Methodology for the selection of enterprise architects in support of EA project execution

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"I can do all things through Christ who strengthens me" – Philippians 4:13

SOLI DEO GLORIA!

ABSTRACT

The research field of this research study is the enterprise architecture discipline. Enterprise architecture (EA) was initiated as a discipline in the late 1980s with Zachman's article that describes a framework for information systems architecture. Since then, EA has become an ever-developing discipline. Its scope, broadened from being information systems focused to including all facets of the organisation and the environment in which the organisation operates. However, consensus on a single description of EA has not been reached yet. There are many different understandings of what EA entails. Yet, organisations invest large amounts of time and money in EA initiatives. Different types of EA work achieve divergent goals as determined by organisations.

A result of the different ideas of what EA entails is that enterprise architects have different understandings of EA. The view that an enterprise architect has of EA is referred to as the architect's EA profile. An architect's EA profile influences the way that the architect approaches EA work. Enterprise architects with different EA profiles will produce different EA deliverables for the same stakeholder requirement.

It is thus crucial that the EA profile of enterprise architects, assigned to EA projects, be aligned with the type of EA work to ensure that the organisation's goals are achieved. Therefore, the emphasis is on the appropriate selection of enterprise architects for EA project execution.

This research study developed a methodology for the selection of enterprise architects in support of EA project execution. An EA project type classification framework is mapped to an EA profile classification framework with guidelines to classify an EA project.

To evaluate the methodology for the selection of enterprise architects in support of EA project execution, a set of measurement criteria was developed. A secondary use of the measurement criteria was discovered; it is suggested as a valuable guideline to EA project managers as it highlights areas where enterprise architects' views on EA affect project success.

This research followed a design science research strategy, with specific implementation of the design science research process (DSRP) developed by Peffers *et al.* (2006). The framework for the evaluation of design science (FEDS) research guided the evaluation of the designed and developed artefact.

Keywords: enterprise architecture, enterprise architecture project, EA project, enterprise architecture project type, EA project type, enterprise architecture project type category, EA project type category, methodology, project, project type, enterprise architecture profile, EA profile, enterprise architecture school of thought, EA school of thought

TABLE OF CONTENTS

1. INTRODUCTION AND MOTIVATION 23

1.1 Introduction 23

1.1.1 Enterprise architecture descriptions and uses 24

1.2 Background to the research problem 26

1.2.1 Misunderstandings and arguments 27

1.2.2 Different types of EA work require specific knowledge and skills 28

1.2.3 Enterprise architect types 28

1.2.4 Emphasis on selection of architects 29

1.2.5 Research topic 30

1.3 Problem statement 31

1.4 Purpose of the study 32

1.5 Research questions 33

1.6 Research approach 33

1.6.1 Research philosophy 34

1.6.2 Data collection 35

1.7 Assumptions 35

1.8 Delineations and limitations 35

1.9 Significance and expected contribution 36

1.10 Thesis chapter overview 37

1.11 Conclusion 40

2. LITERATURE REVIEW 41

2.1 Introduction 41

2.2 Emergence of EA 42

TABLE OF CONTENTS

2.3 EA frameworks ... 44
2.3.1 The Zachman Framework ... 49
2.3.2 TOGAF ... 53

2.4 Three schools of thought on EA ... 58

2.5 Human component of enterprise architecture ... 61
2.5.1 Generic skills ... 64
2.5.2 Business skills and methods ... 64
2.5.3 Enterprise architecture skills ... 65
2.5.4 Programme and project management skills ... 66
2.5.5 IT general knowledge skills ... 67
2.5.6 Technical IT skills ... 68
2.5.7 Legal environment ... 69

2.6 The Daedalus Instrument for Architects (DIA) ... 70
2.6.1 Broad list of EA elements and architect traits ... 71
2.6.2 Taxonomy and indicator to determine EA school of thought ... 72
2.6.3 EA style classification and indicator ... 73
2.6.4 Enterprise architect profile perspective ... 75

2.7 Conclusion ... 77

3. RESEARCH METHODOLOGY ... 78

3.1 Introduction ... 79

3.2 Philosophical assumptions ... 81
3.2.1 Positivism ... 81
3.2.2 Interpretivism ... 81
3.2.3 Critical research ... 82
3.2.4 Pragmatism ... 82

3.3 Research method ... 83

TABLE OF CONTENTS

3.4 Data collection technique 87
3.4.1 Documents 88
3.4.2 Interviews 89
3.4.3 Observation 90

3.5 Data analysis approach 90
3.5.1 Semiotics 91
3.5.2 Hermeneutics 91
3.5.3 Narrative analysis 91
3.5.4 Thematic analysis 91

3.6 Written record 93

3.7 Philosophical assumption 94

3.8 Research method 95

3.9 Data collection technique 97

3.10 Data analysis technique 98

3.11 Written record 100

3.12 Design science research cycles 102

3.13 Research design process guiding design of this research project 103

3.14 Evaluation in DSR 105

3.15 Application of the DSRP and FEDS 108
3.15.1 Step 1: Problem identification and motivation 110
3.15.2 Step 2: Objectives of the solution 112
3.15.3 Step 3: Design and develop 112
3.15.4 Step 4: Demonstrate 120
3.15.5 Step 5: Evaluate 120

3.15.6 Step 6: Communicate 121

3.16 Data collection, data analysis and deliverables per research question 121

3.17 Ethics.. 123

3.18 Written record 123

3.19 Conclusion 124

4. EA PROJECT TYPES 125

4.1 Introduction 125

4.2 Method to determine project types 126

4.2.1 Step 1: Define project and project characteristics 126

4.2.2 Step 2: Identify a method to determine project types from literature review.. 127

4.2.3 Step 3: Apply the method to determine EA project types 128

4.3 EA project types 129

4.3.1 EA project type: EA establishment project................................ 131

4.3.2 EA project type: Applying EA method to understand internal business problems 131

4.3.3 EA project type: Business-IT alignment................................... 132

4.3.4 EA project type: Business transformation................................ 134

4.3.5 EA project type: Digital transformation 135

4.3.6 EA project type: Nine EA project types derived from EA benefits.. 135

4.3.7 EA project types: Three EA project types derived from EA goals… 136

4.3.8 EA project type: Corporate strategic planning 137

4.3.9 EA project type: Organisational development........................... 137

4.3.10 EA project type: IT decision-making 137

TABLE OF CONTENTS

4.3.11 Discussion: Identified EA project types................................... 137
4.3.12 Categorisation of EA project types 145

4.4 Semi-structured interview response 147

4.4.1 Interviewee response – Evaluation of list of EA project types and identification of new types 151
4.4.2 Interviewee response – Refining categorisation of EA project types…. 155
4.4.3 Interviewee response – EA project types are interweaved 156

4.5 Analysis of interviewee response 156

4.5.1 Analysis of interview response – Refinement of list of EA project types… 159
4.5.2 Interview response analysis – further refinement of categorisation of EA project types 167
4.5.3 Interview response analysis – EA project types are interweaved 171

4.6 EA project type classification framework 174

4.7 Conclusion 177

5. EA PROFILES 179

5.1 Introduction 179

5.2 EA profiles as per DIA... 181

5.3 EA schools of thought as per DIA 182

5.3.1 Enterprise IT architecting (EITA) 182
5.3.2 Enterprise integrating (EI).. 184
5.3.3 Enterprise ecological adaptation (EEA) 185
5.3.4 Enterprise configuration (EC) 187
5.3.5 Enterprise power authority (EPA) 189
5.3.6 Enterprise IT design (EITD).. 191

TABLE OF CONTENTS

5.3.7 Enterprise IT planning (EITP) 193
5.3.8 Critical discussion of the DIA: Identifying similar EA schools of thought 195

5.4 EA behavioural styles as per DIA 203
5.4.1 Disrupting technology style 203
5.4.2 Translating technology style 204
5.4.3 Innovating technology style 205
5.4.4 Controlling technology style 205
5.4.5 Directing strategy style 206
5.4.6 Deciding strategy style 207
5.4.7 Shifting advisory style 207
5.4.8 Conversing advisory style 208
5.4.9 Developing advisory style 209

5.5 EA profile classification framework 210

5.6 Conclusion 210

6. MAPPING OF EA PROFILES AND EA PROJECT TYPES 212

6.1 Introduction 212

6.2 EA project type categories 213

6.3 EA profiles 214

6.4 Mapping of EA profile to EA project type category 215
6.4.1 Mapping EA school of thought 215
6.4.2 Mapping EA behavioural style 217

6.5 Conclusion 222

7. MEASUREMENT CRITERIA 224

7.1 Introduction 224

7.2 Measurement criteria 225

7.3 Evaluating the application of the methodology for selection of enterprise architects 225

7.4 Evaluating the impact on EA project execution 226

7.4.1 Literature review approach 227

7.4.2 Literature review findings 228

7.4.3 Evaluation criteria 233

7.5 Interview results 235

7.6 Interpretation of interview results 237

7.7 Confirmed measurement criteria 238

7.8 Conclusion 239

8. METHODOLOGY FOR THE SELECTION OF ENTERPRISE ARCHITECTS 240

8.1 Introduction 240

8.2 Methodology for the selection of enterprise architects 241

8.2.1 Step 1: Classify the EA project or project phase 241

8.2.2 Step 2: Determine relevant EA profiles 244

8.2.3 Step 3: Select architects with relevant EA profiles 246

8.3 Evaluation of the methodology for the selection of enterprise architects 248

8.3.1 Interview results 249

8.3.2 Interpretation of interview results 260

8.4 Refined methodology for the selection of enterprise architects 269

8.4.1 Step 1: Classify the EA project or EA project phase 269

TABLE OF CONTENTS

8.4.2 Step 2: Determine relevant EA profiles 269
8.4.3 Step 3: Select architects with relevant EA profiles 270

8.5 Conclusion 272

9. REPORT ON RESEARCH FINDINGS 274

9.1 Introduction 274
9.1.1 Research process 275
9.1.2 Research contribution 275

9.2 Summary of research study 276
9.2.1 Research chapters 276
9.2.2 Research purpose and challenges 278
9.2.3 Research rationale 279
9.2.4 Design of the methodology for the selection of enterprise architects 279

9.3 Summary of contributions 284
9.3.1 Research area and problem reflection 284
9.3.2 Methodological reflection 285
9.3.3 Scientific reflection 288

9.4 Recommendations 290
9.4.1 Policy and practice 291
9.4.2 Research limitation 291
9.4.3 Future research 292

9.5 Conclusion 292

REFERENCE LIST 293

APPENDIX A. MEASUREMENT INSTRUMENTS 318

A.1 Questions for interview with EA experts regarding EA project types 318

A.2 Question for evaluation of measurement criteria 320

A.3 Questions for evaluation of the methodology for selection of enterprise architects 320

APPENDIX B. ETHICAL CLEARANCE DOCUMENTS 324

B.1 Faculty approval letter 324

B.2 Consent forms 325

B.2.1 Evaluation of EA project types 325

B.2.2 Evaluation of methodology for selection of architects 326

APPENDIX C. PUBLISHED PAPER 328

FIGURES

Figure 1 – Position of Chapter 1 in relation to the rest of the thesis 23
Figure 2 – DSRP model (Peffers *et al.*, 2006) 34
Figure 3 – Thesis structure map 37
Figure 4 – Position of Chapter 2 in relation to the rest of the thesis 41
Figure 5 – Seventy-five different EA Frameworks (Avancier *et al.*, 2018) 47
Figure 6 – Metamodel for EA frameworks as per ISO/IEC/IEEE 42010 (Perez-Castillo, Ruiz-Ggonzalez *et al.*, 2019) 48
Figure 7 – Zachman Framework (Zachman, 2003) 50
Figure 8 - Features of the rows in the Zachman Framework (Sowa & Zachman, 1992) 51
Figure 9 – Rules of the Zachman Framework (Zachman, 2003) 52
Figure 10 – Proposed modelling languages per cell in the Zachman Framework (Noran, 2003) 53
Figure 11 – TOGAF Standards contents (The Open Group, 2018) 55
Figure 12 – TOGAF ADM (The Open Group, 2018) 56
Figure 13 – Human factors influencing EA implementation (Bakar & Hussien, 2018) 62
Figure 14 – Architect skills required in the digital era (Kempegowda & Chaczko, 2018) 63
Figure 15 – TOGAF EA skills categories and architect roles (The Open Group, 2018) 63
Figure 16 – EA elements and architect traits (Du Preez, 2016) 72
Figure 17 – EA schools of thought (Du Preez, 2016) 73

Figure 18 – EA behavioural styles (Du Preez, 2016) 74
Figure 19 – Enterprise architect profile (Du Preez, 2016) 76
Figure 20 – DIA components (Du Preez, 2016) 76
Figure 21 – Position of Chapter 3 in relation to the rest of the thesis 78
Figure 22 – Qualitative research design model (Myers, 2013) and chapter sections 80
Figure 23 – Research strategies associated with IS research (Oates, 2006; Goldkhul, 2012) 83
Figure 24 – Format options for qualitative research output (Myers, 2013) 93
Figure 25 – Three cycles in DSR (Hevner, 2007) 102
Figure 26 – Peffers *et al*. (2008) DSRP 104
Figure 27 – FEDS (Venable *et al*., 2016) 106
Figure 28 – Evaluation episodes derived from FEDS (Venable *et al*., 2016) 109
Figure 29 – Peffers *et al*. (2006) DSRP applied in this research project 110
Figure 30 – Step 1: Problem identification and motivation 110
Figure 31 – Step 2: Objectives of the solution 112
Figure 32 – Step 3: Design and develop 112
Figure 33 – EA project type design-and-develop-demonstrate-evaluate cycle 113
Figure 34 – Hermeneutics framework (Boell & Cecez-Kecmanovic, 2014) 114
Figure 35 – Development of EA project type classification framework 117
Figure 36 – Design and develop – EA profiles and mapping to EA project type category 117
Figure 37 – Design and develop –methodology for selection of enterprise architects in support of EA project execution 118
Figure 38 – Design-and-develop-demonstrate-evaluate cycle for measurement criteria 119
Figure 39 – Step 4: Demonstrate 120
Figure 40 – Step 5: Evaluate 120
Figure 41 – Step 6: Communicate 121
Figure 42 – Research method aligned with qualitative research design model (Myers, 2013) 124
Figure 43 – Position of Chapter 4 in relation to the rest of the thesis 125
Figure 44 – Process followed to determine EA project types 126
Figure 45 – Method to determine EA project types through literature review 128
Figure 46 – EA project lifecycle (Anajafi *et al*., 2010) 133
Figure 47 – Identified EA project type relations 138
Figure 48 – IT decision-making factors (Riempp & Gieffers-Ankel, 2007) 142
Figure 49 – Adapted star model applied for organisation design (Kreye & Jensen, 2014) 143
Figure 50 – Interviewee experience in terms of years in architecture 148
Figure 51 – Industries in which interviewees have EA experience 149
Figure 52 – Additional EA project types identified from interview responses 154
Figure 53 – EA project type categories obtained from interview responses 156
Figure 54 – Optimised list of EA project types 167
Figure 55 – EA project types not included in the optimised list of EA project types 167
Figure 56 - Interweaving of two EA project types 172
Figure 57 – Business transformation EA project type relations 172
Figure 58 – Digital transformation and organisational agility relation 172
Figure 59 – Business-IT alignment relation to cost saving on IT level 173
Figure 60 – Intertwinement of four EA project types 173
Figure 61 – Relations between EA project types 174

Figure 62 – EA project type classification framework 174
Figure 63 – EA project type classification framework (simplified for further use) 176
Figure 64 – EA project classification framework development 177
Figure 65 – Position of Chapter 5 in relation to the rest of the thesis 179
Figure 66 – Attributes known when EA profile is identified (Du Preez, 2016) 181
Figure 67 – Seven EA schools of thought (Du Preez, 2016) 182
Figure 68 – EA school of thought questionnaire – Questions 6 & 7 (Du Preez, 2016) 195
Figure 69 – Positions reflected for EITD school of thought in terms of scope and purpose (Du Preez, 2016) 196
Figure 70 – Positions reflected for EITP school of thought in terms of scope and purpose (Du Preez, 2016) 198
Figure 71 – Positions in terms of scope and purpose for EPA school of thought reflected (Du Preez, 2016) 199
Figure 72 – Positions reflected for EC school of thought in terms of scope and purpose (Du Preez, 2016) 201
Figure 73 – Reduced number of EA schools of thought for mapping of EA profiles to EA project types 202
Figure 74 – Architecture behavioural styles as per the DIA (Du Preez, 2016) 203
Figure 75 – Attributes of disrupting technology architecture behavioural style (Du Preez, 2016) 204
Figure 76 – Attributes of translating technology architecture behavioural style (Du Preez, 2016) 205
Figure 77 – Attributes of innovating technology architecture behavioural style (Du Preez, 2016) 205
Figure 78 – Attributes of control technology architecture behavioural style (Du Preez, 2016) 206
Figure 79 – Attributes of directing strategy architecture behavioural style (Du Preez, 2016) 207
Figure 80 – Attributes of deciding strategy architecture behavioural styles (Du Preez, 2016) 207
Figure 81 – Attributes of shifting advisory architecture behavioural style (Du Preez, 2016) 208
Figure 82 – Attributes of conversing advisory architecture behavioural style (Du Preez, 2016) 209
Figure 83 – Attributes of developing advisory architecture behavioural style (Du Preez, 2016) 210
Figure 84 – EA Profile classification framework 210
Figure 85 – Position of Chapter 6 in in relation to the rest of the thesis 212
Figure 86 – EA project type classification framework 214
Figure 87 – EA profile classification framework 215
Figure 88 – EA school of thought ideally required per EA project type category 216
Figure 89 – EA behavioural styles mapped to EA project type categories 221
Figure 90 – Position of Chapter 7 in relation to the rest of the thesis 224
Figure 91 – Factors that have largest impact on project success (Beleiu *et al*., 2015) 231
Figure 92 – Confirmed measurement criteria to evaluate the methodology for the selection of enterprise architects 239
Figure 93 – Position of Chapter 8 in relation to the rest of the thesis 240
Figure 94 – Methodology for the selection of enterprise architects 241
Figure 95 – EA project type classification framework 242
Figure 96 – Classify EA project or project phase 244
Figure 97 – Topic and information known per EA profile 245
Figure 98 – Questions to determine an architect's EA school of thought adapted from Du Preez (2016) 246
Figure 99 – EA schools of thought adapted from DIA (Du Preez, 2016) 247

Figure 100 – Questions to determine an architect's EA behavioural style adapted from Du Preez (2016) 247
Figure 101 – EA behavioural styles (Du Preez, 2016) 248
Figure 102 – Question to determine an architect's EA school of thought 271
Figure 103 – Question to determine an architect's EA behavioural style 271
Figure 104 – Position of Chapter 9 in relation to the rest of the thesis 274
Figure 105 – Research process based on DSRP of Peffers *et al.* (2006) 275
Figure 106 – DSRP for the design of the methodology for the selection of enterprise architects 283
Figure 107 – Research design factors applicable to this research study 284

TABLES

Table 1 – List of architecture frameworks (Avancier *et al.*, 2018) 45
Table 2 – Columns in the Zachman Framework (Zachman, 2003) 52
Table 3 – EA scope and intent mapped to EA school of thought (Lapalme, 2012) 59
Table 4 – TOGAF skills proficiency levels (The Open Group, 2018) 64
Table 5 – TOGAF Generic skills: Competency levels (The Open Group, 2018) 64
Table 6 – TOGAF Business skills & methods: Competency levels (The Open Group, 2018) 65
Table 7 – TOGAF Enterprise architecture skills: Competency levels (The Open Group, 2018) 66
Table 8 – TOGAF programme and PM skills: Competency levels (The Open Group, 2018) 66
Table 9 – TOGAF IT general knowledge skills: Competency levels (The Open Group, 2018) 68
Table 10 – TOGAF Technical IT skills: Competency levels (The Open Group, 018) 69
Table 11 – TOGAF Legal environment: Competency levels (The Open Group, 2018) 69
Table 12 – Skills per EA school of thought (Du Preez, 2016) 73
Table 13 – Skills per architect behaviour style (Du Preez, 2016) 75
Table 14 – Descriptions and characteristics of research strategies 84
Table 15 – Phases for thematic analysis of semi-structured interview transcript data (Swain, 2018) 92
Table 16 – Selection of philosophical assumption for this research project 94
Table 17 – Selection of research method for this research project 95
Table 18 – Data collection techniques selected for this research project 97
Table 19 – Selection of data analysis techniques for this research project 98
Table 20 – Selection of written record format for this research project 100
Table 21 – FEDS categories for evaluation reasons 106
Table 22 – Criteria for selection of FEDS evaluation strategy (Venable *et al.*, 2016) 107
Table 23 – Summary of data collection and analysis and deliverable per sub-research question 121
Table 24 – Preliminary list of EA project types 129
Table 25 – Interconnectedness of EA project types 138
Table 26 – Categories of EA project types 146
Table 27 – Interviewee EA experience 149
Table 28 – Interview results regarding list of EA project types 152
Table 29 – Themes 157
Table 30 – Confirmed EA project type categorisation with new names per category 168
Table 31 – Summary of EITA school of thought beliefs (Du Preez, 2016) 183
Table 32 – EI school of thought belief concepts (Du Preez, 2016) 185
Table 33 – EEA school of thought belief concepts (Du Preez, 2016) 186

Table 34 – EC school of thought belief concepts (Du Preez, 2016)………………………………………. 188
Table 35 – EPA school of thought belief concepts (Du Preez, 2016)……………………………………..190
Table 36 – EITD school of thought belief concepts (Du Preez, 2016)……………………………………192
Table 37 – EITP school of thought belief system (Du Preez, 2016)………………………………………194
Table 38 – EA behavioural style attributes applicable for determining EA profiles per EA project type category……………………………………………………………………………………………………217
Table 39 – EA profiles per EA project type category…………………………………………………… 222
Table 40 – Criteria for evaluating the application of the methodology for the selection of enterprise architects……………………………………………………………………………………………….. 226
Table 41 – Criteria for evaluating the impact of the methodology for selection of enterprise architects 233
Table 42 – Interviewee role experience………………………………………………………………… 236
Table 43 – interviewee response regarding measurement criteria……………………………………….. 236
Table 44 – Themes for analysis of interview data regarding measurement criteria and its application. 237
Table 45 – Mapping of EA profiles of EA project type categories………………………………………… 245
Table 46 – EA Project A category and methodology-proposed EA profiles………………………………250
Table 47 – EA Project A – Project Architect EA profile…………………………………………………….. 251
Table 48 – EA Project A interview results per evaluation aspect………………………………………… 252
Table 49 – EA Project B category and methodology-proposed EA profiles………………………………254
Table 50 – EA Project B – Project architect EA profile……………………………………………………...255
Table 51 – EA Project B interview results per evaluation aspect………………………………………… 255
Table 52 – EA Project C – Category and methodology-proposed EA profiles……………………………257
Table 53 – EA Project C – Project architects' EA profiles…………………………………………………..258
Table 54 – EA Project C interview results per evaluation aspect…………………………………………258
Table 55 – Themes for analysis of interview data regarding evaluation of the methodology for selection of enterprise architects in support of EA project execution…………………………………………..260
Table 56 – EA projects and phases categorised in EA project type categories…………………………261
Table 57 – Methodology-proposed EA profiles and project architects' EA profiles………………………264
Table 58 – EA school of thought mapped per EA project type category…………………………………269
Table 59 – EA behavioural style per EA project type category……………………………………………270
Table 60 – Thesis alignment……………………………………………………………………………...280
Table 61 – Thesis content alignment……………………………………………………………………..281
Table 62 – Research process reflected per DSR guidelines of Hevner *et al*. (2004)……………………286

Abbreviations and acronyms

Abbreviation / acronym	Description
4IR	Fourth Industrial Revolution
ADM	Architecture Development Method
AI	Artificial Intelligence
BPMN	Business Process Modelling Notation
BSP	Business System Planning
CIO	Chief Information Officer
COTS	Commercial off-the-shelf
DIA	Daedalus Instrument for Architects
DoDAF	Department of Defence Architecture Framework
DSR	Design Science Research
DSRP	Design Science Research Process
EA	Enterprise Architecture
EBIT	Engineering Built and Information Technology
EE	Enterprise Engineering
EEA	Enterprise Ecological Adaptation
EI	Enterprise Integrating
EITA	Enterprise Information Technology Architecting
EITD	Enterprise Information Technology Design
EITP	Enterprise Information Technology Planning
EPA	Enterprise Power Authority
FEAF	Federal Enterprise Architecture
FEDS	Framework for Evaluation of Design Science
GEAO	Global Enterprise Architecture Organisation
ICT	Information and Communication Technology
IEC	International Electrotechnical Committee
IEEE	Institute of Electrical Electronics Engineers
IS	Information System

Abbreviation / acronym	Description
ISO	International Organisation for Standardisation
IT	Information Technology
MIPI	Model Based and Integrated Process Improvement
MODAF	Ministry of Defence Architecture Framework
NIST	National Institute of Standards and Technology
POPIA	Protection of Personal Information Act
SLR	Systematic Literature Review
SRO	Sub-research Objective
SRQ	Sub-research Question
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAFIM	Technical Architecture Framework for Information Management
TOGAF	The Open Group Architecture Framework
WG	Workgroup
ZIFA	Zachman Institute for Framework Architecture

Terms and definitions

Term	Description	Source
Architecture	"The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time."	The Open Group (2018)
Architecture framework	"A conceptual structure used to plan, develop, implement, govern, and sustain an architecture."	The Open Group (2018)
Belief	"Mental conviction of the truth of some statement or the reality of some being or phenomenon."	Merriam-Webster (2022)
Business architecture	"A representation of holistic, multi-dimensional business views of: capabilities, end-to-end value delivery, information, and organizational structure; and the relationships among these business views and strategies, products, policies, initiatives, and stakeholders."	The Open Group (2018)
Category	"Any of several fundamental and distinct classes to which entities or concepts belong."	Merriam-Webster (2022)
Classification	"Systematic arrangement in groups or categories according to established criteria."	Merriam-Webster (2022)
Enterprise	"The highest level (typically) of description of an organization and typically covers all missions and functions. An enterprise will often span multiple organizations."	The Open Group (2018)
Framework	"A structure for content or process that can be used as a tool to structure thinking, ensuring consistency and completeness."	The Open Group (2018)
Governance	"The discipline of monitoring, managing, and steering a business (or IS/IT	The Open Group (2018)

Term	Description	Source
	landscape) to deliver the business outcome required."	
Project	"A temporary endeavour undertaken to create a unique product, service or result."	Schwalbe (2014)
Project manager	"The person responsible for working with the project sponsor, the project team, and other people involved to meet project goals."	Schwalbe (2014)
School of thought	"A way of thinking."	Merriam-Webster (2022)
Stakeholder	"An individual, team, organization, or class thereof, having an interest in a system."	The Open Group (2018)
Type	"A particular class, kind or group."	Merriam-Webster (2022)
View	"An opinion or judgment coloured by the feeling or bias of its holder."	Merriam-Webster (2022)

1. Introduction and motivation

Figure 1 below shows the position of Chapter 1 in relation to the rest of the thesis.

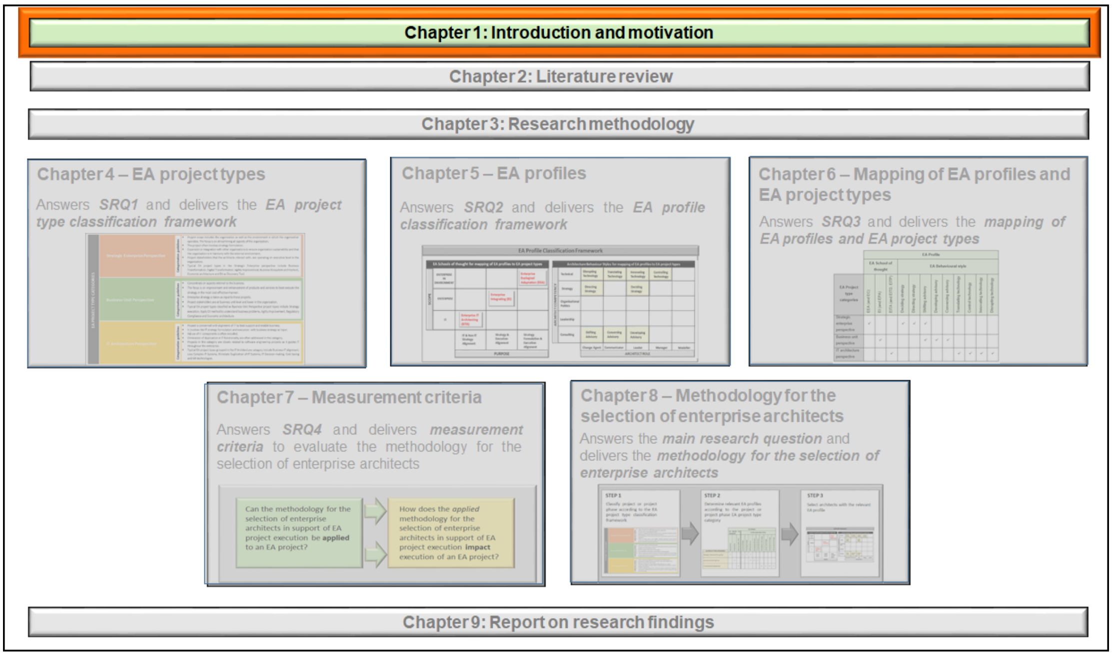

Figure 1 – Position of Chapter 1 in relation to the rest of the thesis

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Chapter 1 layout:

1.1 Introduction

1.2 Background to the research problem

1.3 Problem statement

1.4 Purpose of the study

1.5 Research questions

1.6 Research approach

1.7 Assumptions

1.8 Delineations and limitations

1.9 Significance and expected contribution

1.10 Thesis chapter overview

1.11 Conclusion

1.1 Introduction

Enterprise architects often disagree and argue about execution of enterprise architecture (EA) in terms of processes and phases to be performed (Iyamu, 2013). This statement is supported by Carr (2016), editor of Enterprise

Architecture Professional Journal, when he poses the following question and answer in a LinkedIn blog article. "Question: What do you call a group of architects? Answer: An argument of architects!" Carr (2016) rephrases the "argument of architects" to an "arrogance of architects". However, this research study was conducted to find a way to move from an argument of architects to a symphony of architects.

1.1.1 Enterprise architecture descriptions and uses

Organisations are of the most complex objects invented by human beings (Kappelman & Zachman, 2013). The complexity increases as the role of information technology (IT) in enterprises becomes more essential. Organisations are dependent on IT for the execution of business on strategic level through to operational level. Hence, the importance of IT management is emphasised as it ensures that IT resources are focused on delivering on strategic business objectives (Hugoson, Magoulas & Pessi, 2012). EA assists with the comprehension and management of this complexity that is often associated with organisations (Lange & Mendling, 2011). EA further aids in the communication of this organisational complexity and promotes effective IT management (Närman, Franke, König, Buschle & Ekstedt, 2014; Wagter, Van den Berg, Luijpers & Van Steenbergen, 2005). Organisations implement EA to aid in overcoming business challenges and to organise the different enterprise components accordingly (Rajabi, Minaei & Seyyedi, 2013). EA is regarded as a way to ensure orchestration of IT infrastructure, information systems and the business that it supports (Alwadain, Roseman, Fielt & Korthaus, 2011; Hiekkanen, Korhonen, Collin, Patricio, Helenius & Mykkänen, 2013). Apart from ensuring the aforementioned alignment, EA is viewed as a practice to provide thorough and agile enterprise designs (Bernard, 2012). EA continues to progress towards uniformity in EA methods and the understanding of the discipline (Simon, Fischbach & Schoder, 2013), but it has not been achieved yet as there are still many different descriptions and definitions of EA (Du Preez, Van Der Merwe & Matthee, 2014). Apart from different descriptions and definitions, various interpretations of what EA entails are also found in the literature. This is clear evidence that one single commonly accepted definition and a common understanding of EA do not exist (Kaddoumi & Watfa, 2016;

Lapalme, 2012; Mentz, Kotzé & Van der Merwe, 2012; Saint-Louis & Lapalme, 2016; Gampfer, Jurgens, Muller & Buchkremer, 2018; Gong & Janssen, 2019).

The understandings vary between IT-focused, business-focused and a combination of business- and IT-focused, where business can also include the environment in which the organisation operates (Lapalme, 2012). One view is that EA is used to achieve business-IT alignment (Alaeddini & Salekfard, 2013; Bakar, Harihodin & Kama, 2016; Ernst, 2008; Hafsi & Assar, 2016; Rouhani, Mahrin, Nikpay & Ahmad, 2015; Bhattacharya, 2017). Even where the main theme in the understanding of EA is the same, namely business-IT alignment, there are nuanced differences in the way it is described; this is eminent from the examples that follow. EA delivers a description of the organisation that reflects the integration between business and IT (Kotusev, Singh & Storey, 2015). Urbaczewski and Mrdalj (2006) add that proper maintenance of EA ensures that IT systems stay relevant; thus, business and IT remain aligned. The description of EA provided by Tamm, Seddon, Shanks and Reynolds (2011) also relates to business-IT alignment. They indicate that EA provides a broad representation of the business processes and IT that enables the business processes as well as the relationships between these components. EA translates strategy elements such as organisational goals, principles and capabilities into IT systems and business processes at a solution level to ensure that the organisation achieves its goals (Tamm *et al*., 2011). This perspective is supported by Schekkerman (2004) and Olsen and Trelsgård (2016) who state that EA provides an all-inclusive view of the enterprise and highlights the interrelations between business and IT. They further state that EA can be used for organisation transformation. When business and IT are aligned, it leads to enterprise flexibility (Sessions, 2007).

Another view is that EA is a tool used to ease the management of enterprise IT and to streamline information systems by applying architectural practices when designing IT solutions (Kaddoumi & Watfa, 2016). Researchers such as Urbaczewski and Mrdalj (2006) also see EA in support of IT solution acquisition projects as it provides a blueprint for the IT solution. Another IT-focused interpretation of EA that dates from the 1990s is that it provides a common understanding of the overall design of the enterprise information systems (Armour, Kaisler & Liu, 1999).

Kaddoumi and Watfa (2016) have the perspective that EA is a process that is used to simplify organisational transformation and integration. EA is further recognised by large-scale organisations for its assistance in organisational structuring and development. EA ensures that organisation structure and organisation development are aligned with long-term strategic business plans, resulting in a responsive organisation that delivers on its strategic business objectives (Schelp & Stutz, 2007). In addition to aiding in the design of optimal organisation structures, EA is further defined as a mechanism used for the design of other organisation components in order to increase organisational learning in support of innovation. This is true where the EA scope is seen to include the enterprise as well as the environment in which it operates (Lapalme, 2012). To emphasise this, EA is described as a practice with the focus to improve organisational management, business operations and IT enablement of the business. It is seen as a prominent tool to aid in the design of future enterprises (Lapalme, Gerber, Van der Merwe, Zachman, De Vries & Hinkelmann, 2016). A different way to describe EA is that it entails everything from business and IT strategies, business processes and applications required to enable the business processes to the IT infrastructure necessary to operate the business applications (Ernst, 2008; Urbaczewski & Mrdalj, 2006). Microsoft views EA as a tool to define organisational structures, the interactions between various organisational units and the relationships with elements outside the organisation (Microsoft, 2002).

1.2 Background to the research problem

Architects do not have the same understanding of EA (Du Preez, 2016; Lapalme, 2012) and it is not a “one-size-fits-all discipline” (Van Den Berg & Van Vliet, 2016). Due to these different understandings, architects approach architecture work differently, which leads to misunderstandings and arguments about what EA processes to be followed and which EA phases to be performed (Iyamu, 2013). Enterprise architects find it challenging to work together when they unknowingly have different understandings of EA and approaches to EA execution (Saint-Louis & Lapalme, 2016). There is more than one type of EA work. Specific knowledge, approaches and skills are required to perform these different types of EA work (Korhonen & Poutanen, 2013). It is idealistic to expect that one person possesses the combination of skills. This emphasises the importance of selecting enterprise architects with an understanding of EA that is relevant to the EA work to be performed. This research therefore determined how enterprise architects can be selected in support of EA project execution.

1.2.1 Misunderstandings and arguments

Lapalme (2012) identified three schools of thought on EA. These schools of thought are based on the different understandings of EA. He indicates that the schools of thought represent different approaches to EA, depending on the understanding of EA in terms of purpose and scope. This often leads to misunderstandings between enterprise architects (Lapalme, 2012). The effect of these misunderstandings and different interpretations of EA on EA execution is that the approach to satisfy a requirement will be different, resulting in different EA designs (Du Preez, 2016). Another implication is that architects who work together will differ on what their roles and responsibilities are. This may lead to conflict situations that may complicate stakeholder engagement and EA project execution (Saint-Louis & Lapalme, 2018).

Iyamu (2013) also highlights the different understandings and approaches to EA and the resulting misunderstandings. In a study to determine the things that hamper EA institutionalisation, he identifies technical capability as one of six factors. With technical capability, he refers to the lack of relevant skills and competencies of the architects. It also includes the different understandings that architects that work together have of EA, which leads to conflicting ideas of which EA processes and phases are to be followed. Employment of architects plays a critical role in EA development and implementation (Iyamu, 2013). Iyamu (2013) states that organisations must find ways to overcome the impact of these hampering factors, but he does not provide any solutions.

1.2.2 Different types of EA work require specific knowledge and skills

Architecture work in an organisation can be grouped as "technical architecture, socio-technical architecture and ecosystemic architecture" (Korhonen & Poutanen, 2013). Korhonen and Poutanen (2013) acknowledge that for each type of architecture work a unique approach, knowledge and skills are required. They further mention that it is unrealistic to think that one person possesses all the required skills. This implies that enterprise architects with a combination of skills, knowledge and understanding of EA are required to be able to deliver on EA projects of different types. Korhonen and Poutanen (2013) do not, however, provide a mechanism to determine the required skills, knowledge and understanding of EA per architecture project type or per individual architect.

Architecture frameworks provide guidance in execution of architecture work to develop enterprise architectures (Tang, Han & Chen, 2004). The mostly used and most matured architecture framework is The Open Group Architecture Framework (TOGAF) (Taleb & Cherkaoui, 2012; Cameron & Mcmillan, 2013; Wang, Li, Wang & Jones, 2012; Alwadain, Fielt, Korthaus & Rosemann, 2014; Bhattacharya, 2017; Brosius, Aier & Haki, 2017). TOGAF is well known for its architecture development method (ADM) (Barbau, Lubell, Rachuri & Foufou, 2014). The ADM is a step-by-step method that can be performed several times in an iterative manner to develop, implement and maintain EA (Iacob, Meertens, Jonkers, Quartel, Nieuwenhuis & Sinderen, 2014; The Open Group, 2018). Thus, architecture work is delivered through iterations of the ADM. The first step of the ADM is to establish the architecture project (The Open Group, 2018). Therefore, the terms "architecture work" and "architecture project" are used interchangeably in this research study.

1.2.3 Enterprise architect types

Du Preez (2016) addresses the problem of different views on EA through the development of an instrument to determine to which EA school of thought an enterprise architect belongs, as well as the architect's EA behavioural style. He refers to the combination of EA school of thought and EA behavioural style as EA profile. This provides a partial solution to the EA hampering factor identified by Iyamu (2013). It also addresses the identification of skills and competencies of architects as identified by Korhonen and Poutanen (2013) and supports Lapalme's (2012) EA school of thought theory.

