



Faculty of Information and Communication Technology

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



Siti Nur'asyiqin binti Ismael

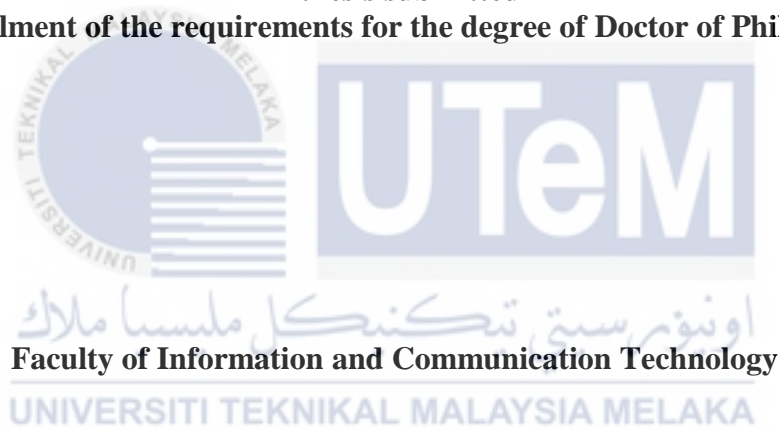
Doctor of Philosophy

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

SITI NUR'ASYIQIN BINTI ISMAEL

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



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

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.



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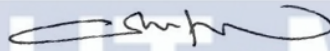
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APPROVAL

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Date :

28 September 2022



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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 MENGUNAKAN 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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TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATION	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xii
LIST OF APPENDICES	xiv
LIST OF PUBLICATIONS	xv
1 CHAPTER 1 INTRODUCTION	1
1.1 Introduction	1
1.2 Definition of topic	4
1.2.1 Higher education institution	4
1.2.2 Malaysia Technical University Network	4
1.2.3 Data sharing	5
1.2.4 Open Data Licenses	5
1.2.5 Open Data	6
1.3 Background of study	7
1.4 Problem Statements	9
1.5 Research Problems	9
1.6 Research Questions	10
1.7 Research Objectives	11
1.8 Scope of the Study	13
1.9 Justifications of the study	13
1.9.1 The knowledge gaps	13
1.9.2 Justification for the Selection of MTUN Academics as Domains	17
1.9.3 Potential Outcomes and Practices	17
1.10 Significance of the Study	18
1.11 Thesis Organisation	19
1.12 Summary	20
2 CHAPTER 2 LITERATURE REVIEW	21
2.1 Introduction	21
2.2 Eleventh Malaysian Plan 2016-2020	22
2.3 Government Online Services	24
2.4 Public Sector Data Ocean	25
2.5 Open Data	26
2.6 Open Government Data	27
2.7 Open Data Licenses	31
2.8 Open Data in Higher Education	36
2.8.1 Open Data in UK Higher Education	38
2.8.1.1 Data Openness	38

2.8.2	Open Data in South Africa Higher Education	39
2.8.2.1	Data Openness	40
2.8.3	Open Data in Saudi Arabia Higher Education	42
2.8.3.1	Data Openness	42
2.9	Data Openness Approaches in Higher Education	47
2.10	Open Data Policies	49
2.11	Summary of Open Data Method in Higher Education	50
2.12	Theories Related to Technology	52
2.12.1	The Technology, Organisation and Environment Framework	55
2.12.2	Theory of Planned Behaviour	61
2.13	Concerns Relating to Data	62
2.13.1	Misuse of Personal Data	62
2.13.2	Data Integrity	63
2.13.3	Data Privacy and Data Security	63
2.13.4	Infringement of Data Act	63
2.14	Enhancement of DTSA	64
2.14.1	Variables of data sharing	65
2.14.1.1	Technological context	65
2.14.1.2	Organisational context	66
2.14.1.3	Environmental context	67
2.14.1.4	Individual context	67
2.14.2	Open Data Licenses (Mediating Variable)	68
2.14.3	Open Data	68
2.15	Data Measurement Scale	69
2.16	Exploratory Factor Analysis	70
2.17	Consensus Agreement	70
2.17.1	Delphi Technique	70
2.17.2	Cohen Kappa (Interrater Index)	71
2.18	Confirmatory Factor Analysis	73
2.19	Structural Equation Modelling	73
2.20	Summary	74
3	CHAPTER 3	75
3.1	Introduction	75
3.2	Research Philosophy	75
3.3	Research Design	79
3.4	Preliminary Study Design	81
3.4.1	Preliminary Study Findings	83
3.5	Theoretical Framework	85
3.5.1	Research Questions and Hypotheses Development	89
3.5.1.1	Hypothesis 1	90
3.5.1.2	Hypothesis 2	91
3.5.1.3	Hypothesis 3	91
3.6	Operational Definition	92
3.7	Research Methodology	100
3.7.1	Sampling Procedures	102
3.7.2	Questionnaire Construction	106
3.7.3	Data Analysis EFA	118
3.7.4	Cronbach Alpha	134
3.7.5	Field Study	135

