



**UNIVERSITY OF  
CANBERRA**

AUSTRALIA'S CAPITAL UNIVERSITY

**Implementation of G-cloud Technology in the Public Sector of the Kingdom  
of Saudi Arabia: Perceived Drivers and Outcomes**

**Rayan Reda Alnuzha Alzighaibi**

Bachelor of Business Informatics (UC)  
Master of Information Technology (UC)  
Master of Computing (Honors) (ANU)

A thesis submitted in fulfilment of the requirements of the  
**Doctorate of Business Administration (DBA)**

School of Management  
Faculty of Business, Government & Law  
University of Canberra

**29/6/2018**

# Abstract

This research proposes and empirically tests a novel framework incorporating the employees' perceived drivers, adoption and outcomes of G-cloud in the Saudi Arabian public sector. In particular, this research identifies factors affecting employees' perceptions of G-cloud technology, the impact of such perceptions on G-cloud adoption and the subsequent outcomes. A systematic literature scan reveals that there is a paucity of research in this particular area and hardly any previous research has focused on the possible outcomes of G-cloud technology implementation in Saudi Arabia's public sector setting. Furthermore, no previous study looked at governmental drivers impacting on employees' perceptions of G-cloud. This study addresses the above lacuna by including an additional governmental construct and an outcome construct in the research framework. This framework has then been tested using multivariate statistical techniques such as correlation and regression analysis. Data for this study have been collected through a structured survey instrument involving employees of a public sector organisation in Saudi Arabia. The results of regression analysis indicate that most perceived drivers have significant and positive impact on employees' perceptions of G-cloud except for two drivers (i.e. integration with current enterprise systems and compliance policy), which have been shown to insignificantly affect employees' perceptions of G-cloud.

The insignificant outcomes might be attributed to the fact that cloud computing is still going through a testing phase and it has not yet been adopted in Saudi Arabian public sector organisations. Therefore, employees are a bit unsure about the integration of G-cloud into the public sector as well as the compliance issues. Perceptions of G-cloud and its perceived adoption have been found to be related significantly in a positive fashion. Finally, employees' perceived adoption of G-cloud have wielded a significant and positive impact on all the perceived outcome variables except for two, these being reduced maintenance and enhanced accessibility. The reasons for this insignificant impact of G-cloud adoption concerning the

above two issues may result from employees lacking precise knowledge as to what type of cloud computing would be implemented. For example, implementation of private cloud computing would be expensive in terms of managing and maintaining a cloud computing system.

These findings have important implications for the implementation of G-cloud in the Saudi Arabian public sector organisations, which are witnessing a trend in acceptance and implementation of advanced technology in its e-government system. These implications include the development of public policy regarding Saudi Arabia's national IT plan. More specifically, the implementation of G-cloud might result in cost reductions in terms of procuring expensive ICT equipment, improvement of system quality, and increased collaboration between different public organisations. Perceived implementation may have implications for security concerns, intrusions of privacy and increased cyber-crimes. Furthermore, the above findings would inform policy-makers to upgrade the current IT policy of public sector organisations in Saudi Arabia. These findings have strategic implications for effective adoption and implementation of G-cloud in the growing public sector in Saudi Arabia. These implications are highlighted in this thesis.