The instrument developed by Du Preez (2016) is the Daedalus Instrument for Architects (DIA). Through the use of the DIA, an enterprise architect's EA profile becomes known. Enterprise architects who work together will be aware of fellow enterprise architects' understanding and approaches to EA. The lack of knowing fellow architects' understanding of EA is mentioned by Saint-Louis and Lapalme (2016) as a reason why enterprise architects find it difficult to work together.

Although the instrument developed by Du Preez (2016) determines the EA profile of enterprise architects, it does not address the different types of EA work and the required understanding of EA per type of EA work.

1.2.4 Emphasis on selection of architects

EA is valued by organisations as the discipline and practice to help cope with continuous change (Saint-Louis, Morency & Lapalme, 2017) and to support decisions regarding organisational changes and relevant technology changes in support of business (Microsoft, 2002). Responding to ongoing change is critical for organisational success; therefore, it is important for organisations to take note of their enterprise architects' capabilities and views on EA as this affects the way they practise as enterprise architects. Shaanika and Iyamu (2014) state that the view on EA informs how EA is executed. This in turn has an impact on how well the organisation responds to environmental changes that necessitate business and IT changes. The human component of an EA service capability is crucial for successful EA service delivery (Shanks, Gloet, Someh, Frampton & Tamm, 2018).

Gartner (in Burke & Blosch, 2015) states that the time period to establish EA in an enterprise varies between 18 and 24 months, and that it takes an additional 12 to 24 months to improve and refine it. Apart from the time spent on EA, organisations also invest financially in EA. This is stressed by Bernard (2012), who mentions that skilled enterprise architects, which come at a large cost, are required to develop architectures. The development of EA artefacts is stressed as a labour-intensive and costly aspect of EA (Perez-Castillo, Ruiz-Gonzalez, Genero & Piattini, 2019). This people component of EA accounts for the larger part of the cost to establish, improve and maintain EA. It is further emphasised that enterprise architects with EA profiles relevant to what the organisation wants to achieve through execution of EA initiatives should be identified and employed.

The problem that architects have different views on EA is confirmed (Lapalme, 2012; Du Preez, 2016). Different types of EA projects are recognised, and it has been established that certain approaches are required for EA projects of different types (Korhonen & Poutanen, 2013). The research gap identified is that although different types of EA projects are acknowledged, a classification framework for EA projects is lacking. Further to this, the different views that architects have on EA are provided, but no mapping of suitable views on EA per EA project type is supplied. The methodology for the selection of enterprise architects in support of EA project execution, delivered by this research study, addresses classification of EA project type categories and mapping of relevant views on EA to different EA project type categories.

1.2.5 Research topic

The immense time and money investments in EA, the various understandings of and approaches to EA and the impact that EA projects have in organisations, highlight the importance for organisations to have insight in the EA profiles of their enterprise architects. Knowledge of the organisation's enterprise architects' EA profiles is required to ensure that the EA investment contributes to the success of the specific organisation.

Enterprise architects with different EA profiles have different understandings of EA which lead to different approaches and reasons why organisations implement EA, resulting in different types of EA projects.

Research topic elements addressed in this research study:

- This research study developed a methodology for the selection of enterprise architects in support of EA project execution.
- The methodology for the selection of enterprise architects for EA project execution consists of an EA project type category classification framework, an adapted EA profile classification framework and a mapping between the two mentioned frameworks.
- The methodology was evaluated by implementing it in retrospect on three successfully completed EA projects.
- The impact of awareness of EA profiles on the execution of EA projects was determined.
- Criteria to evaluate the methodology for the selection of enterprise architects were defined.

1.3 Problem statement

Various understandings and interpretations of EA lead to different approaches to EA execution, resulting in diverse architecture deliverables (Du Preez, 2016). The impact of human understanding on EA deliverables contributes to the complexity of EA models and is seen as a primary challenge in EA (Lucke, Krell & Lechner in Farwick, Schweda, Breu & Janschke, 2016; Perez-Castillo *et al*., 2019). It is also the cause of misunderstandings between enterprise architects working together (Lapalme, 2012) and arguments between architects regarding which EA phases and processes must be performed (Iyamu, 2013). Enterprise architects do not have insight in the understanding and interpretation of EA of fellow architects. This is often the reason why enterprise architects find it difficult to work together (Saint-Louis & Lapalme, 2016) and one of the reasons why EA fails (Banaeianjahromi, 2018). Not all architects have the same information systems (IS) background, level of education, work experience, understanding of what EA is and manner to approach an EA project; therefore, they conduct EA projects differently. So, the same project requirement may result in different architecture designs, depending on the enterprise architect's EA profile (Du Preez, 2016). The selection of enterprise architects has a critical impact on EA development and implementation (Iyamu, 2013), and on EA project success (Bakar & Hussien, 2018). A method to select enterprise architects to support EA project execution is required.

The DIA developed by Du Preez (2016) was identified to address the problem of unawareness of EA understandings of enterprise architects. This instrument can be used by organisations to determine the EA profiles of their enterprise architects. Although the DIA defines different EA profiles, it does not address the selection of enterprise architects for the execution of different kinds of EA projects.

Therefore, the focus of this study is to find a solution to the problem described above. The objectives of the solution are to determine how enterprise architects can be selected in support of EA project execution considering the different types of EA projects and different understandings of EA.

1.4 Purpose of the study

The aim of this research study is to develop a methodology for the selection of enterprise architects in support of EA project execution. EA project execution is supported when enterprise architects with an understanding of EA that correlates with the type of the EA project are selected and employed on the EA project. In order to select enterprise architects in support of EA project execution the different types of EA projects, the different understandings of EA, and the indication of relevant EA understandings to EA project types are required. Research objectives support the objectives of the solution that will be developed to address the identified problem.

The **main objective** of this study is therefore to

- determine how enterprise architects can be selected to support EA project execution by providing a methodology for the selection of enterprise architects for EA project execution.

To realise the main objective, the following sub-research objectives (SRO) were identified:

- SRO1: determine the different EA project types;
- SRO2: identify the different ways that enterprise architects interpret EA;

- SRO3: provide a mapping between the different ways that enterprise architects see EA and EA project types; and
- SRO4: determine criteria to evaluate the methodology for selection of enterprise architects in support of EA project execution.

1.5 Research questions

The main research question of this study is aligned with the main objective of this research study:

- How can enterprise architects be selected to support EA project execution?

To answer the main research question, the following sub-research questions (SRQ), aligned with sub-research objectives, guided the study:

- SRQ1: What are the different EA project types?
- SRQ2: What are the different understandings that enterprise architects have of EA?
- SRQ3: What understanding of EA is required to execute different EA project types?
- SRQ4: What are the measurement criteria to evaluate the methodology for selection of enterprise architects in support of EA project execution?

1.6 Research approach

This study determined how to select enterprise architects in support of EA project execution by providing a methodology for the selection of enterprise architects.

The overall research approach for the development of a methodology for the selection of enterprise architects for EA project execution is design science research (DSR). The emphasis of DSR is on problem-solving and on using an artefact in a real-life situation (Baskerville, 2008; Hevner, March, Park & Ram, 2004). The DSR strategy was therefore selected for the execution of this research study. The design science research process (DSRP) developed by Peffers, Tuunanen, Gengler, Rossi, Hui, Virtanen and Bragge (2006) was selected as it contributed to the rigorousness of the study and was specifically

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developed for DSR in the IS domain (Peffers *et al.*, 2006). This DSRP consists of six steps, namely: identify and motivate the problem; set objectives of the solution; design and develop the artefact; use the artefact to solve the problem; evaluate effectiveness of the artefact, and communicate the results.

The methodology and the impact of its implementation were demonstrated and evaluated through implementation in three EA projects.

1.6.1 Research philosophy

Pragmatism is suitable for research studies that either develop artefacts through design research or that create change through action research (Goldkuhl, 2012b; Hevner, 2007). As this research project will develop an artefact, namely a methodology for the selection of enterprise architects in support of EA project execution, this research project is in the pragmatism research paradigm.
Figure 2 below reflects the steps, as obtained from the DSRP of Peffers *et al*. (2006), that were followed in this research study.

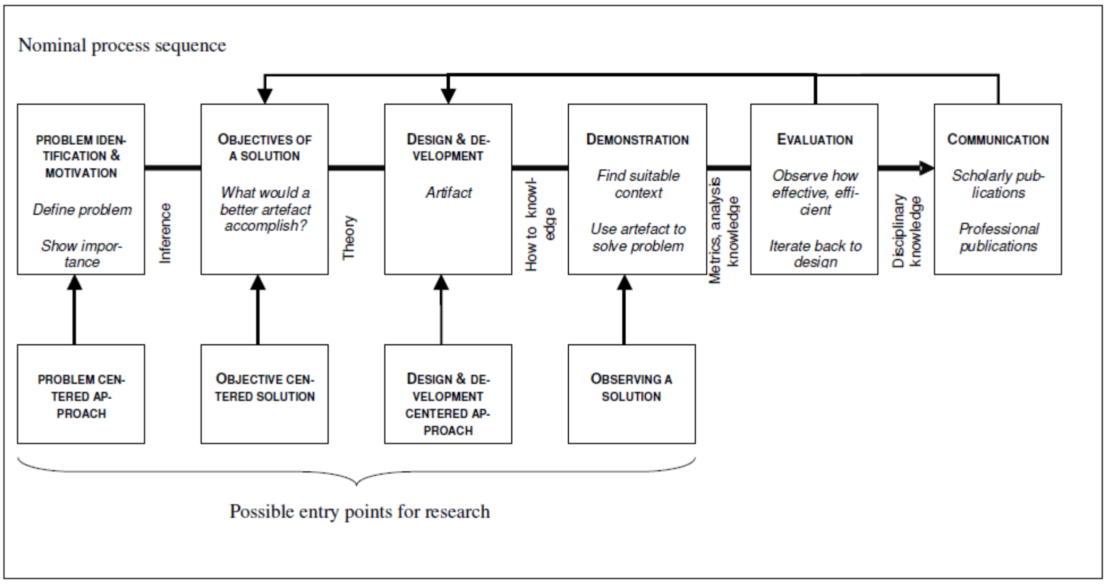

Figure 2 – DSRP model (Peffers *et al.*, 2006)

As this study was performed to address the problem of selecting enterprise architects for EA project execution, the DSRP was executed sequentially from step 1 to step 6, starting at the problem-centred entry point.

1.6.2 Data collection

A combination of literature review and interviews with EA experts and EA project managers was used in the design and develop step.

- Different EA project types and EA project type categories were identified through literature review and evaluated through semi-structure interviews.
- Interviews were held with 12 EA experts to reflect, confirm and refine the EA project types and EA project type categories. These EA experts typically had more than 5 years' experience in the EA practice.
- Different understandings that enterprise architects have of EA were obtained from the DIA (Du Preez, 2016).
- Criteria to evaluate the methodology for the selection of enterprise architects in support of EA project execution were determined through literature review and evaluated through semi-structured interviews with three EA project managers who had managed successful EA projects.
- Evaluation of the methodology for the selection of enterprise architects in support of EA project execution was done through retrospective implementation on three completed EA projects and semi-structured interviews with the managers of the three EA projects.

1.7 Assumptions

It is assumed that an enterprise architect's EA profile and the type of EA project can be used as criteria to select enterprise architects to work on EA projects. Another assumption is that the EA profile of an enterprise architect is accurately determined through the DIA.

1.8 Delineations and limitations

The study was limited to the development and testing of a methodology to select enterprise architects in support of EA project execution. The testing of the methodology for the selection of enterprise architects was limited to retrospective implementation of three successfully completed EA projects. The projects were performed by a South African organisation that performs EA projects, amongst other services. Other factors such as different personality types and its impact on project team composition were not addressed in this research project. The influence of an architect's aptitude, attitude and experience in different industries, such as banking, manufacturing or mining, was not considered when the methodology for the selection of enterprise architects was developed.

The enterprise architecture body of knowledge (EABOK) was not considered in this research study. The publication, "Guide to the (Evolving) Enterprise Architecture Body of Knowledge", is only available as a draft document, dated 2004. In addition to this, the EABOK Advisory Board published on the EABOK website that the EABOK consortium has ceased operations with effect from 1 October 2020 (EABOK, 2020).

1.9 Significance and expected contribution

EA enjoys noteworthy interest from EA practitioners and organisations. This is evident from the results of a survey performed by Infosys in 2009. It shows that almost 90% of the organisations that participated in the survey have an EA capability. A systematic literature review (SLR) to determine EA trends found that the EA discipline has grown into a recognised discipline (Gampfer *et al*., 2018). The existence of numerous EA professional organisations such as The Open Group, Zachman Institute for Framework Architecture (ZIFA) and Global Enterprise Architecture Organisation (GEAO) further stresses the interest in EA. In addition to this, there are several government EA initiatives, such as the Ministry of Defence Architecture Framework (MODAF), the Federated Enterprise Architecture Framework (FEAF) and the Department of Defense Architecture Framework (DoDAF) (Tamm *et al*., 2011). Given the important role that EA plays in organisations and IS, and the time and money spent on EA (Fasanghari, Amalnick, Anvari & Razmi, 2015), research that will contribute to better selection of enterprise architects is necessary and relevant to the IS discipline.

The theoretical contribution includes an amendment to the DIA – specifically applicable when the DIA is applied as part of the methodology for the selection of enterprise architects in support of EA project execution – and an EA project type classification framework. The methodological contribution is a methodology for the selection of enterprise architects in support of EA project execution. The practical contribution is that the proposed methodology may be implemented in an EA practice and criteria that reflect the areas of a project where an architect's EA profile influences project execution may be used by EA project managers to contribute to EA project success. It is expected that other practical executions of EA initiatives will benefit from this research study.

1.10 Thesis chapter overview

The thesis structure map is depicted in Figure 3 below.

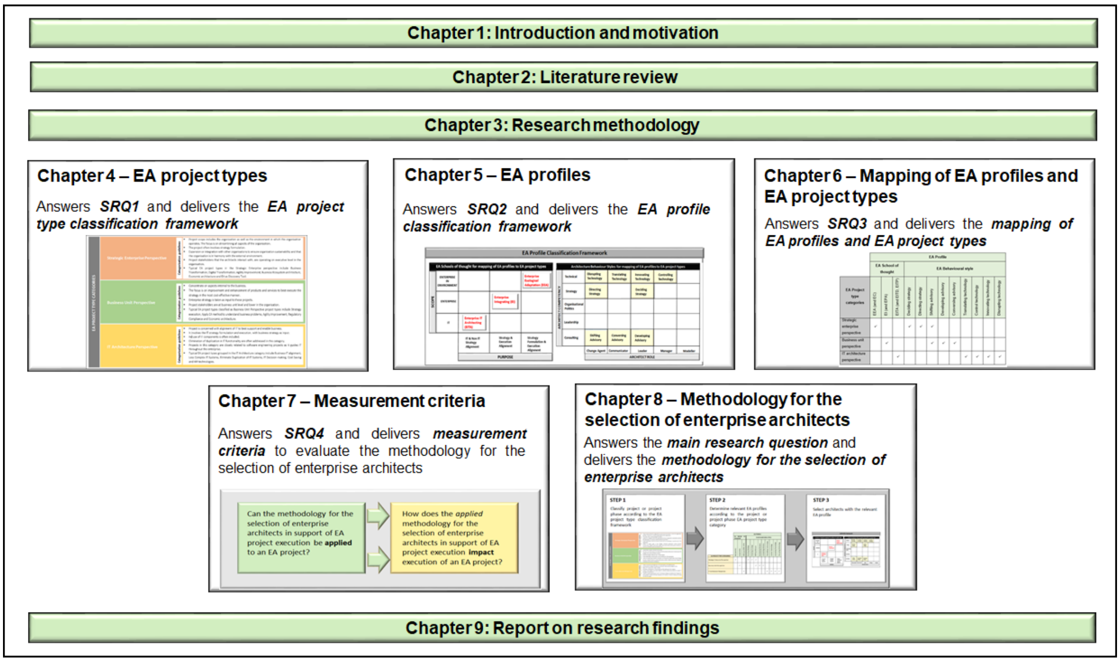

Figure 3 – Thesis structure map

An overview of the thesis chapters is provided below.

Chapter 1 – Introduction and motivation

Research problem: Many interpretations of EA exist. Enterprise architects have different understandings of EA and different approaches to EA execution. This leads to misunderstandings and arguments. An instrument, namely the DIA, was identified which determines EA profiles of architects. Guidance is lacking on how to use the DIA, what to do with the results, identifying EA project types and what EA profiles are required per EA project type.

Motivation: The impact that EA projects have in organisations is described. Enterprise architects approach the execution of an EA project in different ways, therefore delivering different results. Cost and time to execute EA projects – the human component – accounts for the larger part of the cost. Therefore, it is critical that organisations have insight in the EA profiles of their architects and the EA project types performed to ensure that the EA investment contributes to the success of the specific organisation.

Objectives of solution: The objective of the methodology for the selection of enterprise architects in support of EA project execution is to provide a method to classify EA projects. Further, the objective is to select architects with the appropriate EA profile (determined through the DIA) to ensure that EA investments contribute to the organisation's business objectives.

Chapter 2 – Literature review

Literature review:

- Enterprise architecture; and
- The DIA.

Chapter 3 – Research methodology

This chapter describes the research methodology that was followed to develop the methodology for the selection of enterprise architects in support of EA project execution.

Chapter 4 – EA project types

This chapter contains the answer to sub-research question 1:

"What are the different EA project types?"

The results of the hermeneutic literature review to determine different EA project types are reflected. Interview responses regarding the different EA project types are also provided. Analysis of these results delivers the EA project type classification framework and guidelines for categorising an EA project.

Chapter 5 – EA profiles

This chapter answers sub-research question 2:

"What are the different understandings that enterprise architects have of EA?"

The different EA profiles and its characteristics provided by the DIA are reflected in this chapter.

Chapter 6 – Mapping of EA profiles and EA project types

This chapter answers sub-research question 3:

"What understanding of EA is required to execute different EA project types?"

The EA project type classification framework is mapped to EA profiles. Mapping is based on EA profiles and EA project type categories.

Chapter 7 – Measurement criteria

This chapter answers sub-research question 4:

"What are the measurement criteria to evaluate the methodology for the selection of enterprise architects in support of EA project execution?"

The results of the hermeneutic literature review that determined measurement criteria for the methodology to select enterprise architects in support of EA project execution are reflected. Interview responses regarding the measurement criteria are also provided. Analysis of these results confirmed the criteria for the measurement of the methodology for the selection of enterprise architects in support of EA project execution.

Chapter 8 – Methodology for the selection of enterprise architects in support of EA project execution

This chapter answers the main research question:

"How can enterprise architects be selected in support of EA project execution?"

The methodology for the selection of enterprise architects in support of EA project execution was designed and developed by obtaining answers to the four sub-research questions. The methodology was implemented in retrospect of three successfully completed EA projects. The methodology was measured via semi-structured interviews with the EA project managers of the EA projects where the methodology was implemented, against the measurement criteria reflected in Chapter 7. The interview results were analysed to answer the main research question.

Chapter 9 – Report on research findings

This chapter reflects the research findings.

1.11 Conclusion

Chapter 1 contains the introduction and motivation for performing the research study to develop a methodology for the selection of enterprise architects in support of EA project execution. The background to the research problem, the research problem, research objectives, research methodology and contribution are reflected. Chapter 2 provides the literature review regarding EA and the DIA.

2. Literature review

Figure 4 below shows the position of Chapter 2 in relation to the rest of the thesis.

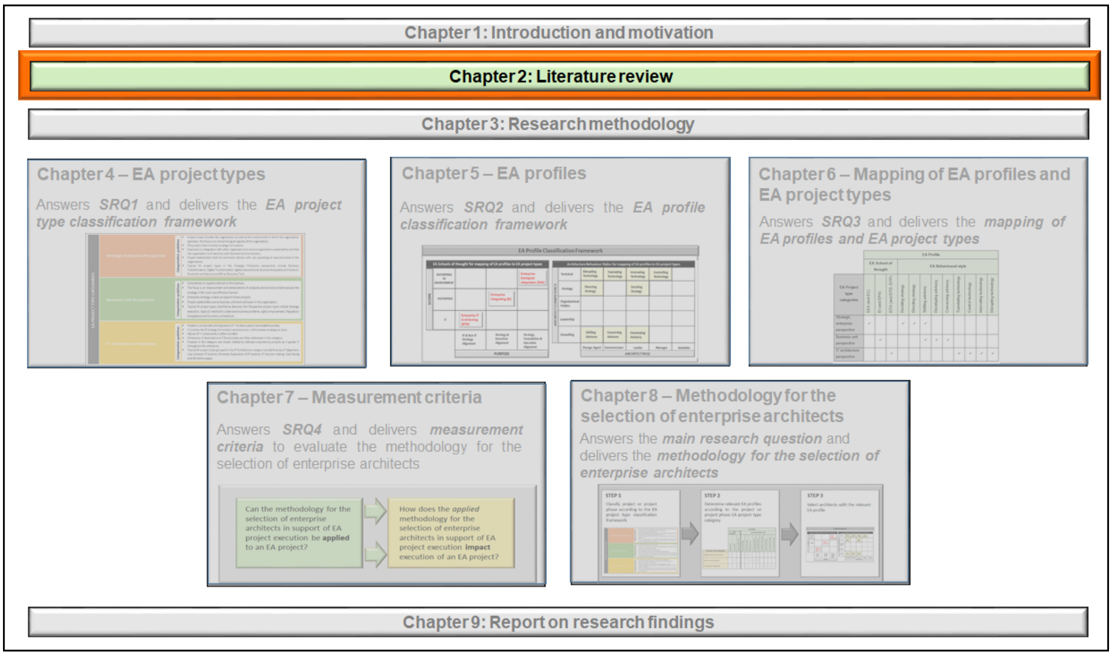

Figure 4 – Position of Chapter 2 in relation to the rest of the thesis

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Chapter 2 layout:

2.1 Introduction

2.2 Emergence of EA

2.3 EA frameworks

2.4 Three schools of thought on EA

2.5 Human component of enterprise architecture

2.6 The Daedalus Instrument for Architects (DIA)

2.7 Conclusion

2.1 Introduction

This chapter provides background information regarding the EA discipline, which is the research field of this study.

It describes the emergence of EA up to the current EA era, which is known for the development of EA frameworks. Therefore, EA frameworks are discussed together with descriptions of the most referenced EA framework, namely the Zachman Framework, and the most matured and mostly used EA framework, namely TOGAF. Seventy-five (75) different EA frameworks were identified through this literature review, which relates to the many understandings of EA. Hence, this is followed by the three schools of thought on EA theory to give context for the different understanding of EA. It is due to the human component of EA that there are different interpretations of EA. The discussion on the schools of thought is followed by a discussion of the human component of EA. Lastly, the DIA is described as it enables determining an enterprise architect's view on EA. The DIA forms part of the methodology for the selection of enterprise architects that is developed through this research.

2.2 Emergence of EA

EA emerged from the Business Systems Planning (BSP) methodology, dating from the 1960s and was introduced by IBM (Kotusev, 2016). In the 1980s, EA was proposed as a method for IS architecture (Van der Aalst, Becker, Bichler, Buhl, Dibbern, Frank, Hasenkamp, Heinzl, Hinz, Hui, Jarke, Karagiannis, Kliewer, König, Mendling, Mertens, Rossi, Voss, Winhardt, Winter & Zdravkovic, 2018). Kotusev (2016) labels the era of BSP the "pre-EA era". He further terms the era stretching from the 1980s to the 1990s "the early-EA years" and the period from late 1990s to today the "modern-EA era".

BSP is performed by a group of people tasked to do top-down planning of information systems in sequenced steps that illustrate relationships between business units, processes, data and the information systems. This characteristic leads to the interpretation that EA stems from BSP (Kotusev, 2016).

Zachman's Framework for Information Systems Architecture was published in 1987, the early-EA period. The framework was developed to aid in the management of increasingly complex and distributed IT systems (Sessions, 2007). When doing information strategy work for aeroplane manufacturing organisations, Zachman (1996) noticed that the manufacturing of complex items, such as aeroplanes, and the producing of enterprise information systems have a lot in common. For instance, both deliver "complex engineering products" (Zachman, 1996). The difference was that the manufacturing industry experienced successful implementations. Zachman (1996) used concepts from manufacturing and the construction world to develop the, commonly believed, first EA framework, the Zachman Framework to overcome the problems experienced. Therefore, many researchers refer to Zachman as the “father of EA” as they consider Zachman’s 1987 article describing a framework for information systems architecture as the invention that initiated the EA discipline. They take the Zachman Framework as the first EA framework which informed all other EA frameworks (Kotusev, 2016). However, the privately sponsored PRISM EA framework was published in 1986, which is a year prior to the publication of the Zachman Framework. The PRISM EA framework was published to a selected group only (Rivera, 2013). It is claimed that the Zachman Framework was created as early as 1982, although no proving documentation is available (Kotusev, 2016). However, the Zachman Framework is more frequently referenced and the better known EA framework (Hugoson, Magoulas & Pessi, 2012; Nogueira, Romero, Espadas & Molina, 2013).

During the early-EA period, the term “enterprise architecture” (EA) was first used by Zachman in 1982, but used on a regular basis only from 1989 when the National Institute of Standards and Technology (NIST) EA framework was described by Rigdon (Kotusev, 2016). According to Kotusev (2016), the first formal description of the term “enterprise architecture” was given by Richardson, Jackson and Dickson (1990) when they described how to apply the PRISM framework. They defined EA as: “This architecture defines and interrelates data, hardware, software and communications resources, as well as the supporting organization required to maintain the overall physical structure required by the architecture.” (Richardson *et al.*, 1990). EA was established to address two related issues. The first issue is continuous higher spending on information and communication technology (ICT); the second issue is to ensure that the increasingly expensive ICT keeps supporting and enabling business (Sessions, 2007). Farwick, Schweda, Breu and Hanschke (2016) add standardisation of IT to the issues addressed through EA. Organisations that implement ICT and business functions as planned through

EA enjoy exceptional benefit from their ICT investments (Najafi & Baraani, 2012).

The time period since the late 1990s until today is referred to as the modern-EA era (Kotusev, 2016).

2.3 EA frameworks

The modern-EA era is known for the establishment of architecture frameworks such as the FEAF and TOGAF (Kotusev, 2016). Architecture frameworks aid in developing EAs (Tang *et al*., 2004). Therefore, this section provides more information on architecture frameworks.

The use of EA frameworks in the development of EA enhances the effectiveness of the EA exercise and ensures that the complete scope of the planned architecture solution is addressed (Kearny, Gerber & Van der Merwe, 2016). EA frameworks are essential for gathering information, storing it in an organised manner to be extracted and displaying it in ways that make sense to different stakeholders (Lnenicka & Komarkova, 2019). The Zachman Framework and TOGAF are mentioned as examples of comprehensive EA frameworks (Lnenicka & Komarkova, 2019) and as examples of EA frameworks that are used to guide EA management and the related EA artefacts (Farwick *et al*., 2016).

Several other EA frameworks exist to assist organisations in the execution of EA. Organisations spend time to select the correct architecture framework for the specific EA project and often use various aspects of different EA frameworks; in the process, new EA frameworks are created on a regular basis. Research by Cameron and Mcmillan (2013) shows that organisations select an EA framework based on the industry type relevant to the organisation or EA project. All the research done on EA frameworks could not determine which of the many EA framework is the most complete framework (Sessions, 2007). The list of 75 architecture frameworks that is maintained by the International Organisation for Standardisation and the International Electrotechnical Commission (ISO/IEC) working group on systems and software architecture

(WG42) is proof that many EA frameworks exist (Avancier *et al*., 2018). Furthermore, the existence of so many EA frameworks is evidence of the importance of EA in industry (Perez-Castillo, Ruiz-Ggonzalez *et al*., 2019). The list of 75 architecture frameworks is depicted in Table 1 and Figure 5 below. EA frameworks range from assisting with the creation of architecture artefacts and descriptions to frameworks that are used to aid in assessments of EA maturity.

Table 1 – List of architecture frameworks (Avancier *et al*., 2018)

No.	Architecture Framework	No.	Architecture Framework	No.	Architecture Framework
1.	Air Force Enterprise Architecture Framework	2.	IEEE P2413 Architecture Framework for Internet of Things	3.	Architecture Framework for Management Systems
4.	Australian Government Architecture Reference Models	5.	Avancier Methods	6.	ArchiMate
7.	Architecting Innovative Enterprise Strategies	8.	Australian Defence Architecture Framework	9.	Automotive Architecture Framework
10.	Business Capability Architecture	11.	Big Data Architecture Framework	12.	Business Enterprise Architecture Modelling
13.	Best-practice Enterprise Architecture Management Method	14.	Customer Objectives, Application, Functional, Conceptual and Realisation Model	15.	Common Approach to Federal Enterprise Architecture
16.	CBDI Service Architecture & Engineering for SOA	17.	CEA Framework: A Service Oriented Enterprise Architecture Framework	18.	Commission Enterprise IT Architecture Framework
19.	Capgemini Integrated Architecture Framework	20.	US DoDAF	21.	Department of National Defence/Canadian Armed Forces Architecture Framework
22.	Dragon1	23.	Dynamic Architecture	24.	Enterprise Architecture Blueprinting
25.	Extended Enterprise Architecture Framework	26.	Enterprise Architecture Management Pattern Catalogue	27.	US OMB Enterprise Architecture Assessment Framework
28.	The EPCglobal Architecture Framework	29.	European Space Agency Architecture Framework	30.	Essential Architecture Framework
31.	Business Process Framework (eTom)	32.	Extreme Architecture Framework	33.	US Federal Enterprise Architecture Framework

No.	Architecture Framework	No.	Architecture Framework	No.	Architecture Framework
34.	Framework of Enterprise Systems and Structures	35.	Functions-Flows-Layers-Views + Governance-Operations-Development-Support	36.	FMLS Architecture Description Framework 3.0
37.	Federal Segment Architecture Methodology	38.	Garland and Anthony	39.	Gartner's Enterprise Architecture Framework
40.	All-of-Government Enterprise Architecture for New Zealand	41.	ISO 15704 Generic Enterprise Reference Architecture	42.	Health Enterprise Architecture Framework
43.	IBM Architecture Description Standard	44.	Index Architecture Framework	45.	iCode Security Architecture Framework
46.	IBM Information Framework	47.	Industrial Internet Reference Architecture	48.	Kruchten's 4+1 view model
49.	Leading Enterprise Architecture Development Practice	50.	MACCIS 2.0 – An Architecture Description Framework for Technical Infostructures and their Enterprise Environment	51.	MEGAF – Infrastructure for realising architecture frameworks
52.	Ministry of Defence Architecture Framework	53.	NATO C3 Systems Architecture Framework	54.	National Enterprise Architecture Framework
55.	NIST Enterprise Architecture Model	56.	Official Information Online Enterprise Architecture Method	57.	Open Safety & Security Architecture Framework
58.	Pragmatic Enterprise Architecture Framework	59.	Processes Pipelines in Object Oriented Architectures	60.	Partnership for Research in Information Systems Management
61.	Queensland Government Enterprise Architecture	62.	Reference Architecture for Space Data Systems	63.	ISO Reference Model for Open Distributed Processing
64.	Rozanski and Woods Software Architecture	65.	Siemens 4 Views	66.	Sherwood Applied Business Security Architecture
67.	Self-Architecting Software Systems	68.	Smart Grid Conceptual Architecture Framework	69.	Specification Quality in DevOps
70.	Treasury Enterprise Architecture Framework	71.	The Open Group Architecture Framework	72.	TRAK, based on MODAF
73.	Universal Architecture Description Framework	74.	Extensible Architecture Framework	75.	Zachman Framework

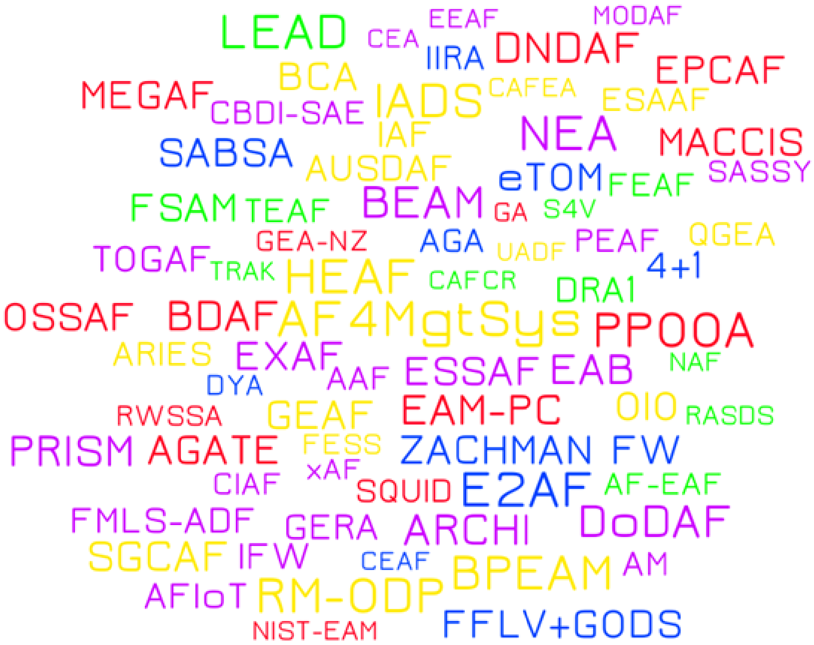

Figure 5 – Seventy-five different EA Frameworks (Avancier *et al*., 2018)

Although there is a large number of EA frameworks, many of them have the same elements and goals (Cameron & Mcmillan, 2013). Aarti and Karande (2017) conducted a study to determine the best EA framework for the development of enterprise software, specifically in the supply chain management environment. They concluded that most EA frameworks are fairly alike in terms of representation of architecture at conceptual, logical and physical levels. The international standard, ISO/IEC/IEEE 42010 – Systems and Software Engineering – Architecture Description, provides a metamodel for EA frameworks. Most EA frameworks comply with ISO/IEC/IEEE 42010 and therefore have commonalities in terms of its construct (Perez-Castillo *et al*., 2019). The EA framework metamodel provided by ISO/IEC/IEEE 42010 is depicted in Figure 6 below.

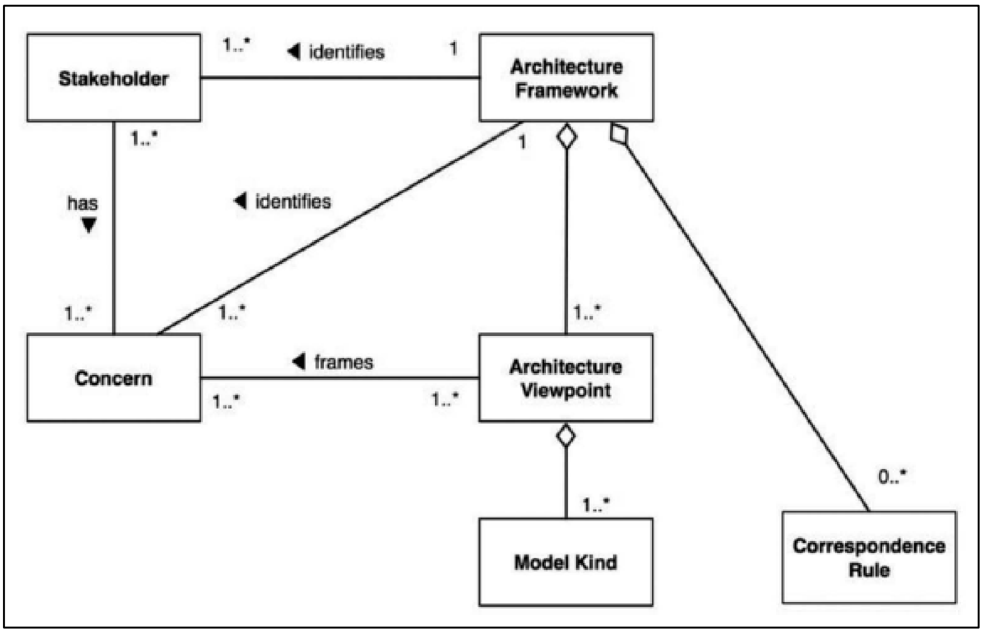

Figure 6 – Metamodel for EA frameworks as per ISO/IEC/IEEE 42010 (Perez-Castillo, Ruiz-Ggonzalez *et al.*, 2019)

EA frameworks are collections of architecture viewpoints. Each architecture viewpoint reflects and addresses concerns of one of more EA stakeholders. Hence, EA frameworks provide rules per viewpoint to ensure it is in a language and format that speak to the relevant stakeholder group. The use of architecture viewpoints helps to handle the complexity of EA (Perez-Castillo, Ruiz-Ggonzalez *et al.*, 2019).

The four key EA frameworks are the Zachman Framework, TOGAF, the FEAF and the proprietary Gartner Methodology (Sessions, 2007). These four frameworks address EA in different ways. The Zachman Framework provides an EA taxonomy; TOGAF is famous for its EA development methodology; the FEAF is seen as an "implemented enterprise architecture" and the Gartner Methodology is regarded to be a procedure (Sessions, 2007). TOGAF is stressed as one of the dominant EA frameworks (Gampfer *et al.*, 2018) and Simon, Fischbach and Schroder (2013) mention that the Zachman Framework, the FEAF and TOGAF are the EA frameworks to which are often referred. However, Fatolahi and Shams (2006) and Huysmans and Verelst (2013) state that the Zachman Framework is counted as the most referenced EA framework. Scherer and Wimmer (2012) performed a literature review to select EA frameworks for their study regarding e-participation and EA. Their investigation resulted in choosing the Zachman Framework and TOGAF. TOGAF is one of the most commonly used and matured EA frameworks (Taleb & Cherkaoui, 2012; Cameron & Mcmillan, 2013; Wang, Li, Wang & Jones, 2012; Alwadain, Fielt, Korthaus & Rosemann, 2014; Bhattacharya, 2017; Brosius, Aier & Haki, 2017). The Zachman Framework and TOGAF are described in the sections that follow.

2.3.1 The Zachman Framework

The Zachman Framework is described in this section. This framework is the most referenced EA framework (Fatolahi & Shams, 2006; Huysmans & Verelst, 2013).

The Zachman Framework is influenced by two matured classification schemes. The first is the six questions, the so-called 5 W and H questions – what, who, where, when, why and how – which are used to gather complete information on a subject. The combination of the answers to these six questions provides a thorough description of a subject. The second scheme was originally proposed by Greek philosophers; it is called reification. Reification means that an abstraction is made easier to understand as it is treated as if it is a concrete idea. The Zachman Framework reflects reification as "identification, definition, representation, specification, configuration and instantiation" (Zachman, 2008). Being based on mature and proven classification schemes is one of the strong points of the Zachman Framework. The Zachman Framework was originally referred to as the Information Systems Architecture Framework (Fatolahi & Shams, 2006).