3.7.6	Data Analysis CFA	136
3.7.7	Structural Equation Modelling	136
3.7.8	OD-MTUN-ACA	137
3.7.9	Bootstrapping	137
3.8	Summary	137
4	CHAPTER 4 DATA ANALYSIS AND FINDINGS	139
4.1	Introduction	139
4.2	Data Analysis: An Overview	140
4.2.1	Descriptive Analysis	140
4.2.2	Confirmatory Factor Analysis	142
4.2.3	Individual Confirmatory Factor Analysis for Every Construct	149
4.2.3.1	CFA Procedure for Validating Technological Factor Construct	150
4.2.3.2	CFA Procedure for Validating Organisational Factor Construct	153
4.2.3.3	CFA Procedure for Validating Environmental Factor Construct	156
4.2.3.4	CFA Procedure for Validating Individual Factor Construct	159
4.2.3.5	CFA Procedure for Validating Open Data Licenses Construct	162
4.2.3.6	CFA Procedure for Validating MTUN_OpenData Construct	164
4.2.4	Pooled-CFA for All Measurement Model of Constructs	167
4.2.5	Structural Equation Modeling	173
4.2.5.1	Testing the ODL as a Mediator	179
4.3	Validation of Mediation Test Using Bootstrapping	181
4.4	Summary	182
5	CHAPTER 5 RESULT AND DISCUSSION	183
5.1	Introduction	183
5.2	Findings	183
5.2.1	Data sharing	184
5.2.2	ODL	186
5.2.3	Summary of Key Findings	188
5.3	Significant Contribution to New Knowledge	189
5.4	Closing the Gaps	192
5.5	Practical Implications of Research Findings	195
5.6	Summary	197
6	CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS	198
6.1	Introduction	198
6.2	Summary of the Research	198
6.3	Conclusion on the Research Objectives	202
6.3.1	Research Objective 1 and 2	202
6.3.2	Research Objective 3	203
6.3.3	Research Objective 4	204
6.4	Research contribution	204
6.4.1	OD-MTUN-ACA	205
6.4.2	Integrating TOE Framework and TPB Theory	206
6.4.3	Introduce ODL as a Mediator between Data Sharing and Open Data	206
6.5	Limitation of the study	206
6.5.1	Survey	207
6.5.2	Time limitation	207
6.6	Future research	207

6.7 Summary
REFERENCES
APPENDICES

208
210
230



LIST OF TABLES

TABLE	TITLE	PAGE
Table 1.1:	Summary of Research Problems	10
Table 1.2:	Summary of Research Questions	11
Table 1.3:	Summaries of Research Problems, Research Questions, and Research Objectives	12
Table 2.1:	Themes as a Component to be Assessed in Open Data Maturity Model	39
Table 2.2:	Evaluation of Data Openness using ODDC 10-point Evaluation	40
Table 2.3:	Evaluation of data openness using 8 principles of OGD	41
Table 2.4:	Models Used in Measuring OGD	43
Table 2.5:	Summary of Interest Groups/Tools/Criteria Engaged in Identifying Data Openness within Selected HE Countries	48
Table 2.6:	Ten Principles of OGD	49
Table 2.7:	Theories considered for this research	53
Table 2.8:	Studies Related to Open Data That Adopt TOE Framework	58
Table 2.9:	Cohen Kappa indicators	72
Table 3.1:	Operational Definition of Constructs	93
Table 3.2:	Krejcie Morgan	103
Table 3.3:	Cohen Kappa Index (Technological Factor)	112
Table 3.4:	Cohen Kappa Index (Organisational Factor)	113
Table 3.5:	Cohen Kappa Index (Environmental Factor)	114
Table 3.6:	Cohen Kappa Index (Individual Factor)	115
Table 3.7:	Cohen Kappa Index (Open Data Licenses)	116
Table 3.8:	Cohen Kappa Index (Open Data)	117
Table 3.9:	Summary of expert's consensus	118
Table 3.10:	The value of KMO and Sphericity Barlett Test (Technological)	119
Table 3.11:	EFA Result (Technological) using PCA (1st Analysis)	120
Table 3.12:	Technological's Item That was Removed	121
Table 3.13:	The Value of KMO and Sphericity Barlett Test (Technological)	121
Table 3.14:	EFA Result (Technological) using PCA (2nd Analysis)	122