**Keywords:**

*E-government, cloud computing, G-cloud, innovation adoption, adoption theory.*

# Contents

- Abstract ..... v
- Contents..... vii
- List of Tables..... xi
- List of Figures ..... xiii
- List of Abbreviations..... xv
- Acknowledgments ..... xix
- Dedications ..... xxi
- Chapter One: Introduction..... 1
  - 1.1 Overview..... 1
  - 1.2 Significance of the study ..... 4
    - 1.2.1 Individual level..... 5
    - 1.2.2 Organisational level..... 6
    - 1.2.3 National level ..... 7
  - 1.3 The research problem ..... 7
  - 1.4 Contribution..... 10
    - 1.4.1 Contribution to theory ..... 10
    - 1.4.2 Contribution to practice:..... 11
  - 1.5 Context of the Research..... 12
    - 1.5.1 Broad context of cloud computing technology in the public sector..... 12
    - 1.5.2 Cloud computing in the Middle East..... 13
    - 1.5.3 Cloud computing in Saudi Arabia ..... 14
    - 1.5.4 Cloud computing in the Saudi Arabian public sector..... 14
  - 1.6 Research question ..... 16
  - 1.7 Objectives of the study ..... 18
  - 1.8 Definition of terms..... 18
    - 1.8.1 E-government ..... 19
    - 1.8.2 Cloud computing ..... 19
  - 1.9 Outlines of the thesis ..... 19
- Chapter Two: Literature review ..... 21
  - 2.1 E-government ..... 22
    - 2.1.1 History of E-government..... 22
    - 2.1.2 Concept of E-government ..... 22
    - 2.1.3 Interactions of E-government systems ..... 24
    - 2.1.4 Objectives of E-government..... 27
    - 2.1.5 E-government stages ..... 28

2.1.6	E-government visions.....	30
2.1.7	Summary .....	34
2.1.8	Background of cloud computing .....	34
2.1.9	Defining cloud computing.....	36
2.1.10	The characteristics of cloud computing.....	37
2.1.11	Cloud computing service types .....	38
2.1.12	Cloud Computing Deployment Models .....	39
2.1.13	Summary .....	40
2.2	Closer look at G-cloud adoption.....	41
2.2.1	UK .....	41
2.2.2	Australia .....	42
2.2.3	USA .....	43
2.2.4	Japan.....	43
2.2.5	China .....	45
2.2.6	Thailand.....	45
2.2.7	Singapore.....	45
2.3	The importance of G-cloud.....	46
2.3.1	Availability and Accessibility .....	46
2.3.2	Cost Effectiveness .....	46
2.3.3	Efficiency .....	46
2.3.4	Flexibility .....	47
2.3.5	Scalability.....	47
2.3.6	Reporting and Intelligence .....	47
2.4	Some issues concerning G-cloud.....	48
2.4.1	Privacy.....	48
2.4.2	Lack of user control.....	48
2.4.3	System Failure.....	48
2.4.4	Security.....	49
2.4.5	Training and Education .....	49
2.5	Adoption of innovation.....	49
2.5.1	Definitions of Innovation .....	49
2.5.2	Innovation adoption.....	50
2.5.3	Organisational innovation adoption .....	53
2.5.4	Literature on cloud computing adoption .....	53
2.6	Saudi Arabia .....	58
2.6.1	Background .....	58
2.6.2	Economy.....	58

2.6.3	Culture .....	59
2.6.4	The introduction of the Internet to Saudi Arabia .....	59
2.6.5	ICT infrastructure in KSA .....	61
2.6.6	E-government in Saudi Arabia .....	62
2.6.7	Summary .....	63
Chapter Three:	Theoretical framework .....	65
3.1	Technology-Organisation-Environment (TOE) framework .....	65
3.2	Diffusion of Innovation Theory (DOI) .....	67
3.3	Theory of Reasoned Action (TRA) .....	70
3.4	Unified Theory of Acceptance and Use of Technology (UTAUT).....	71
3.5	Justification for using the Technology-Organisation-Environment (TOE) framework .....	72
Chapter Four:	Research model and hypothesis development .....	77
4.1	Introduction.....	77
4.2	Definition of the Measurements and Drivers.....	78
4.2.1	Technological Driver.....	78
4.2.2	Organisational Driver .....	82
4.2.3	Governmental driver.....	84
4.3	Summary of hypothesis .....	92
Chapter Five:	Research methodology .....	95
5.1	Introduction.....	95
5.2	Instrumentation .....	96
5.3	Strength of the survey method .....	97
5.4	Sample selection .....	98
5.5	Administration of the survey .....	98
5.6	Ethical considerations .....	99
5.7	Construction of the survey.....	99
5.8	The application of the survey .....	100
5.9	The survey and statistical techniques .....	100
Chapter Six:	Data Analysis, Results and Discussion .....	101
6.1	Introduction.....	101
6.2	Participants' demographics analysis.....	101
6.3	The level of usage of G-cloud by employees .....	103
6.3.1	The likelihood of an organisation's usage of at least one of the cloud computing service models .....	103
6.3.2	The likelihood of an organisation's plan to benefit from various cloud computing processes.....	104
6.3.3	The level of intention to use cloud computing .....	105

