.
- Wilkin, C. L., & Chenhall, R. H. (2010). A Review of IT Governance: A Taxonomy to Inform Accounting Information Systems. *Journal of Information Systems*, 24(2), 107–146. doi:10.2308/jis.2010.24.2.107
- Wilkinson D. (2004). The CICA's IT competency model. *International Journal of Accounting Information System*, 5, 245–50.

- Williams, M. D., Rana, N. P., Dwivedi, Y. K., & Lal, B. (2011). Is UTAUT really used or just cited for the sake of it? a systematic review of citations of UTAUT's originating article. In ECIS (p. 231).
- Wold, H. (1973). Nonlinear iterative partial least squares (NIPALS) modelling: some current developments. In *Multivariate Analysis-III* (pp. 383-407).
- Wright, S., & Wright, M. A. (2002). Information system assurance for enterprise resource planning systems: Unique risk considerations. *Journal of Information Systems* 16 (1): 99-113.
- Wu, T. H., Huang, S. M., Huang, S. Y., & Yen, D. C. (2017). The effect of competencies, team problem-solving ability, and computer audit activity on internal audit performance. *Information Systems Frontiers*, 19(5), 1133-1148.
- Wulandari, S.S. (2003), Information systems audit adopted as an assurance service in accounting firms. *Ingenious*, 1(1), p. 2.
- Xue, Y., Liang, H., & Boulton, W. R. (2008). Information technology governance in information technology investment decision processes: The impact of investment characteristics, external environment, and internal context. *MIS Quarterly*, 67-96.
- Yang, D. C., & Guan, L. (2004). The evolution of IT and internal control standards in financial statement audits: The case of the United States. *Managerial Auditing Journal*, 19(4), 544-555.
- Yang, Z., Kankanhalli, A., Ng, B. Y., & Lim, J. T. Y. (2013). Analyzing the enabling factors for the organizational decision to adopt healthcare information systems. *Decision Support Systems*, 55(3), 764-776. doi:10.1016/j.dss.2013.03.002
- Yen, C.C., Huang, S.M., Li, C.L. and Hsiah, Y.C. (2006). Application, influence and impact of Sarbanes-Oxley Act. *Computer Auditing Journal*, Vol. 15, pp. 1-11
- Yu, D. F., Lee, D. T., and Woo, J.. (2004). Issues and challenges of instrument translation. *Western Journal of Nursing Research* 26: 307-320.
- Zainol, S. S. B., Samsuri, A. S. B., Arifin, T. R. B. T., Hussin, S. B., Othman, M. S. B., & Jie, S. J. (2017). Determinants of computer assisted audit techniques (CAATs) adoption. A study in small and medium practices in Malaysia. *European Journal of Business and Social Sciences*, 6(02), 135-150.
- Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations* (Vol. 1973). New York: Wiley.
- Zhao, N., Yen, D. C., & Chang, I.-C. (2004). Auditing in the e-commerce era. *Information Management & Computer Security*, 12(5), 389-400. doi:10.1108/09685220410563360
- Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: cross-country evidence from the retail industry. *Information Systems Research*, 16(1), 61-84.
- Zhu, K., Kraemer, K., & Xu, S. (2003a). Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems*, 12(4), 251-268.
- Zhu, K., Xu, S., & Dedrick, J. (2003b). Assessing drivers of e-business value: Results of a cross-country study. *ICIS 2003 Proceedings*, 16.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods*. Cengage Learning.