Faculty of Information and Communication Technology

SECURITY RISK ISSUES AND CONTROLS FOR CLOUD COMPUTING IN IRAQI GOVERNMENT ORGANISATIONS

Qusay Kanaan Kadhim Al-Zaidi

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QUSAY KANAAN KADHIM AL-ZAIDI

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DECLARATION

I declare that this thesis entitled "Security Risk Issues and Controls for Cloud Computing in Iraqi Government Organisations" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : QUSAY KANAAN KADHIM AL-ZAIDI

Date : 21/6/2019

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Doctor of Philosophy.

Signature : .....

DR ROBIAH YUSOF
Pensyarah Kanan
Fakulti Teknologi Maklumat Dan Komunikasi
Universiti Teknikal Malaysia Melaka
Hang Tuah Jaya,76100
Durian Tunggal, Melaka

Supervisor Name : DR. ROBIAH YUSOF

Date : 21/6/2018

DEDICATION

Dear Allah
I devoted my life and death to You, Allah. May my life is within your guidance.

My Dear Parent and Parent
Thank you for your sacrifice and love. No such compensate except from Allah.

My Dear brothers and sisters
Thank you for your love, support, patience and encouragement that give me the strength to finish this study. May Allah bless us, guide us and protect us to be good Muslims.

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Thank you for your motivation and love. May Allah forgive us.

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ABSTRACT

Cloud computing is becoming increasingly important in Information Technology (IT) as an enabler for improved productivity, efficiency and cost reduction. It is expected to offer benefits for public sector organisations and government agencies. Cloud computing has the potential to improve the reliability and scalability of IT systems, which in turn allows organisations such as Iraqi governments to focus on their core business and strategy development and implementation. However, governments are still hesitant to adopt cloud computing because of fear for the confidentiality of their data. There are risks and barriers in adopting cloud computing in the Iraqi government whereby the top risk is security. Security issues, classified as the biggest concern, affect the growth of cloud computing technology of Iraqi government organisations. Therefore, this thesis aimed to investigate the Security Risk Issues (SRIs) that affect cloud computing adoption by the Iraqi government organizations. It also intends to investigate the Security Risk Controls (SRCs) that enhance the cloud computing adoption through mitigating the effect of SRIs. Mixed-methods were used to carry out the objectives of this thesis involving two steps; using qualitative and quantitative methods for the initial experiment and the quantitative and intelligent approach methods for the experimental stage. Based on the qualitative and quantitative method, 26 SRIs under 5 domains and 26 SRCs to mitigate the 5 domains were determined that affected the adoption of cloud computing in the Iraq government organisations. The quantitative and intelligent approach methods used in the experimental stage were to develop a conceptual framework security risk management process for identifying the best quality and most accurate SRCs for the 5 domains. In short, the results showed that 26 SRCs mitigate the 5 domains using three intelligent approaches namely SVMR, ANNPSO, ANFIS for easing the cloud computing adoption in the Iraq government organisations. This thesis produced a validated and an effective conceptual of security risks and controls for cloud computing.

ABSTRAK

Pengkomputeran awan menjadi semakin penting di dalam bidang Teknologi Maklumat (IT) untuk meningkatkan produktiviti, kecekapan dan pengurangan kos yang dijangka akan memberi faedah kepada organisasi sektor awam dan agensi kerajaan. Pengkomputeran awan mempunyai potensi untuk meningkatkan kebolehpercayaan dan kebolehkerjaan sistem IT, yang seterusnya membolehkan organisasi-organisasi seperti pemerintah di Iraq untuk menumpukan pada pembangunan teras dan pelaksanaan strategi dan teras mereka. Walau bagaimanapun, keyakinan kerajaan terhadap penggunaan pengkomputeran awan masih rendah kerana kebimbangan terhadap privasi data dan kerahsiaan mereka. Terdapat risiko dan halangan dalam penggunaan pengkomputeran awan di kerajaan Iraq di mana risiko utama adalah keselamatan. Isu-isu keselamatan yang dikelaskan sebagai kebimbangan terbesar, menjejaskan pertumbuhan teknologi pengkomputeran awan dalam organisasi kerajaan Iraq. Oleh itu, tesis ini bertujuan untuk mengkaji isu-isu risiko keselamatan (SRI) yang mempengaruhi penggunaan pengkomputeran awan oleh organisasi kerajaan Iraq. Ia juga berhasrat untuk mengkaji kawalan risiko keselamatan (SRCs) yang meningkatkan penggunaan pengkomputeran awan dengan mengurangkan kesan (SRI). Kaedah campuran digunakan untuk melaksanakan objektif tesis ini yang melibatkan dua langkah; menggunakan kaedah kualitatif dan kuantitatif untuk peringkat awal eksperimen dan kaedah pendekatan kuantitatif dan pintar untuk peringkat eksperimen. Berdasarkan kaedah kualitatif dan kuantitatif, 26 SRI di bawah 5 kawasan kekuasaan dan 26 SRC untuk mengurangkan kesan SRI untuk 5 kawasan kekuasaan telah ditentukan yang mempengaruhi penggunaan pengkomputeran awan dalam organisasi kerajaan Iraq. Kaedah pendekatan kuantitatif dan pintar yang digunakan dalam peringkat percubaan adalah untuk membangunkan proses pengurusan risiko keselamatan konseptual untuk mengenal pasti SRC yang berkualiti dan paling tepat untuk 5 kawasan kekuasaan. Pendek kata, hasilnya menunjukkan bahawa 26 SRCs mengurangkan 5 kawasan kekuasaan menggunakan tiga pendekatan pintar iaitu SVMR, ANNPSO, ANFIS untuk memudahkan penggunaan pengkomputeran awan dalam organisasi kerajaan Iraq. Tesis ini menghasilkan pengurusan risiko keselamatan yang sah dan berkesan.

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LIST OF ABBREVIATIONS

ANN PSO	_	Artificial Neural Network using Particle Swarm Optimization
ANFIS	_	Adaptive Neuro-Fuzzy Inference System
CC	_	Cloud Computing
CCM	_	Cloud Computing Manager
CNS	_	Cloud Network Security
CSA	_	Cloud Security Alliance
CSSA	_	Cloud Security Services and Application
CSD	_	Cloud Security Data
CSPI	_	Cloud Security Platform and Infrastructure
CSP	_	Cloud Service Providers
ENISA	_	European Network Security and Information Agency
GO	_	Government Organisation
MAPE	_	Mean Absolute Percentage Error
MCGAS	_	Mobility and Cloud Government Application Security
MSE	_	Mean Square Error
NIST	_	National Institute of Standards and Technology
PaaS	_	Platform as a Service
RMSE	_	Root Mean Square Error
SaaS	_	Software as a Service
SOP	_	Standard Operating Procedure
SLAs	_	Service Level Agreement
SRCs	_	Security Risk Controls
SRIs	_	Security Risk Issues
SVMR	_	Support Vector Machine Regression
UNDP	_	United Nations Development Programmed

LIST OF PUBLICATIONS

JOURNAL PAPER

Qusay Kanaan Kadhim, R. Yusof, and S. R. Selamat, "A Review Study on Cloud Computing Issues," Journal of Physics, 2018, pp. 1–10. Published Scopus.

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