Contents

Acknowledgements 3

Contents 5

List of figures 9

List of tables 11

Abstract 13

Resumen 15

Resum 17

Abbreviations and acronyms 19

Chapter 1. Introduction 21

1.1. Motivation 21

1.2. Hypothesis, research questions and objectives 23

1.2.1. Hypothesis 23

1.2.2. Specific research questions and objectives 23

1.3. Contributions 24

1.3.1. Main contributions 24

1.3.2. Journal publications and conference contributions 26

1.3.3. Research visits 29

1.3.4. Grants 30

1.3.5. Projects 31

1.3.6. Software 32

1.3.7. Other contributions 32

1.4. Structure of the thesis 33

Chapter 2. Electronic health record formalization and semantic interoperability 35

2.1. Health information systems and electronic health records 35

2.2. Semantic interoperability of health data 39

2.3. Electronic health record standards 41

2.4. Clinical information models 45

2.5. Clinical terminologies 48

Chapter 3. Study of archetype modeling methodologies and governance initiatives 53

3.1. Modeling of archetypes 53

3.1.1. Software development methodologies 56

3.1.2. Clinical information modeling methodologies 56

3.1.3. Ontological modeling methodologies 57

3.2. Governance of archetypes 58

3.2.1. Governance initiatives and systems 61

3.2.2. Comparative analysis 69

Chapter 4. Archetype modeling methodology 77

4.1. Requirements 77

4.2. Work group 79

4.3. Selection of the Reference Model 80

4.4. Design guidelines 81

4.5. Methodology phases 81

4.5.1. Phase 1. Analysis 83

4.5.2. Phase 2. Design 85

4.5.3. Phase 3. Development 87

4.5.4. Phase 4. Validation 90

4.5.5. Phase 5. Publication 92

4.6. Discussion 93

Chapter 5. Archetype governance 99

5.1. Definition and scope 99

5.2. Management of participants and roles 102

5.3. Governance style 104

5.4. Archetype development strategy 107

5.5. Quality assurance 109

5.6. Publication and visibility 111

5.7. Alignment of archetype governance activities to PRINCE2 project management processes 112

Chapter 6. Software development and use cases 119

6.1. Software developments 119

6.1.1. LinkEHR Studio 119

6.1.2. LinkEHR Model Manager 140

6.2. Use cases 151

Chapter 7. Conclusions and future work 157

Bibliography 163