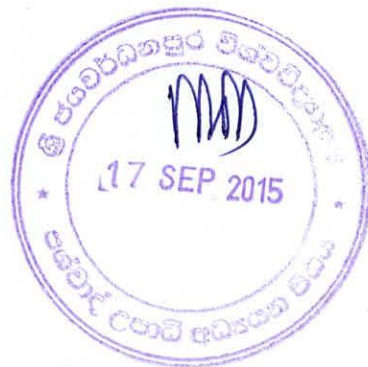


LEGAL ONTOLOGY DRIVEN LEGAL SERVICE PROCESS MANAGEMENT



By

RAZIK KARIAPPER AHMADH RJFAI KARIAPPER

Thesis submitted to the University of Sri Jayewardenepura for the
award of the Degree of Master of Philosophy in Computer
Science on 2015

DEDICATION

இதற்கு,

மாதிரி காரணங்களை மறக்க வேண்டும் !!!

அர்ப்பணிப்பு,

எனது அன்பான உம்மாவுக்கும் வாப்பாவுக்கும் !!!

Dedication,

To

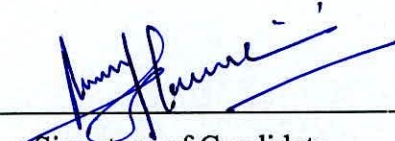
My beloved Mum and Dad !!!

DECLARATION BY THE CANDIDATE

The work described in this thesis was carried out by me under the supervision of Dr. Prasad M Jayaweera and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree/Diploma.

17.09.2015

Date

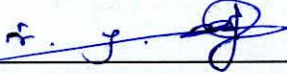


Signature of Candidate

DECLARATION BY THE SUPERVISOR

I/We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

17/09/2015
Date


Signature of Supervisor

Date

Signature of Supervisor

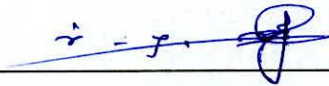
Date

Signature of Supervisor

RECOMMENDATION BY THE SUPERVISOR

I/We certify that the candidate have made all the required corrections, additions and amendments to the thesis taking into account the comments and suggestions made by examiners.

17/09/2015
Date


Signature of Supervisor

Date

Signature of Supervisor

Date

Signature of Supervisor

TABLE OF CONTENT

TABLE OF CONTENT	i
LIST OF FIGURES	v
LIST OF TABLES	vii
LIST OF ABBREVIATION	viii
ACKNOWLEDGEMENT	x
ABSTRACT	xii
1. INTRODUCTION	01
1.1. General Background	01
1.2. Research Domain.....	02
1.3. Problem statement and Research Questions	03
1.4. Research Goal.....	04
1.5. Research purpose	05
1.6. Research Methodology	06
1.6.1. Research approach	06
1.6.2. Research procedure	08
1.6.2.1. Design an artifact	08
1.6.2.2. Problem relevance	08
1.6.2.3. Design evaluation.....	09
1.6.2.4. Research contribution.....	09
1.6.2.5. Research rigor	09
1.7. Disposition.....	10
1.8. Dissemination of Research Contribution.....	11
2. LITERATURE AND RELATED WORK.....	12

2.1. The ontology.....	12
2.2. Why and where ontology is being used.....	13
2.3. Classification of ontologies	15
2.4. Categories of ontology.....	18
2.5. Some selected popular ontology framework models in industries	19
2.5.1. Tove ontology	19
2.5.2. UMM (Unified Modeling Methodology	20
2.5.3. e3 value	22
2.5.4. REA ontology model	23
2.6. A short survey of selected popular legal ontologies.....	24
2.6.1. McCarty's LLD.....	25
2.6.2. Stamper's NOR.....	25
2.6.3. Valente's LFU.....	26
2.6.4. Van Kralingen's and Visser's FBO.....	27
2.7. Existing DEMO methodology	28
2.8. Enterprise ontology.....	29
2.9. Notion of DEMO ontological model & enterprise engineering	31
2.10. The system development process	33
2.11. The DEMO methodology	34
2.11.1. Modeling theory	34
2.11.2. Operation axiom.....	34
2.11.3. Transaction axiom.....	36
2.12. Development of DEMO aspect models	38
2.12.1. Construction model.....	39