The Zachman Framework is displayed as a six-by-six matrix, with the reifications as rows and the 5 W and H questions as columns. The cells in the matrix represent the classifications of the Zachman Framework. Zachman (2008) accentuates that the Zachman Framework provides an ontology for EA and not a process. The Zachman Framework states the important elements of an object for which clear statements are required in order to establish, manage and change the object. The object can be anything such as a product, a solution, an enterprise, a unit of an enterprise or a project. Zachman mentions that a process that is grounded on ontology will deliver repeatable products or outcomes, whereas the results from processes that are not based on ontology are dependent on the skills of the executer. Therefore, the Zachman Framework can be seen as a metamodel for EA. Huysmans and Verelst (2013) refer to the Zachman Framework as an informative framework without the objective to prescribe guidelines for execution of EA. A disadvantage of the Zachman Framework is that it does not include an EA methodology, EA repository and modelling notation for artefacts per cell (Fatolahi & Shams, 2006; Fan, Yue & Zhang, 2016; Mayer, Aubert, Grandry, Feltus, Goettelmann & Wieringa, 2019). Figure 7 below depicts the Zachman Framework.

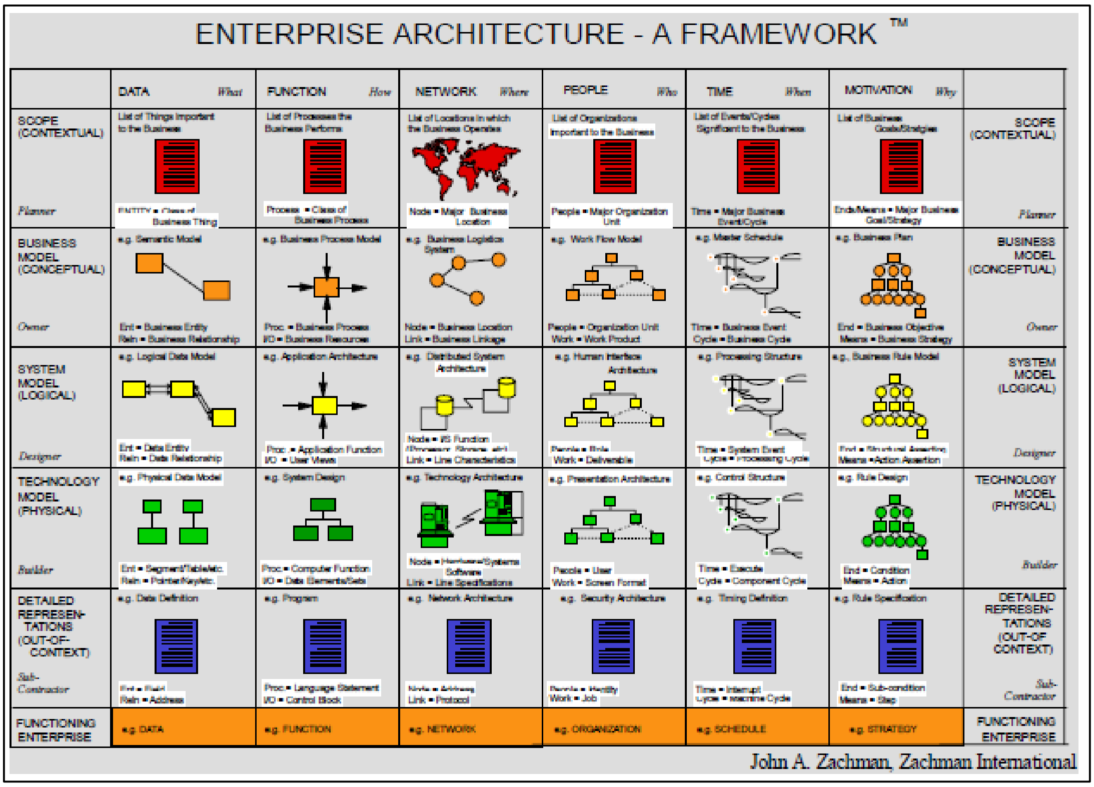

Figure 7 – Zachman Framework (Zachman, 2003)

The rows in the matrix in Figure 6 above, which are derived from reification, depict the views of different EA stakeholders. The columns, derived from the six interrogative questions, represent different ways to describe an object for different uses. The cells where rows and columns meet contain unique artefacts that describe the architecture relevant to the corresponding row and column headings (Fatolahi & Shams, 2006).

The first row in the Zachman Framework provides the planner view. It is equivalent to an executive summary that scopes the EA exercise. The second row provides the owner view. It describes the design of the business and how entities and processes work together. The third row reflects the designer view, which contains the artefacts developed by a systems analyst. The fourth row has the builder view, which reflects the designer view in terms of the technology that will be used to deliver the information system. The fifth row reflects detail for the sub-contractor view. It contains detailed specifications that are provided to software developers that develop individual system components without having to be concerned about the enterprise picture of the system. In instances where the development of systems is outsourced, the fifth row would be indicated as “out of context” for that specific EA (Fatolahi & Shams, 2006). The last row reflects the physical system in production (Sowa & Zachman, 1992). The views provided by the rows become more detailed and specific from top (the planner view) to bottom (the user view or implemented system) (Cameron & Mcmillan, 2013). However, the model in cells lower down in a column is not the same model in a cell higher up in the column but at a lower level of detail. Levels of detail vary within a cell (Zachman, 2003). The first five rows and their features are depicted in Figure 8 below as provided by Sowa and Zachman (1992). Note that row 6 reflects the implemented system and is, strictly spoken, not architecture as it is not a depiction, but the actual system. It is included in the Zachman Framework to complete the architecture. The implemented system in row 6 must satisfy the owner view in row 2 (Zachman, 2003).

Row	Perspective	Constraint	Model
1	Planner	Financial/external	Scope
2	Owner	Usage/policy	Enterprise model
3	Designer	Structure/operation	System model
4	Builder	Technology	Technology model
5	Subcontractor	Implementation	Out-of-context models

Figure 8 - Features of the rows in the Zachman Framework (Sowa & Zachman, 1992)

The interrogative dimension represented in the columns in the Zachman Framework is described in Table 2 below.

Table 2 – Columns in the Zachman Framework (Zachman, 2003)

No.	Column heading	Description
1.	What	Reflects what the enterprise consists of. The cells where the planner and owner views cross the "what" column reflect objects that the enterprise consists of. From the designer view downwards, it is data that are reflected.
2.	How	Reflects how things work. The functions and processes involved are described.
3.	Where	Reflects where objects are located and the relationships between the objects in terms of location. From designer view downwards, it reflects the network.
4.	Who	Reflects who performs the work. Actors and roles are reflected through workflow models.
5.	When	Reflects when things happen. This includes schedules and events that trigger actions.
6.	Why	Reflects the rationale for actions or things that happen. This includes business rules that are converted to system rules when going down from planner view to implemented system.

Zachman (2003) provides seven rules, depicted in Figure 9 below, that must be adhered to when using the Zachman Framework.

Rule 1 **No rows or columns may be added to the Framework.**

- When rows or columns are added redundancies and misalignment will occur. The Framework with its six rows and six columns categorise all required descriptions to completely describe an object.

Rule 2 **All cells in a column form part of a single model.**

- Column 1 = Data Model; Column 2 = Process Model; Column 3 = Network Model; Column 4 = Workflow Model, Column 5 = Dynamics Model and Column 6 = Motivation Model.

Rule 3 **The model of each cell is a specialization of the single model per column.**

- The model per cell will use the single column model as starting point and then address requirements and constraints relevant to the row perspective. Level of detail increases per cell, and not per column or row.

Rule 4 **The Framework is normalised, resulting in each cell to be unique.**

- Therefore, a meta concept may only be categorised within one cell.

Rule 5 **No crosswise relationships between cells are allowed.**

- Cells may only be related to other cells in the same row, and to the cell directly above and directly below in the same column. The reason for this is that a change to a cell has a ripple effect to the cells next to it and directly above and below of it.

Rule 6 **The names of the rows and the columns may not be changed.**

- When changing the names of rows and columns it may also change the meaning and corrupt the logical structure and normalisation of the Framework.

Rule 7 **The Framework Logic is universal and can describe any object as well as itself.**

- The Framework does not prescribe for what analysis it must be used for. The analyst applies the generic framework in the specific situation and context.

Figure 9 – Rules of the Zachman Framework (Zachman, 2003)

Another guideline is that as rows are directly planned and developed from the row above and reverse-engineered from the row directly below, it is crucial to maintain alignment between these rows (Sowa & Zachman, 1992).

Figure 10 below provides possible modelling languages that can be used to reflect the information gathered per cell in the Zachman Framework (Noran, 2003), although it does not form part of the Zachman Framework.

	What	How	Where	Who	When	Why
Scope (Contextual)	RP / English	RP / English	RP / Map	RP / English	RP / English	RP / English
Enterprise Model (Conceptual)	ER(M), IDEF1, UML Class	IDEF0, IDEF3 UOB, UML Act, GRAI Nets	Graph	Org Chart, GRAI Grid	GANTT / PERT, IDEF3 OSTN, Timed Petri	Struct English
System Model (Logical)	ER, IDEF1x, UML Class	UML Use Case Data Flow Diag.	UML Component	GRAI Grid, UML Use Case	Data Flow, IDEF3 OSTN, Timed / Colored Petri	FOL, Struct English, Z
Technology Model (Physical)	Relational, UML Class	UML Class, Activity, Structure Chart	UML Deployment	UML Real Use Case, UI Design	UML Sequence, Collab, State, Statecharts	FOL, Struct English, Z
Components (Out of Context)	DB Schema	Programming language	URL, IP, TCP/IP	UI Programming language	Struct English	Rule spec. In Prg Lang
Functioning Enterprise	DD L(*SQL*)	Machine code (0/1)	Address, Comm language	User / Worker	English (Schedule)	English

Figure 10 – Proposed modelling languages per cell in the Zachman Framework (Noran, 2003)

2.3.2 TOGAF

The most matured and mostly used EA framework is TOGAF (Taleb & Cherkaoui, 2012; Cameron & Mcmillan, 2013; Wang *et al*., 2012; Alwadain *et al*., 2014; Bhattacharya, 2017; Brosius, Aier & Haki, 2017). It is therefore appropriate to include a description of it as part of the reflection on the EA discipline.

TOGAF is the architecture framework developed by The Open Group, a world-wide association with the focus to empower businesses to achieve their business objectives. The Open Group has a broad range of member organisations of different sizes from various industries, including academics. The Open Group has more than 675 member organisations from 50 different countries. The TOGAF 9.2 document was compiled by The Open Group Architecture Forum (The Open Group, 2019).

TOGAF is not a proprietary EA framework and not meant to be used in only certain industries. It is an open EA framework, with content accepted by industry that can be used to develop every type of architecture in every environment. The TOGAF documentation consists of a document containing the TOGAF Standard and a repository, referred to as "The Open Group TOGAF Library" which contains guidelines, reference architectures and templates for artefacts and deliverables to aid EA practitioners in the application of TOGAF. TOGAF was first published in 1995. It had several reviews and updates; the current version, version 9.2, was published in 2018 (The Open Group, 2018). The first version of TOGAF is influenced by the US Department of Defence's Technical Architecture Framework for Information Management (TAFIM) (Cameron & Mcmillan, 2013).

The TOGAF Standard consists of six divisions. The first division is the introduction describing the TOGAF approach, terms and definitions and architecture theory at a high level. The second division contains the ADM. The ADM is mentioned as being the central part of TOGAF. Division 3 provides techniques and guidelines for applying the ADM. Architecture content is addressed in division 4 through a content metamodel and information regarding architecture artefacts and deliverables. Division 5 addresses the enterprise continuum, which includes architecture and solutions, EA tools and how the architecture repository can be structured. The last division provides guidance on establishing the architecture capability in an organisation (The Open Group, 2018). The content of the TOGAF Standard is depicted in Figure 11 below.

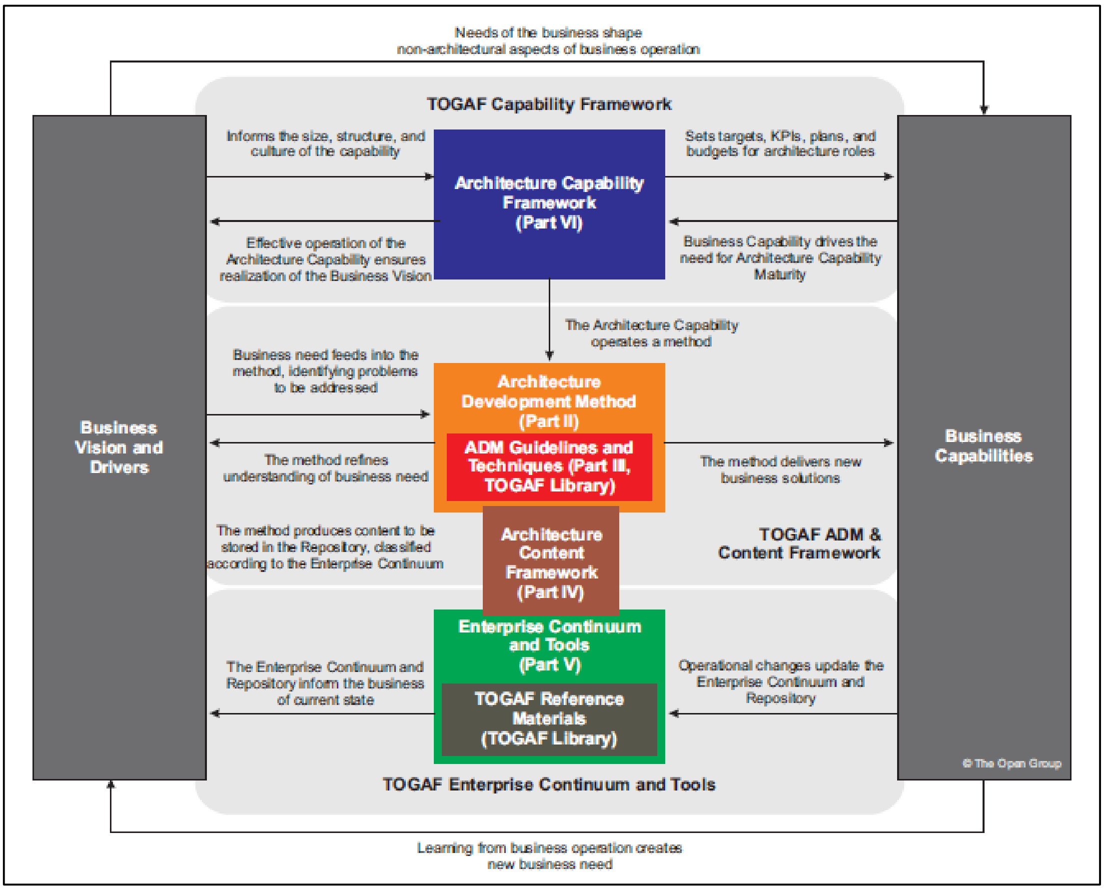

Figure 11 – TOGAF Standards contents (The Open Group, 2018)

As described above, TOGAF provides much more than its core, the ADM, but TOGAF is known for the ADM (Barbau *et al*., 2014). The ADM is a step-by-step method that can be performed several times in an iterative manner to develop, implement and maintain EA (Iacob *et al*., 2014; The Open Group, 2018). Figure 12 below depicts the TOGAF ADM, including reflection of iterative execution.

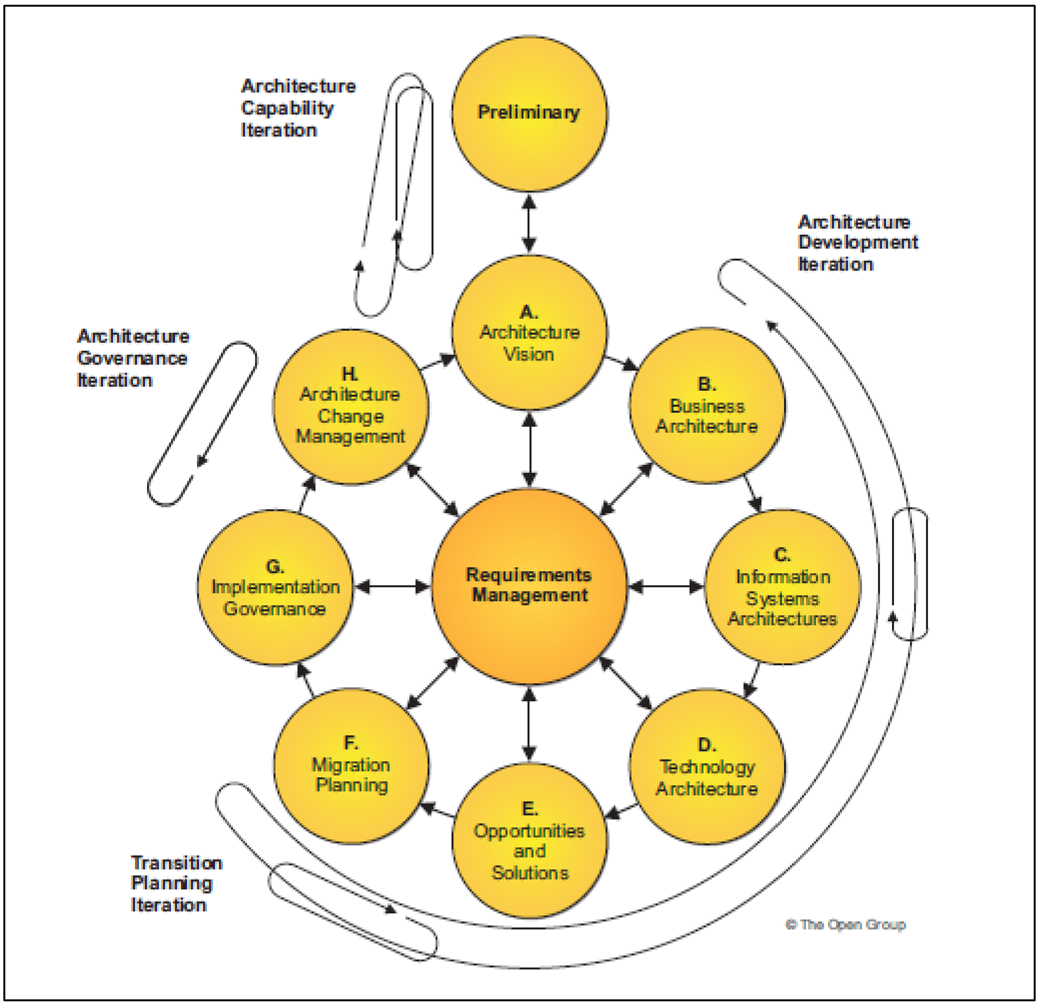

Figure 12 – TOGAF ADM (The Open Group, 2018)

Each yellow circle in Figure 12 above represents a phase in the TOGAF ADM. There are ten phases. Execution of the first phase establishes the architecture capability. The objective of the next phase, Architecture Vision, is to obtain approval for the execution of the architecture project by providing high-level architecture vision and business value that will be realised through the EA effort. The next three phases deliver target architecture, identify gaps between target architecture and the current architecture and indicate possible architecture roadmap building blocks for the transition to the target architecture. Business, data, application and technology architecture are addressed. Phase E, Opportunities and Solutions, delivers the first version of the architecture roadmap, created from gap analysis results and roadmap building blocks identified in the preceding three phases. The architecture roadmap indicates the implementation approach and includes transition architecture for incremental implementations. The objective of the next phase, Migration

Planning, is to complete the architecture roadmap and the plan to implement the roadmap. Target architecture conformance is ensured by the next phase, Implementation Governance, when the implementation plan is realised through implementation projects. Maintenance of the architecture life cycle is ensured through the execution of Phase H, Architecture Change Management. The Requirements Management phase is performed in parallel with all other phases. This phase accommodates identification, logging and prioritisation of new requirements identified throughout execution of the ADM. Each organisation must tailor the TOGAF ADM to suit the EA initiative at hand (The Open Group, 2018). Steps per phase are complete and easy to understand but are flexible in how it is implemented to allow architects to create architecture that is fit for purpose (Tang, Han & Chen, 2004).

TOGAF was compared to 11 EA frameworks and was found to be the most appropriate EA framework to provide architecture as basis for the development of enterprise software in an agile environment (Aarti & Karande, 2017). The methodical and iterative approach of TOGAF addresses an agile environment well. Furthermore, TOGAF promotes transparency in terms of accountability and risk and it includes mechanisms for governance and monitoring (Aarti & Karande, 2017).

To determine how EA should address data differently than before the big data era, TOGAF was selected as EA framework as it is reckoned as the most used EA framework. The ADM provides good foundation for determining how data should be integrated in EA development (Kearny *et al*., 2016).

Other instances identified through literature review where TOGAF is selected as EA framework are Gunawan and Indrajani (2018), Soares and Setyohady (2017) and De Fatima Gusmao and Setyohadi (2017) that developed strategic IT plans for a bank, a university and library respectively. Palupi, Hambali, Fauzan and Surosa (2018) used TOGAF to design EA for construction services. Rusli and Bandung (2017) combined TOGAF with the use of Model Based and Integrated Process Improvement (MIPI) to develop EA and optimise business processes.

The Open Group acknowledges ArchiMate as the standard for architecture modelling languages (Josey, Lankhorst, Band, Jonkers & Quartel, 2016) which complements TOGAF (Jonkers, Proper & Turner, 2009). ArchiMate is an enterprise architecture modelling language that provides a standardised way of representing architecture descriptions and diagrams. Expression of dependencies and relations between the different architecture domains is supported (Josey, *et al*. 2016). Although ArchiMate provides a standardised notation to describe architectures it does not provide guidance on the types of EA projects and the different understandings of EA.

2.4 Three schools of thought on EA

The many different EA frameworks may be a result of the different views on EA. Therefore, Lapalme's (2012) three schools of thought on EA theory is provided in this paragraph.

The three schools of thought on EA defined by Lapalme (2012) provide clarity on the different interpretations of EA. The different interpretations of EA contribute to the problem statement of this research study.

Each school of thought has its own belief system made up of a number of concepts. These concepts are EA description, EA objectives, EA assumptions, EA skills, EA challenges, and understanding of EA and its limitations. The three schools are differentiated by the values allocated to these concepts per school of thought (Lapalme, 2012).

EA scope and EA intent are two key factors influencing the description of EA and, ultimately, the EA school of thought. Lapalme (2012) provides three different views on EA scope and EA intent, resulting in nine different combinations of EA scope and EA intent. Through literature review, the three most common combinations were identified and mapped to schools of thought on EA (Lapalme, 2012). Table 3 below depicts these combinations.

Table 3 – EA scope and intent mapped to EA school of thought (Lapalme, 2012)

COMBINATION 1	COMBINATION 2	COMBINATION 3
EA Scope	**EA Scope**	**EA Scope**
Scope is limited to IT components of the enterprise.	Scope concerns the enterprise as a whole, including business and IT.	Scope includes the IT components, business components as well as the environment and interactions between the enterprise and the environment.
EA Intent	**EA Intent**	**EA Intent**
Performing EA with the focus to align the IT strategy with the business strategy. This is done to ensure that relevant IT components are developed to enable current as well as future business.	Performing EA to ensure that all aspects of the enterprise (such as IT, human resources policies, control structures and business processes) are synchronised to ensure an enterprise that operates optimally as a coherent unit.	Performing EA with the purpose to improve organisational learning by designing all aspects of the enterprise to enable the organisation to be innovative and able to adapt to its environment.
EA School of thought	**EA School of thought**	**EA School of thought**
"Enterprise IT architecting" (EITA) with slogan *"the glue between business and IT"* (Lapalme, 2012:39).	"Enterprise Integrating (EI)" with slogan *"the link between strategy and execution"* (Lapalme, 2012:39).	"Enterprise Ecological Adaptation" (EEA) with slogan *"the means for organisational innovation and sustainability"* (Lapalme, 2012:39).

All three schools of thought have an EA objective concerned with the enterprise strategy. The focus of the EITA school of thought is on enablement of the strategy; the EI school of thought has the objective of implementing the strategy, where the EEA school of thought aims to adapt and modernise the enterprise strategy. Further objectives of the EITA school of thought are to reduce IT costs and to promote IT planning. Another objective of the EI as well as the EEA school of thought is to ensure unity in the organisation. The EEA school of thought goes further and aims to promote "system-in-environment" (Lapalme, 2012) co-development. The theory provides content values to each of the other variables per school of thought. These variables are assumptions, skills, challenges and limitations (Lapalme, 2012).

In a study to determine which school of thought on EA received the most interest in terms of research regarding EA measurements, Abdallah, Lapalme and Abran (2016) found that the EITA school of thought is the only school of thought that is researched in terms of EA measurement. Future research may focus on determining how to measure performance for the EI and EEA schools of thought (Abdallah *et al*., 2016). The EEA school of thought is recognised by Schmidt (2015) in a statement that it is obvious that an organisation's business model must ensure organisational alignment with the environmental circumstances in which the organisation operates and its strategic objectives. The orientor theory is proposed to be used in conjunction with the EEA school of thought (Schneider & Matthes, 2014).

The three schools of thought theory was acknowledged by Du Preez *et al*. (2014) in a study performed to investigate the aspects and characteristics that influence the enterprise architect's understanding of EA and, in the end, the enterprise architect's EA school of thought. Through this study, four additional EA schools of thought were identified. These belief systems identified by Du Preez *et al*. (2014) are:

- "Enterprise configuration" (EC)
    - The EC school of thought focuses on strategic business strategy and the execution thereof to ensure continuous business growth.
- "Enterprise power authority" (EPA)
    - Enterprise architects from the EPA school of thought use EA as a tool to influence and to negotiate enterprise strategic alignment.
- "Enterprise IT planning" (EITP)
    - The EITP school of thought emphasises the EA planning process, with focus on the analysis of the enterprise components and, to a lesser extent, on the organisation as a whole.
- "Enterprise IT design" (EITD)

- The EITD school of thought has an external focus; alignment with external IT environments and best practices is important.

EA schools of thought refer to the views or perceptions of enterprise architects on EA. This leads to the next section, which further discusses the human component of EA.

2.5 Human component of enterprise architecture

Information regarding the human component of EA is considered necessary as this research study delivers a methodology for the selection of enterprise architects in support of EA project execution.

The people component of EA is important for successful EA establishment. Effective EA implementation depends on the right type of person, with relevant skills, utilised to perform EA tasks (Wißotzki, Timm & Stelzer, 2017). By identifying and addressing human issues that influence the use and acceptance of EA as an organisational strategy, enterprises can prevent failure of their EA implementations (Gilliland, Kotzé & Van der Merwe, 2015).

There are five human-related factors identified through literature review that impact on EA implementation (Bakar & Hussien, 2018). The importance of keeping enterprise architects skilled to deliver EA work to the benefit of the organisation is the first factor and is labelled “skilled EA talent”. Second, a centralised EA function is mentioned to promote successful EA implementation. The third and fourth human factors are related, as one addresses management of EA talent through an EA talent management plan and the fourth focuses on retention of EA talent through an EA talent retention programme. The EA talent management plan and EA talent retention programme ensure EA succession planning and an EA career path in an organisation. The last human factor identified by Bakar and Hussien (2018) is labelled as “EA learning culture”, which refers to the organisational readiness for EA implementation. The five people elements impacting on successful EA implementation are depicted in Figure 13 below.

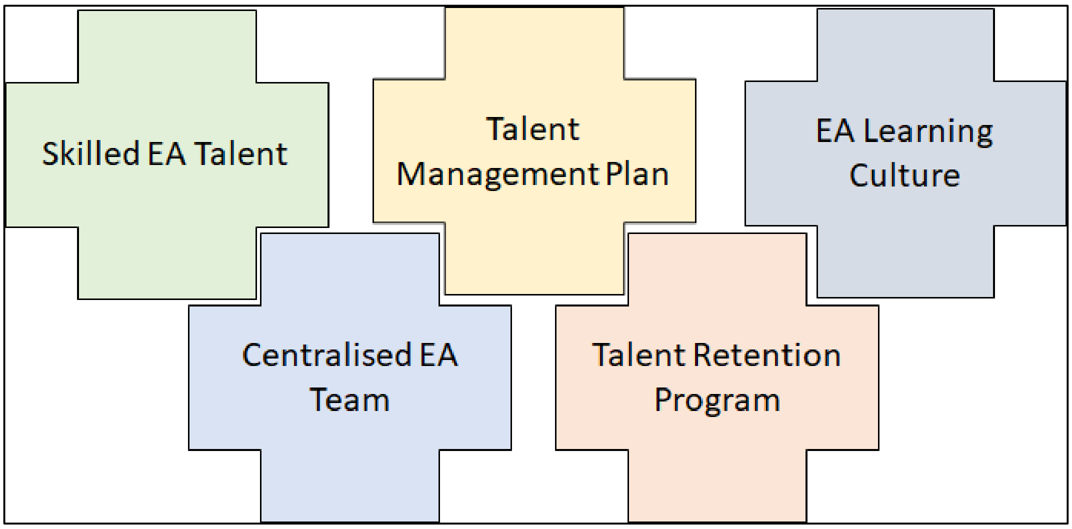

Figure 13 – Human factors influencing EA implementation (Bakar & Hussien, 2018)

The research by Ylinen and Pekkola (2018) focuses on identifying skills that enterprise architects themselves believe are crucial for performing EA work. They found that the skills set to perform EA work is very broad and consists of various separate tasks. In fact, 257 different skills were provided by the enterprise architects that participated in the study. This is due to different perceptions and experiences of EA. The importance of selecting the right enterprise architect with the relevant skills for the specific EA project or phase of the project is emphasised. This shows that the selection of enterprise architects for EA project execution needs to be addressed. Conceptual thinking and modelling architecture content are highlighted as the two most important skills for EA work (Ylinen & Pekkola, 2018). The finding that a large variety of skills are required for successful EA project execution is confirmed as covering technical and non-technical categories of people skills, business skills and technical skills (Shaanika & Iyamu, 2014; Wißotzki *et al*., 2017; Mapingire, Van Deventer & Van der Merwe, 2018). The skills that enterprise architects need to be able to operate in the digital age are mainly classified as human or general skills (Kempegowda & Chaczko, 2018). Figure 14 below depicts the skills required for performing EA work in the digital period.

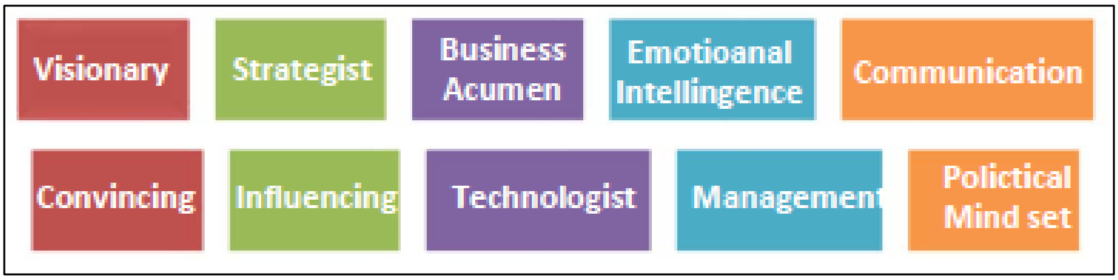

Figure 14 – Architect skills required in the digital era (Kempegowda & Chaczko, 2018)

TOGAF provides a comprehensive skills framework for architecture. The TOGAF Architecture Skills Framework describes architect roles, skills required to fulfil those roles and the level of knowledge required per role. The TOGAF Skills Framework does not indicate how to select architects with relevant skills, nor how to determine what skills are required per EA project type. Different types of EA projects are not addressed, and the impact that an architect's view on EA has on the execution of an EA project is ignored. The TOGAF Skills Framework contains 76 different skills that are categorised in seven groups, which corresponds to the broad range of EA skills identified by Tambouris, Zotou, Kalampokis and Tarabanis (2012), Shaanika and Iyamu (2014), Wißotzki *et al*. (2017), Mapingire *et al.* (2018) and Ylinen and Pekkola (2018). The TOGAF Skills Framework identifies nine architect roles for which required skills are reflected. Figure 15 below depicts the skill categories and architecture roles of the TOFAG Skills Framework, whereafter the TOGAF Skills Framework is described.

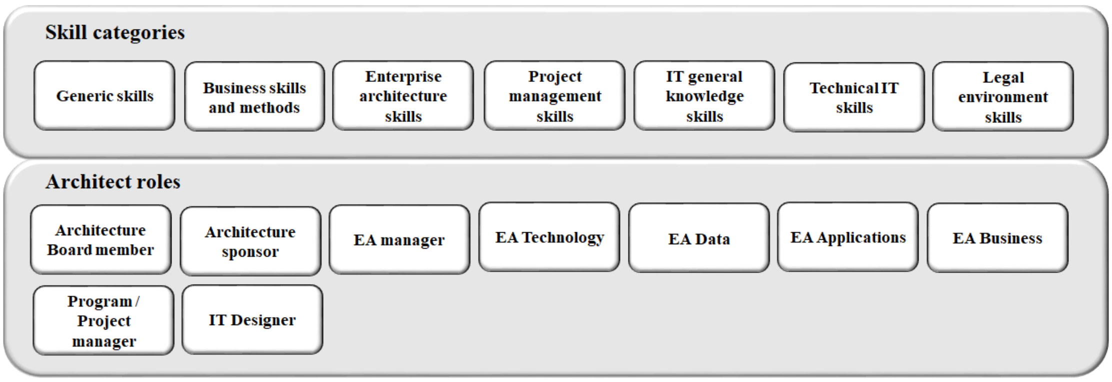

Figure 15 – TOGAF EA skills categories and architect roles (The Open Group, 2018)

TOGAF allocates a level of competency per skill per architect role. The competency levels are depicted in Table 4 below. Four levels are identified, with level 1 requiring background information only, level 2 requiring awareness, level 3 requiring detailed knowledge and level 4 requiring expert knowledge (The Open Group, 2018).

Table 4 – TOGAF skills proficiency levels (The Open Group, 2018)

Level	Achievement	Description
1	Background	Not a required skill, though should be able to define and manage skill if required.
2	Awareness	Understands the background, issues, and implications sufficiently to be able to understand how to proceed further and advise client accordingly.
3	Knowledge	Detailed knowledge of subject area and capable of providing professional advice and guidance. Ability to integrate capability into architecture design.
4	Expert	Extensive and substantial practical experience and applied knowledge on the subject.

Skill categories are discussed in sections 2.5.1 to 2.5.7 below.

2.5.1 Generic skills

Skills in terms of leadership, teamwork, inter-personal, oral and written communication, logical analysis, stakeholder management and risk management are listed as generic skills. The majority of the nine EA roles identified require detailed knowledge to expert competency level on generic skills. It is only the IT designer role that can be fulfilled with little competency in generic skills (The Open Group, 2018). Table 5 below reflects the competency level required per role for each generic skill.

Table 5 – TOGAF Generic skills: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Generic Skills									
Leadership	4	4	4	3	3	3	3	4	1
Teamwork	3	3	4	4	4	4	4	4	2
Inter-personal	4	4	4	4	4	4	4	4	2
Oral Communications	3	3	4	4	4	4	4	4	2
Written Communications	3	3	4	4	4	4	4	3	3
Logical Analysis	2	2	4	4	4	4	4	3	3
Stakeholder Management	4	3	4	3	3	3	3	4	2
Risk Management	3	3	4	3	3	3	3	4	1

2.5.2 Business skills and methods

Skills categorised as "business skills and methods" are skills in terms of business case, business scenario, organisation, business process, strategic planning, budget management, visioning, business metrics, business culture, legacy investments and business functions. Most of the roles demand detailed knowledge or expert knowledge in each skill area. The IT designer role requires detailed knowledge regarding only budget management skill and business metrics skill. It is not expected that the enterprise business, data, application and technology architect roles have in-depth or detailed knowledge of legacy investments (The Open Group, 2018). Table 6 below depicts the skill level required per skill per role.

Table 6 – TOGAF Business skills & methods: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Business Skills & Methods									
Business Case	3	4	4	4	4	4	4	4	2
Business Scenario	2	3	4	4	4	4	4	3	2
Organization	3	3	4	3	3	3	4	3	2
Business Process	3	3	4	4	4	4	4	3	2
Strategic Planning	2	3	3	3	3	3	4	3	1
Budget Management	3	3	3	3	3	3	3	4	3
Visioning	3	3	4	3	3	3	4	3	2
Business Metrics	3	4	4	4	4	4	4	4	3
Business Culture	4	4	4	3	3	3	3	3	1
Legacy Investments	4	4	3	2	2	2	2	3	2
Business Functions	3	3	3	3	4	4	4	3	2

2.5.3 Enterprise architecture skills

The skills grouped under EA skills are in terms of business modelling, business process design, role design, organisation design, data design, application design, systems integration, IT industry standards, services design, architecture principle design, architecture view and viewpoint design, building block design, solutions modelling, benefits analysis, business interworking, systems behaviour and project management. The architecture manager role and the four architecture roles for business, data, application and technology must have a competency level of detailed knowledge or expert knowledge for the majority of skills listed in this category. Background knowledge or awareness regarding EA skills is sufficient to fulfil the architecture board member role and the architecture sponsor role. These two roles require only detailed knowledge for business interworking skill. The project manager role requires knowledge at the level of awareness for 13 of the 17 skills listed. Expert knowledge is necessary in terms of benefit analysis skill and project management skill. The IT designer role must have detailed knowledge of data design, application design, IT industry standards, building block design and solutions modelling (The Open Group, 2018). Table 7 below contains the skill levels required per skill per role.

Table 7 – TOGAF Enterprise architecture skills: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Enterprise Architecture Skills									
Business Modeling	2	2	4	3	3	4	4	2	2
Business Process Design	1	1	4	3	3	4	4	2	2
Role Design	2	2	4	3	3	4	4	2	2
Organization Design	2	2	4	3	3	4	4	2	2
Data Design	1	1	3	3	4	3	3	2	3
Application Design	1	1	3	3	3	4	3	2	3
Systems Integration	1	1	4	4	3	3	3	2	2
IT Industry Standards	1	1	4	4	4	4	3	2	3
Services Design	2	2	4	4	3	4	3	2	2
Architecture Principles Design	2	2	4	4	4	4	4	2	2
Architecture Views & Viewpoints Design	2	2	4	4	4	4	4	2	2
Building Block Design	1	1	4	4	4	4	4	2	3
Solutions Modeling	1	1	4	4	4	4	4	2	3
Benefits Analysis	2	2	4	4	4	4	4	4	2
Business Interworking	3	3	4	3	3	4	4	3	1
Systems Behavior	1	1	4	4	4	4	3	3	2
Project Management	1	1	3	3	3	3	3	4	2

2.5.4 Programme and project management skills

Five skills are classified as programme and project management skills. These are programme management, project management, managing business change, change management and value management. It is understandable that the programme and project manager role requires detailed knowledge to expert knowledge for all the skills grouped in this category. The technology, data and application architect roles require detailed knowledge in terms of all programme and project management skills. The EA manager role and the business architecture role require expert knowledge for three skills, namely managing business change, change management and value management. The IT designer role needs to be aware of only programme and project management skills. Value management is reckoned as an important skill for the architecture board member and architecture sponsor roles (The Open Group, 2018). Table 8 below depicts the level of competency required for each skill per role.

