Faculty of Information and Communication Technology

OPEN DATA FRAMEWORK FOR MTUN ACADEMICS USING OPEN DATA LICENSE AS MEDIATOR

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in fulfilment of the requirements for the degree of Doctor of Philosophy

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DECLARATION

I declare that this thesis entitled OPEN DATA FRAMEWORK FOR MTUN ACADEMICS USING OPEN DATA LICENSE AS MEDIATOR is the result of my own research 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.

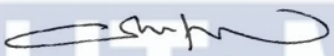
Signature : 

Name : SITI NUR'ASYIQIN BINTI ISMAEL

Date : 28 September 2022

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 the degree of Doctor of Philosophy.

Signature : 

Supervisor Name : GS. DR. OTHMAN BIN MOHD

Date : 28 September 2022

DEDICATION

To my beloved husband, mother, father, and family.

ABSTRACT

Data sharing has become prominent nowadays. The need for data sharing in the educational world is crucial and worth exploring as higher education is one of the critical sectors that produce a vast amount of data.However, most of the data are not permitted to be published, always kept in a silo, unavailable and confidential.The hesitation of data sharing are perhaps due to universities' disinterest to embrace the potential of Open Data and at the same time universities have difficulties in opening up data and identifying workable practices that strike a balance between sharing data while maintaining its privacy and security. Due to these reasons, the Open Data initiatives are introduced to explore and embrace the data potential. In this study, the Technological, Organisational, and Environmental (TOE) framework and Theory of Planned Behaviour (TPB) were integrated to examine the factors influencing data sharing. The intention of data sharing is expected when it comes to Open Data.There were questioned whether the theories and approaches related to the developed, modified, and extended Open Data in the advanced countries are relevant to a developing country such as Malaysia and whether other determinants and mediators play essential roles in the specific environment.Therefore, this study examined the factors that influence Malaysia Technical University Network (MTUN) academics on data sharing and the existence of a mediator between data sharing and Open Data. In seeking empirical evidence of data sharing practices and Open Data, this study undertook a preliminary study to confirm the problem of data sharing and Open Data within the MTUN environment. Seventeen (17) MTUN Officers were interviewed by conducting a Personal Structured Interview.Based on the preliminary study, the concerns of misuse of personal data (29.41%), data integrity (23.53%), data privacy, security (17.65%) and, infringement of data act (17.65%) were highlighted.The development of Open Data Framework for MTUN Academics (OD-MTUN-ACA) was based on the factors that influence MTUN academics on data sharing and the introduction of Open Data Licenses (ODL) as a mediator between Data sharing and Open Data. The quantitative method; survey technique was used in collecting primary data. Samples were selected using stratified random sampling, which yielded 442 usable questionnaires. The result of Confirmatory Factor Analysis (CFA) showed that the factors that influence MTUN academics on data sharing depend on these components; technical infrastructure, usability, norms, data sharing policy, resources, data sharing culture, research practice, attitude, normative belief, and perceived behavioural control.These components met the fitness indexes in CFA analysis and were found to have a significant influence on the data sharing. Structural Equation Modeling (SEM), was used to analyse structural relationships between data sharing, ODL, and Open Data. Based on the analysis, ODL was found significant in mediating the relationship between data sharing and Open Data. This result was once again reconfirmed with the bootstrapping method.The introduction of ODL as a mediator would solves the concerns of misuse of personal data, data integrity, data privacy, security and, infringement of data act. Thus, OD-MTUN-ACA must include ODL as one of the additional components. In general, this study successfully achieved its main objective; the development of OD-MTUN-ACA and the introduction of new mediator, ODL. It was hoped that this study would narrow down the gaps in the knowledge area and could trigger Open Data initiatives among Malaysia Universities.