2.12.2. Process model	39
2.12.3. State model.....	40
2.12.4. Action model.....	40
2.13. DEMO extended	40
2.14. Modification needed	41
3. LSPM FRAMEWORK	44
3.1. Overall Approach of LSPM.....	44
3.2. Development of LSPM.....	45
3.3. CAP framework.....	46
3.4. Aspect models.....	46
3.5. Analysis and synthesis.....	47
3.5.1. Performa-informa-forma analysis	48
3.5.2. Coordination-actors-production analysis	50
3.5.3. Transaction pattern synthesis	51
3.5.4. Result structure analysis.....	53
3.5.5. Construction synthesis	54
3.5.6. Organization synthesis	55
3.6. Aspect models.....	55
3.6.1. Interaction model	55
3.6.2. Process model	59
3.6.3. Action model.....	69
3.6.4. State model.....	75
3.6.5. Data model	77
3.6.6. Interstriction model	80

4. THE SUPPORTIVE ENHANCEMENTS	84
4.1. Decision point at the standard transaction model	84
4.2. Recognizing the duplicated actor role	85
4.3. Direction of the information access link.....	86
4.4. Data access level toward data model	86
4.5. Introduction of DEMO-E transaction meta-model	87
5. DISCUSSION	89
5.1. General Discussion	89
5.2. Application and Evaluation	95
6. CONCLUSION AND RECOMMENDATION	97
6.1. General conclusion	97
6.2. Direction for future research and recommendation	99
6.2.1. Concept model for the life of the case	99
6.2.2. Automate the system.....	99
6.2.3. Structure re-engineering.....	99
REFERENCE.....	101
ANNEXURE.....	109

LIST OF FIGURES

Figure 1 Basic classification of an ontology	16
Figure 2 REA basic model	23
Figure 3 The system design process.....	32
Figure 4 Ontology system construction	33
Figure 5 The system development process	34
Figure 6 Graphical representation of the operation axiom.....	35
Figure 7 Representation of a coordination act	36
Figure 8 Basic transaction pattern.....	36
Figure 9 Basic pattern of a transaction.....	37
Figure 10 Standard transaction pattern	38
Figure 11 The ontological aspect models	39
Figure 12 LSPM approach	44
Figure 13 The ontological aspect model of DEMO-E	47
Figure 14 Result structure chart of case filing	54
Figure 15 Global ATD of case filing at District court	56
Figure 16 Detailed ATD of District court (case filing).....	58
Figure 17 Standard transaction pattern of DEMO-E.....	61
Figure 18 PSD I of District court (case filing).....	62
Figure 19 PSD II of District court (case filing)	63
Figure 20 Standard transaction diagram for tendering.....	65
Figure 21 Standard transaction diagram for payment.....	65
Figure 22 Standard transaction diagram for binding.....	66
Figure 23 Standard transaction diagram for decision	66

Figure 24 OFD of District Courts (case filing)	76
Figure 25 Data Transaction Meta-Model	77
Figure 26 Coordination level data access	78
Figure 27 Data Model of District Courts (case filing)	79
Figure 28 ABD of District Courts (case filing)	81
Figure 29 OCD for District Courts (case filing)	82
Figure 30 Data access model	87
Figure 31 DEMO-E transaction meta-model	87

LIST OF TABLE

Table 1 Transaction Result Table	52
Table 2 Transaction results and types	52
Table 3 Combined Transaction and Result Table	53
Table 4 Transaction and actor roles	54
Table 5 TRT of case filing	56
Table 6 Information use table of District Courts (case filing)	69
Table 7 OPL of District Courts (case filing)	76
Table 8 BCT of District Courts (case filing)	80

LIST OF ABBREVIATION

ABD	Actor bank diagram
AM	Action model
ATD	Actor transaction diagram
C-act	Coordination act
C-fact	Coordination fact
CM	Construction model
DEMO	Dynamic Essential Modeling of Organization
DEMO	Design and Engineering Methodology for Organization
DEMO-E	DEMO extended
DT	Data Transfer model or Data access model
IAM	Interaction model
ICT	Information Communication Technology
ISM	Insterstriction model
IUT	Information use table
LSPM	Legal Service Process Management
OFD	Object fact diagram
OPL	Object property list
ORM	Object role modeling
P-act	Production act
P-fact	Production fact
PM	Process model
PSD	Process structure diagram
RUT	Result used table

SM

State model

WOSL

World ontology specification language

ACKNOWLEDGEMENTS

I would like to take this opportunity to offer my hearty thanks and gratitude to my academic supervisors, Dr. Prasad M Jayaweera Senior Lecturer, University of Sri Jayawardenepura and Professor Hans Weigand, Tilburg University, Netherlands whose supervision and guidance are important contributing factors to this research work success. Their continuous motivation, deep interest in this research and encouragement helped me to achieve breakthroughs and to overcome many of the problems in this research work. Their meticulous reviews of report and suggestions have been invaluable.