Table 8 – TOGAF programme and PM skills: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Program or Project Management Skills									
Program Management	1	2	3	3	3	3	3	4	2
Project Management	1	2	3	3	3	3	3	4	2
Managing Business Change	3	3	4	3	3	3	4	4	2
Change Management	3	3	4	3	3	3	4	3	2
Value Management	4	4	4	3	3	3	4	3	2

2.5.5 IT general knowledge skills

The list of skills categorised as IT general knowledge skills is just as extensive as the EA skills list. It consists of IT application development methodologies and tools, programming languages, brokering applications, information consumer applications, information provider applications, storage management, networks, web-based services, IT infrastructure, asset management, service level agreements, systems, commercial off-the-shelf (COTS), enterprise continuums, migration planning, management utilities and infrastructure. It is required from the architecture board member and architecture sponsor roles to be aware of IT application development and methodologies and tools. For the rest of the skills listed in this category, background knowledge is enough. The EA manager must have detailed knowledge of the majority of IT general knowledge skills with expert knowledge required in asset management, service level agreements, enterprise continuums and migration planning. For the technology and data architecture roles, expert knowledge is required in most of the skills and detailed knowledge in the rest. The application architect role requires expert knowledge in most skills, with detailed knowledge in asset management, systems and migration planning. It is adequate for the application architect role to have knowledge at awareness level in storage management, networks and IT infrastructure. The business architect role only needs expert knowledge in enterprise continuums. For the rest of the skills, a combination of awareness and detailed knowledge is sufficient. The project manager role needs to have only detailed knowledge regarding IT application development methodologies and tools. The IT designer role must have detailed knowledge in terms of all skills grouped in this category (The Open Group, 2018). Table 9 below reflects the competency level required per skill per role.

Table 9 – TOGAF IT general knowledge skills: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
IT General Knowledge Skills									
IT Application Development Methodologies & Tools	2	2	3	4	4	4	2	3	3
Programming Languages	1	1	3	4	4	4	3	2	3
Brokering Applications	1	1	3	3	4	4	3	2	3
Information Consumer Applications	1	1	3	3	4	4	3	2	3
Information Provider Applications	1	1	3	3	4	4	3	2	3
Storage Management	1	1	3	4	4	2	2	2	3
Networks	1	1	3	4	3	2	2	2	3
Web-based Services	1	1	3	3	4	4	2	2	3
IT Infrastructure	1	1	3	4	3	2	2	2	3
Asset Management	1	1	4	4	3	3	3	2	3
Service Level Agreements	1	1	4	4	3	4	3	2	3
Systems	1	1	3	4	3	3	2	2	3
COTS	1	1	3	4	3	4	2	2	3
Enterprise Continuums	1	1	4	4	4	4	4	2	3
Migration Planning	1	1	4	3	4	3	3	2	3
Management Utilities	1	1	3	2	4	4	2	2	3
Infrastructure	1	1	3	4	3	4	2	2	3

2.5.6 Technical IT skills

The technical IT skills are software engineering, security, systems and network management, transaction processing, location and directory, user interface, international operations, data interchange, data management, graphics and image, operating system services, network services and communications infrastructure. The architecture board member and architecture sponsor roles need only background knowledge regarding technical IT skills. Detailed knowledge regarding all skills listed in this category is required to fulfil the architecture manager role. The technology architect role requires expert knowledge in the majority of IT general knowledge skills. The data and application architect roles need detailed knowledge for most of the skills in this category and expert knowledge for those where detailed knowledge is not required. It is expected from the business architect role to have detailed knowledge of software engineering, security, systems and network management, transaction processing, location and directory and user interfaces skills. The programme and project manager roles require knowledge at only awareness level. The IT designer role must have detailed knowledge in terms of all skills in this category except for international operations skill where knowledge level of awareness is sufficient (The Open Group, 2018). Table 10 below contains the competency level per skill per role.

Table 10 – TOGAF Technical IT skills: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Technical IT Skills									
Software Engineering	1	1	3	3	4	4	3	2	3
Security	1	1	3	4	3	4	3	2	3
Systems & Network Management	1	1	3	4	3	3	3	2	3
Transaction Processing	1	1	3	4	3	4	3	2	3
Location & Directory	1	1	3	4	4	3	3	2	3
User Interface	1	1	3	4	4	4	3	2	3
International Operations	1	1	3	4	3	3	2	2	2
Data Interchange	1	1	3	4	4	3	2	2	3
Data Management	1	1	3	4	4	3	2	2	3
Graphics & Image	1	1	3	4	3	3	2	2	3
Operating System Services	1	1	3	4	3	3	2	2	3
Network Services	1	1	3	4	3	3	2	2	3
Communications Infrastructure	1	1	3	4	3	3	2	2	3

2.5.7 Legal environment

Skills categorised in the legal environment category are skills regarding contract law, data protection law, procurement law, fraud and commercial law. Expert skill in terms of data protection law is required to fulfil the architecture manager role, and in terms of procurement law to fulfil the project manager role. The architecture board member role is the role that requires detailed knowledge in almost all legal environment skills, with the exception of contract law where awareness is adequate. Detailed knowledge to expert knowledge is required in data protection for all roles except for the project manager and IT designer roles. The IT designer role needs only background knowledge for the rest of the skills in this category (The Open Group, 2018). Table 11 below depicts the competency level per skill per role.

Table 11 – TOGAF Legal environment: Competency levels (The Open Group, 2018)

Roles	Architecture Board Member	Architecture Sponsor	Enterprise Architecture Manager	Enterprise Architecture Technology	Enterprise Architecture Data	Enterprise Architecture Applications	Enterprise Architecture Business	Program/ Project Manager	IT Designer
Legal Environment									
Contract Law	2	2	2	2	2	2	2	3	1
Data Protection Law	3	3	4	3	3	3	3	2	2
Procurement Law	3	2	2	2	2	2	2	4	1
Fraud	3	3	3	3	3	3	3	3	1
Commercial Law	3	3	2	2	2	2	3	3	1

The TOGAF Skills Framework reflects different roles applicable to EA execution and categories of skills. Note that the enterprise architect needs different levels of competency in all skills provided, and not only the skills categorised as EA skills.

Korhonen and Poutanen (2013) acknowledge that there are different types of EA work or projects and that for each type of EA project a unique approach, knowledge and skills are required. They do not provide a mechanism to determine different types of EA projects or to determine the required skills, knowledge and understanding of EA per type of EA project. Although the TOGAF Skills Framework provides lists of skills per architect role, it does not provide guidelines to determine the type of an EA project or the required skills relevant to different types of EA projects.

The DIA (Du Preez, 2016), which is described in the next paragraph, identifies different ways that architects understand EA. Du Preez (2016) refers to the understanding that an architect has of EA as the architect's EA profile, which consists of an EA school of thought indicator and an architect behavioural style indicator. The DIA provides skills per EA school of thought and per architect behaviour style.

A research gap of identifying different types of EA projects and mapping of architects with suitable EA profiles is identified.

2.6 The Daedalus Instrument for Architects (DIA)

The DIA is applicable to this study as it addresses the different understandings of EA.

The DIA was developed by Du Preez (2016) to complement existing EA frameworks such as TOGAF. The DIA provides insight regarding the enterprise architect's EA profile. By knowing the architect's EA profile, organisations are in the position to understand why enterprise architects execute architecture work the way they do (Du Preez, 2016). The paragraphs that follow provide a description of the DIA as obtained from the work of Du Preez (2016).

DSR methodology was followed to develop the DIA. The DIA assumes that enterprise architects can be grouped per their enterprise architect profiles and that enterprise architects that support the same EA school of thought have similar beliefs regarding EA and how it is practised. An SLR was performed to identify factors that are related to the enterprise architect. The goal of the SLR was to provide the basis for understanding the enterprise architect. A list with enterprise architect attributes and concepts related to EA was compiled. This formed the first construct in the research process. These architect traits and elements were used to determine the different architect profiles. EA elements or factors include EA deliverables, EA frameworks, EA methodologies and tools. Enterprise architect traits or attributes refer to personal values such as personal beliefs, attitude and behaviour. These were used to order and group the various EA concepts. The second construct, namely the EA school of thought taxonomy and indicator, was developed by utilising the classified EA concepts, the EA school of thought taxonomy provided by Lapalme (2012), SLR results and refined during data collection in this regard. The architect behavioural style indicator was developed as the third construct. The results of the SLR and the analysis of EA schools of thought information informed the development of the architect behavioural style indictor. It was found that only two architect attributes have an impact on the architect's behavioural style. These two attributes are architect's role and architect's competencies. Various EA profiles were defined based on the EA concepts and constructs. It is referred to as the "Enterprise Architect Profile Theory" (Du Preez, 2016:201).

The DIA consists of four components. These components are a broad list of EA elements and architect traits, taxonomy and indicators to determine EA school of thought, EA style classification and indicator, and the enterprise architect profile perspective. The components are described in the sections 2.6.1 to 2.6.4 below.

2.6.1 Broad list of EA elements and architect traits

This list with EA elements and architect traits was obtained through the execution of an SLR from 56 studies. The list was used as input to determine the EA schools of thought as well as the architect behavioural styles. The list with EA elements and architect traits as provided by Du Preez (2016) is contained in Figure 16 below.

Level of detail	**Governance**	**Standards**	**Positions**	**Challenges and Problems**
Architecture segment	**Maturity stage**	**Views**	**Roles**	**Concerns**
Certification	**Methodologies**	**Organisational segment (Business unit)**	**School of thought**	**Critical success factors**
Configuration	**Modelling notation**	**Reporting line**	**Skills category**	**Goals**
Definitions	**Models**	**Competencies**	**Stakeholders**	**Organisational culture**
Deliverables	**Profile (Organisation, UML)**	**Discipline**	**Type**	**Outcomes**
Domains	**Purpose**	**Experience**	**Benefits**	**Politics (Power)**
Framework	**Scope**	**Position levels**	**Business objectives**	**Techniques**

Figure 16 – EA elements and architect traits (Du Preez, 2016)

2.6.2 Taxonomy and indicator to determine EA school of thought

The EA school of thought classification utilises EA purpose and EA scope as determining factors. The EA purpose and EA scope are used as it reflects the enterprise architect's perception of the EA scope and purpose for planning an EA project. There are three possible viewpoints on EA scope and EA purpose respectively. Therefore, theoretically, there are nine different EA schools of thought. The research study performed by Du Preez (2016) shows that only seven of the nine possible EA schools of thought are applicable. It was determined by classifying architect respondents to the questionnaire that was used to collect data for the EA school of thought indicator, in different EA schools of thought, based on their answers to the questions on EA scope and EA purpose. Answers to the rest of the questions in the questionnaire were used to determine beliefs per EA school of thought. Answers from architects classified into the same EA school of thought were used to decide on the beliefs of that specific EA school of thought.

The seven EA schools of thought are "enterprise IT design", "enterprise power authority", "enterprise ecological adaptation", "enterprise IT planning", "enterprise integration", "enterprise configuration" and "enterprise IT architecting" (Du Preez, 2016:148). Figure 17 below depicts the EA schools of thought. The three possible views on EA purpose are reflected on the x-axis and the three possible views on EA scope are reflected on the y-axis in Figure

17 below. Seven combinations of EA purpose and scope, depicted in blue squares, reflect the different EA schools of thought.

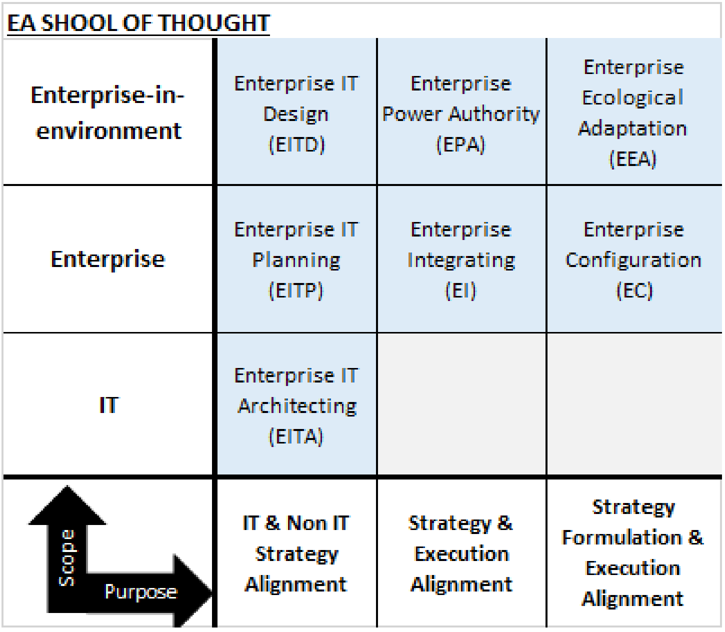

Figure 17 – EA schools of thought (Du Preez, 2016)

Skills characteristics per EA school of thought are provided in Table 12 below.

Table 12 – Skills per EA school of thought (Du Preez, 2016)

EA SCHOOLS OF THOUGHT	EITA	EI	EEA	EC	EPA	EITD	EITP
SKILLS							
Technical competence	X						X
Small group facilitation		X			X	X	X
Systems thinking		X			X		
Dialogue fostering			X				
System and system-in-environment thinking			X	X			
Larger group facilitation			X	X		X	
Engineering knowledge						X	X

2.6.3 EA style classification and indicator

EA competency and EA role are the deciding factors to determine EA style. These two factors reflect the behavioural style of the enterprise architect when performing EA work. EA role and EA competency each has five possible viewpoints, resulting in 25 different EA styles. Through the research exercise it was found that only nine of the 25 EA styles were relevant. These nine EA behavioural styles are “disrupting technology”, translating technology”, “innovating technology”, “controlling technology”, “directing strategy”, “deciding strategy”, “shifting advisory”, “conversing advisory” and “developing advisory” (Du Preez, 2016:179). Figure 18 below portrays the nine EA behavioural styles. The five possible views on architect role are reflected on the horizontal axis and the five possible views on architect competency are reflected on the vertical axis in Figure 18 below. Nine combinations of architect role and competency, depicted in blue squares, reflect the different architect behavioural styles.

ARCHITECT BEHAVIOUR STYLE

Technical	Disrupting Technology	Translating Technology	Innovating Technology	Controlling Technology	
Strategy	Directing Srategy		Deciding Strategy		
Organisational Politics					
Leadership					
Consulting	Shifting Advisory	Conversing Advisory	Developing Advisory		
Competency / Role	**Change Agent**	**Communi-cator**	**Leader**	**Manager**	**Modeller**

Figure 18 – EA behavioural styles (Du Preez, 2016)

The DIA defines skills per architect behaviour style. Note that the skill set for architect behaviour style differs from the EA school of thought set of skills. Table 13 below reflects skills per architect behaviour style.

Table 13 – Skills per architect behaviour style (Du Preez, 2016)

SKILLS	EA	Business	General IT	Technical IT	N/A	Project Management	General Skills
ARCHITECT BEHAVIOUR STYLE							
Disrupting technology	X						
Translating technology	X	X					
Innovating technology	X	X	X				
Controlling technology	X		X				
Directing strategy	X		X	X			
Deciding strategy					X		
Shifting advisory	X	X	X			X	
Conversing advisory							X
Developing advisory		X	X	X		X	

2.6.4 Enterprise architect profile perspective

Figure 19 below reflects how the enterprise architect profile is determined. It shows that the combination of the architect's EA school of thought and EA style is used. Figure 19 below, further reflects that the EA school of thought and EA style are informed by the comprehensive list of EA factors and architect attributes.

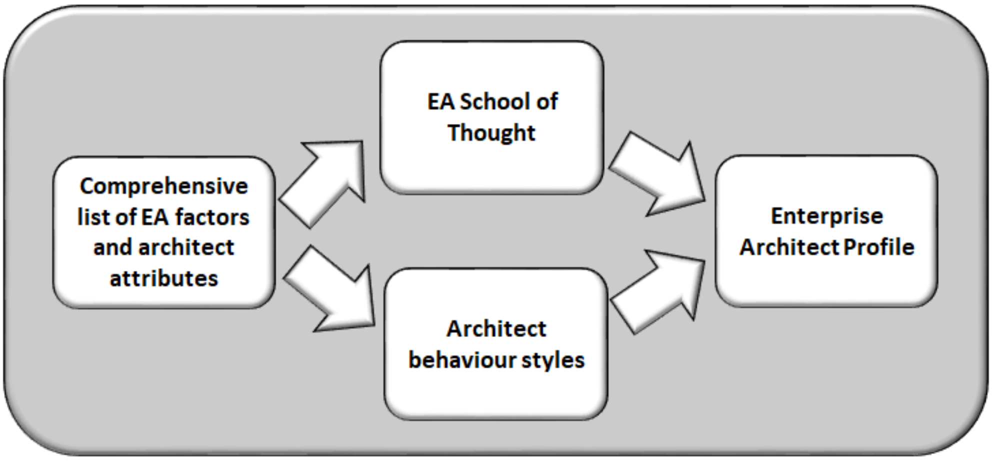

Figure 19 – Enterprise architect profile (Du Preez, 2016)

The composition of the DIA, as described above, is provided in Figure 20 below.

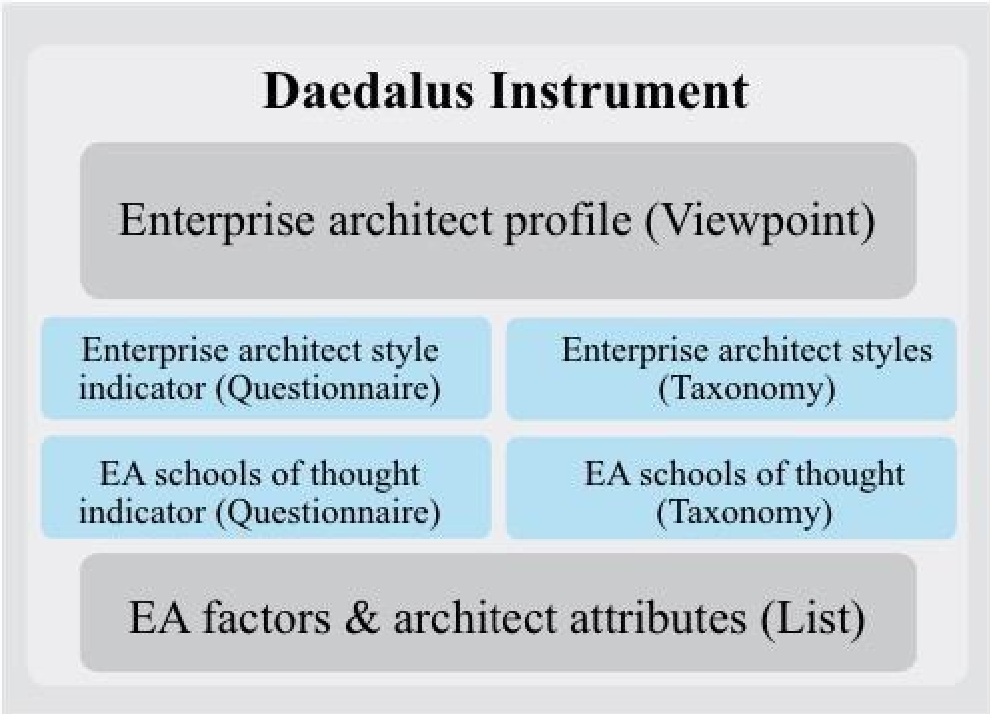

Figure 20 – DIA components (Du Preez, 2016)

The DIA was evaluated by a focus group consisting of five members with diverse background in terms of age, EA industry experience, education and seniority. This group had members from academia and industry. Du Preez (2016) presented the research study details and the DIA to the focus group. In addition to this, he demonstrated the technical implementation of the instrument. He furthermore also performed the evaluation of the instrument through discussions and a question-and-answer session.

Although Du Preez (2016) provides a guideline for the use of the DIA, there is a lack with regard to an extensive methodology for the use of the DIA in EA practice. Guidance should be provided to organisations on how to use the DIA and what to do with the results. Also, how do organisations know what type of EA profile is required for successful EA implementation in the specific organisation circumstances.

2.7 Conclusion

This chapter gives and overview of EA by providing EA background and discussing EA frameworks that are used to plan and execute EA initiatives, the human component of EA and different views on EA as well as EA project types. The research gap filled by this research is identified.

The research problem is strengthened through the discovering of 75 different EA frameworks. The existence of many different EA frameworks relates to the different understandings of EA and different EA project types. Lapalme's (2012) three schools of thought on EA theory highlights the different views on EA. The TOGAF skills framework lists the various skills required for EA projects, but does not provide guidance regarding different EA skills required for different EA project types. The DIA focuses on the understanding that the enterprise architect has of EA, and also does not address different EA project types. The problem of selecting enterprise architects for EA projects is emphasised through the literature review reflected in this chapter.

This research study builds on the DIA by providing a methodology for the selection of enterprise architects in support of EA project execution. The next chapter describes the research methodology applicable to this study.

3. Research methodology

Figure 21 below shows the position of Chapter 3 in relation to the rest of the thesis.

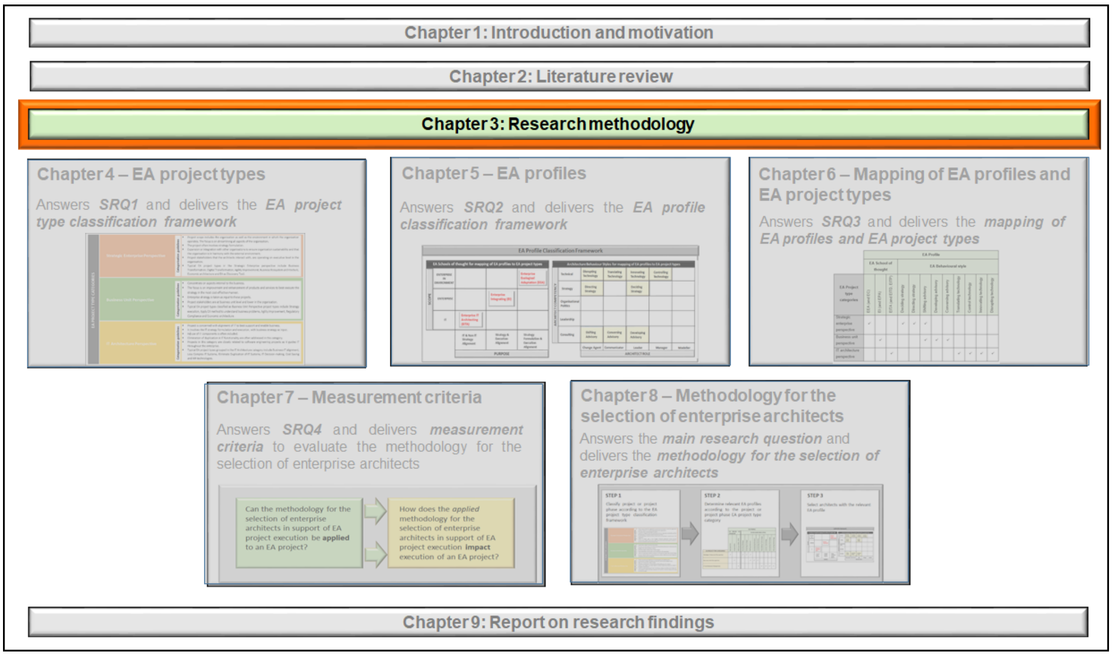

Figure 21 – Position of Chapter 3 in relation to the rest of the thesis

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Chapter 3 layout:

3.1 Introduction

Section 1 – Theoretical background

3.2 Philosophical assumptions

3.3 Research method

3.4 Data collection technique

3.5 Data analysis approach

3.6 Written record

Section II – Selection for this study

3.7 Philosophical assumption

3.8 Research method

3.9 Data collection technique

3.10 Data analysis technique

3.11 Written record

Section III – Customised research design

3.12 Design science research cycles

3.13 Research design process guiding design of this research project

3.14 Evaluation in DSR
3.15 Application of the DSRP and FEDS
3.16 Data collection, data analysis and deliverables per research question
3.17 Ethics
3.18 Written record
3.19 Conclusion

3.1 Introduction

This chapter spells out the plan for the research study that provided a methodology for the selection of enterprise architects in support of EA project execution. Qualitative research focuses on a specific group and aims to obtain detailed knowledge of the specific group under study. Quantitative research, in contrast, focuses on large populations to use the broader view to generalise to a larger group than the one being studied (Swanson & Holton, 2005). This research study focused on a small group, namely enterprise architects employed on an EA project, and aimed to gain detailed insight into the selection of enterprise architects for EA projects, and is therefore seen as a qualitative study. Hence, the qualitative research design model provided by Myers (2013) (Figure 22) was used to guide the development of the research plan or research methodology.

This chapter has three main sections, depicted as vertical lines crossing the horizontal lines of Myers's (2013) qualitative research design model in Figure 22 below. Section 1 gives theoretical background per the qualitative research design model component. Section 2 states the selection per component applicable to this study. Section 3 contains the customised design of the research study.

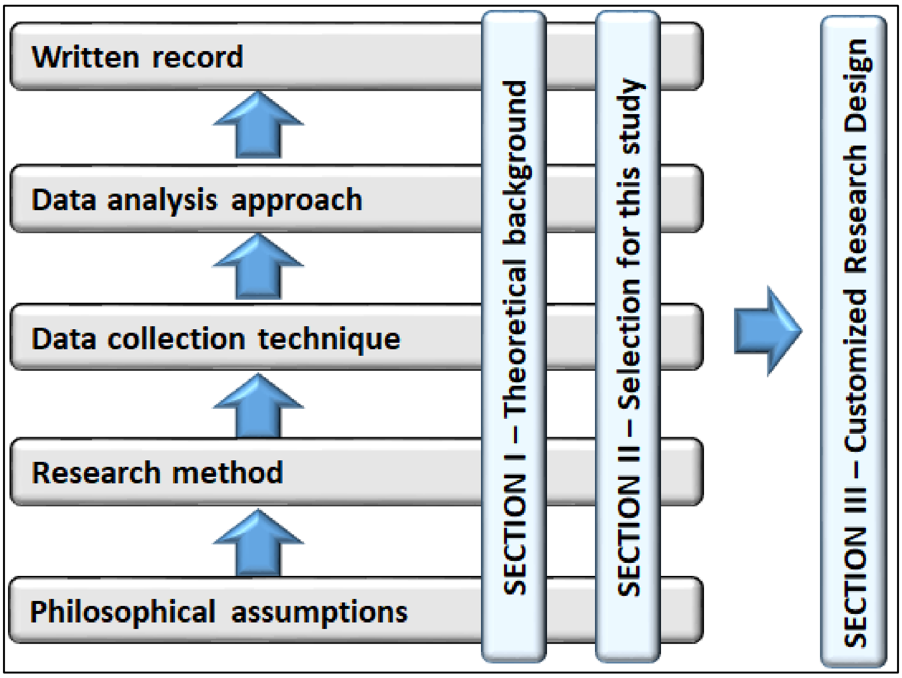

Figure 22 – Qualitative research design model (Myers, 2013) and chapter sections

3.2 Philosophical assumptions

Research philosophies often used in IS research are positivism, interpretivism and critical research (Oates, 2006; Myers & Klein, 2011; Goldkhul, 2012). A fourth research paradigm that is associated with qualitative IS research is pragmatism (Goldkuhl, 2012b). These four research philosophies are broadly described in the paragraphs that follow.

3.2.1 Positivism

Positivism originated from the natural science discipline (Orlikowski & Baroudi, 1991) and underpins the scientific method (Oates, 2006). The scientific method assumes that the world is orderly with no random incidences and that the world can be studied factually, without human interpretations and perceptions (Oates, 2006). Things that are determined to be true through the scientific method are true only until it is found to be untrue, even if there is only one occurrence that proves it wrong. Therefore, theories determined in the positivist paradigm are understood as the best knowledge at the current time. Following the scientific method, a theory is formulated first; from there the hypothesis is derived. Next, the hypothesis is tested through objective process and the results of the test are observed to determine if the hypothesis is proved or disproved. The last action in the iteration is to acknowledge, amend or discard the theory (Oates, 2006). The positivist researcher plays an inactive and objective role that does not partake in the phenomenon that is studied (Orlikowski & Baroudi, 1991).

3.2.2 Interpretivism

In contrast to positivism, interpretive research does not confirm or refute a hypothesis, but it aims to discover, investigate and clarify how aspects in a specific social situation are linked and mutually dependent (Oates, 2006). Interpretive research acknowledges that groups of people and individuals see the world differently. Therefore, interpretive studies aim to understand the world according to the perceptions that people have of it and how it differs from person to person or group to group over time. Interpretive research recognises that there are multiple versions of the truth. Reality is a product of what people think, either as individuals or as a group. The researcher's frame of reference and view have an impact on the research results. Therefore, influence of the researcher must be reflected (Oates, 2006).

3.2.3 Critical research

The critical research philosophical paradigm has attributes that relate to interpretivism as well as positivism. Similar to interpretivism, critical research professes that social reality is constructed and reconstructed by humans. Critical research differs from interpretivism and relates to positivism in the sense that, according to critical research, social reality has objective characteristics which influence the way people view the world. Critical research acknowledges the control that blueprints and best practices have on social reality creation (Oates, 2006). Critical research is not often applied in the IS discipline (Myers & Klein, 2011). Principles applicable to critical research are grouped into two categories, namely critique and transformation. The first category contains principles that relate to using the ideas of critical theorists. The second category reflects principles related to individual emancipation and improvement in humanity and social theories (Myers & Klein, 2011). Critical research values completeness and context, meaning that objects are not considered in isolation but are seen in relation to the bigger picture of which it is a part (Orlikowski & Baroudi, 1991).

3.2.4 Pragmatism

Pragmatism focuses on actions that lead to change. The real-world implications of an artefact constitute the meaning. Pragmatism is suitable for research studies that either develop artefacts through design research or that create change through action research (Goldkuhl, 2012b; Hevner, 2007). Pragmatism can be categorised as functional, either specific or in general, referential and methodological. All four these categories are associated with design research (Goldkuhl, 2012a).

The pragmatism paradigm is understood as a collection of theoretical instruments that are used to attend to problems (Biesta *et al.*, 2010).

Hevner (2007) argues that DSR can be seen as similar to the pragmatic research perspective as it focuses on relevance and practical impact. Therefore, the philosophical beliefs for design as research paradigm provided by Vaishnavi *et al*. (2019) are applicable to pragmatism. Vaishnavi *et al*. (2019) state that design as research paradigm follows the principle that there are several alternative realities depending on socio-technological context. Furthermore, design as research paradigm acknowledges that knowledge is gained through creating (Vaishnavi *et al*., 2019).

3.3 Research method

Six research strategies or methods that are typically used in IS research are experiments, surveys, ethnography, case studies, action research and DSR. The different research strategies are linked to the four philosophical paradigms, positivism, interpretivism, critical research and pragmatism (Oates, 2006; Goldkhul, 2012) as depicted in Figure 23 below.

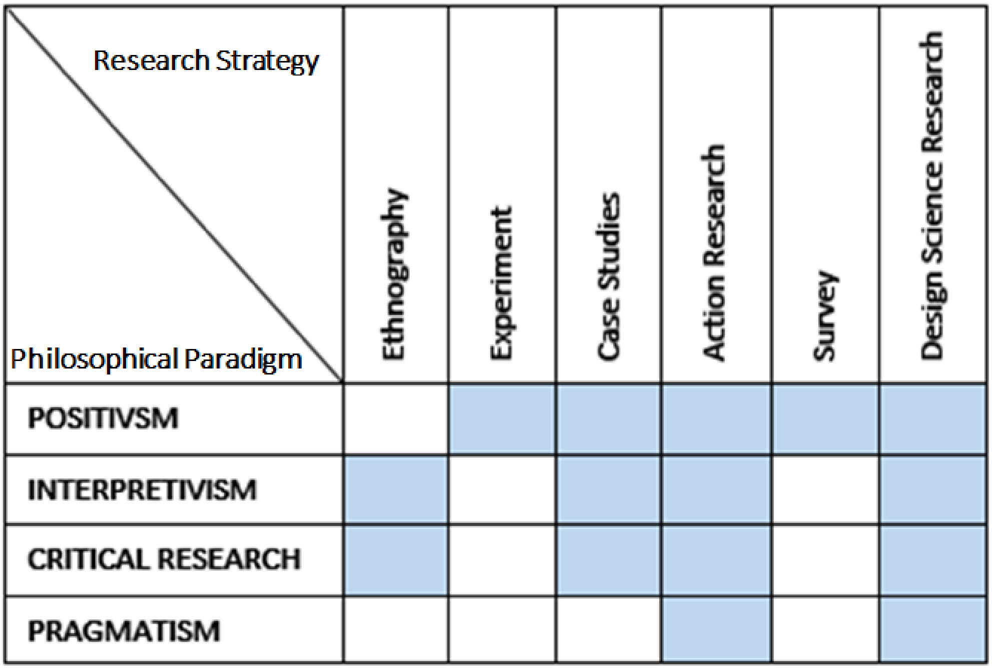

Figure 23 – Research strategies associated with IS research (Oates, 2006; Goldkhul, 2012)

Descriptions and characteristics of the six research strategies are provided in Table 14 below.

Table 14 – Descriptions and characteristics of research strategies

No.	Attribute name	Attribute content
1.	**Research strategy:**	**Ethnography**
	Description:	Ethnography research strategy can be seen as a purposeful investigation of cultures and society, directed by the researcher's theoretical opinion and questions (Erickson, 1984). The process entails gathering data about the society or culture, revealing the procedure followed to comprehend the society or culture and indicating how the researcher might have influenced the culture or society. Lastly, the observations are associated with literature (Oates, 2006).
	Properties:	The researcher participates in the life of the culture or society being studied when making observations (Oates, 2006). The researcher's participation in the culture lasts for a long period of time; it may be for a period of 8 months to a period of up to 2 years (Bhattacherjee, 2012).
		Research takes place in the natural environment of the society or culture. The researcher blends in with the environment to avoid disruption (Oates, 2006).
		The researcher plays the role of the research instrument by making notes of personal experiences, observations and interviews with community members (Oates, 2006; Bhattacherjee, 2012).
		The researcher's aim is to depict the world as seen and experienced by the society or culture being studied (Oates, 2006).
		All aspects of the society or culture are studied to provide a complete description of their world (Oates, 2006).
2.	**Research strategy:**	**Experiment**
	Description:	An experiment entails proving or disproving a hypothesis by examining two or more factors or situations and their relationships. The hypothesis is often stated as Factor Y instigates Factor X. Physical science research often makes use of experiments (Oates, 2006).

No.	Attribute name	Attribute content
	Properties:	Examining the correlation between two or more issues, and proving as true or false (Oates, 2006).
		Cause and effect are identified (Oates, 2006; Bhattacherjee, 2012).
		Detailed and accurate examination and measurement of results when things that can influence the outcome are added or removed (Oates, 2006).
		Experiments are normally repeated several times under different circumstances before conclusions are derived and confirmed (Oates, 2006).
3.	**Research strategy:**	**Case Study**
	Description:	Case study research strategy is often selected when in-depth knowledge of a real-life incident is required (Yin, 2003; Bhattacherjee, 2012). Live incidents can be any existing entity; examples are an information system, enterprise, organisational unit and decision (Oates, 2006). The incident is investigated in detail and all complexities of the real-life situation are taken in consideration. The research result provides comprehensive insight in the one incident or situation being studied, which may be applicable to other scenarios (Oates, 2006).
	Properties:	Research is narrow and deep. It focuses on one instance of a thing and obtains detailed, in-depth knowledge of it (Oates, 2006; Zainal, 2007).
		Research is done in a real-life environment (Oates, 2006).
		The complete case is investigated. The intricacy of processes and how they interact are addressed (Oates, 2006).
		A variety of data sources are used. As much as possible data are collected about the case in order to gain in-depth knowledge (Oates, 2006). Data collection methods such as observations, documents and interviews are suitable for case study research strategy (Bhattacherjee, 2012).
4.	**Research strategy:**	**Action research**

No.	Attribute name	Attribute content
	Description:	Action research strategy is applicable when no theory or possible solution to a problem is known upfront. Thus, there is no artefact that will be tested; the artefact will be created through actions in a real-life environment. The researcher works with the people in the research situation and often facilitates execution of daily tasks to allow the people to participate in the research (Oates, 2006). Action research strategy is suitable to study unique problems that cannot be simulated outside the real-life context (Bhattacherjee, 2012).
	Properties:	Research focuses on practical matters that people experience when working or in everyday living (Oates, 2006).
		Cycles of plan-do-check are performed iteratively (Oates, 2006). Thus, problem-solving and gaining of insight are done concurrently (Bhattacherjee, 2012).
		To effect change through the research action is important (Oates, 2006).
		People active in the research environment participate in the research action and not only as research subjects (Oates, 2006).
		Any type of data can be gathered in any way. A combination of qualitative and quantitative data can be obtained through observation, interviews, questionnaires and documents containing notes prepared during the research activity by the researcher or other participants (Oates, 2006).
		Action research delivers two types of outcome, namely action and research outcomes. Action outcome refers to the practical realisation in the real-life situation. Research outcome refers to knowledge gained regarding problem-solving and how to act in problem situations (Oates, 2006).
5.	**Research strategy:**	**Survey**
	Description:	A survey gathers the same type of information from a large population, in a consistent manner. Patterns in the responses are identified and used to generalise the result to a larger group than the sample group used for collecting data (Oates, 2006). Survey research strategy is suitable in situations where unobservable

No.	Attribute name	Attribute content
		data such as people's attitudes, characteristics and opinions are required for the research (Bhattacherjee, 2012).
	Properties:	Data can be collected via interviews and questionnaires that are standardised (Bhattacherjee, 2012).
		Large volumes of data are generated (Oates, 2006).
		Quantitative data analysis is applicable (Oates, 2006).
6.	**Research strategy:**	**Design science research (DSR)**
	Description:	Venable and Baskerville (2012:142) explain DSR as "*research that invents a new purposeful artefact to address a generalised type of problem and evaluates its utility for solving problems of that type*". The DSR strategy is applicable when new IT artefacts are developed (Oates, 2006). The term, IT artefact, includes not only computer systems, but also methodologies and models (Oates, 2006; Gregor & Hevner, 2013).
	Properties:	The designed artefact must be properly explained so that it can be implemented in a relevant area (Hevner *et al*., 2004).
		The focus of DSR is on improving operations or the world through design, development and implementation of artefacts, rather than just understanding the world (Myers & Venable, 2014).
		DSR produces an artefact that can be implemented by organisations to solve practical problems (Hevner *et al*., 2004; Van Aken, 2005).
		Knowledge about a problem area and a resolution for the problem is gained through developing and implementing the designed object (Hevner *et al*., 2004) .

3.4 Data collection technique

Techniques for data collection in qualitative studies include making use of documents, conducting interviews and doing fieldwork (Myers, 2013). Oates (2006) includes these three data collection techniques as techniques to gather data for research that designs or creates, such as this research study that will design and create a methodology for the selection of enterprise architects in support of EA project execution. The aforementioned data collection techniques are described and their applicability to this research study are indicated in the sections that follow.

3.4.1 Documents

Myers (2013:152) defines a document as "anything that can be stored in a digital file on a computer". Although it is stated that anything that is classified as documents can be stored digitally, it does not mean that it will always be stored digitally. Documents are categorised as being personal documents, private documents or public documents. Personal documents are documents such as diaries, personal notes and letters. Private documents are generated by private enterprises for internal use and include, amongst other corporate communication, minutes of meetings and budgets. Public documents such as newspaper articles and company annual reports are created for public use (Myers, 2013). Another classification of documents is based on when and for what purpose the document was created. Documents that existed before the research study commenced are classified as "found-document" and documents that are compiled as part of the research study are classified as "researcher-generated" documents. Found-documents can be obtained via searches on the internet, from databases subscribed by a university's library, from a librarian in person or from people in the organisation that forms part of the research study (Myers, 2013). Oates (2006) mentions that academic works such as conference papers, journal articles and books are all forms of document-based data.