6.4	Factor Analysis .....	105
6.5	Correlations.....	106
6.6	Correlations between perceived drivers and employees’ perceptions of G-cloud ..	107
6.7	Correlation between employees’ perceptions of G-cloud and the employees’ perceived G-cloud adoption. ....	110
6.8	Correlations between employees’ perceived G-cloud adoption and the perceived outcomes.....	110
6.9	Regression analysis.....	112
6.10	Discussion of results and findings regarding hypothesis testing .....	114
6.10.1	Hypotheses 1, 2, 3 and 4.....	114
6.10.2	Hypotheses 5, 6 and 7.....	114
6.10.3	Hypotheses 8 and 9.....	115
6.10.4	Hypothesis 10 .....	115
6.10.5	Hypotheses 11, 12, 13, 14, 15, 16, 17 and 18.....	116
Chapter Seven: Conclusion .....		119
7.1	Research summary .....	120
7.2	Implications .....	124
7.2.1	Implications for theory .....	124
7.2.2	Implications for practice.....	125
7.2.3	Implications for government .....	125
7.2.4	Implications for public organisations .....	127
7.2.5	Implications for employees .....	127
7.2.6	Implications for IT managers .....	128
7.2.7	Implications for citizens .....	128
7.2.8	Implications for public policy-makers .....	129
7.3	Limitations and future research .....	129
7.4	Recommendations.....	130
References .....		133
Appendices .....		159
Appendix A .....		159
Appendix B.....		169
Appendix C.....		171
Appendix D .....		175

# List of Tables

<b>Table Number</b>	<b>Table description</b>	<b>Page number</b>
<b>Table 1</b>	G2C services	25
<b>Table 2</b>	The different stages of e-government	30
<b>Table 3</b>	Public services	31
<b>Table 4</b>	E-government delivered benefits for businesses	32
<b>Table 5</b>	Examples of pilot projects using cloud computing in Australia	42
<b>Table 6</b>	The key concepts emerging from the literature	56
<b>Table 7</b>	Summary of prior studies that upgraded the TOE framework.	73
<b>Table 8</b>	Four Worldviews	95
<b>Table 9</b>	Administration of the survey	99
<b>Table 10</b>	Participants' demographic information	102
<b>Table 11</b>	Likelihood of an organisation's usage of at least one of the cloud computing service models	104
<b>Table 12</b>	Likelihood of an organisation's plan to benefit from various cloud computing processes	105
<b>Table 13</b>	Level of intention to use cloud computing	105
<b>Table 14</b>	The three correlation analysis of the study	107
<b>Table 15</b>	The relationships between the perceived drivers and employees' perceptions of G-cloud	109
<b>Table 16</b>	The relationship between employees' perceived G-cloud adoption and outcomes	111
<b>Table 17</b>	Regression analysis with employees' perceptions of G-cloud as a dependent variable	112
<b>Table 18</b>	Regression analysis with adoption of G-cloud as a dependent variable and employees' perceptions of G-cloud as an independent variable	113
<b>Table 19</b>	Regression analysis with perceived outcomes as dependent variables	113
<b>Table 20</b>	Hypotheses' testing results	117



