



**CLOUD ENTERPRISE RESOURCE PLANNING ADOPTION
FRAMEWORK FOR SMALL AND MEDIUM ENTERPRISES IN
MALAYSIA**



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DOCTOR OF PHILOSOPHY

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Faculty of Information and Communication Technology

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ARIF RAZZAQ OBAID

**A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this thesis entitled “Cloud Enterprise Resource Planning Adoption Framework For Small And Medium Enterprises In Malaysia” is the result of my own research except as cited in the references. The thesis has not been accepted or not concurrently submitted in the candidature of any other degree.




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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  :

Supervisor Name : Ts. Dr. Siti Azirah Asmai

Date : 8-JULY-2022

DEDICATION

I dedicate this thesis to my beloved family who has always supported me, particularly my dear mother and father, my wife and kids. They have never hesitated to provide me with all that I needed to succeed. This work is a symbol of my appreciation to all that they have given me. My gratitude also goes out to my brothers, sisters, and friends.



ABSTRACT

Cloud enterprise resource planning (ERP) is now becoming a more critical enabler for increased productivity, performance, and cost reduction in information technology (IT). This system is expected to provide advantages to all types of businesses, regardless of their scale. Cloud ERP has the potential to increase the scalability and efficiency of IT systems, allowing SMEs to concentrate on their core business and strategy growth and execution. Despite the many advantages of cloud ERP such as lower upfront and deployment costs and shorter implementation times that come with its adoption, there is a strong aversion to its adoption by many SMEs and adoption is still falling short of expectations. In general, research on the use of Cloud ERP in SMEs is limited, and there is a major research gap in the study of this innovation's adoption in SMEs. There are currently no empirical studies on the factors that affect Cloud ERP adoption in Malaysia. To fill the void, a research framework was developed based on the diffusion of innovation theory (DOI), the Iacouvo model, and critical mass theory (CMT), combined with the technology-organization-environment (TOE) framework. This research employed a quantitative method to achieve the research objectives. Data were collected from a total of 203 questionnaires out of 384 questionnaires distributed to Malaysian SMEs. For the analysis of data, the Structural Equation Modelling specifically SmartPLS-Version 3 was employed. The findings indicate that there is a significant positive relationship between technological factors (trialability, privacy & security, system quality, employee knowledge, complexity) and the adoption of cloud ERP. However, the results also indicated that compatibility and IT readiness pose an insignificant effect on the adoption of cloud ERP among SMEs in Malaysia. Moreover, the findings show that the dimensions of organizational factors (perceived benefits, financial readiness, and cost) have positively significant influences on the adoption of cloud ERP. With regards to the environmental factors hypotheses, the results indicated that government regulations and critical mass pose a significant and positive influence on the adoption of cloud ERP, whereas competitive pressure has no significant influence on the adoption of cloud ERP among SMEs in Malaysia. The findings of this study can be utilized as the basis for future studies on cloud ERP and serve as a guideline in designing cloud ERP projects.

**KERANGKA KERJA PENERIMAGUNAAN PERANCANGAN SUMBER
PERUSAHAAN AWAN UNTUK PERUSAHAAN-PERUSAHAN KECIL DAN
SEDERHANA DI MALAYSIA**

ABSTRAK

Perancangan Sumber Perusahaan (ERP) Awan kini menjadi pemboleh yang lebih kritikal untuk peningkatan produktiviti, prestasi, dan pengurangan kos dalam Teknologi Maklumat (IT). Sistem ini dijangka memberi kelebihan kepada semua jenis perniagaan, tanpa mengira skala mereka. Cloud ERP mempunyai potensi untuk meningkatkan skalabiliti dan kecekapan sistem IT, membenarkan PKS untuk menumpukan perhatian kepada perniagaan teras mereka, pertumbuhan strategi dan pelaksanaan. Walaupun banyak kelebihan cloud ERP seperti kos pendahuluan dan penggunaan yang lebih rendah dan masa pelaksanaan yang lebih pendek dari penerimagaannya, terdapat keengganan yang kuat terhadap penerimaannya oleh banyak PKS dan penerimagaan masih kurang daripada jangkauan. Secara umumnya, penyelidikan mengenai penggunaan Cloud ERP dalam PKS adalah terhad, dan terdapat jurang penyelidikan utama dalam kajian bagi penerimaan inovasi ini dalam PKS. Pada masa ini tiada kajian empirikal mengenai faktor-faktor yang menjejaskan penggunaan Cloud ERP di Malaysia. Untuk mengisi kekosongan, rangka kerja penyelidikan adalah dibangunkan berdasarkan teori Penyebaran Inovasi (DOI), model Iacouvo, dan teori kritikal jisim (CMT), digabungkan dengan Teknologi-Organisasi-Persekitaran (TOE) kerangka kerja. Penyelidikan ini menggunakan kaedah kuantitatif untuk mencapai objektif kajian. Data telah dikumpul daripada sejumlah 203 borang soal selidik daripada 384 borang soal selidik yang diedarkan kepada PKS Malaysia. Untuk analisis data, Structural Equation Modeling secara khusus SmartPLS-Versi 3 telah digunakan. Hasil dapatan menunjukkan bahawa terdapat positif yang signifikan hubungan antara faktor teknologi (kebolehcubaan, privasi & keselamatan, kualiti sistem, pengetahuan pekerja, kerumitan) dan penggunaan ERP awan. Walau bagaimanapun, hasilnya juga menunjukkan bahawa keserasian dan kesediaan IT menimbulkan kesan yang tidak ketara ke atas penggunaan cloud ERP dalam kalangan PKS di Malaysia. Selain itu, dapatan menunjukkan bahawa dimensi bagi faktor organisasi (faedah yang dirasakan, kesediaan kewangan, dan kos) mempunyai positif pengaruh penting terhadap penggunaan ERP awan. Berkenaan dengan alam sekitar hipotesis faktor, keputusan menunjukkan bahawa peraturan kerajaan dan kritikal jisim menimbulkan pengaruh yang signifikan dan positif terhadap penggunaan ERP awan, manakala kompetitif tekanan tidak mempunyai pengaruh yang signifikan terhadap penggunaan ERP awan dalam kalangan PKS di Malaysia. Dapatan kajian ini boleh digunakan sebagai asas untuk kajian akan datang mengenai awan ERP dan berfungsi sebagai garis panduan dalam mereka bentuk projek ERP awan.