Table 3.15: The Value of KMO and Sphericity Barlett Test (Organisational)	123
Table 3.16: EFA Result (Organisational) using PCA (1st Analysis)	123
Table 3.17: Organisational's Items that Were Removed	125
Table 3.18: The Value of KMO and Sphericity Barlett Test (Organisational)	125
Table 3.19: EFA result (organisational) using PCA (2nd analysis)	126
Table 3.20: The Value of KMO and Sphericity Barlett Test (Environmental)	127
Table 3.21: EFA Result (Environmental) using PCA (1st Analysis)	128
Table 3.22: The Value of KMO and Sphericity Barlett Test (Environmental)	128
Table 3.23: EFA Result (Environmental) using PCA (2nd Analysis)	129
Table 3.24: The Value of KMO and Sphericity Barlett Test (Individual)	130
Table 3.25: EFA Result (Individual) using PCA (1st Analysis)	130
Table 3.26: Individual's Items That were Removed	132
Table 3.27: The Value of KMO and Sphericity Barlett Test (Individual)	132
Table 3.28: EFA Result (Individual) using PCA (2nd Analysis)	133
Table 3.29: Summary of Cronbach Alpha	134
Table 4.1: Demographic Profiles	141
Table 4.2: Categories of Model Fit and Level of Acceptance	143
Table 4.3: Hypotheses statement based on theoretical framework	144
Table 4.4: AVE and CR for Technological Factor Construct	152
Table 4.5: AVE and CR for Organisational Factor Construct	155
Table 4.6: AVE and CR for Environmental Factor Construct	158
Table 4.7: AVE and CR for Individual Factor Construct	161
Table 4.8: AVE and CR for Open Data License Construct	164
Table 4.9: AVE and CR for MTUN_OpenData Construct	166
Table 4.10: AVE and CR for All Constructs	169
Table 4.11: Discriminant Validity Index Summary for All Constructs	171
Table 4.12: Assessment of Normality for All Constructs	172
Table 4.13: The R ² and Its Implication in This Study	175
Table 4.14: Regression Path Coefficient	177
Table 4.15: Regression Path Coefficient and Its Significance	178
Table 4.16: The Hypotheses Testing for Direct Effect	178
Table 4.17: Bootstrapping Result for Testing ODL as a Mediator	182
Table 5.1: Closing the Gaps in Knowledge Area Existed in Preliminary Study	192

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1:	Creative Commons Licenses	6
Figure 1.2:	The Knowledge Gap	15
Figure 2.1:	Overview of Public Sector ICT Strategic Plan	23
Figure 2.2:	Government Online Services	24
Figure 2.3:	Public Sector Data Ocean	25
Figure 2.4:	Public Sector Open Data Framework	29
Figure 2.5:	Current Open Data Ecosystem in Public Sector	30
Figure 2.6:	Types of CC Licenses	33
Figure 2.7:	Scoring Model and 5 Level of Data Maturity	46
Figure 2.8:	Methodologies Employed by Selected HE Countries	51
Figure 2.9:	Conceptual framework	64
Figure 2.10:	Cohen Kappa Index Formula	72
Figure 3.1:	Research onion	77
Figure 3.2:	Organisation of research design	79
Figure 3.3:	Research design	80
Figure 3.4:	Personal structured interview session	82
Figure 3.5:	Current scenario of MTUN Data Management	83
Figure 3.6:	Concerns regarding data publication and data sharing	84
Figure 3.7:	Theoretical framework Developed for OD-MTUN-ACA Research	87
Figure 3.8:	Integration of TOE Framework and TPB theory	88
Figure 3.9:	Factors Influencing Open Data	89
Figure 3.10:	Hypothesis 1	90
Figure 3.11:	Hypothesis 2	91
Figure 3.12:	Hypothesis 3	91
Figure 3.13:	Research Methodology	101
Figure 3.14:	Slovin's sample size formula	102

Figure 3.15: Population determination	105
Figure 3.16: Stratified random sampling	105
Figure 4.1: Population, Sample Size, and Sample	139
Figure 4.2: Theoretical Framework of the Study	144
Figure 4.3: Latent Construct of the Study and Its Respective Components	145
Figure 4.4: Technological Factor Construct	146
Figure 4.5: Organisational Factor Construct	147
Figure 4.6: Environmental Factor Construct	148
Figure 4.7: Individual Factor Construct	149
Figure 4.8: Technological Factor Construct (CFA)	151
Figure 4.9: Organisational Factor Construct (CFA)	154
Figure 4.10: Environmental Factor Construct (CFA)	157
Figure 4.11: CFA Results for Individual Factor Construct	160
Figure 4.12: Open Data Licenses Construct (CFA)	162
Figure 4.13: CFA Results for MTUN_OpenData Construct	165
Figure 4.14: Pooled-CFA	167
Figure 4.15: Pooled-CFA Results	168
Figure 4.16: Structural Model of this Study	174
Figure 4.17: Standardized Regression Path Coefficient	175
Figure 4.18: Regression Path Coefficient among Constructs	177
Figure 4.19: Procedure for Testing Mediation Effect	179
Figure 5.1: OD-MTUN-ACA Tested Model	186
Figure 5.2: Enhancement of DTSA (OD-MTUN-ACA)	189
Figure 5.3: MTUN Universities Planning Regarding Data Management	194

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

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Comparative Table of Open Data Component	230
B	Preliminary Study Questionnaire	240
C	www.randomizer.org	251
D	A Set Of Questionnaire For Pilot Study	252
E	Letter Of Appointment Content Validity Experts	263
F	Letter Of Invitation To Participate In Pilot Study	268
G	Official Letter To Conduct Research To MTUN TNC Office	269
H	A Set Of Questionnaire For Field Study	274



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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