RANGKA KERJA DATA TERBUKA BAGI PENSYARAH MTUN MENGGUNAKAN LESEN DATA TERBUKA SEBAGAI PERANTARA

Perkongsian data penting pada masa kini.Keperluan perkongsian data dalam dunia pendidikan sangat tinggi nilainya untuk diteroka berikutan pendidikan tinggi adalah salah satu sektor yang banyak mengeluarkan data.Walau bagaimanapun, kebanyakan data tidak boleh dikongsikan kepada umum dan bersifat sulit.Keraguan terhadap perkongsian data disebabkan tiada minat terhadap potensi data terbuka selain universiti menghadapi kesulitan untuk mengenalpasti amalan berkesan yang mampu mengimbangi keperluan antara perkongsian data di samping mengekalkan keselamatan.Sehubungan itu, inisiatif data terbuka diperkenalkan untuk memberi pendedahan ke atas potensi data.Kajian ini mengintegrasikan rangka kerja Teknologi, Organisasi, Persekitaran (TOE) dan Teori Tingkahlaku Yang Dirancang (TPB) dalam menilai faktor yang mempengaruhi perkongsian data.Perkongsian data merupakan prasyarat terhadap data terbuka.Terdapat persoalan berkenaan teori dan kaedah data terbuka yang telah dibangun, diubah, dan digunakan ke atas negara maju sama ada ia relevan diaplikasikan di negara membangun seperti Malaysia, serta persoalan berkenaan kewujudan perantara yang juga memainkan peranan penting dalam persekitaran yang spesifik. Oleh itu, kajian ini akan mengkaji faktor yang mempengaruhi pensyarah Rangkaian Universiti Teknikal Malaysia (MTUN) terhadap perkongsian data serta kewujudan perantara perkongsian data dan data terbuka. Kajian awal dilaksanakan untuk mengenalpasti masalah berkenaan perkongsian data dan data terbuka di persekitaran MTUN.Seramai 17 Pegawai MTUN ditemubual menggunakan kaedah temubual berstruktur secara individu. Berdasarkan hasil kajian awal yang dijalankan,kerisauan terhadap isu penyalahgunaan data peribadi menunjukkan 29.41%, integriti data 23.53%, privasi data dan keselamatan 17.65% serta pelanggaran akta data 17.65% telah diketengahkan.Pembangunan rangka kerja data terbuka bagi pensyarah MTUN (OD-MTUN-ACA) adalah berdasarkan faktor yang mempengaruhi pensyarah MTUN ke atas perkongsian data dan pengenalan lesen data terbuka (ODL) sebagai perantara perkongsian data dan data terbuka. Kaedah kuantitatif (soal selidik) digunakan untuk mengumpul data.Sebanyak 442 sampel diperoleh melalui kaedah persampelan rawak berstrata. Komponen perkongsian data ditentukan dengan membuat penilaian terhadap konteks teknologi, organisasi, persekitaran dan individu.Hasil analisis Analisis Faktor Pengesahan (CFA) menunjukkan faktor yang mempengaruhi pensyarah MTUN terhadap perkongsian data berdasarkan komponen-komponen berikut; infrastruktur teknikal, kebolehpenggunaan, piawai, norma, polisi perkongsian data, sumber, tadbir urus, pembudayaan perkongsian data, kelaziman kajian, sikap, kepercayaan norma dan kawalan gelagat.Komponen-komponen ini mencapai indeks kecergasan CFA dan mempunyai pengaruh yang besar terhadap perkongsian data. Permodelan Persamaan Struktur (SEM) digunakan untuk menganalisis hubungan struktur antara perkongsian data, ODL dan data terbuka. Hasil analisis mendapati ODL berpengaruh sebagai perantara perkongsian data dan data terbuka. Kewujudan pengaruh ODL ini disahkan sekali lagi dengan menggunakan kaedah Bootstrapping.ODL sebagai perantara akan menyelesaikan isu penyalahgunaan data peribadi, integriti data, privasi data dan keselamatan, serta pelanggaran akta data. Kajian ini berjaya mencapai objektif utama;pembangunan OD-MTUN-ACA dan pengenalan perantara baharu, ODL. Diharapkan agar kajian ini dapat mengecilkan jurang pengetahuan dan mencetuskan inisiatif data terbuka antara universiti di Malaysia.

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LIST OF ABBREVIATIONS

ASA	American Scientific Agency
OGD	Open Government Data
MAMPU	Malaysian Administrative Modernisation Planning Unit
ICT	Information Communication Technology
MDEC	Malaysian Digital economy Corporation
KKMM	Ministry of Communication and Multimedia Malaysia
ODI	Open Data Institute
OD-MTUN-ACA	Open Data for MTUN Academics
MTUN	Malaysia Technical University Network
ODL	Open Data Licenses
HEIs	Higher Education Institutions
MOHE	Ministry of Higher Education
HE	Higher Education
TUCN	Technical University College Network
TVET	Technical Vocational Education Training
UTHM	Universiti Tun Hussein Onn
UTeM	Universiti Teknikal Malaysia Melaka
UMP	Universiti Malaysia Pahang
UniMAP	Universiti Malaysia Perlis
UKM	Universiti Kebangsaan Malaysia
UniSZA	Universiti Sultan Zainal Abidin
UiTM	Universiti Teknologi MARA
FAIR	Findable Accessible Interoperable Reusable
TOE	Technology, Organisation, Environment
TPB	Theory of Planned Behaviour
MP 11	Eleventh Malaysia Plan
BDA	Big Data Analytics

