

# Preface

The exponential growth of demand for sharing of knowledge beyond the normative mental capacity of human beings is accelerating construction of and contributions to the Semantic Web. Development and integration of computer ontologies, with multi-agent knowledge access systems serving both related and disparate domains of value to society, have become vital imperatives in the opening decades of the twenty-first century. This book builds upon separate research activities simultaneously conducted between 2009 and 2013. It examines and promotes the merging for purpose, of two ontology concepts while including an update review of both domains. Employer Demand Intelligence (EDI) signifies articulation of methods for projecting worker needs, while Patient Practitioner Assistive Communication (PPAC) offers a pathway to a more productive engagement between patients and healthcare practitioners, notably involving culturally and linguistically disadvantaged patient communities. In concert and with philosophical justification, these two ontology concepts are presented as formulaic ontology propositions for the introduction of efficiencies in the critical supply chain for evolving and future healthcare delivery.

## **Chapter 1 Current Issues**

The first chapter introduces the conceptual ecosystem for knowledge management modelling. Three key questions about discovery, data and change parameters are posed and discussed. Current issues are supported with a general overview of trends emerging over the last few years with emphasis on change affecting the two domains; most significantly affecting Employer Demand Intelligence as illustrated by contemporary and emerging disruptive influences in recruitment processes.

## **Chapter 2 Information Technology Challenges and Opportunities**

Expansion of the world of data and accompanying digital enterprise complexity as research and development activity brings new opportunities and challenges. Big Data, Data Analytics, Data Science and Disruptive Technology are covered in context. Emphasis is placed on greater awareness of advances in artificial intelligence and machine learning, and importance of interdisciplinary research.

Multi-agent system (MAS) advantages are explored with explanation of Agent Communication Language (ACL) message exchange.

### **Chapter 3 Ontology Engineering**

This chapter presents domain knowledge representation and organisation via specific structure(s). It focuses on ontology engineering methodologies, ontology design, ontology editor tool and reuse of existing ontologies. There is no single consensual ontology engineering methodology. Examination of some is given to illustrate the differences. Six different ontology engineering methodologies are covered and compared. Protégé editor tool and logical consistency verification are explained.

### **Chapter 4 Patient Practitioner Assistive Communication Ontology**

This chapter specifies development of the Patient Practitioner Assistive Communication (PPAC) ontology. It briefly covers all PPAC ontology classes and subclasses, properties and constraints, with future access to fine detailed development. Graphics include Type 2 Diabetes Ontology Concepts; Aboriginal English Home Talk Ontology Concepts; Object and Data Properties; ontology instance populations. Text contains a case study in which distinctive cultural attributes are then accommodated in the ontology structure.

### **Chapter 5 Cross-Cultural Healthcare Communication System**

This chapter follows on from the previous chapter presenting healthcare communication systems in which the PPAC ontology and knowledge base are placed as main components. It presents data and knowledge assimilation in and dissimulation from the PPAC ontology. It illustrates the system architecture and considers components, knowledge capture, knowledge linking and integration, and anticipation of continued growth with expansion of knowledge. A practical use case scenario is offered.

### **Chapter 6 Employer Demand Ontology**

This chapter is to crossover to the workforce management topic. It presents development of Employer Demand Ontology (EDO)-based Application for employer demand identification with EDO. Concepts are divided into two parts, i.e. non-specific job advertisements and detailed occupation-specific. Overview of EDO as developed in Web Ontology Language (OWL), EDO classes and Object and Data Properties is presented. Case scenario relating to Government Official Developing Policy and Funding Protocols is covered. It shows querying and its result illustrated from Protégé system. Vacancy advertisements, Human Resources management and tertiary training make up three case scenarios.

### **Chapter 7 Employer Demand Intelligence**

This chapter emphasises the importance of job market status clarity. It introduces Employer Demand Intelligence Tool (EDIT), with system architecture, unstructured and structured data collection description and case scenario. It specifically focuses on occupations under the Registered Nurse and Midwifery classification. Seven-step process in EDIT Pipeline is presented.

**Chapter 8 Intelligent System**

This chapter correlates domains including software engineering, health, education, e-commerce, finance, etc. and provides a summary of existing ontology-based multi-agent systems. Literature review of MAS is presented. It covers integration of Ontologies and Software Agents, ontology for knowledge representation, knowledge integration, knowledge sharing and reuse. Software agent and multi-agent system are for benefits of autonomy, reactivity, pro-activeness, social ability, adaptability and dynamism. Employment Demands and Healthcare Service Delivery Management Systems are discussed in combination with questions still to consider: factoring in uncertainty affecting physicians' perspectives and confidence; study of implications for culturally competent critical healthcare staffing; and cognitive computing. It also includes a vector-borne infectious disease epidemic case study.

**Chapter 9 Open Issue and Concluding Remarks**

This chapter merges issues and relationships embracing Employment and Service Communications; shared knowledge weaknesses; western medical culture power distance; unsatisfactory healthcare worker communications; patients disadvantaged due to lack of cultural competence; and disease symptom diagnosis and treatment controversies that also influence communications. It also includes Multicultural Mental Health Australia (MHiMA) project data illustrating cultural and linguistic diversity in Australia. It offers advocacy concept for blending of EDI and Culturally Competent Health Care (CCHC) domain ontologies.

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