Documents can usually be obtained easily and at a low or no cost. The permanency of documents and that they are usually publicly accessible and traceable, or accessible for other researchers via university libraries, add to the credibility of work that uses document-based data (Oates, 2006; Myers, 2013). When using documents as data collection method, the purpose for which it was generated must be taken in consideration (Oates, 2006). Care must be taken to evaluate the validity of documents that are used for data collection (Myers, 2013).

3.4.2 Interviews

Collecting data through interviews is a way to collect primary data that is specific and relevant to the research study being conducted. Three types of interviews are structured interviews, unstructured interviews and semi-structured interviews (Oates, 2006; Myers, 2013).

Structured interviews consist of a set of predetermined questions in a specific sequence. The interviewer asks the questions in the same manner and voice tone to all interviewees. No interpretation or explanation from the interviewer's side is allowed. The interviewer asks the predetermined questions and records the answers of the interviewee only. No discussions regarding the subject take place to ensure consistency between all interviewees. Structured interviews are suitable for research such as surveys or market research and for intercept research in the society (Myers, 2013). Consistency between all interviews is seen as the major advantage of structured interviews. However, this advantage is also reckoned as the main disadvantage of structured interviews as it restricts the gaining of knowledge to the scope of the set of predetermined interview questions (Myers, 2013).

For unstructured interviews, introductory statements regarding the topic are normally used to start the discussion. The interviewer may further use predetermined questions when the conversation stops as a way to start it again. Interviewees can speak freely and say what they please. The interviewer may ask questions that are formulated on the spot to trigger the interviewee's thoughts. Unstructured interviews are all different and reflect the interviewee's opinions, experience, thoughts and beliefs about the research topic. The researcher records all information with the least possible interruption (Oates, 2006; Myers, 2013). The advantage of unstructured interviews is that the response is not limited to a predetermined scope. Again, this advantage can also be seen as a disadvantage as the interviewer is not in control of the interview. It depends on the willingness and eagerness of the interviewee to talk as the interviewee may either say too little or too much, and the content of the conversation may be irrelevant to the research topic (Myers, 2013).

The semi-structured interview technique has the advantages of structured and unstructured interview techniques, without the disadvantage counterpart of the benefits. For semi-structured interviews, the interviewer prepares questions and themes to be discussed. The pre-formed questions are asked, but, in contrast to structured interviews, the sequence of the questions may change as found necessary and new questions may be asked. New questions will be formulated during the interview when the interviewee provides detail of an area for which no predetermined questions exist. This way, deeper and new knowledge about the research topic is gained (Myers, 2013).

3.4.3 Observation

Qualitative data can be gathered through field work, also referred to as participant observation or merely observation. The researcher interacts and observes people or participates with people in their everyday environment. When participant observation is applied, the researcher participates with the community in some activities with the aim to gain insight into the research topic from the community's point of view. In contrast to participant observation, when observation alone is applied, the researcher only observes the society and records what is experienced (Myers, 2013).

3.5 Data analysis approach

Gathering and analysing of qualitative data are often done simultaneously. Therefore, it must be acknowledged that data collection processes for gathering qualitative data are not completely distinct from the data. The researcher's frame of reference, experience, approach to and understanding of the research topic applied during data collection are all seen as analytical processes that affect the data (Thorne, 2000). However, data analysis is also performed as a separate step after data collection. Qualitative data analysis requires logical and abstract thinking processes to generate profound insight from the raw data (Thorne, 2000) and the researcher's ability to recognise patterns and topic themes within the data influences the data analysis (Oates, 2006). This paragraph addresses the separate step of data analysis after data collection.

Methods of qualitative data analysis often applied are semiotics, hermeneutics and narrative analysis (Myers, 2013). Another method for qualitative data analysis is thematic analysis, which focuses on interpretation of the views and understanding of contributors to the research study (Smith & Firth, 2011).

3.5.1 Semiotics

Semiotics involves the study of signs and symbols and what is meant by each sign or symbol within the context that it is used. The rules that govern the signs and symbols are also studied (Myers, 2013). Semiotics is mainly used in marketing research, consumer research and information systems, with the aim to discover the things that control social conduct (Myers, 2013).

3.5.2 Hermeneutics

Hermeneutics involves comprehending the meaning of text. The hermeneutic circle is key to the hermeneutics data analysis technique. First, the researcher understands the complete text and then interprets the parts that make up the whole, and then circles back to understanding the whole. With each cycle, new insight is gained (Myers, 2013).

3.5.3 Narrative analysis

A narrative refers to a story, normally structured with an introduction, middle and closure, reflecting a sequence and content of events. Narrative analysis can be applied by either producing a narrative or by reading or interpreting a narrative. When producing a narrative, data that were collected are put together to tell a story in a consistent manner. When reading a narrative, the narrative analysis technique is used to understand and decipher an already existing narrative obtained through, for example, an interview (Myers, 2013).

3.5.4 Thematic analysis

Thematic analysis requires the practice of continuous comparative analysis (Thorne, 2000). It is a method for detecting, examining and understanding qualitative data through the identification of themes (Clarke & Braun, 2017). Data are methodically examined and compared to detect patterns or themes within the data to arrive at an educational explanation of the studied phenomenon (Smith & Firth, 2011).

Data can be coded before themes are determined (Braun & Clarke, 2006). However, Swain (2018) argues that both code and theme reflect interpretation and it is therefore not required to differentiate between coding and defining of themes when doing thematic analysis. The terms "code" and "theme" can be used interchangeably (Swain, 2018). Table 15 below reflects three phases that were followed in thematic analysis of data gathered through semi-structured interviews (Swain, 2018).

Table 15 – Phases for thematic analysis of semi-structured interview transcript data (Swain, 2018)

Thematic analysis phases
PHASE 1
• Prepare a table of the themes and information
• Create *a priori* themes (derived from literature review)
• Get familiarised with the data
PHASE 2
• Work through interview transcripts and derive *a aposteriori* themes in addition to the *a priori* themes.
• Add information from interview transcripts to the table with themes
PHASE 3
• Copy interview transcript into the report
• Merge *a priori* and *a posteriori* themes if necessary

Thematic analysis accommodates two methods to identify themes, namely in an inductive manner or in a deductive way. Inductive analysis is applicable when data are coded or themed without aiming to fit into predetermined themes. Deductive analysis is advised when analysis and theme identification are done to answer a specific research question and previous research regarding the topic is taken in consideration (Braun & Clarke, 2006).

Guidelines for good thematic analysis provided by Braun and Clarke (2006) include the following:

- Transcription of data reflects interview responses accurately;
- All data were considered when determining themes;
- Analysis of data is supported with extracts from interview transcripts; and
- Approach followed for thematic analysis is provided and followed.

3.6 Written record

Write-up of qualitative research is considered as the most important stage of the research study as only through the written record and presentations of it at seminars can other people learn about the research work. Different layouts used for qualitative research output as provided by Myers (2013) are depicted in Figure 24 below.

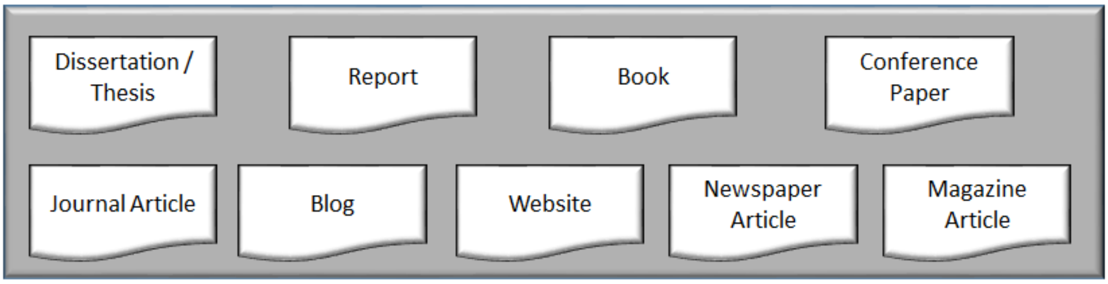

Figure 24 – Format options for qualitative research output (Myers, 2013)

3.7 Philosophical assumption

The relevance of the four philosophical paradigms to this study is reflected in Table 16 below.

Table 16 – Selection of philosophical assumption for this research project

PHILOSOPHICAL ASSUMPTIONS:	**Positivism**	**Interpretivism**	**Critical Research**	**Pragmatism**
Philosophical assumption applicable to this study				

No.	**Philosophical assumption**	**Applicability to this study**
1.	Positivism	The positivist research paradigm is considered to be not suitable for this study, as the research subject includes humans and their understanding of EA and the mapping to different types of EA projects performed in organisations, thereby falling into the social world category mentioned by Oates (2006). Lee (1991) confirms that social reality cannot be studied by applying methods that are designed to study natural science.
2.	Interpretivism	The interpretive philosophical paradigm is not considered applicable to this research study as an artefact was designed, developed, demonstrated and evaluated to create change in a real-life situation.
3.	Critical Research	The critical research philosophical paradigm is not applicable to this study. As powers that control what is perceived as EA forms part of the research subject, there is not one single objective

PHILOSOPHICAL ASSUMPTIONS:	Positivism	Interpretivism	Critical Research	Pragmatism
Philosophical assumption applicable to this study				■

No.	Philosophical assumption	Applicability to this study
		understanding of EA that can be used as control.
4.	Pragmatism	Pragmatism is the philosophical paradigm applicable to this research study, as a new artefact was designed and developed and real-world implications of the artefact were determined.

3.8 Research method

The suitability of each of the six research methods to this study is reflected in Table 17 below.

Table 17 – Selection of research method for this research project

RESEARCH METHODS:	Ethnography	Experiment	Case Study	Action Research	Survey	DSR
Research method applicable to this study						■

No.	Research method	Applicability to this study
1.	Ethnography	None of the characteristics of the ethnography research strategy apply to the research study, which developed a methodology for the selection of enterprise architects in support of EA project execution. Thus, the ethnography research strategy was not selected.

RESEARCH METHODS:	Ethnography	Experiment	Case Study	Action Research	Survey	DSR
Research method applicable to this study						

No.	Research method	Applicability to this study
2.	Experiment	This research project did not prove or disprove a hypothesis and, furthermore, none of the attributes of experiment as research method are applicable to this study. Hence, experiment research strategy was not selected.
3.	Case study	Although many of the case study characteristics can be associated with this research study, the case study research strategy does not accommodate the design and development of an artefact (the methodology to select enterprise architects for EA project execution), which is the main deliverable of this research study. Therefore, the case study research strategy was not selected.
4.	Action research	As the action research strategy is suitable when a possible solution to a problem is not known upfront, it was not selected for the research study, which developed a methodology as a possible solution to the problem of selecting enterprise architects for EA project execution.
5.	Survey	This research study collected qualitative data and did not gather data from a large population. Thus, survey research strategy was not selected.
6.	DSR	This research study developed a new artefact, namely the methodology to select enterprise architects to execute an EA project. The methodology addresses the common problem of selecting the right type of architect to deliver on a specific type of EA project. The usefulness of the

RESEARCH METHODS:	Ethnography	Experiment	Case Study	Action Research	Survey	DSR
Research method applicable to this study						■

No.	Research method	Applicability to this study
		newly developed methodology for solving the problem of selecting enterprise architects with EA views relevant to the type of EA project was implemented in retrospect at a South African organisation performing EA projects. Therefore, the DSR strategy was selected for this research study.

3.9 Data collection technique

Table 18 below depicts the data collection techniques selected for this research project.

Table 18 – Data collection techniques selected for this research project

DATA COLLECTION TECHNIQUES:	Documents	Interviews	Fieldwork
Data collection techniques applicable to this study:	■	■	

No.	Data collection technique	Applicability to this study
1.	Documents	Documents as data collection technique are applicable to this study. Journal articles and conference papers were used to develop the artefact.
2.	Interviews	Interviews are applicable to this research project. Interviews were used in the demonstration phase as well as in the design-and-develop phase where two cycles of

DATA COLLECTION TECHNIQUES:	Documents	Interviews	Fieldwork
Data collection techniques applicable to this study:			

No.	Data collection technique	Applicability to this study
		design-and-develop- demonstrate-evaluate were performed.
3.	Observation	This research study collected data during scheduled sessions with specific people at a set time and duration. Data collection did not take place while the EA project was executed; no observation of the project team was made. The observation data collection technique is therefore not applicable to this research study. Furthermore, observation is often associated with the ethnography research strategy.

3.10 Data analysis technique

The selected data analysis techniques are depicted in Table 19 below.

Table 19 – Selection of data analysis techniques for this research project

DATA ANALYSIS TECHNIQUES:	Semiotics	Hermeneutics	Narrative Analysis	Thematic Analysis
Data analysis techniques applicable to this study:				

No.	Data analysis technique	Applicability to this study
1.	Semiotics	Semiotics was not considered to be a suitable data analysis technique for this research study as meaning and interpretation of views and understanding of participants are not supported.

DATA ANALYSIS TECHNIQUES:	Semiotics	Hermeneutics	Narrative Analysis	Thematic Analysis
Data analysis techniques applicable to this study:				

No.	Data analysis technique	Applicability to this study
2.	Hermeneutics	Hermeneutics is applicable to this research study. It was applied in the literature review where data collection and analysis are performed in parallel to determine the initial list of EA project types, EA project measurement criteria and EA profiles.
3.	Narrative Analysis	Narrative analysis is not applicable to this study as the data were not collected in narrative form and the reflection of analysis results was also not in such format.
4.	Thematic Analysis	Deductive thematic analysis is considered applicable to this research study as analysis and theme identification were done to answer a specific research question and previous research regarding the topic was taken in consideration. First, EA project type and EA project measurement criteria data collected through hermeneutic literature review were analysed through deductive thematic analysis, delivering *a priory* themes. Interview results of semi-structured interviews were analysed by applying deductive thematic analysis. *A posteriori* themes were added. Data from the following semi-structure interviews were analysed: • with EA experts regarding EA project types; • with EA project managers regarding EA project measurement criteria; and • with EA project managers regarding retrospective implementation of the methodology for the selection of enterprise architects for EA project execution.

DATA ANALYSIS TECHNIQUES:	Semiotics	Hermeneutics	Narrative Analysis	Thematic Analysis
Data analysis techniques applicable to this study:				

No.	Data analysis technique	Applicability to this study
		Thematic analysis, as described by Swain (2018), guided the thematic analysis performed in this research study.

3.11 Written record

The selection of the written record format for this research study is reflected in Table 20 below.

Table 20 – Selection of written record format for this research project

WRITTEN RECORD:	Dissertation/Thesis	Report	Book	Conference Paper	Journal article	Blog	Website	Newspaper article	Magazine article
Written record format applicable to this study:									

No.	Written record format	Applicability to this study
1.	Dissertation/Thesis	Dissertation/thesis written record format is applicable to this research project as it was performed in partial fulfilment of the degree PhD Information Systems.
2.	Report	Report could be considered as applicable to this research project as the research results were reported. However, as this is an academic

WRITTEN RECORD:	Dissertation/Thesis	Report	Book	Conference Paper	Journal article	Blog	Website	Newspaper article	Magazine article
Written record format applicable to this study:									

No.	Written record format	Applicability to this study
		study, the dissertation/thesis format was selected.
3.	Book	Book format is not applicable.
4.	Conference paper	Although the final written record of this research project is in dissertation/thesis format, a conference paper was compiled which reflects portions of the research results in partial fulfilment of the degree PhD Information Systems.
5.	Journal article	Journal article may be applicable, as a conference paper was compiled.
6.	Blog	Blog is not applicable to this academic research work.
7.	Website	Website is not applicable to this academic research work.
8.	Newspaper article	Newspaper article is not applicable to this academic research work.
9.	Magazine article	Magazine article is not applicable to this academic research work.

3.12 Design science research cycles

DSR is characterised by three research cycles, namely "Relevance Cycle", "Design Cycle" and "Rigour Cycle". The quality of a DSR project is enhanced when all three cycles are included and easily recognisable (Hevner, 2007). Figure 25 below depicts the three DSR research cycles.

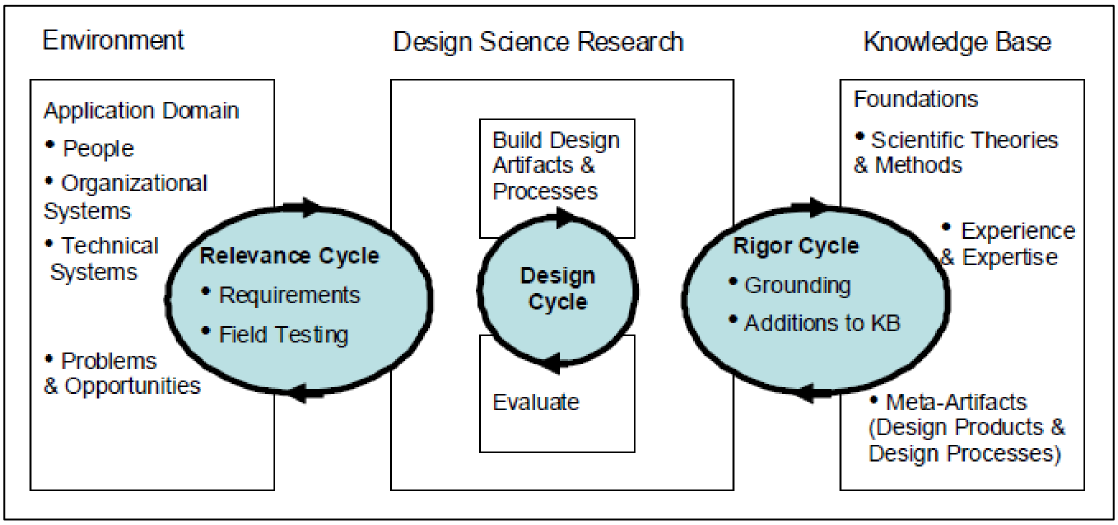

Figure 25 – Three cycles in DSR (Hevner, 2007)

DSR starts with the "relevance cycle" which entails the requirement for the research study and the criteria to be used for determining how the designed artefact impacts on the environment. The "relevance cycle" is repeated if testing of the artefact identifies enhancements or refinements to the designed artefact. The "relevance cycle" may further be repeated, with a new requirement statement, if test results show that the original requirements for the DSR were not formulated correctly to address the identified research problem (Hevner, 2007).

The purpose of the "rigour cycle" is to ensure that the DSR adds new knowledge to the research field's knowledge base. A way to ensure this is to reflect the previous knowledge in the research field to ensure and to indicate the contributions (Hevner, 2007).

The “design cycle” is the core of a DSR project. This cycle entails several iterations of design and development of the artefact, testing and improving or refining of the artefact. The “design cycle” interacts with the other two cycles by receiving the requirement from the “relevance cycle” and the methodologies for design and evaluation of the artefact are taken from the “rigour cycle”. However, while the “design cycle” is executed, there is little interaction with the “relevance cycle” and the “rigour cycle” (Hevner, 2007).

3.13 Research design process guiding design of this research project

Several process models to perform DSR exist (Gregor & Hevner, 2013; Vaishnavi *et al*., 2019). However, Gregor and Hevner (2013) based their DSR on the DSR process (DSRP) of Peffers, Tuunanen, Rothenberger and Chatterjee (2008) because they state that the Peffers *et al*. (2008) DSRP is a practical process consolidated from and based on other approaches to DSR. Furthermore, Vaishnavi *et al*. (2019) also emphasise the Peffers *et al*. (2008) DSRP as a model that synthesises other DSRP models and they state that it is recognised for its property of allowing entry into the DSRP from various points of view. The Peffers *et al*. (2008) DSRP was specifically developed for IS research (Peffers et al., 2008). For these reasons, this research study followed the Peffers *et al*. (2008) DSRP.

The DSRP consists of six steps, namely identify and motivate the problem, set objectives of the solution, design and develop the artefact, use the artefact to solve the problem, evaluate effectiveness of the artefact and communicate the results. Figure 26 below depicts the Peffers *et al*. (2008) DSRP.

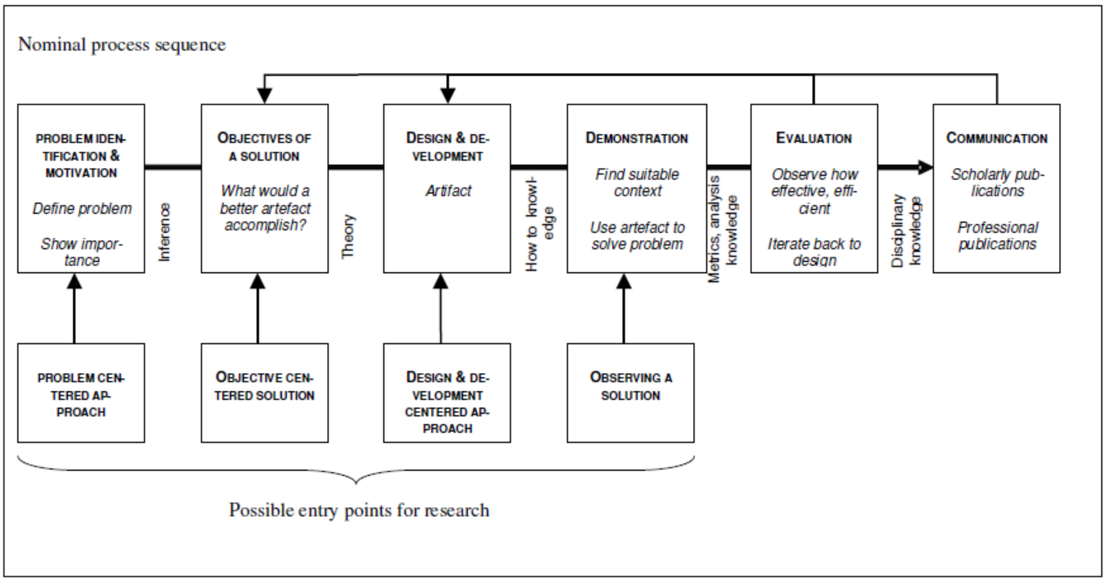

Figure 26 – Peffers *et al*. (2008) DSRP

Step 1: Explain the research problem and provide the reason why a solution to the problem will be valuable. By describing the value of a solution to the problem, the problem is better understood (Peffers, Tuunanen, Rothenberger & Chatterjee, 2007).

Step 2: Use the problem definition to determine the objectives of a solution to the problem. Another factor that influences the selection of solution objectives is the understanding of what is realistically achievable (Peffers *et al*., 2007).

Step 3: Design and develop the artefact. Methodologies and models are examples of such artefacts. During this step, the preferred functionality of the artefact is determined, designed and developed. Knowledge of relevant theories will aid in the development of the artefact (Peffers *et al.*, 2007).

Step 4: Use the artefact to solve at least one instance of the problem. This can be done through experiments, implementations, case studies, proofs of concept or simulations (Peffers *et al*., 2007).

Step 5: Evaluate how well the artefact provides a solution to the problem. A feedback loop from Step 5, evaluate, to Step 3, design and develop, is followed to refine the artefact (Peffers *et al*., 2007).

Step 6: In this step, the research process and results are communicated. It includes the research problem, its significance, the artefact, its usefulness and how it was designed. The preferred objectives of a solution, defined in Step 2, can be compared to the results recorded when the artefact is used in the demonstration (Peffers *et al*., 2007).

3.14 Evaluation in DSR

Another factor that influenced the research design is the importance of evaluation in DSR. Evaluation generates input for improvement of the designed artefact or to initiate development of new artefacts. It further enhances the thoroughness of the research project (Venable *et al*., 2016).

Evaluation in DSR is twofold, namely to test relevance and to test rigour as per the three cycles of DSR model (Hevner, 2007), depicted in Figure 26 above. First, relevance is tested by determining if it adds value to the environment; that is, does application of the new artefact have an impact on the environment? Secondly, rigour is tested by determining if a contribution to the knowledge base is made via the design and development of the new artefact (Venable *et al*., 2016).

Evaluation is often jointly executed within the design-and-develop phase in the DSR process. As DSR is performed in an iterative manner, several evaluation episodes may be required at different phases in the DSR project (Venable *et al*., 2016).

To enhance research precision of this research project, the Framework for Evaluation in Design Science (FEDS), provided by Venable, Pries-Heje and Baskerville (2016) (Figure 27), was used as guide for evaluations.

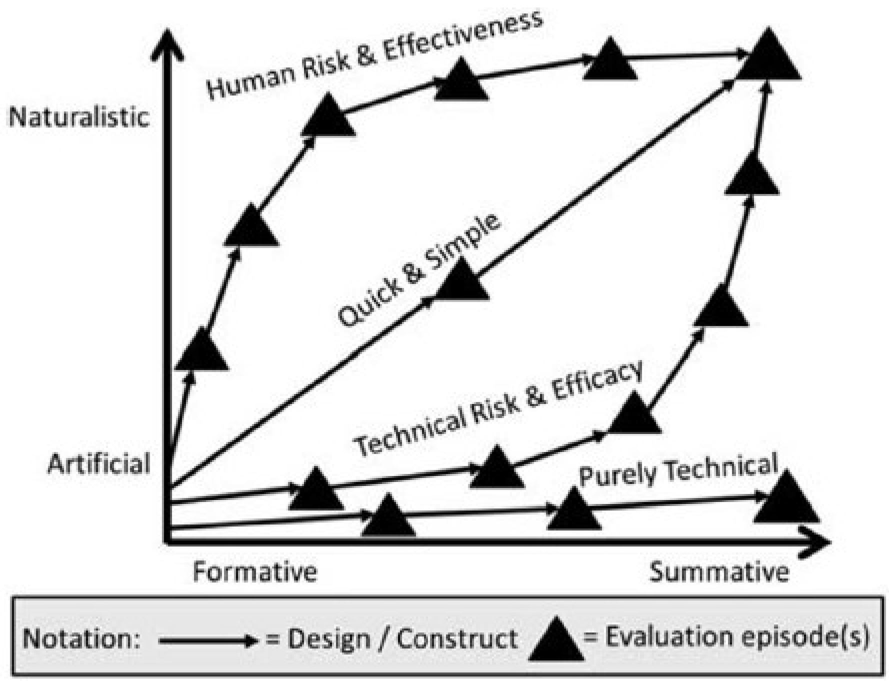

Figure 27 – FEDS (Venable *et al.*, 2016)

At the core of FEDS are two dimensions for determining the evaluation strategy. The first dimension is the reason why evaluation is done and is depicted on the x-axis of the diagram in Figure 27 above. According to FEDS, the reasons for evaluation can be "formative", "summative" or at any stage as a combination of two values. Table 21 below reflects the attributes of the two evaluation reason categories.

Table 21 – FEDS categories for evaluation reasons

No.	Reason category	Attributes
1.	Formative	• Evaluation is performed to aid in improvement of the effect that the artefact under evaluation has on the environments.
		• Evaluation sets the base for effective action.
		• "Meanings are validated by their consequences" (Wiliam & Black, 1996:544).
2.	Summative	• Evaluation is performed to assess to what degree expectations have been realised.
		• Interpretation of meanings is consistent.

No.	Reason category	Attributes
		• “Consequences are validated by their meaning” (Wiliam & Black, 1996:544).

The second dimension is the practical paradigm of the evaluation. FEDS provides two practical paradigms to select from, namely artificial and naturalistic, reflected on the y-axis of the diagram in Figure 27 above. The way that evaluation is done determines the practical paradigm. Artificial evaluation is performed as experiments in laboratories, mock-ups or through academic arguments. Naturalistic evaluation involves implementing the designed artefact in a real-life scenario (Venable *et al*., 2016).

FEDS provides four evaluation strategies and the selection criteria to decide on an applicable evaluation strategy. These four strategies are depicted in Figure 27 above and are “human and risk effectiveness”, “quick and simple”, “technical risk and efficacy” and “purely technical”. The evaluation strategies start at the artificial and formative side of the FEDS and evolve to end with a more naturalistic and summative assessment as final evaluation of the DSR artefact. The triangles on each evaluation strategy line in Figure 27 above indicate evaluation incidents. However, the number of triangles and the position of the triangles are for illustration purposes only (Venable *et al*., 2016). The FEDS criteria used to decide which evaluation strategy was applicable are provided in Table 22 below.

Table 22 – Criteria for selection of FEDS evaluation strategy (Venable *et al*., 2016)

No.	Evaluation strategy	Selection criteria
1.	Human and risk Effectiveness	• Main risk is human oriented.
		• Evaluation in a real-life situation can be afforded.
		• If it is required that the designed artefact continues to add value in real-life circumstances.
		• Purpose of the designed artefact is to resolve a problem.

No.	Evaluation strategy	Selection criteria
2.	Quick and simple	• The design action is small and straightforward.
		• The risk is low.
3.	Technical risk and efficacy	• If it cannot be afforded to evaluate in a real-life environment, but the design action is not small and straightforward.
4.	Purely Technical	• If the designed artefact is developed to address a pure technical problem without affecting humans.
		• If the use of the artefact is foreseen to be far in the future.

3.15 Application of the DSRP and FEDS

It is not necessary to follow the DSRP of Peffers *et al*. (2006) sequentially from step 1 through to step 6. As depicted in Figure 26 above, the process can be started at any step, from step 1 to step 4. Note that although the entry point into the process is flexible, all six steps must be executed. If the research stems from proposed future research of a previous project, or when the problem was observed, the entry point would be step 1. If an industry need is identified and it can be satisfied through the development of an artefact, the entry point would be step 2. Step 3 will be the starting point if the research is about an existing artefact that has been used to solve another problem, even in a different domain. Step four is the entry point if a solution that addresses the problem is observed and the design process is retroactively applied (Peffers *et al*., 2007).

As this study found a solution to the problem of selecting enterprise architects in support of EA project execution, the DSRP was entered from the problem-centred entry point and executed sequentially from step 1 to step 6, with feedback loops from step 5 (evaluation) to step 3 (design and develop) and from step 6 (communicate) to step 2 (objectives of artefact).

The human and risk effectiveness evaluation strategy as per FEDS (Venable *et al*., 2016) was selected for this research project. This implies that there were three evaluation episodes, as depicted in Figure 28 below.

The first two evaluation episodes were in the artificial paradigm and formative of nature. These evaluation episodes happened during the design and development phase of the methodology for the selection of enterprise architects in support of EA project execution. Evaluation of the EA project types and the measurement criteria for the evaluation of the methodology for the selection of enterprise architects was done. It entailed demonstration via interviews with EA experts and evaluation through analysis of the interview responses.

The third evaluation episode was naturalistic and summative of nature. This entailed the evaluation of the methodology itself, by implementing it in retrospect in an EA project, interviews with the EA project managers and finally the analysis of the interview responses.

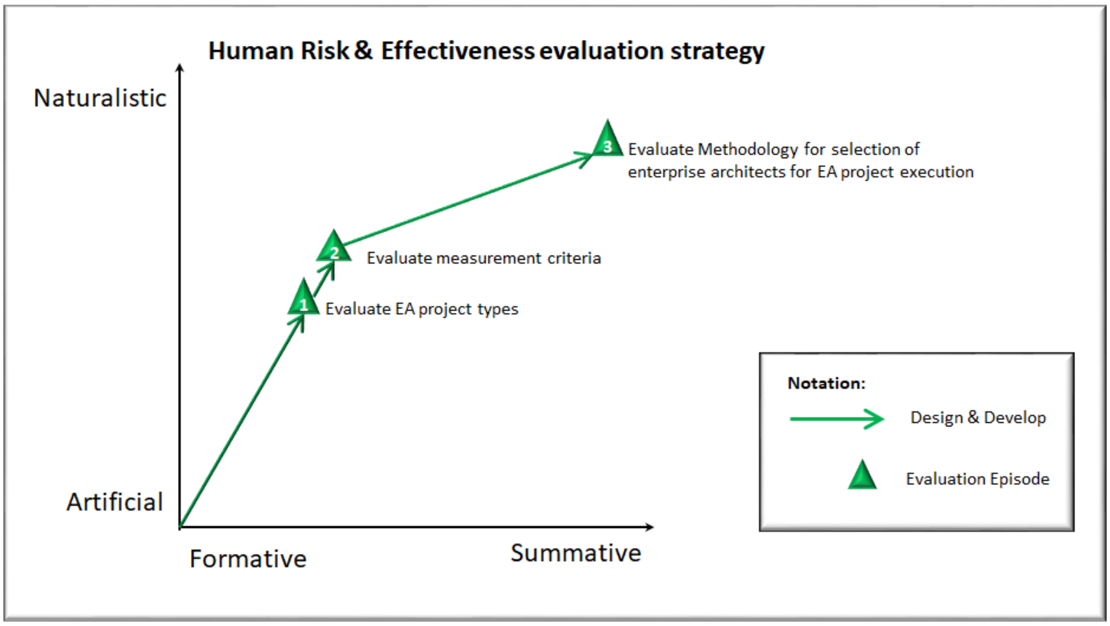

Figure 28 – Evaluation episodes derived from FEDS (Venable *et al.*, 2016)

Figure 29 below indicates the application of the DSRP of Peffers *et al.* (2006) with evaluation episodes as per the human risk and effectiveness FEDS evaluation strategy.

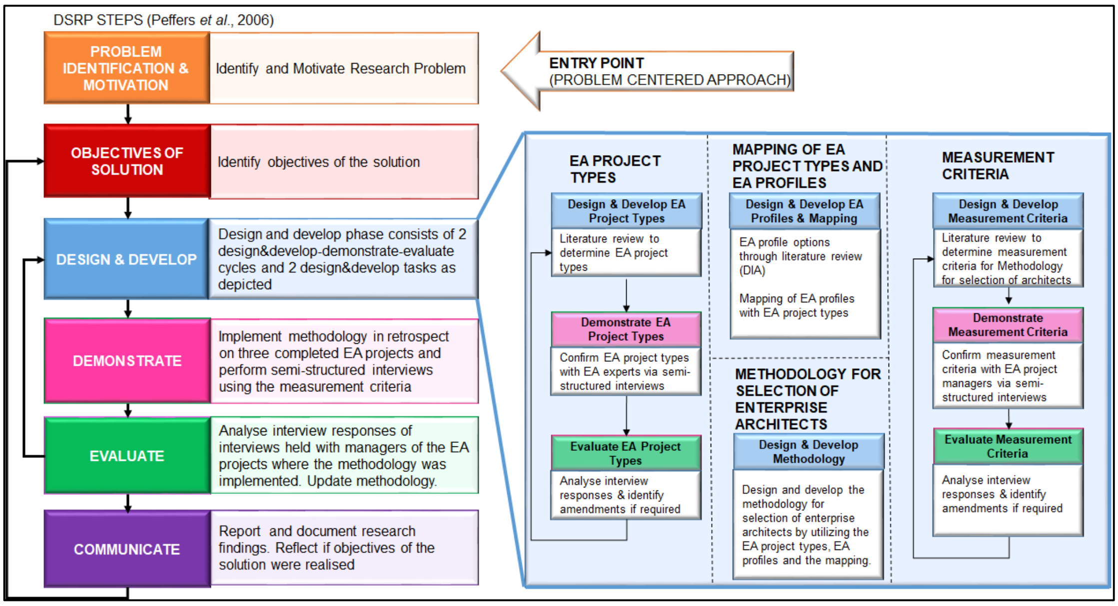

Figure 29 – Peffers *et al.* (2006) DSRP applied in this research project

Each step of the DSRP by Peffers *et al*. (2006) as applied in this research project is described below (figures 30, 31, 32, 39, 40 and 41) on the basis of components reflected in Figure 29 above.

3.15.1 Step 1: Problem identification and motivation

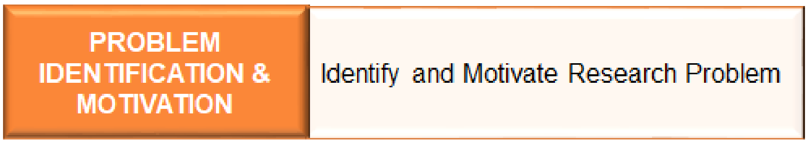

Figure 30 – Step 1: Problem identification and motivation

Problem identification and motivation are addressed in Chapter 1. The problem was identified and motivated by results of a literature review on EA. The argument for the research problem is that many interpretations of EA exist (Lapalme, 2012; Mentz *et al*., 2012; Du Preez *et al*., 2014; Kaddoumi & Watfa, 2016; Saint-Louis & Lapalme, 2016). Enterprise architects therefore have different understandings of EA (Lapalme, 2012; Du Preez, 2016) and different approaches to EA project execution, which leads to misunderstandings and arguments (Iyamu, 2013). Due to arguments and misunderstandings, enterprise architects find it challenging to work together (Saint-Louis & Lapalme, 2016). Iyamu (2013) states that organisations must find ways to overcome the problem of different understandings that architects have of EA, but he does not provide any solutions. Further to this, there are different types of EA work or projects for which specific knowledge and skills are required (Korhonen & Poutanen, 2013). Although Korhonen and Poutanen (2013) acknowledge that there are different types of EA projects that require different approaches and EA knowledge, they do not provide a mechanism to determine the different types of EA projects with related EA understanding required per EA project type. The emphasis is thus on the selection of enterprise architects suitable for the type of EA project and to ensure that architects understand each other to avoid unnecessary arguments. The understanding that an architect has of EA needs to be mapped to the type of EA project. Du Preez (2016) partially addresses this problem by developing an instrument to determine an architect's understanding of EA or the architect's EA profile. He does not address different types of EA projects and mapping of relevant EA profiles per EA project type. Therefore, this research determined how enterprise architects can be selected in support of EA project execution.

The reasoning for the importance to find a solution to the identified research problem stems from the acknowledgement of EA as a discipline of note (Gampfer *et al*., 2018), the time (Gartner in Burke & Blosch, 2015) and money (Bernard, 2012) that organisations invest in EA (Perez-Castillo, Ruiz-Ggonzalez, *et al*., 2019), and the important role that EA plays in IS and organisations (Microsoft, 2002; Fasanghari *et al*., 2015; Saint-Louis *et al*., 2017). The existence of several professional organisations like ZIFA, The Open Group and GEAO emphasises the significance of EA. Furthermore, there are government initiatives such as MODAF, DoDAF and FEAF (Tamm *et al*., 2011) which stress the role of EA in the public sector. The view on EA of an enterprise architect dictates how EA is executed (Shaanika & Iyamu, 2014); thus, the human aspect of EA is critical for effective EA execution (Shanks *et al*., 2018). It is therefore crucial to select enterprise architects with EA profiles relevant to the EA project type to ensure expected results, optimum time usage and to prevent fruitless expenditure.

3.15.2 Step 2: Objectives of the solution

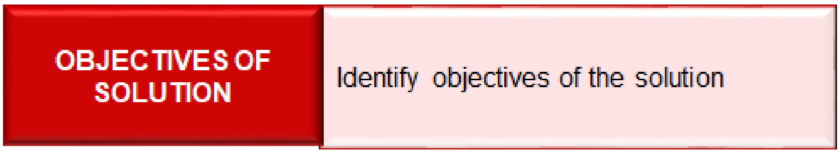

Figure 31 – Step 2: Objectives of the solution

The main objective of the research study and thus also for the solution to the research problem was handled in Chapters 1 and 2. The main objective of the solution was to provide a method for the selection of enterprise architects in support of EA project execution. Sub-objectives were identified in support of the main objective. Sub-objectives of the research study that translate to objectives of the solution are to:

- Deliver an EA project type classification framework;
- Describe the different ways that enterprise architects interpret EA; and
- Provide a mapping of the different ways that enterprise architects see EA to EA project types as defined in the EA project type classification framework.