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LIST OF ABBREVIATIONS

ACCA	-	Asia Cloud Computing Association
APS	-	Planning and Scheduling
AVE	-	Average Variance Extracted
B2B	-	Business-to-Business
CC	-	Cloud Computing
CEO	-	Chief Executive Officer
CIO	-	Chief Information Officer
CM	-	Critical Mass
CMM	-	Capability Maturity Model
CMT	-	Critical Mass Theory
COMP	-	Compatibility
COST	-	Cost
COX	-	Complexity
CP	-	Competitive Pressure
CR	-	Composite Reliability
CSP	-	Cloud Service Provider
CRM	-	Customer Relationship Management
DOI	-	Diffusion of Innovation
EDI	-	Electronic Data Interchange
ENISA	-	European Network and Information Security Agency
EK	-	Employee Knowledge

ERP	-	Enterprise Resource Planning
FVM	-	Fit-Viability Model
FR	-	Financial Readiness
GoF	-	Goodness of Fit
GR	-	Government Regular
GDP	-	Gross Domestic Product
Iacouvo	-	Iacouvo Model
IaaS	-	Infrastructure as a Service
ICT	-	Information and Communication Technology
IPMA	-	Importance-Performance Map Analysis
IOS		Inter-Organizational Systems
IS	-	Information System
IT	-	Information Technology
ITR	-	IT Readiness
MDEC	-	Malaysia Digital Economy Corporation
MRP	-	Manufacturing Resource Planning
NIST	-	National Institute of Standards and Technology
PaaS	-	Platform as a Service
PB	-	Perceived Benefits
PLS	-	Partial Least Squares
POS	-	Prediction-oriented Segmentation
PRSE	-	Privacy and Security
OoS	-	Quality of Service
SaaS	-	Software as a Service
SCM	-	Supply Change Management
SD	-	Standard Deviation
SEM	-	Structural Equation Modelling

SLA	-	Service Level Agreements
SME	-	Small and Medium Enterprise
SML	-	Small Medium and Large
SPSS	-	Statistical Package for Social Sciences
SQ	-	System Quality
TAM	-	Technology Acceptance Model
TCO	-	Total Cost of Ownership
TBP	-	Theory of Planned Behavior
TOE	-	Technology-Organization-Environment Framework
TRI	-	Trialability
UTAUT	-	Unified theory of acceptance and use of technology
VIF	-	Variance Inflation Factors



LIST OF SYMBOLS

Q^2	-	Predictive Relevance
f^2	-	Effect Size
R^2	-	Coefficient of Determination



LIST OF PUBLICATIONS

This study grants an account of the study undertaken by the authors. Some articles have been presented as follows:

1. Razzaq, A., Asmai, S. A., Talib, M. S., Ibrahim, N. and Mohammed, A. A. 2020. Cloud ERP in Malaysia: Benefits, challenges, and opportunities. *International Journal of Advanced Trends in Computer Science and Engineering*, 9(5), pp. 7510–7516.
2. Razzaq, A., Asmai, S. A., Zainal Abidin, Z., Talib, M. S and Mohammed, A. A. 2021. Propose A Conceptual Framework for the Cloud ERP Adoption Among Malaysian SMEs. *Journal of Engineering Science and Technology*, 16(4), PP. 2780–2803.



CHAPTER 1

INTRODUCTION

1.1 Background

Data and knowledge are vital resources for every corporation in today's competitive environment. This allows businesses to gain a deeper understanding of their clients, market problems, and users (Salum and Rozan, 2017). Information Technology (IT) has long been known as a potent mechanism that provides companies with a competitive advantage (Dhewanto et al., 2020). Through the adoption of information systems by organisations, they have evolved systems to fulfill particular organisational duties (Bjørn-Andersen and Raymond, 2014). As a result, numerous disparate applications were scattered throughout the company. Work duplication may occur when various organisational roles fail to exchange and communicate information effectively due to diverse applications. It may also lead to circumstances where decision-makers are forced to make decisions using obsolete, inaccurate, and hard to obtain data. ERP is a significant and widely used information systems for businesses, having first been implemented in the 1990s (Peng et al., 2014). This cohesive information system is utilized for coordinating all departmental functions within the enterprise as well as to communicate with suppliers (Shehab et al., 2004).

The standard database can exchange information across operating areas and also functions as an integrated data department i.e. the two reasons for this solution's popularity. ERP system developers mainly aim to solve legacy i.e. separating systems by bringing all functions together in one system (Sergio, 2002); (Muscatello, Small and Chen, 2003). This