ICM	Implementation Council Meeting
MSC	Multimedia Super Corridor
ODF	Open Data Framework
MOF	Ministry of Finance
DOSM	Department of Statistic Malaysia
SPAD	Land Public Transport Commision
UK	United Kingdom
HESA	Higher Education Statistic Agency
ODC	Open Data Certificate
ODP	Open Data Pathway
DHET	Department of Higher Education and Training
CHET	Centre of Higher Education Transformation
HEMIS	Higher Education Management Information System
ODDC	Open Data in Developing Countries
EFA	Exploratory Factor Analysis
PCA	Principal Component Analysis
SPSS	Statistical Package for Social Sciences
KMO	Kaiser-Meyer-Olkin
MCO	Movement Control Order
CFA	Confirmatory Factor Analysis
SEM	Structural Equation Modelling
RMSEA	Root Mean Square Error Approx
CFI	Comparative Fit Index
AVE	Average Variance Extracted
CR	Composite Reliability

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LIST OF PUBLICATIONS

Journals

Ismael, S.N., Mohd, O., Abd Rahim, Y., and Mohamad, K., 2018. Implementation Of Open Data In Higher Education: A Review. *Journal of Engineering Science and Technology. Selangor*, 13(11), pp. 3489-3499.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Open Data is data that freely can be used, distributed, and reused by anyone (Open Knowledge International, n.d.). According to Giuseppe (2014), the Open Data objective is to access government data through an open format form. The above sentences were supported by Manyika et al. (2013), where this study emphasised that Open Data is well-defined as machine-readable information, predominantly government data that can be shown, available, and used by others.

The term Open Data was introduced in 1995 by the American Scientific Agency (ASA) relating to data openness of geophysical and environmental data (Chignard, n.d.). However, this term has been theorized, and only in 2007, thirty (30) thinkers and internet activists had a meeting at Sebastopol, North of Francisco, to discuss the Open Data term (Chignard, n.d.). Based on this discussion, they developed the Open Data Principle that guides us to evaluate Open Data. Subsequently, in 2009, President of the United States, Barack Obama had announced the Open Government Data (OGD) initiative with the objectives to increase the transparency of the government at an unprecedented level (Schrier, 2014).

Since Open Data was introduced, it has created a phenomenon worldwide for its potential capability to improve the delivery of public service and encourage the participation of the citizens towards having a transparent government. This phenomenon

is expected to encourage public engagement with the government. The participation and collaboration from the public will benefit both parties: the public and government, in determining their goals and objectives and accelerating decision-making.

According to Dove (2015), three (3) important elements are highlighted when discussing Open Data; re-use, redistribution, and universal participation. In the context of re-use and redistribution, (Davies et al., 2016) has elaborated that it always refers to the licensing term that must be well understood where the data can be reused, redistributed, and intermixed with other data. Apart from it, universal participation has been stressed that there should not be any restriction or discrimination towards the group, field endeavour, or any domain.

The rapid changes of information and communication technology nowadays require the transformation in the working culture of public administration (Giuseppe, 2014). A closed and self-referential system that was introduced before must be transformed to Open Data system that enables to adapt to the bottom-up requests of transparency, participation, and collaboration. The transformation is required to change the concept of the top-down approach in Open Data implementation, leading to the effectiveness of the Open Data concept.

The transformation has been meticulously investigated in recent years. Tran and Scholtes (2015) have underlined that the implementation of Open Data would address some existing legal challenges, such as the scope of access to information and data ownership. Typically, to access any information, one needs to follow some procedures and received permission from the data owner. However, with the concept of Open Data, the data owner will identify the data that have been categorised as opened by following some guidelines. Despite the legal challenges, the data owner is advised to be well conceptualised and

understand how the data is collected, why the data is collected, and who would benefit from Open Data to ensure that the data sharing is efficient and accurate.

According to Al Rushaid and Saudagar (2016), the implementation of open data relies on every country's governance structure and policies. In Malaysia, the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) is the appointed agency to lead the Public Sector's Information, Communication, and Technology (ICT) agenda. It is agreed that the appointed agency to lead Open Data would be responsible for setting the direction and planning for ICT implementation in the Public Sector (Centric and Services, 2016).

Justifying the above statement, the kick-off initiative of Open Data is recalled (Am and Menteri, 2015). In 2015, MAMPU and Malaysian Digital Economy Corporation (MDEC), an agency under the Ministry of Communications and Multimedia Malaysia (KKMM) had collaborated in conjunction with Open Data Institute (ODI) to embark on Open Data for the Malaysian Public Sector. This collaboration had successfully developed the Malaysia Public Sector Open Data framework and the Open Data guideline. The implementation of the Open Data initiative at the agencies level must be based on the activities agreed by the institution governance (Am and Menteri, 2015).

MAMPU was appointed to lead the Open Data initiative in Malaysia and based on Public Sector Open Data framework (DTSA), it can be seen that DTSA is lacking of Open Data License (ODL) in the framework (World Bank Group, 2017). The ODL is used to give permission to the data published; protecting and securing the use of data at the same time. The enhancement of DTSA in term of the security must be considered for Open Data framework for MTUN Academics (OD-MTUN-ACA). Thus, OD-MTUN-ACA must be based on DTSA specification with an additional measurement of security and addressing the research problems. This research endeavours to enhance the DTSA. The enhancement