3.15.3 Step 3: Design and develop

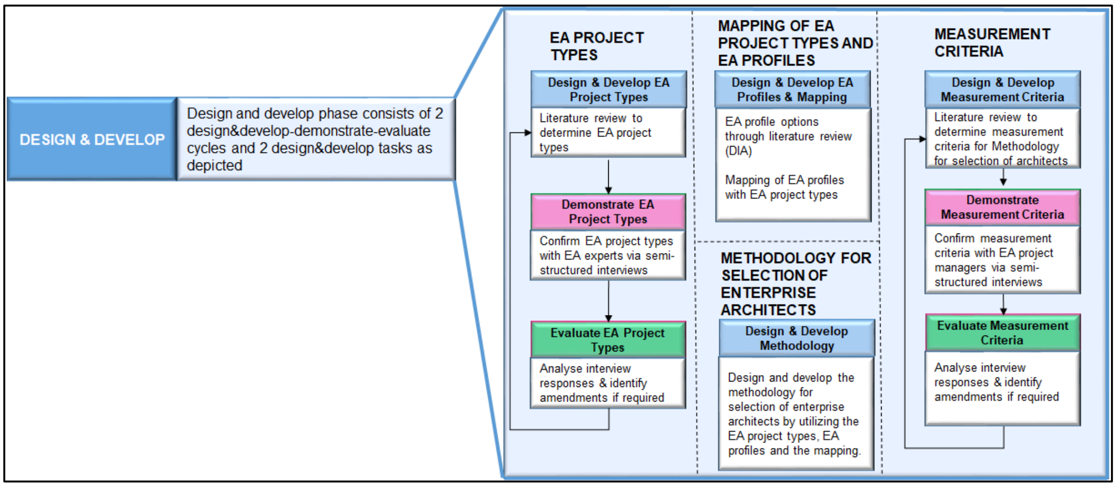

Figure 32 – Step 3: Design and develop

In order to design the methodology for the selection of enterprise architects in support of EA project execution, the following research questions had to be answered:

- What are the different EA project types?
- What are the different ways that enterprise architects perceive EA?

- What understanding of EA is required per EA project type?
- What are the measurement criteria to evaluate the methodology for selection of enterprise architects in support of EA project execution?

3.15.3.1 Determine different EA project types

To determine the different EA project types, a design-and-develop-demonstrate-evaluate cycle, with feedback loop, to update the EA project type classification framework was performed as depicted in Figure 33 below.

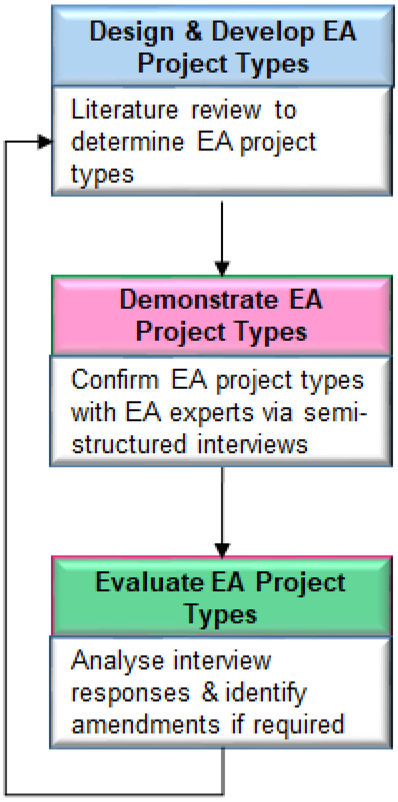

Figure 33 – EA project type design-and-develop-demonstrate-evaluate cycle

Data for the design and develop of EA project types were collected through documents and interviews.

Documents involved were journal articles, conference papers and books. Data from the documents were obtained through literature review. The literature review followed a hermeneutic approach, which implied that data collection and data analysis were performed simultaneously. Comprehension of literature was progressively enlightened through previous understanding of other literature, without being restricted by research protocols and formal approaches with specific rules in terms of articles that may and may not be included in the study

(Boell & Cecez-Kecmanovic, 2014). The framework for hermeneutic literature review developed by Boell and Cecez-Kecmanovic (2014) was applied. This framework prescribes two interlinked cycles, namely "analysis and interpretation" as the broader cycle and "search and acquisition" as the internal cycle. Each cycle consisted of specific phases that were performed iteratively, which resulted in gradual better understanding of the literature. With each iteration through the hermeneutic circle, understanding of the topic was improved. Numerous iterations were done until the researcher reached the point where a thorough recording of the literature was compiled. The hermeneutic framework is depicted in Figure 34 below. The literature review started with a primary topic, following the first iteration through the inner circle of searching, sorting, selecting, acquiring and reading. This was followed by the mapping and classifying, critical assessment and argument development phases of the first iteration through the outer circle. The inner circle continued when new literature was identified and search criteria refined through reading, whereafter the next iteration through the inner circle started, and the next iteration was done through the outer circle.

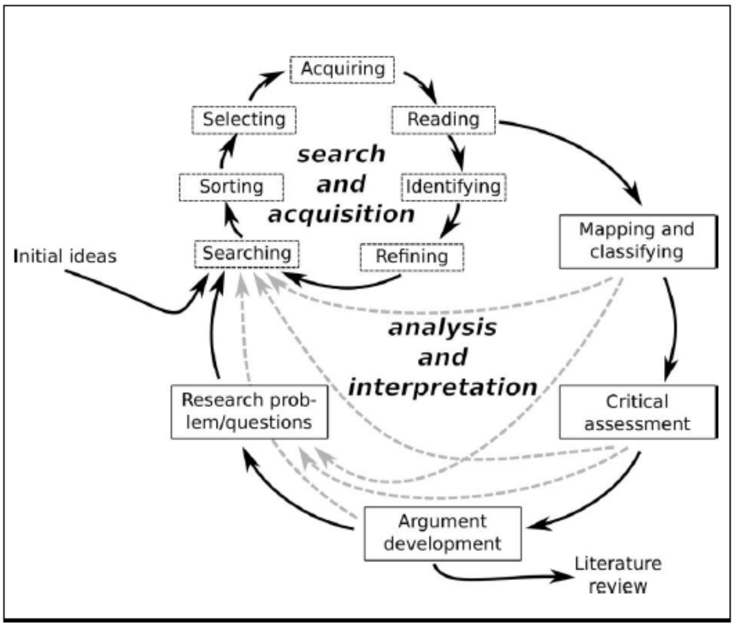

Figure 34 – Hermeneutics framework (Boell & Cecez-Kecmanovic, 2014)

Data collection through interviews was in the form of semi-structured interview as it provided enough structure for consistency across interviews and also enough freedom to prompt new insights and improvisation. Semi-structured interviews were conducted with 12 EA experts to gather data for evaluation of the EA project types, which were compiled through hermeneutic literature review. There is no ideal number of interviews to be conducted (Myers, 2013). The number of interviews is less important than the experience and expertise of the EA experts. EA experts had at least 5 years' EA experience. The online networking platform LinkedIn was searched to identify people who work as enterprise architects. These people were asked via LinkedIn if they were willing to participate in the research study.

Interviewees have performed EA projects in a large variety of industries, including banking, mining, public sector, telecoms manufacturing, insurance and retail. Interviewee experience in terms of architect roles includes roles such as enterprise architect, data architect, EA manager, business architect, application architect, EA lead and principal architect. The interview questions are given in section A.1 in Appendix A.

Evaluation of the EA project types was done through thematic analysis of the literature review data and the interview results. Continuous comparison of results was done to determine themes that provided good explanation and interpretation of the interview results. Thematic analysis as adapted from Swain (2018) was applied.

Analysis results were reflected in a combination of text, tables and charts such as pie charts and bar charts.

The collected data per EA project type and interviewee were reflected in a matrix indicating information as shown below.

- Interviewee agrees it is an EA project type and interviewee has worked on such a project;
- Interviewee agrees it is an EA project type, but interviewee has not worked on such a project; and
- Interviewee disagrees – it is not an EA project type.

Data collected that reflected addition and elimination of EA project types by interviewees were presented in a combination of text, lists and figures.

Analysis results were also reflected in a combination of text, lists, tables and figures reflecting:

- Identified themes;
- Refinement and optimisation of EA project types;
- Optimisation of EA project type categories; and
- Confirmation of interweaving of EA project types.

Deductions were made based on the response. For example, more experienced architects' responses versus less experienced and responses were considered in context of the architect's EA experience. Removal of EA project types depended on the reasons for removing provided by the interviewee. Adding of EA project types depended on the reasons for adding provided by the interviewee.

Once the list of EA project types had been determined through the design-and-develop-demonstrate-evaluate cycle, the EA project type classification framework was compiled. The EA project type classification framework was compiled through deductive reasoning, utilising the list of EA project types. The EA project type classification framework is discussed in section 4.6.

Figure 35 below depicts the development of the EA project type classification framework through a design-and-develop-demonstrate-evaluate cycle of the DSRP. The design-develop phase delivered an initial list of 20 EA project types. The demonstrate phase involved semi-structured interviews with EA experts. The evaluate phase entailed analysis and interpretation of interview results. A feedback loop from the evaluation phase to the design-and-develop phase delivered a refined list of EA project types and the EA project type classification framework.

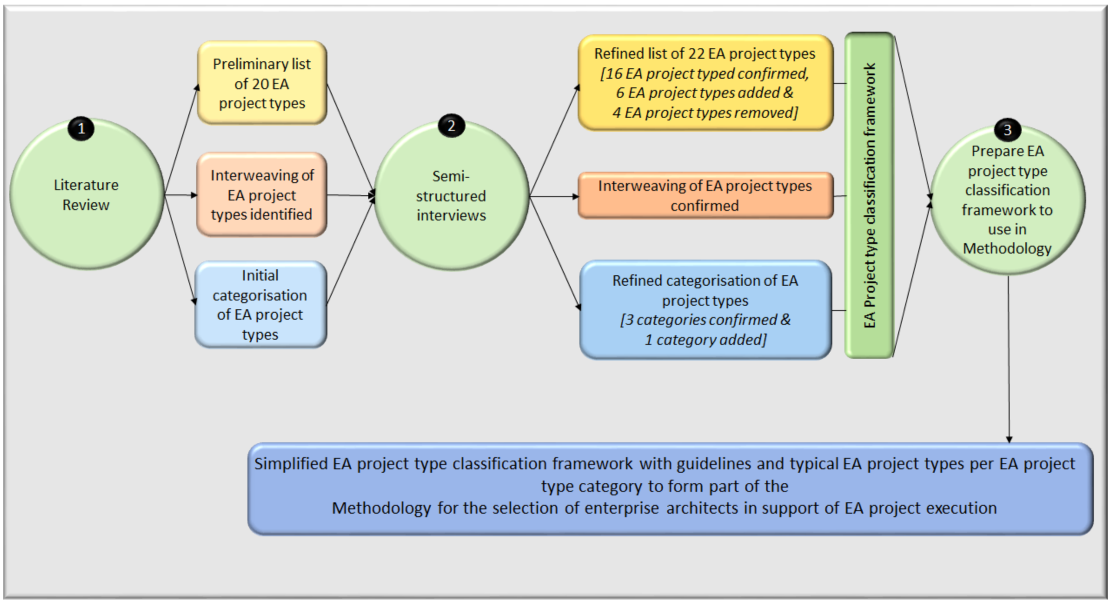

Figure 35 – Development of EA project type classification framework

3.15.3.2 Determine different views on EA and map it to EA project types

EA profiles and the mapping between EA profiles and EA project type categories were done by performing the design and develop phase for each as depicted in Figure 36 below.

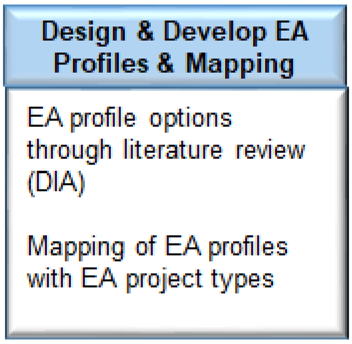

Figure 36 – Design and develop – EA profiles and mapping to EA project type category

The DIA developed by Du Preez (2016) was identified through literature review as an instrument that provides and determines the different understandings of EA. The EA profile classification framework was derived from the DIA (see section 5). A mapping of EA project types and EA profiles was performed by comparing EA profiles and EA project types. The mapping is provided in section 6.

3.15.3.3 Methodology for the selection of enterprise architects for EA project execution

The methodology for selection of enterprise architects consists of the EA project type classification framework and EA profile classification framework and a mapping between the two frameworks. Figure 37 below depicts the components of the methodology for the selection of enterprise architects in support of EA project execution. The methodology for the selection of enterprise architects in support of EA project execution is provided in section 8.

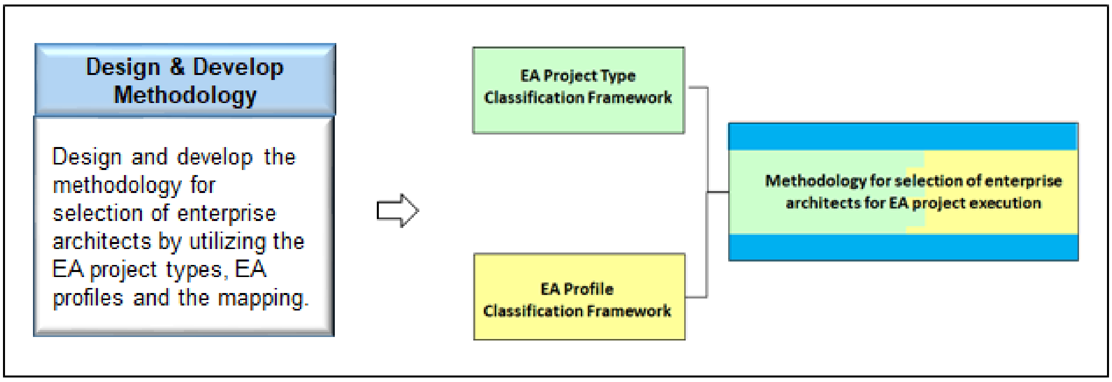

Figure 37 – Design and develop –methodology for selection of enterprise architects in support of EA project execution

3.15.3.4 Measurement criteria

To create measurement criteria for the effectiveness of the methodology for the selection of enterprise architects in support of EA project execution, another design-and-develop-demonstrate-evaluate cycle with feedback loop was performed, as depicted in Figure 38 below. The same data collection techniques, namely hermeneutic literature review and semi-structured interviews, were applied as in the design-and-develop-demonstrate-evaluate cycle that produced EA project types and its categorisation.

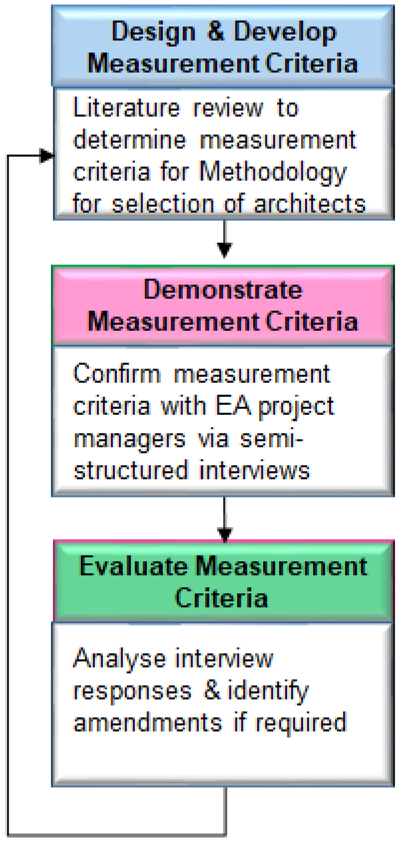

Figure 38 – Design-and-develop-demonstrate-evaluate cycle for measurement criteria

The result of this cycle was measurement criteria that were applied in the evaluation phase of the methodology for selection of enterprise architects. Semi-structured interviews with managers of three EA projects that have been completed successfully were used to confirm the measurement criteria. Interviewee experience in terms of roles includes roles such as EA project manager, EA project architect, functional manager, business architect and business developer.

The methodology for the selection of enterprise architects as well as the rationale for determining the measurement criteria was explained to the interviewees. The interviewees' opinions regarding the applicability of the measurement criteria were obtained during semi-structured interviews.

Evaluation of measurement criteria was performed through analysis of the interview results. The same data analysis technique, namely thematic analysis, that was used in the design-and-develop-demonstrate-evaluate cycle that delivered EA project types was applied. Although provision for a feedback loop from the evaluation phase to the design and develop phase was made, evaluation results showed that no refinement of the measurement criteria was required. The measurement criteria are provided in section 7.

3.15.4 Step 4: Demonstrate

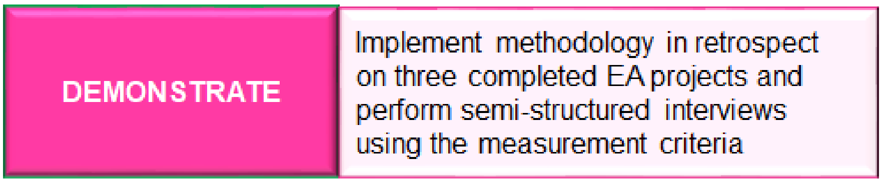

Figure 39 – Step 4: Demonstrate

The methodology for the selection of enterprise architects in support of EA project execution was demonstrated by implementing it in retrospect on three successfully completed EA projects performed by a South African organisation that delivers EA services, among other services. Interviews based on the measurement criteria were held with the project managers of the respective EA projects. The interview results, the EA profiles of architects employed in the EA projects and the types of the projects were used as data for the evaluation phase. Collection of data was guided by the interview questions provided in Appendix A, section A.3.

3.15.5 Step 5: Evaluate

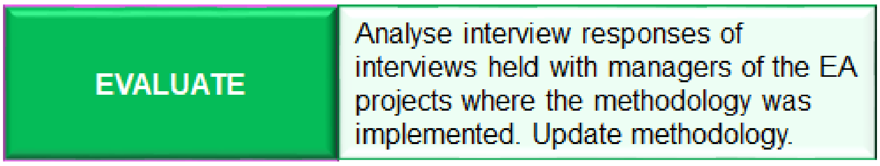

Figure 40 – Step 5: Evaluate

The methodology for the selection of enterprise architects in support of EA project execution was evaluated by interpreting the results of the interviews with the project managers of the three EA projects. The EA profiles of the enterprise architects employed on the EA projects and the categorisation of the EA projects were included in the interpretation of interview results.

Evaluation of the methodology reflected that EA projects performed by architects with EA profiles that matched the EA project type were effective in terms of the measurement criteria. Evaluation results were used in a feedback loop to the design-and-develop phase to refine the methodology for the selection of enterprise architects in support of EA project execution.

3.15.6 Step 6: Communicate

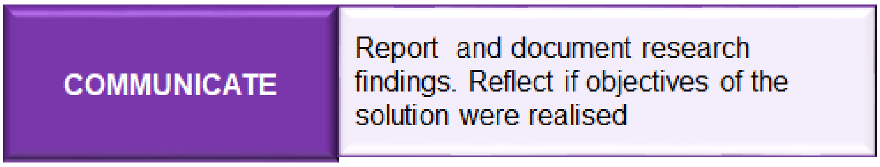

Figure 41 – Step 6: Communicate

The complete dissertation document, built throughout the research project, is seen as the communication of the research study. Specific focus of step 6 is on reporting research findings and, if the objectives of the solution are realised, provided in Chapter 9 of the thesis.

3.16 Data collection, data analysis and deliverables per research question

Table 23 below provides a summary of the data collection, data analysis methods and deliverables per sub-research question.

Table 23 – Summary of data collection and analysis and deliverable per sub-research question

No.	Sub-research question	Chapter	Data collection	Data analysis	Deliverable
1.	What are the different EA project types?	4	Hermeneutic literature review Semi-structured interviews with EA experts	Thematic analysis of interview results Thematic analysis in parallel with hermeneutic literature review	List of EA project types and EA project type categories resulting in EA project type classification framework
2.	What are the different EA profiles?	5	Literature review – DIA	Thematic analysis	EA Profile Classification Framework

No.	Sub-research question	Chapter	Data collection	Data analysis	Deliverable
3.	What EA profiles are required to execute different EA project types?	6 & 8	Semi-structured interviews with EA project managers that implemented the methodology in retrospect	Thematic analysis of interview results	Mapping of EA profiles per EA project type category
4.	What are the measurement criteria to evaluate the methodology for selection of enterprise architects for EA project execution?	7	Hermeneutic literature review Semi-structured interviews with EA project managers that implemented the methodology in retrospect	Thematic analysis of literature and interview results	Criteria for evaluation of the methodology for the selection of enterprise architects in support of EA project execution
No.	**Main research question**	**Chapter**	**Data collection**	**Data analysis**	**Deliverable**
5.	How can enterprise architects be selected in support of EA project execution?	8	Retrospective implementation of methodology for the selection of enterprise architects for EA project execution on successfully completed EA projects Semi-structured interviews with EA project managers based on measurement criteria developed	Thematic analysis of interview results	Refined methodology for the selection of enterprise architects in support of EA project execution

No.	Sub-research question	Chapter	Data collection	Data analysis	Deliverable
			to evaluate the methodology		

3.17 Ethics

The University of Pretoria's Code of Ethics for Scholarly Activities and the Policy and Procedures for Responsible Research are applicable to this research study and were adhered to. The Faculty of Engineering, Built Environment and Information Technology Committee for Research Ethics and Integrity granted approval for this study in May 2018 before data collection had commenced. Ethical implications addressed during the study are:

- The participating organisation where the methodology for the selection of enterprise architects for EA project execution was demonstrated and evaluated granted executive approval for the participation in the research study;
- All individuals that participated in the research study signed an informed consent form as proof that they were willing to voluntary participate in the research study;
- Personal and organisational details were removed from transcribed interviews; and
- Data accuracy and objective data analysis were conscientiously considered throughout the research study.

Ethical clearance documents are provided in Appendix B.

3.18 Written record

Write-up of qualitative research is considered as the most important stage of the research study as only through the written record, and presentations of it at seminars, can other people learn about the research work. As this research study was performed in partial fulfilment of the requirements for the degree Philosophiae Doctor (Information Systems) at the University of Pretoria, the guidelines of the relevant faculty, namely Faculty of Engineering, Built and Information Technology (EBIT), were followed in producing the written record.

One research paper regarding this study was presented at the 5th International Conference on Digital Economy as reflected in Annex C of this thesis.

3.19 Conclusion

This chapter provides the research methodology applicable to the research study that delivered a methodology for the selection of enterprise architects in support of EA project execution. To summarise and to reflect the completeness of the research process, alignment with the Myers (2013) qualitative research design model is reflected in Figure 42 below.

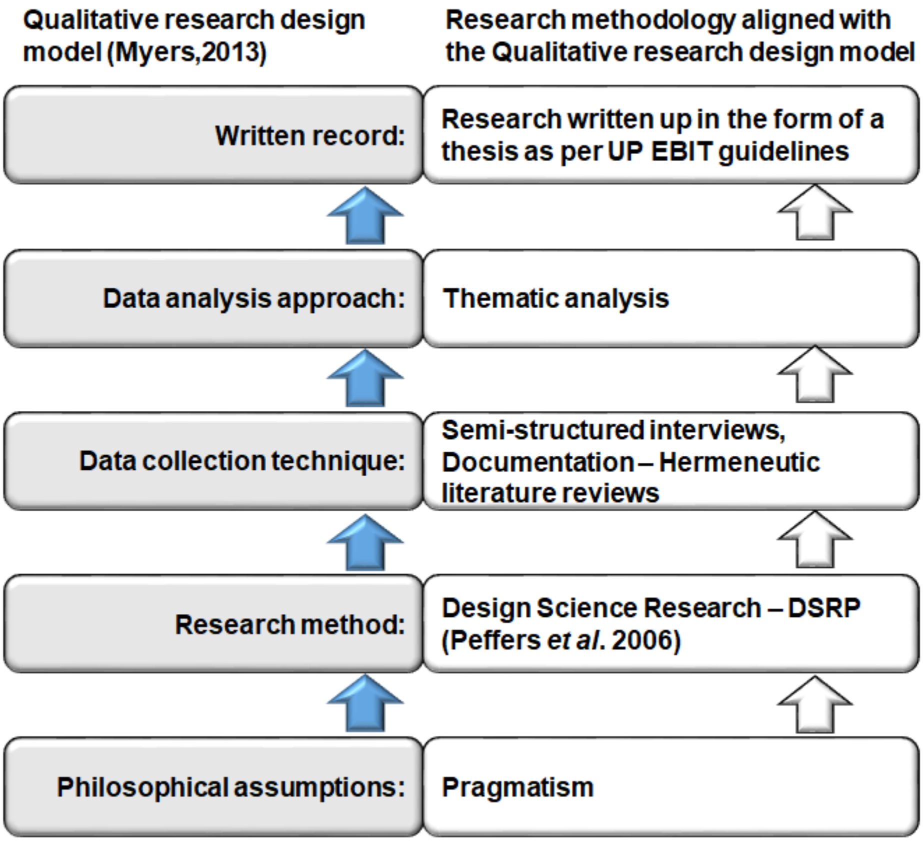

Figure 42 – Research method aligned with qualitative research design model (Myers, 2013)

4. EA project types

Figure 43 below shows the position of Chapter 4 in relation to the rest of the thesis.

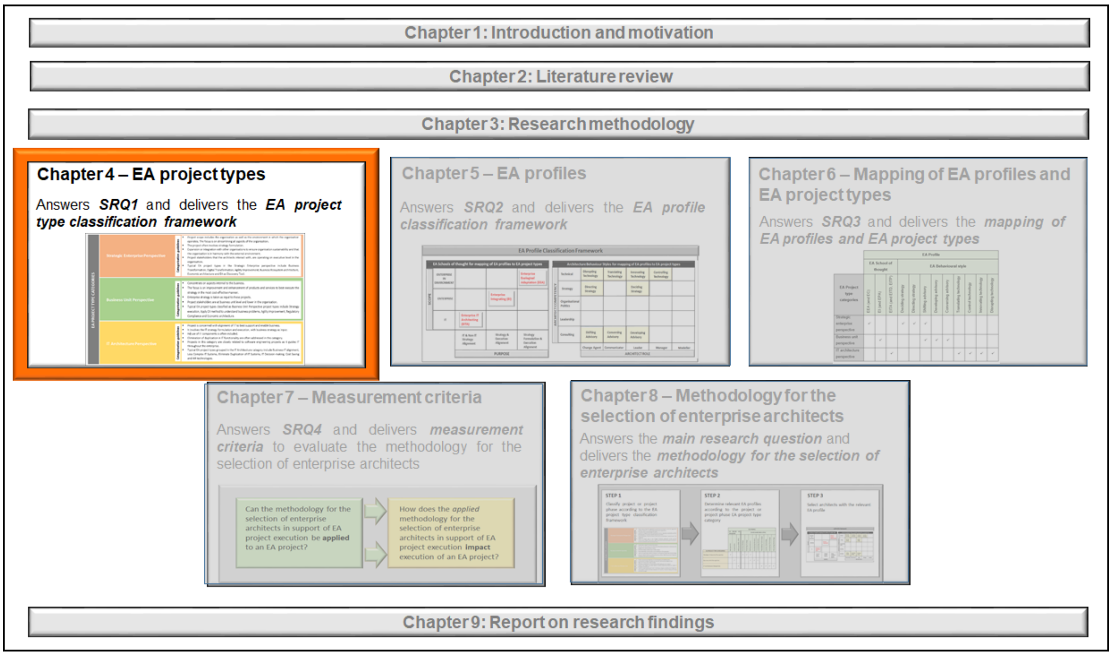

Figure 43 – Position of Chapter 4 in relation to the rest of the thesis

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Chapter 4 layout:

4.1 Introduction

4.2 Method to determine project types

4.3 EA project types

4.4 Semi-structured interview response

4.5 Analysis of interviewee response

4.6 EA project type classification framework

4.7 Conclusion

4.1 Introduction

This chapter answers sub-research question 1: “What are the different EA project types?”

To answer sub-research question 1, a method to determine project types, obtained through literature review, was applied. A preliminary list of 20 EA project types was identified. Categorisation of EA project types was required due to interweaving of the different EA project types. The EA project types, categorisation and overlapping of EA project types were confirmed with 12 EA experts through individual semi-structured interviews. Interview results are provided as well as a thematic analysis of the results. Finally, an EA project type classification framework is provided.

4.2 Method to determine project types

The following three steps were followed to identify EA project types: (1) the definition and characteristics of a project were determined, (2) a method was identified to determine project types from a literature review, and (3) a list of EA project types was derived by applying the method identified in step 2. Figure 44 below illustrates the process followed.

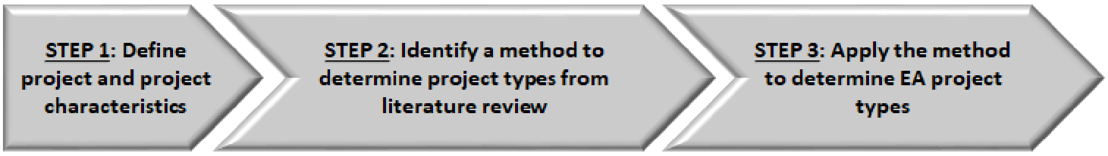


Figure 44 – Process followed to determine EA project types

4.2.1 Step 1: Define project and project characteristics

The Project Management Institute describes a project as a "temporary endeavour undertaken to create a unique product, service, or result" (Project Management Institute, 2017:4). Schwalbe (2014) lists the following six project characteristics. 1) The unique purpose of a project relates to the delivery of a specific product, service or result as per the Project Management Institute's definition of a project. 2) A project has a definite start and a definite end. 3) Projects can evolve over time and are performed in increments as more knowledge is gained. 4) People and other resources are required to execute a project. 5) A project has a key sponsor who normally dictates the project direction and provides funding. 6) There are unknown factors involved, such as time required to execute certain tasks and availability of resources. Scope, time and cost of a project are referred to as the "triple constraint". Of these three constraints, the scope of a project defines what the project will deliver and what will be done to deliver it (Schwalbe, 2014).

4.2.2 Step 2: Identify a method to determine project types from literature review

In a study where method engineering processes are enhanced, Bucher, Klesse, Kurpjuweit and Winter (2007) distinguish between context and project type. They refer to the products that are developed through the execution of projects as work systems, as their research is in the IS subject field. It is stated that a work system includes all objects that are developed or transformed via a method. In context of EA projects, EA project deliverables, delivered via a method, are similar to work systems. A project type can be derived from the state of the original work system and the state of the target work system (Bucher *et al.*, 2007:38), which relates to the project scope as defined by Schwalbe (2014:7).

By applying the Bucher *et al*. (2007) method for determining project types to the EA subject area, Aier, Riege and Winter (2008:15) give two examples of EA project types. The first example is the establishment of business processes and supporting information systems for a new business. The other example provided is the amalgamation of existing information systems that support business processes that are alike.

Therefore, the method to be followed is a literature review that focuses on what is delivered by or achieved through EA exercises, projects or initiatives as the project type classification can be derived from it. Duplicate and similar EA project types will be consolidated to arrive at the list of EA project types. Figure 45 below depicts how the method to identify EA project types was determined.

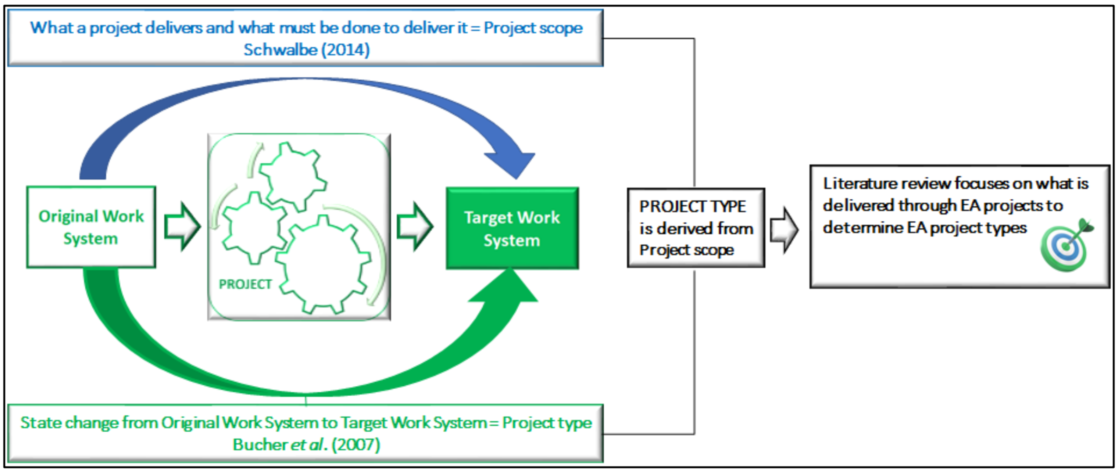


Figure 45 – Method to determine EA project types through literature review

4.2.3 Step 3: Apply the method to determine EA project types

For step 3, a literature review was performed with the focus on what is delivered through EA projects or initiatives. The literature review followed a hermeneutic approach, which implies that data collection and data analysis were performed simultaneously. Comprehension of literature was progressively enlightened through prior understanding of other literature, without being restricted by research protocols and formal approaches with specific rules in terms of articles that may or may not be included in the study (Boell & Cecez-Kecmanovic, 2014).

For this study, more than 500 papers from three databases, namely Scopus, ScienceDirect and IEEE Xplore, were identified in several iterations through the hermeneutic circle. Initially, papers were identified through database searches using “enterprise architecture” and “enterprise architecture” as well as “project” in the title, abstract and keywords as search criteria. Papers were scanned for relevance and an understanding of the EA project topic was gained, which triggered selection of more papers. Information gathered was compared to information previously gathered to identify EA project types. The relevance of papers was determined by applying the method to identify project types as described in paragraph 4.3. First, the abstract was read; if it seemed as if the original work system versus the target work system could be obtained, the paper was read. Again, it was determined if the original work system versus the target work system could be obtained. If it could not be obtained, the paper was excluded. Through the process of eliminating papers based on relevance as described above, 46 papers remained and were used to identity EA project types.

4.3 EA project types

A preliminary list of 20 EA project types as identified from 46 papers, depicted in Table 24 below, was identified through the hermeneutic literature review by applying the method, identified in paragraph 4.2.2, to determine the type of a project.

Table 24 – Preliminary list of EA project types

No.	EA Project Type	Source
1.	EA Establishment project	Aier *et al*. (2008); Pulkkinen and Kapraali (2015)
2.	Applying EA method to understand internal business problems	Werewka and Spiechowicz (2017)
3.	Business-IT alignment	Lehong *et al*. (2013); Olsen (2017); Alaeddini and Salekfard (2013); Niemi and Pekkola (2017); Antunes *et al*. (2013); Aldea *et al*. (2013); Zhang *et al*. (2018); Nogueira *et al*. (2013); Alaeddini *et al*. (2017); Bradley *et al*. (2012); Malta and Sousa (2016); Ruldeviyani *et al*. (2017); Hinkelmann *et al*. (2016); Banaeianjahromi and Smolander (2016); Saint-louis and Lapalme (2018); Alwadain *et al*. (2011); Hiekkanen *et al*. (2013); Bakar *et al.* (2016); Rouhani *et al.* (2015); Bhattacharya (2017); Kotusev *et al*. (2015); Urbaczewski and Mrdalj (2006); Tamm *et al*. (2011); Schekkerman (2004); Olsen and Trelsgård (2016); Sessions (2007); Ernst (2008); Lange and Mendling (2011); Hafsi and Assar (2016)
4.	Business transformation	Nardello *et al*. (2015); Abraham *et al*. (2015); Kaddoumi and Watfa (2016); Olsen and Trelsgård (2016)
5.	Digital transformation	Hafsi and Assar (2016)

No.	EA Project Type	Source
6.	Improvement of organisational agility	Hafsi and Assar (2016); Lange and Mendling (2011)
7.	Cost saving, including reduction in the cost of IT	Hafsi and Assar (2016); Lange and Mendling (2011); Ojo *et al*. (2012); Saint-louis and Lapalme (2018); (Abunadi, 2019)
8.	Risk management	Hafsi and Assar (2016); Lange and Mendling (2011)
9.	Enhance interoperability	Hafsi and Assar (2016); Ojo *et al*. (2012)
10.	Improvement in the results of strategic business programmes	Hafsi and Assar (2016)
11.	Business process optimisation	Hafsi and Assar (2016); Abunadi (2019)
12.	Less complex IT systems	Hafsi and Assar (2016)
13.	Higher utilisation of IT systems	Hafsi and Assar (2016); Abunadi (2019)
14.	Eliminate duplication of information systems	Saint-louis and Lapalme (2018); Ojo *et al.* (2012); Aier *et al*., (2008)
15.	Standardisation	Schönherr (2008); Lange and Mendling (2011); Ojo *et al*. (2012)
16.	Governance	Schönherr (2008); Lange and Mendling (2011); Ojo *et al*. (2012)
17.	Regulatory compliance	Schönherr (2008); Lange and Mendling (2011); Ojo *et al*. (2012)
18.	Corporate strategic planning	Aldea *et al*. (2013); Simon *et al*. (2014)
19.	Organisation development	Närman, Johnson *et al*. (2014); Rajabi *et al.* (2013); Schelp and Stutz (2007); Bernard (2012)
20.	IT decision-making	Van Den Berg and Van Vliet (2016); Van den Berg *et al*. (2019); Urbaczewski and Mrdalj (2006); Armour *et al*. (1999)

Each of these project types is discussed in more detail below.

4.3.1 EA project type: EA establishment project

Pulkkinen and Kapraali (2015) observed an EA establishment project during their study to develop a method to obtain information from ICT business users. The method is meant to be used for the development of EA. The EA initiation project is performed in a large organisation that has the vision to implement EA. The method focuses on obtaining a business view first, not only by involving business managers but also by obtaining information regarding lower-level business operations and business processes. The original work system state is an organisation without an EA function and the target work system state is an organisation where EA is implemented. The EA project type identified establishes and deploys EA in an organisation, similar to the first type of project mentioned by Aier *et al.* (2008), when they applied the Bucher *et al*. (2007) method to determine project types.

4.3.2 EA project type: Applying EA method to understand internal business problems

Sometimes, EA modelling and concepts are used for purposes other than to deliver EA. One such case is where Werewka and Spiechowicz (2017) apply an EA approach to pinpoint problems with a specific process step in a SCRUM agile development method for developing software. This process step is called the retrospective step. An EA approach is considered suitable for this exercise, as EA provides an all-inclusive view of an organisation and describes the organisation's future state and how to get to the future state. Further to this, EA models are known for providing different viewpoints relevant to different participants. Through different viewpoints, stakeholders understand problems experienced in the agile software development approach and can determine the reasons why the agile software development method does not always achieve its goals (Werewka & Spiechowicz, 2017). In this case, EA concepts and modelling are applied to gain insight into a problem. The original work system state is a situation of experiencing a problem and the target work system state is a position of understanding the problem. This type of EA project is performed to understand problems experienced in specific business situations.