<b>Table 21</b>	Constructs' validity and reliability	159
<b>Table 22</b>	Factor 1: Adoption (Usage)	162
<b>Table 23</b>	Factor 2: Technological knowledge	162
<b>Table 24</b>	Factor 3: Cloud Security	163
<b>Table 25</b>	Factor 4: Required IT infrastructure availability	163
<b>Table 26</b>	Factor 5: Service-level agreement	163
<b>Table 27</b>	Factor 6: Government policy	163
<b>Table 28</b>	Factor 7: Compliance policy	164
<b>Table 29</b>	Factor 8: Business scalability	164
<b>Table 30</b>	Factor 9: Integration with current enterprise systems	164
<b>Table 31</b>	Factor 10: Employees' learning capability	164
<b>Table 32</b>	Factor 11: Employees' perceptions of G-cloud	165
<b>Table 33</b>	Factor 12: On-demand service	165
<b>Table 34</b>	Factor 13: Reduced maintenance	165
<b>Table 35</b>	Factor 14: Enhanced collaboration with other firms	165
<b>Table 36</b>	Factor 15: Cost reduction	166
<b>Table 37</b>	Factor 16: Improved performance	166
<b>Table 38</b>	Factor 17: Improved system and service quality	166
<b>Table 39</b>	Factor 18: Enhanced accessibility	166
<b>Table 40</b>	Factor 19: Better availability	166
<b>Table 41</b>	Sources for the survey items	175

# List of Figures

<b>Figure Number</b>	<b>Figure description</b>	<b>Page number</b>
<b>Figure 1</b>	The pathway of this research study	12
<b>Figure 2</b>	Technical flow of G-cloud	16
<b>Figure 3</b>	Pathway of the literature review	21
<b>Figure 4</b>	Evolution of cloud computing	36
<b>Figure 5</b>	Kasumigaseki cloud. Government of Japan, Ministry of Internal Affairs and Communications (2009)	44
<b>Figure 6</b>	Technology, organisation, and environment framework	66
<b>Figure 7</b>	A model of Five Stages in the Innovation-Decision Process	69
<b>Figure 8</b>	Theory of Reasoned Action	70
<b>Figure 9</b>	Unified Theory of Acceptance and Use of Technology	72
<b>Figure 10</b>	Research model	78

# List of Abbreviations

<b>Abbreviation</b>	<b>Full Phrase</b>
<b>ACC</b>	Enhanced Accessibility
<b>AGIMO</b>	Australian Government Information Management Office
<b>AMSA</b>	Australian Maritime Safety Authority
<b>AVE</b>	Average Variance Extracted
<b>AVL</b>	Better Availability
<b>AWS</b>	Amazon Web Services
<b>B2B</b>	Business to Business
<b>B2G</b>	Business to Government
<b>CC</b>	Cloud Computing
<b>COL</b>	Enhanced Collaboration
<b>COM</b>	Compliance Policy
<b>CRM</b>	Customer Relationship Management
<b>CSA</b>	Cloud Security Alliance
<b>CST</b>	Cost Reduction
<b>C-TAM-TPB</b>	Combining the Technology Acceptance Model and Theory of Planned Behaviour
<b>DHS</b>	Department of Human Services
<b>DIAC</b>	Department of Immigration and Citizenship
<b>DOI</b>	The Diffusion of Innovation theory
<b>DTF</b>	Department of Treasury and Finance
<b>EC2</b>	Elastic Computer Cloud
<b>EIU</b>	Economist intelligence Unite
<b>ELC</b>	Employees' Learning Capability
<b>ENISA</b>	European Network and Information Security Agency
<b>ERP</b>	Enterprise Resource planning
<b>G2B</b>	Government to Business
<b>GC</b>	Government Cloud