I extend my sincere thanks to Sabaragamuwa University of Sri Lanka, which has been supporting me in many ways such as providing paid leave and necessary information with positive communication along with administrative and nonacademic staff members.

I would like to share my sincere thanks to HETC project and the crews of the project for supporting me in financial means, especially my heartfelt thanks to Prof. LL Rathnayaka, Prof. Munasinghe, Dr. Munasinghe, Mr. Nawarattna and Ms. Yohani for their valueless services.

I would also wish to extend my gratitude to Tilburg University for enrolling me as a visiting researcher for a certain period of time. I will be failing my duty if I miss to thank Ms. Sandra, the HRM executive at Tilburg University for her wonderful guidance and kind assistance towards me. Meanwhile, I like to take this moment to share my

credits with department of economic for providing well equipped office room and the facilities along with essential guidance of Ms. Alice, secretary to the department.

I would like to convey my sincere thanks to Vice Chancellor of Sabaragamuwa University of Sri Lanka Prof Chandana P Udawatta along with Registrar Mr. MF. Hibathul Careem for providing handfull encouragement and also to convey my sincere thanks to Prof. Mahinda S Rupasinghe for the supports given towards my studies during the period he served as Vice Chancellor to the Sabaragamuwa University of Sri Lanka.

Further I extend my gratitude to my beloved parents Razik Kariapper and Hajara Razik Kariapper who were passed away during my research work, my sister Dr. Shaikila Issadeen, and my brothers Mr. RM. Nowshad Kariapper, Mr. RM. Azmie Kariapper and my brother in law Dr. A Izzadeen.

Next, I would like to extend my sincere thanks to Mr. MSK. Sharik Kariapper, Mrs. Sulaiha Kalantharlebbe, Mr. MM.Alikhan, Mrs. KL. Siyana Alikhan, Mr.KLM. Rameez, Dr. KLM.Rayeez, Eng. KLM.Razeen and Rev. Mou.KLM.Ziyanudeen.

At last but not at least, my wife Mrs. Silmiya Rifai Kariapper and my kitties Athaf Kariapper, Kashif Kariapper and Imadh Kariapper are also acknowledged and remembered within as well as outside the context of this work for their love and encouragements that made me to successfully complete the Master of Philosophy.

LEGAL ONTOLOGY DRIVEN LEGAL SERVICE PROCESS

MANAGEMENT

RK AHMADH RIFAI KARIAPPER

ABSTRACT

Process management and optimization play vital role in almost all industries regardless of different domains. The process managements involves with designing the process and applying the engineering principles on it in order to reduction of complexities in the selected system in the domain interested. The process optimization involves with reduction of time in between processes and possibility to automate the processes. The legal domain is one of the complex domains in Sri Lanka since more number of collaborative actors; interoperable issues within the system; complex legislation laws and rules; and difficult Courts procedures. This research project was initiated and completed in order to develop an ontology framework model for the service process management at the District Courts in the legal sector. The ontology framework model was developed with five aspect models namely action model, process model, object model, data model and construction model. These all five aspect models deal with five different views and construction of the ontology framework model. The development model is named as Design and Engineering Modeling of Organization – Extended (DEMO-E). The backbone of the DEMO-E is the “transaction” (which is the complete cycle of one or more coordination acts and a production act to produce an either material or immaterial output as the result). DEMO-E is a theory to do a construction and operation of any enterprises. The intended result is provided through the standard pattern of the transaction (it is series of communication act in order to achieve an output which cause an effect on social world) via series of communication acts. The legal

domain is rich in more communicational agenda and more number of participants in a single case. A transaction meta-model was developed in order to apply on the mile stone events and get the relevant model for the transaction in both within the selected case filing area and other stages of the case in legal sub domains. A case must pass around four basic stages such as filing, hearing, case moving or transferring when necessary and verdict. The case filing major transaction it has many sub-transactions namely case tender, necessary payments, binding and decision of the judge collectively implies as case filing. The said each sub transactions obey the generic transaction stages including both coordination acts such as request, promise, state and accept and production act such as execution act. In fact all five different ontology aspect models map the conceptual design of legal process management with easy understanding.

Further, DEMO-E can be successfully applied to the legal domain due to optimal constructional pattern and the optimal operational acts. More than this, the DEMO provides re-engineering and re-designing options to the designers. Thus the judicial Courts procedure and the organization can be restructured for the optimal output and it leads to break the barrier of complexity and inter-operable issues