4.3.3 EA project type: Business-IT alignment

A major challenge for enterprises to stay relevant and competitive is agility, which means that an organisation must be agile to be able to react to constant and unanticipated change and to be able to integrate into the changing milieu in which it operates (Banaeianjahromi & Smolander, 2016; Hinkelmann, Gerber, Karagiannis, Thoenssen, Van der Merwe & Woitsch, 2016). EA improves organisational agility and, by implication, also enhances organisational performance (Hazen, Bradley, Bell, In & Byrd, 2017). Enterprise agility is achieved when enterprise business and IT are kept aligned, despite changes in business and changes in technology. Business-IT alignment is achieved through enterprise engineering (EE) (Hafsi & Assar, 2016; Hinkelmann *et al*., 2016). As constant business-IT alignment is required, EE is not seen as a project but as a continuous task (Hinkelmann *et al*., 2016). EE and EA are closely related disciplines. EE is described as the use of engineering theory to develop EA (Nurcan & Schmidt, 2014). For purposes of this study, EA with the purpose to align business and IT is regarded to be the same as EE. Therefore, according to this argument, EA with the purpose to align business and IT is also not viewed as a project as it is an ongoing effort with no specific start and end date. Keeping business and IT aligned through EA can be viewed as maintenance or sustainment of EA. The research of Agievich, Taratukhin, Becker and Gimranov (2013) describes a method to create an EA baseline and to keep it current and in step with new IT solutions implemented in the organisation. The motivation for having such a method is that one of the key success factors for a successful business, and to gain competitive advantage, is good administration and utilisation of information by means of IT. This is addressed through EA. Agievich *et al*. (2013) refer to the establishment of baseline EA and the maintenance of EA that follows to keep the baseline relevant. Establishment of baseline EA relates to the EA establishment and deployment project type derived from the work of Pulkkinen and Kapraali (2015), and the sustainment of EA relates to the view that EA with the purpose to align business and IT is a continuous activity (Hinkelmann *et al*., 2016). The EA project lifecycle has four main stages. These phases are initiate, planning, execute and maintain (Anajafi, Nassiri & Shabgahi, 2010) and are depicted in Figure 46 below.

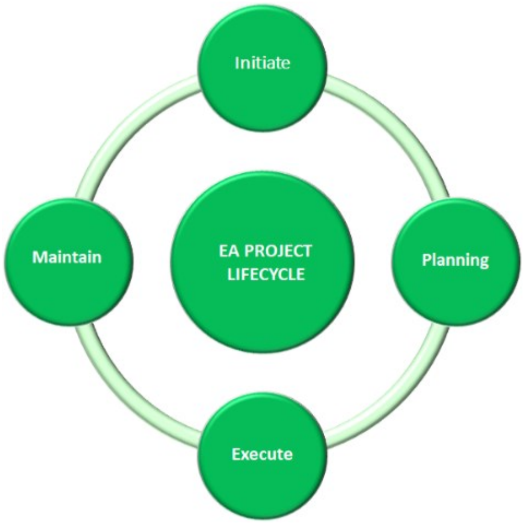


Figure 46 – EA project lifecycle (Anajafi *et al*., 2010)

Each EA project will have these four phases. Where EA is seen as a continuous task (Hinkelmann *et al*., 2016) or reference is made to sustainment of EA (Agievich *et al*., 2013), it relates to the maintenance phase in the EA project life cycle and is not considered as a different type of EA project.

Lehong, Dube and Angelopoulos (2013) and Olsen (2017) confirm that EA plays a large role in business-IT alignment. Business-IT alignment is achieved through EA when business architecture, data architecture, application architecture and technology architecture are analysed and understood. This refers to the business processes in support of organisational objectives, the information that will be created, replaced, updated and deleted by these business processes, applications that can manipulate the information, and the technology on which the applications execute (Alaeddini & Salekfard, 2013; Niemi & Pekkola, 2017). Antunes, Bakhshandeh, Mayer, Borbinha and Caentano (2013) state that business-IT alignment can be achieved through EA models reflecting the business and IT components of the organisation. Aldea, Iacob, Quartel and Franken (2013) identify EA development as a solution to align business and IT. They further stress the importance of this alignment as it improves enterprise competitive advantage, organisational performance and ensures that strategic goals are supported and achieved through EA. An SLR on research regarding business-IT alignment through EA points out that EA is perceived as a method to address business-IT alignment problems (Zhang, Chen & Luo, 2018). By utilising the Zachman Framework, EA can be developed that ensures alignment of business objectives and IT (Nogueira, Romero, Espada & Molina, 2013). Alaeddini, Asgari, Gharibi and Rad (2017) mention that EA is a way to achieve business-IT alignment. They evaluate and measure the impact of executing EA on maturity of business-IT alignment. Their study confirms the positive effect of performing EA on business-IT alignment. Then again, EA maturity enhances business-IT alignment (Bradley, Pratt, Byrd, Outlay & Wynn, 2012). EA, specifically performed through a process-focused method, benefits business-IT alignment (Malta & Sousa, 2016). EA planning can be used to develop an architecture or ICT master plan that ensures integrated systems to support business goals (Ruldeviyani, Wisnuwardhani & Sucahyo, 2017; Wikusna, 2018). Business-IT alignment through EA is further recognised by several other authors, namely Alaeddini and Salekfard (2013), Alwadain *et al.* (2011), Bakar *et al*. (2016), Bhattacharya (2017), Ernst (2008), Hafsi and Assar (2016), Hiekkanen *et al.* (2013), Kotusev *et al*. (2015), Lange and Mendling (2011), Olsen and Trelsgård (2016), Rouhani *et al*. (2015), Schekkerman (2004), Sessions (2007), Tamm *et al*. (2011) and Urbaczewski and Mrdalj (2006).

Therefore, one type of EA project is to achieve business and IT alignment. Although Hinkelmann *et al*. (2016) argue that EE is not a project, their argument that EE (and thus also EA with the purpose to align business and IT) ensures that business-IT alignment supports the business-IT alignment EA project type.

4.3.4 EA project type: Business transformation

Nardello, Lapalme, Toppenberg and Gøtze (2015) investigate how EA supports innovation. They view EA as per the three schools of thought on EA (Lapalme, 2012) and found that the enterprise ecological adaptation (EEA) school of thought is the only school of thought on EA that supports innovation. The reason for this is that the EEA school of thought includes the enterprise, the environment in which it operates and the interaction between the enterprise and its environment.

Enterprises need to adapt to a changing environment; this transformation may be required due to internal incidents or to external incidents such as emerging and disrupting technologies or new governance requirements. Enterprise transformation has an impact on more than one organisation unit, and it affects the enterprise relationships with one or more key stakeholders. Common understanding among the various role players in enterprise transformation is required. EA models contain the necessary information to establish common understanding between the different stakeholder groups. EA models contain information that spans stakeholder views, providing a holistic view of the organisation (Abraham, Aier & Winter, 2015). EA is thus used for business transformation (Olsen & Trelsgård, 2016); in fact, it is seen as a process that simplifies business transformation and integration (Kaddoumi & Watfa, 2016). EA is further viewed as a solution for enterprise integration into the changing environment in which it operates (Banaeianjahromi & Smolander, 2016; Saint-Louis & Lapalme, 2018). The business transformation EA project type is derived from enterprise adaptation and integration into the dynamic environment and the need for agility and innovation.

4.3.5 EA project type: Digital transformation

Related to the business transformation project type is the project type EA as a tool in support of digital transformation episodes. This type is derived from work done by Hafsi and Assar (2016) to determine how EA can be used in support of digital transformation. They emphasise four areas where EA can contribute to digital transformation based on TOGAF. These areas are the holistic view of all initiatives, an architecture vision that determines the scope of the project and ensures that business goals are addressed, the architecture repository and stakeholder management.

4.3.6 EA project type: Nine EA project types derived from EA benefits

Another product that was delivered as part of Hafsi and Assar's (2016) study is a list of EA benefits obtained through literature review. These benefits are improvement of organisational agility, business and IT alignment, a reduction in the cost of IT, better risk management and interoperability, improvement in the results of strategic business programmes, business process optimisation, less complex IT systems and higher utilisation of these IT systems. Business process optimisation, reduction in IT cost and higher utilisation of IT systems are mentioned as EA benefits by Abunadi (2019). In this study, each benefit is taken as a different EA project type as each benefit represents what is achieved through an EA project. Of these EA project types, business-IT alignment, organisational agility, cost saving and better risk management were included as EA goals when Lange and Mendling (2011) extended Schönherr's (2008) list of EA goals. EA goals are realised through execution of EA projects and therefore each goal represents an EA project type. Ojo *et al*. (2012) identify the realising of interoperability as a reason to perform EA in the public sector. Thus, it strengthens the concept of the EA project type, enabling interoperability.

The cost saving EA project type is also derived from a study where reduction in business and IT cost through elimination of duplicate information systems and business processes is mentioned as a reason why EA is performed in the public sector (Ojo, Janowski & Estevez, 2012). A systematic mapping study of literature on various ways and reasons why EA is conducted confirms that EA can be performed to eliminate duplication in functionality and to enhance reuse of functionality in order to reduce IT cost (Saint-Louis & Lapalme, 2018). Thus, elimination of duplication of information systems is another EA project type that is derived. Elimination of duplication of information systems relates to the amalgamation of information systems that support business processes that are alike, as identified by Aier *et al*. (2008) when they applied Bucher *et al*.'s (2007) method for determining project types to the EA subject area.

4.3.7 EA project types: Three EA project types derived from EA goals

The list of EA goals compiled by Schönherr (2008) was extended by Lange and Mendling (2011). Apart from the EA goals, already mentioned with the EA benefits identified by Hafsi and Assar (2016), standardisation, governance and regulatory compliance complete the extended list of EA goals (Lange & Mendling, 2011). Each of these goals signifies what is achieved through EA and therefore may represent an EA project type.

4.3.8 EA project type: Corporate strategic planning

Facilitation of strategic business planning is identified as an application of EA (Aldea *et al*., 2013; Simon, Fischbach & Schoder, 2014), and therefore corporate strategic planning is identified as a potential EA project type.

4.3.9 EA project type: Organisational development

Närman, Johnson and Gingnell (2014) developed a framework that increases the application of EA to address organisational structure development. Enterprises use EA for organisation structuring in order to overcome business challenges (Rajabi *et al*., 2013). EA is recognised as a discipline that aids in organisational structuring by delivering agile enterprise designs (Schelp & Stutz, 2007; Bernard, 2012). Hence, another EA project type derived is organisational development.

4.3.10 EA project type: IT decision-making

One more application of EA is to assist in IT decision-making. EA improves the quality of IT decisions (Van den Berg & Van Vliet, 2016) as well as decisions regarding investments in IT (Van den Berg, Slot, Van Steenbergen, Faasse & Van Vliet, 2019). EA projects are further used for IT decision-making by delivering blueprints for IT solutions (Urbaczewski & Mrdalj, 2006) and providing a common understanding of the overall design of enterprise IT solutions (Armour *et al*., 1999).

4.3.11 Discussion: Identified EA project types

The identified EA project types are intertwined in different ways as depicted in Figure 47 below.

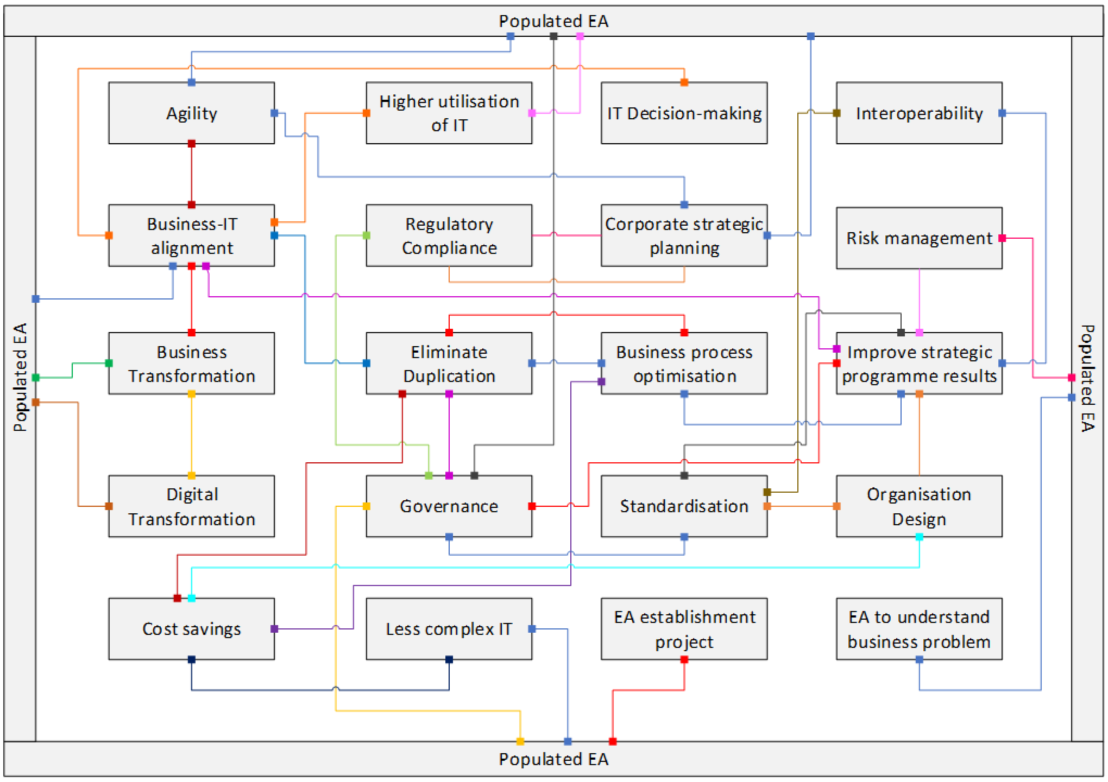


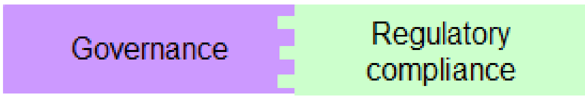
Figure 47 – Identified EA project type relations

The identified EA project types and their interconnectedness are discussed in Table 25 below.

Table 25 – Interconnectedness of EA project types

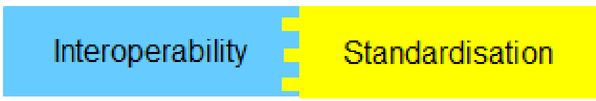
Agility is achieved through **business-IT alignment** (Hafsi & Assar, 2016; Hinkelmann *et al.*, 2016). An **agile** organisation is able to respond effectively and quickly to changes (Ravichandran, 2018; Zacarias, Martins & Gonçalves, 2017) in terms of its internal processes and interaction with the environment (Sambamurthy, Bharadwaj & Grover, 2003), thus **business transformation** is enabled. Business transformation often entails **digital transformation** and vice versa. Digital transformation refers to organisations responding to changes in the environment through digital technologies that lead to considerable business transformations (Vial, 2019). The use of digital technologies differentiates digital transformation from traditional IT-enabled transformation that implemented technology such as customer relation management (CRM) system and enterprise resource planning (ERP) systems (Gong, Yang & Shi, 2020). Digital transformation has an impact on an organisation's business strategy, products, business services, processes, business model and interaction with other organisations (Gong *et al.*, 2020).

When **business and IT are aligned**, **higher utilisation of IT systems** is ensured, as redundant IT systems will be identified and all remaining systems will support or enable business functions. Corporate governance of IT aims to eliminate redundant IT systems and that all IT investments are linked to business objectives (Delport, Von Solms & Gerber, 2016:8).

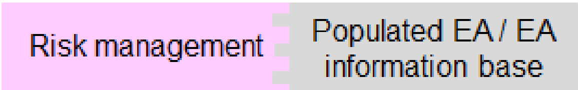


The identified **governance** EA project type can deliver at different levels, either at business and IT level to achieve corporate governance of IT, only at IT level when IT is governed in terms of compliance to IT standards and approved architecture, or at level of corporate governance. Corporate governance addresses, among other concerns, **regulatory compliance**, which is identified as an EA project type. Populated EA provides organisation-wide governance structures (Diefenbach, Lucke & Lechner, 2019). Holistic views of an organisation's current architecture enabled by EA are used by governance bodies when formulating governance regulations (Abunadi, 2019).

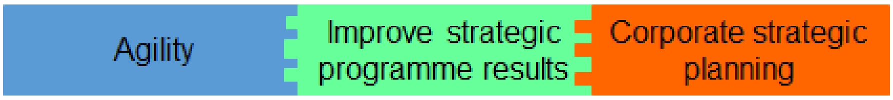
Elimination of duplication in IT systems can be addressed following two approaches. 1) Duplicate IT systems are identified in the process of **aligning business and IT**. 2) The second approach is to focus on the IT portfolio of an organisation by comparing only IT systems. Once identified, the duplicate IT systems can be phased out. When duplicate IT systems are eliminated and the reuse of IT system components is enhanced, the cost of IT decreases (Saint-Louis & Lapalme, 2018), as less IT systems are maintained. Business cost is reduced when duplicate business functionality in business processes is eliminated (Ojo *et al.*, 2012). **Business process optimisation** and development of a cost-effective organisation structure contribute to **cost saving**.



Entities such as organisations and IT systems are interoperable when they can exchange information and work together as a unit (Liu, Li, Aljohani, Lytras, Hassan & Nawaz, 2020). There are different levels of **interoperability,** and it is recommended that interoperability should be addressed at the different levels. Levels of interoperability are technical interoperability, semantic interoperability and organisational or process interoperability (Kotzé & Neaga, 2010; Kuziemsky & Peyton, 2016). The scope of the interoperability EA project type depends on the interoperability requirement. It could be focusing on only technical interoperability, but a bigger picture may include factors such as political, organisational and social factors (Gottschalk, 2009; Kotzé & Neaga, 2010). Lately, the focus of interoperability moved from being mainly IT-focused to include business-focused interoperability as well (Liu *et al.*, 2020). Interoperability can be achieved through **standardisation** and through architecture (Kotzé & Neaga, 2010), illustrating the relation between the interoperability and standardisation EA project types. Therefore, standardisation can be achieved at the different levels of interoperability.



The **risk management** standard, ISO 31000, defines risk management as “coordinated activities to direct and control an organisation with regard to risk”, and it defines risk as “effect of uncertainty on objectives” (Diefenbach *et al.*, 2019). Several risk management frameworks exist. At a high level, all these frameworks prescribe principles and a risk management process which at least have process steps for risk assessment and treatment of risk. EA provides an information base for risk management as it contains organisational elements, the relation between these elements and between the organisational elements and the environment. Information is used for risk assessment and risk treatment evidence can be linked to elements in the EA repository to ease risk management decision-making (Diefenbach *et al.*, 2019).



Corporate strategic planning is the activity an organisation performs to identify what the organisation wants to accomplish, why it must be achieved and how it will be achieved. It entails the vision, mission and related goals of the organisation and plan to realise the set goals. The external environment is taken in consideration when developing corporate strategy (Kreye & Jensen, 2014). The enterprise strategy dictates which services and products the organisation delivers and how it will be delivered. EA aligns and integrates the components from strategy to operations of an organisation (Azevedo, Van Sinderen, Pires & Almeida, 2015), aiding in the **improvement of the results of strategic business programmes**. The strategic plan is contained in the business architecture layer of EA, reflected in terms of internal, customer and financial goals, value proposition, competencies, activities, processes and structure (Roelens, Steenacker & Poels, 2019). Enterprise agility is often part of organisational strategies (Fallmyr & Bygstad, 2014), thus a potential relation between the EA project types **improvement of organisational agility** and **corporate strategic planning** is highlighted. For strategic planning the internal and external environments must be taken into consideration (Bora, Borah & Chungyalpa, 2017).

EA establishment project | Populated EA / EA information base

An SLR on EA implementation critical success factors identified EA framework, including a methodology, as one of the critical success factors for EA implementation. The study shows that TOGAF is the EA framework that is mostly used, specifically in the public sector (Ansyori, Qodarsih & Soewito, 2018). Ori and Szabo (2019) mention TOGAF as one of the generally acknowledged EA frameworks. The study of Abunadi (2019) focuses on large private organisations; it is stated that organisations use TOGAF if it has been decided to implement an EA framework. Chapter 40 of TOGAF that addresses establishment of an EA capability is used to describe an **EA establishment project.** Establishing an EA capability follows the same approach applicable to establishing any business unit by applying the complete TOGAF Architecture Development Methodology (ADM). Thus, business architecture, data architecture, application architecture and technology architecture for the architecture capability must be developed (The Open Group, 2018). Architects tasked to establish an EA capability must have knowledge of processes to execute enterprise architecture. The focus is on the EA practice within the organisation and aligned with the chosen EA framework.

Business-IT alignment | IT Decision-making

One of the EA deliverables is an application portfolio or service portfolio which assists Chief Information Officers (CIOs) and IT managers with IT decision-making (Riempp & Gieffers-Ankel, 2007). An EA project that is initiated to enable IT decision-making will include an application portfolio as a deliverable. A combined reflection of the operational IT environment, technology architecture and **business-IT alignment** is considered necessary to support **IT decision-making** (Riempp & Gieffers-Ankel, 2007). Establishment of application portfolio management (APM) that provides guidelines, techniques and EA models for IT decision-making is essential. Figure 48 below depicts factors to take in consideration for IT decision-making. The factors are business requirements for applications, IT strategy, operational IT, technology architecture, management of IT projects and IT investment (Riempp & Gieffers-Ankel, 2007). Figure 48 further reflects EA models required per factor. The EA models are aggregated and represented via decision-making indicators.

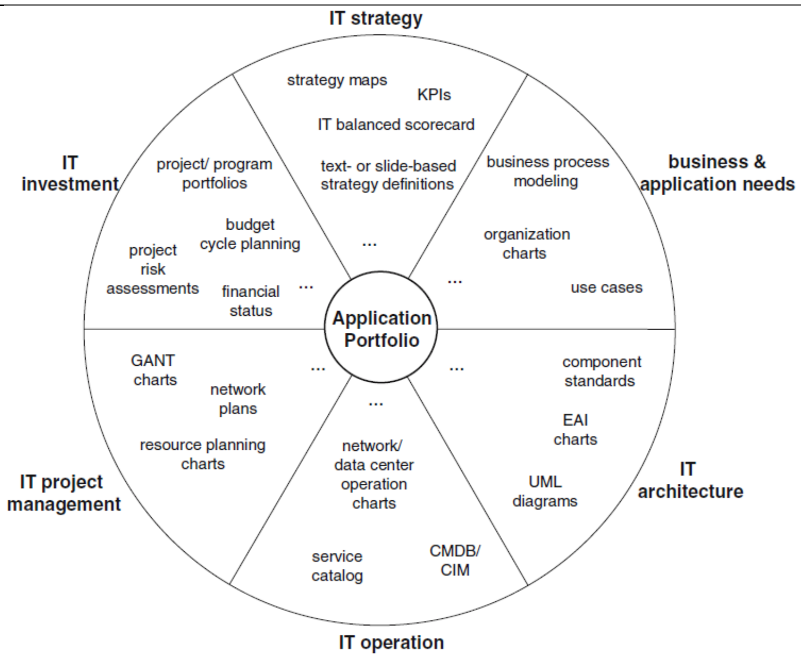


Figure 48 **– IT decision-making factors (Riempp & Gieffers-Ankel, 2007)**

Organisational Development | Corporate strategic planning

Kreye and Jensen (2014) adapted the star model of Galbraith (2002) to describe **organisational design**. As illustrated in Figure 49 below, organisational strategy dictates direction and enterprise goals. Capabilities to realise goals are linked to strategy. Organisation structure, business processes, human resource capability and performance management must be aligned in order to establish capabilities that will achieve organisational goals (Kreye & Jensen, 2014). Therefore, **organisation design** is informed by **organisation strategy** which is influenced by the external environment; it further entails business processes, organisation structure, human resources and rewards requirements.

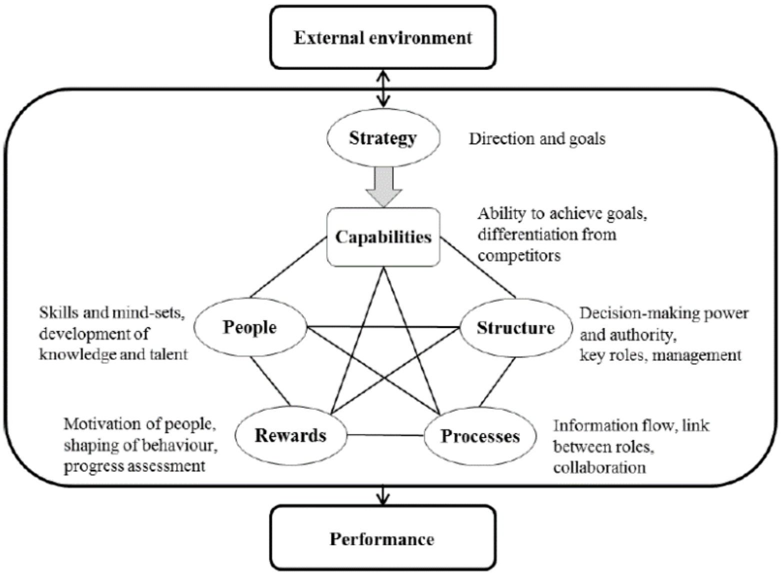


Figure 49 – Adapted star model applied for organisation design (Kreye & Jensen, 2014)

Improve strategic programme results | Organisational development | Business-IT alignment | Interoperability

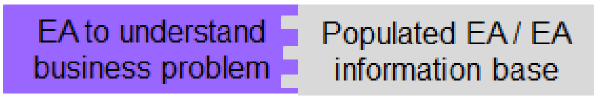
Business process optimisation | Standardisation | Governance | Corporate strategic planning

The EA project type **improvement in the results of strategic business programmes** relates to **organisation development** EA project type, as the organisation is designed in order to deliver on strategic business programmes informed by the business strategy. Other aspects of EA such as **business-IT alignment**, **enhancement of interoperability**, **business process optimisation**, **standardisation** and **governance** will further aid in delivering on **strategic business programmes**. Thus, if the requirement is improvement in the results of strategic business programmes, assessment of the organisation needs to be done to determine which aspects need attention to improve results of strategic programmes.

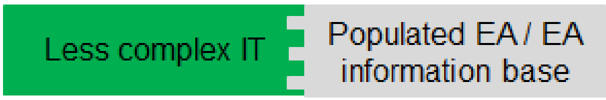
Improve strategic programme results | Business process optimisation | Business-IT alignment

Organisation strategy is interpreted and requirements are derived through business process management. Business processes are developed to be aligned with the business strategy in order to facilitate strategy execution. Further, **alignment between business process activities and IT systems** is essential to support business strategy execution. Constant optimisation of business processes is required to ensure continuous and improved support to business. It is further required as organisations need to change to stay competitive (Trkman, 2010). **Business process optimisation** therefore requires process knowledge and awareness of business strategy and IT systems to ensure the required alignment for business strategy execution.

Lückmann and Feldmann (2017) list governance of business process management projects, modelling techniques, IT and human elements such as knowledge and skills as critical success factors for business process management that enables business process optimisation. Business processes are optimised when duplicate procedures and bottlenecks are identified and addressed. Removal of duplicate processes leads to cost saving (Löhe & Legner, 2014). Therefore, EA project types **business process optimisation** and **cost saving** have a relation.



A project initiated to use an **EA approach to understand internal business problems**, such as the project described by Werewka and Spiechowicz (2017) to pinpoint problems with a process step in a SCRUM agile development method, relies on EA discipline knowledge. Understanding of EA framework is essential as the EA framework provides a holistic view of the enterprise by integrating components such as business strategies, processes and IT systems (Abunadi, 2019), which assists in the understanding of business problems. The scope of the project will depend on the business scenario that needs to be understood; it could be on strategy level, business process or IT systems.



Less complex IT systems can be achieved through an EA project as EA can be used as a mechanism to handle complexity. The focus of such a project is on IT systems. Complexity of IT systems can be understood as EA reflects all interdependencies between system components. It is specifically valuable when micro-services are implemented, often done through the DevOps approach to system development (Perez-Castillo, Ruiz, Piattini & Ebert, 2019).

An EA project can aid in achievement of more than one benefit, although the trigger for the project is a specific requirement, classifying as one of the identified EA project types. Rico (2006) states that it is important to know what must be achieved through execution of an EA project. Many benefits may be realised, but the one that triggered the execution of the EA project may not have been realised, and then the project does not deliver the expected result.

As the various project types are intertwined and work together to achieve EA benefits, and most EA project types can be executed in different contexts, requiring different skills, the next step is to identify broader categories in which the different project types can be classified. Note that one EA project type may be classified in more than one category depending on the stakeholder requirement. An example is the EA project type **enhance interoperability**. Depending on the project stakeholder requirement and budget, this EA project can satisfy different levels of interoperability.

4.3.12 Categorisation of EA project types

Riege and Aier (2009) group EA work in three categories. The first group entails EA work that supports organisational strategy formulation. Market impact on the business is considered. Business processes are optimised to serve the relevant market segment most effectively. The second group focuses on EA work that supports IT management. It includes consolidation of IT systems, APM and architectural compliance assessments. The third group concentrates on daily business operations, thus strategy execution. Business requirements are taken in consideration to ensure all process interfaces are relevant and in support of business. The categorisation of Riege and Aier (2009) relates to the parameters used for Lapalme's (2012) three EA schools of thought and is as follows: enterprise-in-environment, enterprise, IT, IT and non-IT strategy alignment, strategy execution alignment and strategy formulation and execution alignment.

The discussion on the 20 identified EA project types shows that project types can impact on different levels. It may develop organisational strategy and/or IT strategy, align strategies or execute strategies, depending on the context of the stakeholder requirement. In considering the classifications of Riege and Aier (2009) and Lapalme (2012) as well as the literature review and discussion on identified EA project types, three EA project requirement perspectives are proposed. The requirement perspectives are organisation strategy perspective, business perspective and IT perspective.

Organisation strategy perspective entails considering internal and external impact on the architecture work and organisation strategy formulation. The business perspective is concerned with internal business impact on the architecture work, focusing on business operations and strategy execution. The IT perspective concentrates on the IT environment and strategy aligned with business strategy. The requirement perspectives are used to categorise the identified EA project types. Table 26 below reflects the categorisation of EA project types.

Table 26 – Categories of EA project types

CATEGORIES OF EA PROJECT TYPES
Category: ORGANISATIONAL STRATEGY PERSPECTIVE
EA PROJECT TYPES
• Business transformation • Digital transformation • Improvement of organisational agility • Risk management • Enhance interoperability • Standardisation • Governance • Regulatory compliance • Corporate strategic planning
Category: BUSINESS PERSPECTIVE
EA PROJECT TYPES
• EA establishment • Applying EA method to understand internal business problem • Improvement of organisational agility • Cost saving • Risk management • Enhance interoperability • Improvement in the results of strategic business programmes • Business process optimisation • Higher utilisation of IT systems • Standardisation • Governance

• Regulatory compliance • Organisation development
Category: IT PERSPECTIVE
EA PROJECT TYPES
• Business-IT alignment • Cost saving • Risk management • Enhance interoperability • Less complex IT systems • Eliminate duplication of information systems • Standardisation • Governance • Regulatory compliance • IT decision-making

4.4 Semi-structured interview response

The purpose of the semi-structured interviews was to demonstrate and evaluate the initial list of EA project types, the categorisation of EA project types as well as the interweaving of EA project types with architects working in the industry.

Individual semi-structured interviews were held with 12 EA experts. These architects brought rich EA experience in terms of roles, years and industries to the table.

Roles mentioned by interviewees that they have performed are those of business architect, data architect, application architect, business analyst, strategy facilitator, architect establishing EA practice, EA manager, EA project manager, security architect, modeller, technology architect, enterprise architect, EA lead, principal architect, enterprise service and system management architect, EA consultant, project implementation architect, governance, software architect, integration architect and distributed system management architect. Refer to Table 29 below for roles per interviewee.

Summarised interviewee EA experience in terms of years is depicted in Figure 50 below. Refer to Table 29 further below for experience per interviewee. Nine (9) of the 12 interviewees have between **10 and 19 years' EA experience**; 1 has less than 10 years' experience and 2 have more than 20 years' EA experience.

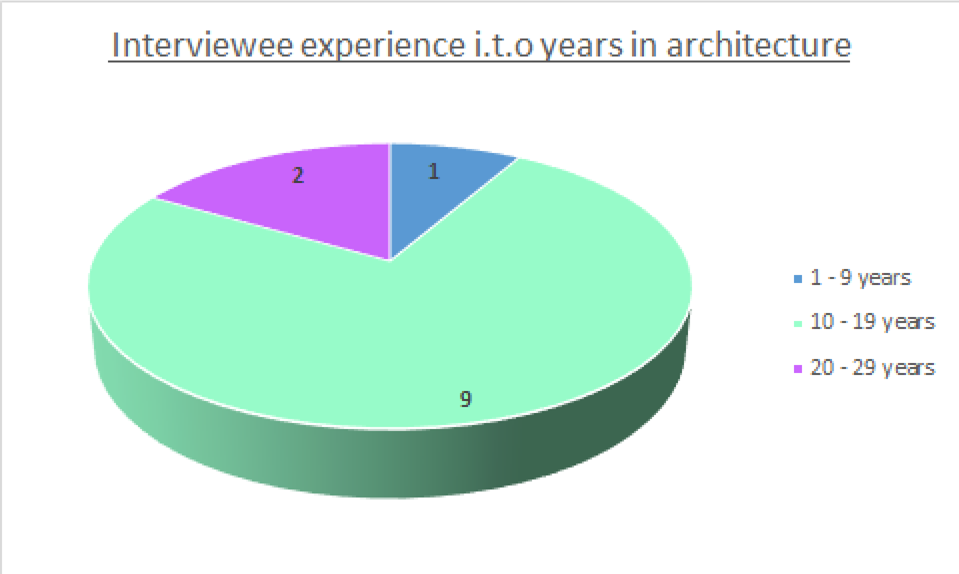


Figure 50 – Interviewee experience in terms of years in architecture

Interviewees have performed EA projects in a large variety of **industries**, including the banking, mining and public sectors. Refer to Figure 51 below for a complete list of industries where interviewees obtained their EA experience and applied their EA knowledge. Refer to Table 28 further below for industries per interviewee.

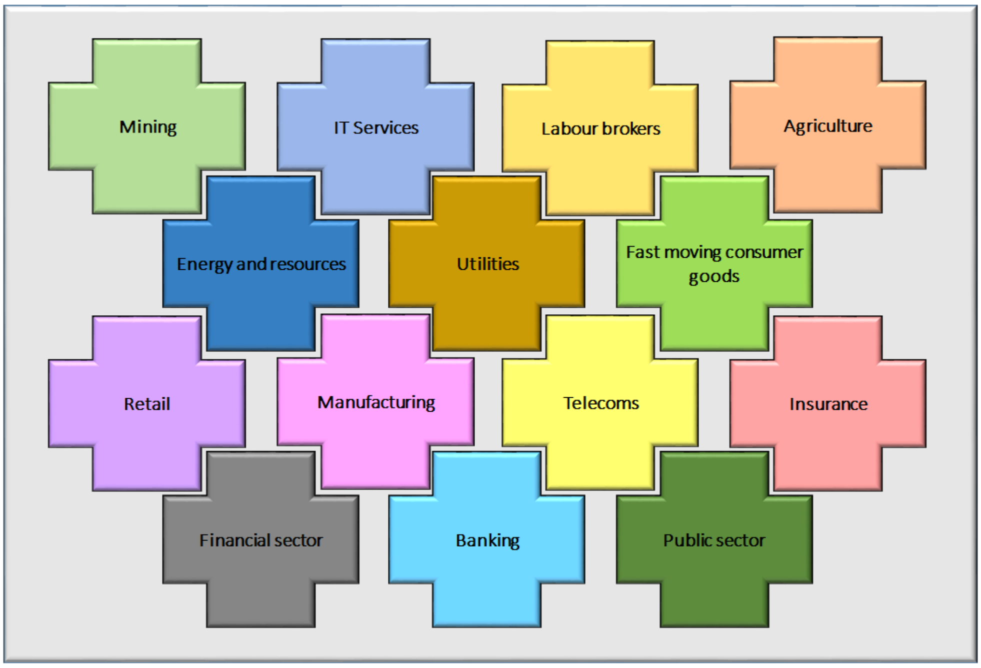


Figure 51 – Industries in which interviewees have EA experience

Table 27 below reflects EA experience per interviewee.

Table 27 – Interviewee EA experience

Interviewee No.	EA Experience		
	Years	**Roles**	**Industries**
1	18 years	• Data architect • Application architect • Solutions architect • Strategy facilitator • Architect establishing EA practice • EA manager • Business architect • Security architect	• Mining • Public sector – State-owned enterprises • Fast moving consumer goods • Banking • Financial sector • Government • Utilities (water board, independent power producers)
2	14 years	• Solution architect • Application architect • Business architect	• Financial sector • Energy and resources • Public sector • Telecoms
3	10 years	• Business architect • Enterprise architect • Solution architect	• Consulting • Mining • Public sector

Interviewee No.	EA Experience		
	Years	Roles	Industries
		• Business analyst	
4	10 years	• Modeller • EA project manager • Data architect • Business architect • Application architect • Technology architect	• Public sector • Mining • Agriculture • Finance • Manufacturing
5	10 years	• Business architect • Solution architect • Enterprise architect • EA project manager • EA lead	• Banking • Insurance • Mining • Manufacturing
6	23 years	• Principal architect • Responsible for IT strategy • Application architect • Financial structure development • Responsible for innovation and digital transformation	• Mining
7	5 years	• Solution architect	• Insurance
8	11 years	• Data architect • Solution architect • Strategy facilitation	• Telecommunication • Insurance • Banking • Labour brokers • Retail • Government
9	17 years	• Responsible government-wide EA • Principal architect • Enterprise service and system management architect	• Public sector
10	17 years	• Enterprise architect • EA consultant • Solution architect	• Banking • Mining • IT services

Interviewee No.	EA Experience		
	Years	Roles	Industries
11	15 years	• Solution architect • Enterprise architect • Project implementation architect • Architect establishing EA capability • EA governance • Modelling EA and solution • Software architect	• Banking • Insurance • Mining • Retail
12	27 years	• Integration architect • Business architect • Solution architect (holistic) • Distributed systems management architect	• Telecommunication • Financial sector

The purpose of the interviews was to refine three factors, namely 1) the list of EA project types; 2) the categorisation of EA project types; and 3) the interweaving of EA project types.

4.4.1 Interviewee response – Evaluation of list of EA project types and identification of new types

First, interviewee response data of semi-structured interviews with EA experts regarding the list of different EA project types are provided. The list of EA project types, determined through literature review, was presented to interviewees. Their responses are reflected in Table 28 below. Identified EA project types are listed in the second column and interviewee responses are reflected per interviewee in the next 12 columns.

Legend:

- A: Interviewee agrees that it is an EA project type and interviewee has worked on such a project;
- B: Interviewee agrees that it is an EA project type, but interviewee has not worked on such a project; and
- C: Interviewee disagrees – it is not an EA project type.