<b>GCC</b>	Gulf Cooperation Council
<b>G-cloud</b>	Government Cloud
<b>GITS</b>	Government Information Technology Service
<b>GOV</b>	Government Policy Variable
<b>GSA</b>	General Services Administration
<b>HOT-fit</b>	Human-Organisation-Technology fit
<b>HREC</b>	by the University of Canberra Human Research Ethics Committee
<b>IaaS</b>	Infrastructure as a Service
<b>ICT</b>	Information and Communication Technology
<b>IDC</b>	International Data Corporation
<b>IDPM</b>	Innovation Decision Process Model
<b>INT</b>	Integration with Current Enterprise Systems
<b>ISPs</b>	The Internet Service Providers
<b>ISU</b>	Internet Service Unit
<b>ITA</b>	Required IT Infrastructure Availability
<b>I-TOE</b>	Individual-Technological-Organisational-Environment
<b>IVR</b>	Interactive Voice Response
<b>KSA</b>	Kingdom of Saudi Arabia
<b>MCaaS</b>	Managed Cloud as a Service
<b>MCIT</b>	Saudi Arabian Ministry of Communication and Information Technology
<b>MIN</b>	Reduced Maintenance
<b>MM</b>	Motivational Model
<b>MPCU</b>	Model of PC Utilization
<b>NASA</b>	National Aeronautics Space Administration
<b>NBC</b>	The Department of Interior's National Business Center
<b>NIC</b>	National Information Center
<b>NICTP</b>	National ICT Plan
<b>NIST</b>	National Institute of Standard and Technology
<b>ODS</b>	Delivery of On-Demand Services
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>ONI</b>	OpenNet Initiative
<b>PaaS</b>	Platform as a Service
<b>PER</b>	Employees' Perceptions of G-Cloud

<b>PKI</b>	PUBLIC KEY INFRASTRUCTURE
<b>PRF</b>	Improved Performance
<b>QUL</b>	Improved System and Service Quality
<b>ROI</b>	Return on Investment
<b>SaaS</b>	Software as a Service
<b>SAP</b>	System Application and Products
<b>SCA</b>	Business Scalability
<b>SCM</b>	Supply Chain Management
<b>SCT</b>	Social Cognitive Theory
<b>SFA</b>	Sales Force Automation
<b>SLA</b>	Service-Level Agreement
<b>SMEs</b>	Small and Medium Enterprises
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>TAM</b>	Technology Acceptance Model
<b>TCC</b>	Technology Control Company
<b>TEC</b>	Technological Knowledge
<b>TNR</b>	Tenure
<b>TOE</b>	Technology-Organisation-Environment
<b>TOGD</b>	Technology-Organisation-Governmental-Demographics
<b>TPB</b>	Theory of Planned Behaviour
<b>TRA</b>	Theory of Reasoned Action
<b>UN</b>	United Nations
<b>UTAUT</b>	The Unified Theory of Acceptance and Use of Technology
<b>WA Health</b>	West Australian Health

# Acknowledgments

Thanks and gratitude to Almighty Allah, the creator who glorified us with his blessings and kindness, without which this thesis would never have been completed.

I would like to thank the following people who have been instrumental in completing this research enterprise:

I am grateful to my father who is the main source of my inspiration in life, who also provided with material and moral support throughout the tenure of this dissertation. I am also grateful to my beloved mother who played an important role in completing this thesis by extending her affections and love. She has helped me in wiping away my sadness and inspired me to work hard towards completing this task. My brother and sisters have always stood by me and extended all the required support and inspiration unconditionally. I would like to express my special gratitude to my brother Ahmad who has provided me with all possible assistance that I have asked for. My beloved wife always was there to take care of me day and night and also took special care of my three beautiful children and always inspired me to complete this challenging task. I extend my sincerest love to her. I would like to express my sincerest appreciation to my principal supervisor Prof. Ali Quazi who provided much help and advice throughout the tenure of this dissertation. His continued motivation, encouragement and inspiration have enabled me to complete this dissertation. I would also like to thank him for painstaking evaluation of a number of drafts of this thesis. He was always there for me whenever I ran into a problem requiring guidance and directions. His guidance, patience, and immense knowledge of the topic of my study have been instrumental in the successful completion of this dissertation.

My sincere thanks also go to my secondary supervisor Dr. Majharul Talukder and advisor Dr. Masoud Mohammadian for their constant inspiration that helped me to complete this dissertation.

# Dedications

I dedicate this dissertation to my beloved family; my parents, wife and children, brother and sisters.