Table 28 – Interview results regarding list of EA project types

NO.	EA Project type	Interviewee response 1	2	3	4	5	6	7	8	9	10	11	12
1.	EA establishment project	A	A	B	A	A	A	A	A	A	A	A	A
2.	Applying EA method to understand internal business problems	A	A	A	A	B	A	A	A	A	A	A	A
3.	Business-IT alignment	A	A	A	A	A	A	A	A	A	A	A	A
4.	Business transformation	A	A	A	A	A	A	A	A	A	A	A	A
5.	Digital transformation	A	A	A	A	A	A	B	A	A	A	A	A
6.	Improvement of organisational agility	A	B	B	A	A	A	A	A	A	A	A	A
7.	Cost saving including reduction in IT cost	A	A	A	A	A	A	A	A	A	A	A	A
8.	Risk management	A	A	B	A	A	B	A	A	A	A	B	A
9.	Enhance interoperability	A	A	B	A	A	A	A	A	A	A	A	A
10.	Improvement in the results of strategic business programmes	A	A	A	A	A	B	B	A	A	A	A	A
11.	Business process optimisation	C	A	C	A	A	A	A	A	A	A	C	A
12.	Less complex IT systems	A & C	A	C	A	B	A	A	A	A	B	A	A
13.	Higher utilisation of IT systems	B	A	A	A	B	C	A	A	A	B	A	C
14.	Eliminate duplication of information systems	A	A	B	A	A	A	A	A	A	A	A	A
15.	Standardisation	A	A	B	A	A	A	A	A	A	A	A	A
16.	Governance	A	A	B	A	A	A	A	A	A	A	A	A
17.	Regulatory compliance	A	A	B	A	A	B	A	A	A	A	A	A
18.	Corporate strategic planning	C	A	B	A	A	C	A	A	A	A	A	A
19.	Organisation development	C	A	A	A	B	C	A	A	A	B	A	C
20.	IT decision-making	A	A	A	A	A	A	A	A	A	A	A	A

Interviewees had the opportunity to add EA project types to the list. Additional EA project types identified by interviewees are listed and depicted in Figure 52 below.

- The current trend to work more remotely and with global vendors was mentioned as the rationale for adding **security architecture** as an EA project type. The security architecture project will typically deliver a security framework and security architecture principles that are applicable to all solution delivery projects.
- An EA project type addressing **fourth industrial revolution (4IR) technologies** was mentioned due to new strategies required to utilise these new technology platforms, with specific impact on capacity management and the tendency that business users procure software, and that the IT department is not in control of which software is implemented anymore. Cloud migration as EA project type was mentioned apart from 4IR technologies and the use of EA views to motivate cloud migration to management.
- A project where EA methodology was used to model concepts that an organisation does not have knowledge of was mentioned. In this instance, information is obtained from literature, modelled and mapped to concepts that the organisation does understand. New concepts are identified. Thus, **EA is used as a discovery tool** to educate an organisation on a specific topic, for example on artificial intelligence (AI), using the different views that EA provides.
- A **merger-and-acquisition** project was stated, and the project type was motivated by mentioning that standardisation is critical for mergers and acquisitions to be successful.
- **Business ecosystem architecture** was mentioned as an EA project type. It was explained as a project being initiated to understand the industry or environment in which an organisation operates, the stakeholders or ecosystem role players, shared services between organisations that collaborate as well as collaboration between regulatory bodies.

- **Business architecture** was proposed as another EA project type. This type of project is concerned with the organisation as a whole. It addresses the purpose of the organisation, business building blocks, the value chain, stakeholders, policies, information required and the organisation's operating model. It was stated that business architecture gives input to strategy formulation, and the output of strategy formulation is fed back into business architecture that oversees execution of the strategy.
- Another new EA project type included in interview response is **economic architecture** EA project type, which addresses micro-economics applicable to the organisation.
- **Compliance** as an EA project type was mentioned in support of governance and risk management EA project types.
- The last additional EA project type contained in the interview response is **architecture maintenance**.

Figure 52 below displays the nine additional EA project types mentioned by EA experts during the semi-structured interviews.

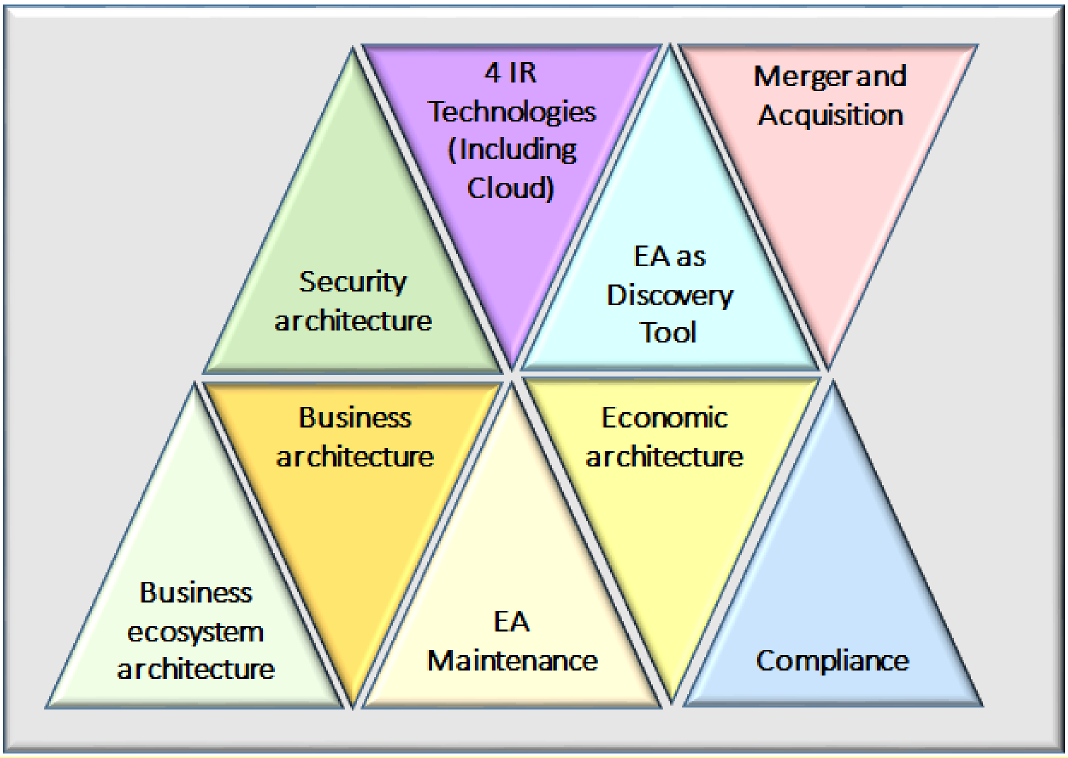


Figure 52 – Additional EA project types identified from interview responses

4.4.2 Interviewee response – Refining categorisation of EA project types

The second factor on which interviewees' opinions were obtained was the categorisation of EA project types. All interviewees agreed that EA project types should be categorised. They agreed on the criteria for categorisation, namely the environments taken in consideration when performing a project. These are the environments external to the organisation, internal to the organisation and internal IT environment. Minor changes on where different project types should be categorised were recommended.

4.4.2.1 New names proposed for EA project type categories

Different names for the three categories were proposed. For example, organisational strategy perspective to change to strategic enterprise perspective as this would eliminate confusion between the words "organisational" and "business" of the next category. To be more specific, it was proposed to change the name of the second category from business perspective to business unit perspective. An additional category for EA establishment was proposed; the rationale given was that EA establishment needs to be done to execute any project categorised in the original three categories.

4.4.2.1.1 Foundational category proposed

There are EA project types that were classified in more than one category, as it depends on the specific stakeholder requirement what environments will be taken in consideration. There was a proposal to reflect these EA project types as a foundational category that runs across the other categories, instead of reflecting them in each category. The implication is that each EA project type category will include and address these elements.

4.4.2.1.2 EA establishment category proposed

A distinction between general business projects and core projects was suggested. The EA establishment project type was proposed as being the only core project type. It was compared to the preliminary phase of TOGAF.

4.4.2.2 EA project type categories obtained from interviews

Figure 53 below depicts the EA project type categories mentioned during interviews.

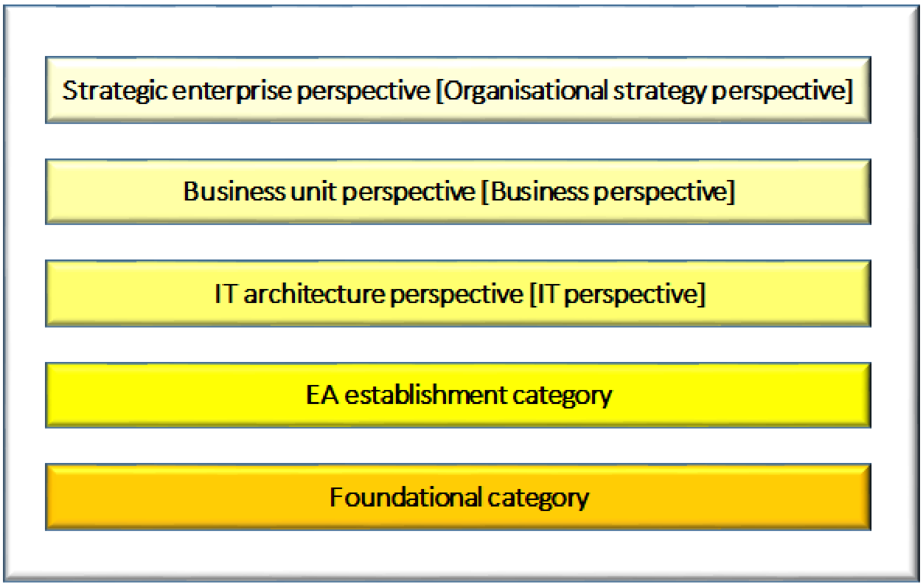


Figure 53 – EA project type categories obtained from interview responses

4.4.3 Interviewee response – EA project types are interweaved

The last concept that was discussed during the interviews is that an EA project can often be classified as more than one EA project type. A project may be classified as a primary type with secondary types. An example was given of the digital transformation EA project type that can be categorised in different categories. It has an IT perspective, business perspective as well as strategy perspective because digital transformation is a strategy for which business processes and IT need to be changed. All interviewees agreed that a specific EA project have a primary project type and it can have one or more secondary EA project type. Thus, EA project types are intertwined.

4.5 Analysis of interviewee response

Interview response data were interpreted to optimise and confirm the list of EA project types, the classification of EA project types and the interweaving of EA project types. A posteriori themes identified during analysis of interview results (reflected in the second column in Table 29 below) were compared to a priori themes identified during the hermeneutic literature review done to determine the initial list of EA project types (reflected in the third column in Table 29 below). Refer to the separate document with interview transcripts for interview data where themes are identified. The sections that follow reflect analysis of interview results.

NOTE applicable to section 4.5 and all its sub-paragraphs:

- **The responses of all interviewees are available in a separate document.**
  - **Themes are highlighted in different colours according to a legend included in the said document.**
  - **The last column of the table in the said document reflects how different topics were addressed.**
- **Extracts from interviews are provided in this section in italics and smaller font size to show data that support the statements. However, not all supporting interview responses are repeated in this paragraph.**
- **Interviews were mainly held in Afrikaans; thus, extracts reflected in this section were translated from Afrikaans.**

Table 29 – Themes

No	Theme identified during thematic analysis of interview results (*a posteriori* theme)	Theme identified during hermeneutic literature review (*a priori* theme)
1.	Apply EA method to understand internal business problems	Apply EA method to understand internal business problems
2.	Architecture maintenance	Maintenance phase of architecture project lifecycle, not considered as an EA project type
3.	Business architecture	Business architecture was identified but not considered as an EA project type
4.	Business ecosystem architecture	New theme, not identified during literature review
5.	Business-IT alignment	Business-IT alignment
6.	Business process optimisation	Business process optimisation
7.	Business transformation	Business transformation
8.	Business unit perspective / Business perspective category	Business unit perspective / Business perspective category

No	Theme identified during thematic analysis of interview results (*a posteriori* theme)	Theme identified during hermeneutic literature review (*a priori* theme)
9.	4IR technologies	New theme, not identified during literature review
10.	Corporate strategic planning	Corporate strategic planning
11.	Cost saving, including reduction in IT cost	Cost saving, including reduction in IT cost
12.	Digital transformation	Digital transformation
13.	EA as discovery tool	New theme, not identified during literature review
14.	EA establishment	EA establishment
15.	Economic architecture	New theme, not identified during literature review
16.	Eliminate duplication of information systems	Eliminate duplication of information systems
17.	Enhance interoperability	Enhance interoperability
18.	Foundational category	New theme, not identified during literature review
19.	Governance	Governance
20.	GRC	Governance, risk management and regulatory compliance EA project types
21.	Higher utilisation of IT systems	Higher utilisation of IT systems
22.	Improve organisational agility	Improve organisational agility
23.	Improve the results of strategic business programs	Improve the results of strategic business programs
24.	Intertwined	Intertwined
25.	IT decision-making	IT decision-making
26.	IT perspective / IT architecture perspective category for EA project types	IT perspective / IT architecture perspective category for EA project types
27.	Less complex IT systems (on IT landscape level – APM)	Less complex IT systems (on IT landscape level – APM)
28.	Organisational development	Organisational development

No	Theme identified during thematic analysis of interview results (*a posteriori* theme)	Theme identified during hermeneutic literature review (*a priori* theme)
29.	Regulatory compliance	Regulatory compliance
30.	Risk management	Risk management
31.	Security (including cyber security)	New theme, not identified during literature review
32.	Stakeholder	Stakeholder
33.	Standardisation	Standardisation
34.	Strategic category for EA project types / Strategic enterprise perspective category	Strategic category for EA project types / Strategic enterprise perspective category
35.	Mergers and acquisitions	New theme, not identified during literature review

All *themes* identified during literature review were recognised in the interview results. However, not all of these themes were considered EA project types. Section 4.5.1 below provides more detail on these findings. New themes discovered from interview results are:

- Business ecosystem architecture
- 4IR technologies
- EA as discovery tool
- Economic architecture
- Security
- Mergers and acquisitions
- Foundational EA project type category

4.5.1 Analysis of interview response – Refinement of list of EA project types

The list of EA project types was refined by eliminating certain EA project types, adding new EA project types and confirming EA project types that were on the original list of EA project types prepared from EA literature.

4.5.1.1 EA project types eliminated

The paragraphs that follow list EA project types that were eliminated as a result of interviews with EA experts.

4.5.1.1.1 Business process optimisation

Most interviewees acknowledged business process optimisation as an EA project type, and indicated that they have worked on such projects. However, it was pointed out by more experienced interviewees that business process optimisation is an operational task that tends to be process engineering rather than architecture. Business process optimisation is normally performed by people who understand the business and process engineering, such as industrial engineers. [Interviewee 1: *"No, that is operational. It is rather process engineering that is done there and not architecture. It is a specialist area; business process optimisation is an engineering function and not an EA project type. Industrial engineers are responsible for this. They must understand the business, know where bottlenecks exist, they must know about Kaizan, six sigma and optimisation. Architects get involved to do design; the aim with business process optimisation is not to change the design of business processes, but only to improve business process."* Interviewee 3: *"You know, I have not seen that EA is used for business process optimisation. It is definitely more the work of an industrial engineer."*] In order to do business process optimisation, processes need to be modelled at a detailed level, and EA usually does not model to the lowest level of detail. [Interviewee 3: *"Architecture maps processes not to the lowest level required for business process optimisation. With EA, you do not get to the point where you really know what the business processes are. You will have a business capability map and then maybe take one area of the capability map, for example supply chain management and model the five, six or eight areas in supply chain management."*] EA does play a role in business process optimisation to identify which business areas need optimisation. It will then be identified via an EA project of type applying EA methods to understand internal business problems. Therefore, business process optimisation is not considered as an EA project type [Interviewee 11: *"In my experience, the identification of certain business areas that need optimisation is part of EA, but the actual optimisation of business processes is not seen as an EA project. Architects identify the business area that needs process optimisation. The task to optimise business processes is done by people such as business process engineers."*]

4.5.1.1.2 Higher utilisation of IT systems

To achieve higher utilisation of IT systems is considered as an operational task. [Interviewee 1: *"Well, higher utilisation of IT systems, what happens is your operational environment runs out of capacity; thus, it is actually capacity management and capacity planning. So, it is your IT operations that should perform this."* Interviewee 6: *"But I would not put it under EA. We categorise it (higher utilisation of IT systems) as part of operations."* Interviewee 12: *"So, I don't think that it is an EA project type. See, architecture may be involved, but I will say it (higher utilisation of IT systems) is in the operational and change management environment."*] Although interviewee architects acknowledge this EA project type, their arguments make it clear that higher utilisation of IT systems is achieved in the operational environment through capacity management and measurement of web site and application utilisation. [Interviewee 2: *"It is solution level work, almost like Google analytics. It was done to determine utilisation of web sites, thus, who is the customer, how long do they stay on the site and to where do they navigate?"*] It further involves the change management discipline [Interviewee 12: *"See, architecture may be involved, but I will say it (higher utilisation of IT systems) is in the operational and change management environment."*] Higher utilisation of IT systems is therefore taken off the list of EA project types.

4.5.1.1.3 Corporate strategic planning

Corporate strategic planning EA project type is marked as EA project type by most interviewees. However, it was argued that architects are involved in corporate strategic planning, only to provide input taken from already populated architecture and to capture the results. Architecture information enables corporate strategic planning, as a good understanding of the organisation and the external environment is required. Architecture executes the corporate strategic plan. [Interviewee 1: *"No, it is not an EA project type. Corporate strategic planning, your output will be an architecture. For example, a business transformation project is where architecture is involved. Strategic planning involves external factors that must be in place. Architecture is an input to corporate strategic planning. So, to be able to do strategic planning, you must know the business and you need to have an architecture understanding of the business. Strategic planning is about understanding the external and internal tactical information. Only then will you involve architects, provide them with the strategic plan, the technology environment and the technologies, and task them to assist with planning of the business transformation. So, strategic planning is an input to business transformation."*

Interviewee 1: *"Strategic planning is input to business transformation and architecture is enabling strategic planning. But I will never initiate an EA project to do corporate strategic* *planning. The two are very close, but EA and corporate strategic planning are two different disciplines. So, the purpose of EA in this context is to consider the internal business, to determine building blocks, and how the building blocks should be linked to realise the corporate strategy."*

Interviewee 12: *"Corporate strategic planning, yes, that will be strategy formulation, but EA is not responsible for it. EA only informs strategic corporate planning."*

Interviewee 12: *"Yes, architecture gives input to it (corporate strategic planning), the output of the strategy formulation comes back to architecture, which then addresses the execution of the strategy."*]

4.5.1.1.4 Organisational development

Organisational development EA project type is marked as an EA project type by most interviewees. However, it was argued that architects are involved in organisational development, only to provide input taken from already populated architecture and to capture the results. Organisational development is a large user of architecture information, specifically business process information, as input. It is performed by human resource specialists, and the result is again captured as architecture content. [Interviewee 1: *"HR will do the organisational design as part of their role, and the architect will provide input. But, as architect you will not have the required skills to change the organisation structure."* Interviewee 12: *"I would say, no, again EA informs it. So, EA aligns in terms of terminology, but we (architects) do not do the organisational development. It is a matter of informing the organisational development effort."*] Organisational development content is used as input to business transformation EA projects. Thus, organisational development EA project type is removed from the list of EA project types.

4.5.1.1.5 Merger-and-acquisition

Merger-and-acquisition projects where EA was applied were mentioned by interviewees. [Interviewee 10: *"I think one type that can be added, which I work on a lot is mergers and acquisitions. Many of the other EA project types fit in here, for example standardisation and IT landscape rationalisation and so forth. But, I think it may be a specific type where EA can play a role."* Interviewee 2: *"With a merger-and-acquisition project, where one company wanted to buy another, an EA method was applied to audit and to understand the IT investment and reusability. To understand if it is worth it to buy the company."*]. From their descriptions of the involvement in merger-and-acquisition projects, it was found that many of the already mentioned EA project types overlap with this, such as standardisation, rationalisation of the IT landscape (eliminate duplicate

IT systems), applying EA method to understand business problems and business-IT alignment. [Interviewee 6: "*Then there are lower levels of strategy to align with, because in our business your critical success factor is how fast you can sell businesses or how fast you can do mergers and acquisitions. So, we have developed a complete framework for bringing in a new business. It addresses things like what to standardise and what not"*]. Therefore, mergers-and-acquisition is not considered as a separate EA project type.

4.5.1.1.6 EA maintenance

Another EA project type proposed but not included as an EA project type is architecture maintenance as it is a phase in the project lifecycle of all EA projects of every EA project type. As mentioned by an interviewee, architecture maintenance covers all EA project types. [Interviewee 8: *"Maintenance of EA is important. So, it starts with a strategy which initiates things to be done in business which then leads to certain optimisation, such as IT optimisation. Because it is done as a project, you normally have a project scope and the project timeline is a month, 6 months or a year, where you can't address all the things. And the other problem with a project is it delivers a roadmap, but the execution of the roadmap can take many years. When the roadmap gets executed, the architecture needs to be updated because what was to-be became as-is, and re-planning needs to be done. EA maintenance will address all aspects of all the EA project types, and it not an EA project type on its own"*].

4.5.1.1.7 Business architecture

The different types of architecture, namely business, data, application and technology architecture were not obtained from literature review as EA project types. All EA project types address all four types of architecture, in different degrees. However, it was pointed out that there are EA projects that are performed as business architecture projects and that business architecture is positioned as a method to execute strategy. Business architecture was further mentioned to have the purpose to understand the internal business. Instead of listing business architecture as a separate EA project type, the different project types mentioned as business architecture projects are included as individual EA project types. The individual EA project types are strategy execution, economic architecture, apply EA to understand internal business problems, business transformation and digital transformation. [Interviewee 1: *"Business architecture is underlying to all these things (strategy execution / improvement in results of* *strategic business programmes, business transformation)"*. Interviewee 2: *"See, we do risk management together with business architecture. We did an architecture risk blueprint and landscape to enable risk management from an architecture perspective. But it was not a project on its own, it was part of the business architecture of a digital transformation project."* Interviewee 12: *"Yes, business architecture is part of it, also where you do value streams." (Response to EA project type, apply EA method to understand internal business problems).* Interviewee 12: *"Yes, yes, definitely. And, for example, BIZBOK positions business architecture as a method to do strategy execution."*] As strategy execution type is accommodated by the EA project type improvement in the results of strategic business programmes, this EA project type name is changed to "strategy execution".

4.5.1.2 EA project types added

The paragraphs that follow list EA project types that were added as a result of interviews with EA experts.

4.5.1.2.1 Economic architecture

Economic architecture was added as EA project type to include an EA project type that is concerned with micro-economics applicable to the organisation [Interviewee 12: *"And another not so pertinent one, and I do not know how big it is in these days, but it is economic architecture. The issue is that you focus on the organisation, there is a set of micro-economics involved at each organisation – how does the organisation make money and aspects around this? So, one dimension of it, where I am quite involved, is the new initiative of collaboration between a part of our company and other similar companies. And we determine shared services, the business model and the business case for it"*].

4.5.1.2.2 Business ecosystem architecture

Business ecosystem architecture is an EA project type that is performed to understand the business ecosystem in which the organisation operates. Through this type of project, the organisation gets insight into the relevant industry interconnectedness and industry role players. This EA project type is classified in the strategic enterprise perspective. [Interviewee 12: *"Look, the other one I'm quite involved in is business ecosystem architecture. To better understand the business ecosystem architecture. Business ecosystem architecture is a relatively new one. We have a few things around it, for example Company K supervises other companies. It is important that we understand how the other companies relate to each other. So, there are different levels. To understand the interconnectedness of the companies and the industry interconnectedness. And another thing is, there are many different organisations under the umbrella of our organisation,* *and there we determine the stakeholders or ecosystem role players that interact with our organisation."*]

4.5.1.2.3 Security EA and compliance project types

Another new theme recognised is security. Security forms part of each EA project type, like governance, risk and compliance. Therefore, security and compliance are categorised in the foundational EA project type category. [Interviewee 1: *"So, risk management links closely with security – the governance, risk and compliance environment. Definitely."* Interviewee 3: *"I have addressed it in projects, but it is those views and viewpoints. You take data and present something on that data, So, one of the views may show the risks of the current application stack. You address risk and security on an EA project, but I have never seen an EA project where the project was initiated specifically to address risk or security."*]

4.5.1.2.4 EA as discovery tool

A new project type is where EA method is used as a discovery tool to assist business to understand new concepts such as AI [Interviewee 4: *"How will I put it, there is a large component of awareness to understand the problem domain, for example when a client does not have knowledge of a topic, for example security policies or artificial intelligence, but they know they need to implement it. EA is used to model the concepts and best practice for these organisations with a low maturity level in the applicable subject areas. This way, the client gets familiar with the terminology, and when they understand it, they prioritise the work and can start a project to do the roadmap. So, it is more an EA discovery project whereafter another EA project may be initiated to deliver architecture roadmapping and other architecture levels"*].

4.5.1.2.5 4IR technologies

An EA project type for 4IR technologies is further included [Interviewee 1: *"There are a lot of challenges in the cloud environment. Let us rather refer to it as the new 4IR technologies. The platform differs, so the way of thinking must change. Your strategy is totally different than before these technologies. You must think differently; how you will manage the technologies and how vendor interaction will change"*].

4.5.1.3 EA project types confirmed

EA project types that were confirmed by all interviewees to be included as EA project types are:

- Business-IT alignment

- Business transformation
- Risk management
- Cost saving, including reduction in IT cost
- Digital transformation
- Improvement of organisational agility
- Eliminate duplication of information systems
- Strategy execution
- Governance
- Enhance interoperability
- Regulatory compliance
- IT decision-making
- Standardisation
- EA establishment
- Applying EA method to understand internal business problems
- Less complex IT systems

  An EA project type that not all interviewees agree on is less complex IT systems. The argument is that it can be treated as an EA project type as long as it addresses the application landscape or portfolio of the organisation. When it is about the complexity of an individual IT solution, it is classified as software engineering. [Interviewee 1: *"If it involves optimisation of the application or IT system landscape, less complex IT systems is an EA project type. But if it involves the application itself, then it is solution design that will be done. Then I feel it is a software engineering case. If the application performance gives problems, or the latency between components is not right, I must do code walkthrough to determine how performance and latency can be improved or simplified. This is again an engineering function.*] The EA project type less complex IT systems remains on the list of EA project types in the context of addressing the application landscape or portfolio of the organisation.

4.5.1.4 Optimised list of EA project types

The optimised list of EA project types is depicted in Figure 54 below. EA project types depicted in rectangles that have a green colour background are EA project types that were added as a result of semi-structured interviews with EA experts.

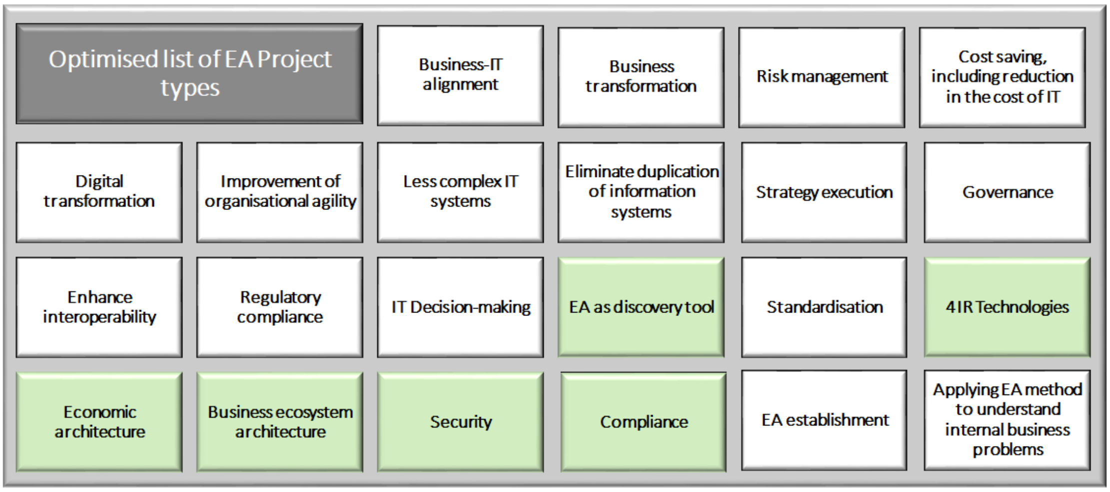


Figure 54 – Optimised list of EA project types

EA project types that were removed from the original list of EA project types and those that were mentioned as additional EA project types during interviews but are not considered as EA project types are reflected in Figure 55 below.

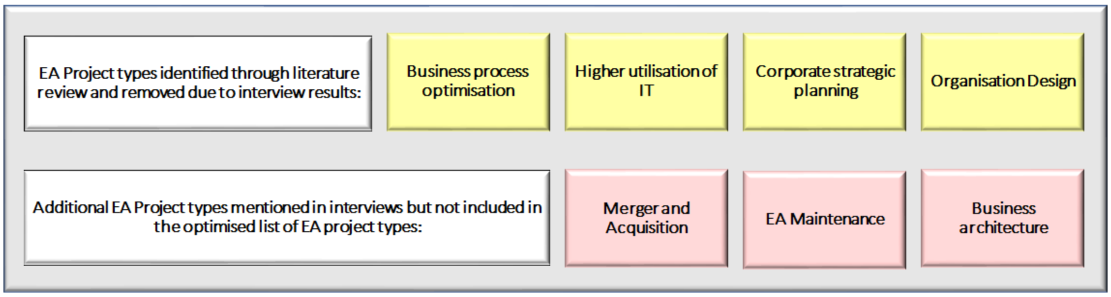


Figure 55 – EA project types not included in the optimised list of EA project types

4.5.2 Interview response analysis – further refinement of categorisation of EA project types

All interviewees accepted the three categories of EA project types as determined from the literature review. It was agreed that classification of EA project types is based on the project stakeholder requirement that determines the context in which the project will be executed. The context implies which environments impact on the architecture work. [Interviewee 1: *"To summarise, there are three categories. First one is on company group level, how to do business. You will not focus on products, but rather on the organisation. To streamline and to progress. The second one at business unit level addresses products, and how to expand products, how to make things less costly, and how to combine services. IT architecture perspective is the third category, and it focuses on how will IT cost be reduced, how will I align IT better to business, how will I ensure that my IT organisation is lean and mean to enable and support business"*. Interviewee 2: *"It is correct, yes."* (On the question if the interviewee agrees with the 3 EA project type categories and the foundational category). Interviewee 3: *"So, I agree with the three categories. It is definitely three focus areas."*] The original three EA project type categories were confirmed; however, new names for the categories were obtained from interview results.

4.5.2.1 Confirmation of categorisation with name changes

The organisational strategy perspective changed to strategic enterprise perspective, business perspective to business unit perspective and to differentiate from solution development, the IT perspective is now referred to as the IT architecture perspective. Table 30 below depicts the new names per category.

Table 30 – Confirmed EA project type categorisation with new names per category

Name as presented to interviewees	New name as obtained from interview results
Organisational strategy perspective	Strategic enterprise perspective
Business perspective	Business unit perspective
IT perspective	IT architecture perspective

Note that some interviewees are of the opinion that the EA establishment project type should be in a category of its own as it is required for the execution of all EA project types. [Interviewee 1: *"And then I would add EA establishment as an overarching category as you need to establish EA in order to do any EA project type in the other three categories."*] However, in terms of linking enterprise architects to EA projects, this type of project is classified in the business unit perspective as the internal business environment impacts on the architecture work performed to establish an EA capability. The confirmed EA project type categories are described below.

4.5.2.1.1 Strategic enterprise perspective

The scope of projects categorised in the strategic enterprise perspective include the organisation as well as the environment in which the organisation operates. The focus is on streamlining all aspects of the organisation and often involve strategy formulation. Expansion or integration with other organisations to ensure organisation sustainability and that the organisation is in harmony with the external environment are further characteristics of projects in this category. [Interviewee 3: *"Let's take an example; for strategic enterprise perspective* *(organisation strategy perspective), you will typically have the McKinseys of the world. The people that do strategy and analysis of what is going on in the market, so the focus is specifically on the strategy layer."*] Project stakeholders that the architects interact with are operating on executive level in the organisation. EA project types that are categorised in the strategic enterprise perspective are business transformation, digital transformation, agility improvement, business ecosystem architecture, economic architecture and EA as discovery tool.

4.5.2.1.2 Business unit perspective

Project types in the business unit perspective concentrate on aspects internal to the business. The focus is on improvement and enhancement of products and services to best execute the strategy in the most cost-effective manner. Thus, enterprise strategy is taken as input to these projects. Project stakeholders are at business unit level and lower in the organisation. [Interviewee 3: *"And then for the second bucket, business unit perspective (business perspective), you will have the typical subject matter expert architect, you will send in an architect consulting team, with a manager, and you will interact and cooperate with business experts."*]. EA project types classified as business unit perspective project types are strategy execution, apply EA method to understand business problems, agility improvement, regulatory compliance and economic architecture.

4.5.2.1.3 IT architecture perspective

The IT architecture perspective is concerned with alignment of IT to best support and enable business. It involves the IT strategy formulation and execution, with business strategy as input. Reuse of IT components and elimination of duplication in IT functionality are addressed in this category. [Interviewee 3: *"And then the last one, IT architecture perspective (IT perspective) will typically be something like a cloud migration."*] Projects in this category are closely related to software engineering projects as it guides IT throughout the enterprise. EA project types grouped in the IT architecture category are business-IT alignment, less complex IT systems, eliminate duplication of IT systems, IT decision-making, cost saving and 4IR technologies.

4.5.2.2 Newly added category

EA project types derived from EA goals, namely standardisation, governance and regulatory compliance, and two of the types obtained from EA benefits, namely risk management and enhance interoperability, were classified in all three categories of EA project types during the literature review. Interviewees indicated that it could be classified as a foundational category of all other categories. [Interviewee 2: *"I would remove the EA project types in bold that you reflected in each of the three categories, and put them all in a foundational category. It is foundational elements that are addressed with each EA project. For example, when you do a digital transformation type of project, you also address cost saving, regulatory compliance, standardisation and risk management."* Interviewee 11: *"Just one proposal; I would move things like governance, regulatory compliance and risk management to a fourth category as it is a different dimension on the three other categories."*] Thus, all EA project types address standardisation, governance, regulatory compliance, risk management and interoperability. [Interviewee 3: *"I have never done a project where the purpose is to specifically do standardisation, governance or regulatory compliance, but all EA projects in my environment address these things."* Interviewee 12: *"Risk management is definitely addressed in all EA projects. I do not think it is an EA project type on its own, it is an integral part of EA (foundational category)."*] Governance, risk and compliance are three aspects of the same problem. When an organisation is not compliant, there is risk, and governance ensures or enforces compliance. Some organisations have more compliance requirements than others, but all South African organisations are now required to comply with the Protection of Personal Information Act (POPIA). All aspects of architecture are impacted. Hence, governance, risk and compliance are taken in consideration in all EA projects. [Interviewee 6: *"There is a lot of regulatory compliance in the industry that I work in; it forms part of every EA project. We do not initiate a project to address those topics indicated in bold (regulatory compliance, standardisation, risk management); it is part of every EA project."*] Regulatory compliance, or merely compliance as a separate EA project type, is applicable where an organisation needs to comply to specific prescriptions to be allowed to operate as a business. The trigger for this type of EA project is to prepare the organisation to comply with relevant regulations to be certified to operate as a business. [Interviewee 1: *"Say you operate a duck abattoir. For the abattoir to obtain the relevant licence to operate, the abattoir needs to comply with certain legislation and prescripts. So, the EA project to get the abattoir compliant is seen as a regulatory compliance EA project."*]

To summarise, governance, risk and compliance form part of every EA project, and it can be initiated as a separate project, which will have the type of regulatory compliance. Another EA project type that justifies the existence of a foundational project type category is security as interviewees mentioned that all EA projects address security, irrespective of the type. [Interviewee 1: *"Risk management is closely related to security."* Interviewee 8: *"You have risk management on top, security is already part of risk management."* Interviewee 9: *"Well … security … information security is recognised as part of the EA capability; it is a separate domain which provides specialisation due to various regulations and standards that govern security. But it is not a project type; it is interweaved in the EA, business, data, application and technology architecture."*]

The fourth category is therefore the foundational category. It contains EA project types that represent aspects that are addressed by all EA projects. These aspects are governance, risk, compliance, standardisation, security and interoperability. Each of the aforementioned aspects is attended to in accordance with the relevant EA project category, namely strategic enterprise perspective, business unit perspective and IT architecture perspective. [Interviewee 11: *"So, I agree 100% with the three categories, the strategic view, business view and IT view. I would move things like governance, regulatory compliance and risk management to a fourth category as it is a different dimension on the three other categories."*]

Interviewees acknowledge the EA project types identified during literature review as valid EA project types. They state that architecture work usually includes most elements of the different EA project types. This statement, the intertwining of the different EA project types and the foundational category strengthen the argument of categorising EA project types according to stakeholder requirement context. Classification of a specific EA project for the purpose to link suitable enterprise architects is therefore primarily done according to the **different EA project type *categories***.

4.5.3 Interview response analysis – EA project types are interweaved

Interviewees agree that the different EA project types are interweaved. The intertwining of the EA project types theme is confirmed by the statements, taken from interview results, which follow in this section. The EA project type **apply**

EA method to understand internal business problems relates to business architecture. It is focused internally and helps the business to understand its problems and to work differently, which leads to **business transformation**. [Interviewee 1: *"Business transformation and apply EA method relate to each other; it flows into each other."*] The relation is reflected in Figure 56 below.

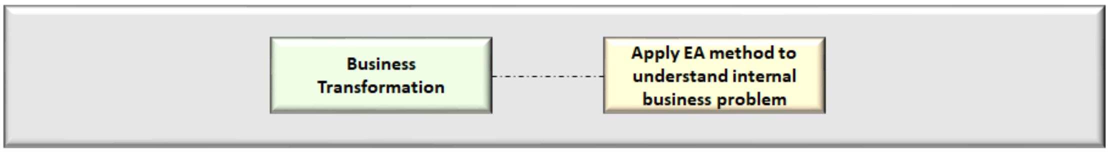


Figure 56 - Interweaving of two EA project types

Business transformation aids in **strategy execution**, **improvement of organisational agility** and **cost saving on business level** as reflected in Figure 57 below. [Interviewee 1: *"Agility, again it relates to business transformation because you will address internal processes, how can I make myself better and more effective, so, it is the same as business transformation."* Interviewee 1: *"If you want to save cost at business, it will be business transformation."* Interviewee 1: *"Improvement in the results of strategic business programmes; it goes back to business transformation."*]

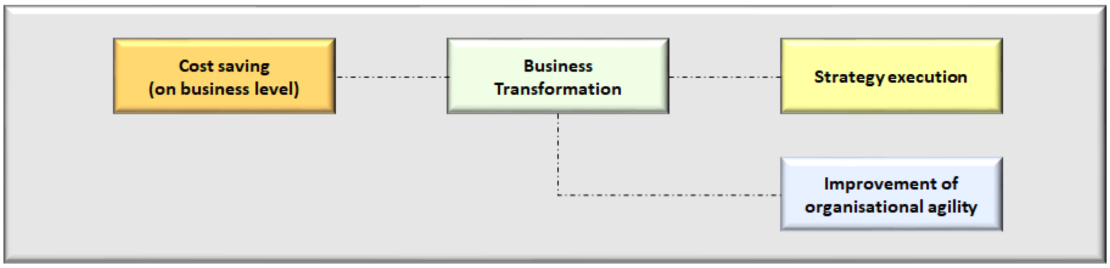


Figure 57 – Business transformation EA project type relations

Digital transformation and **improvement of business agility** go hand in hand, although it is seen as two different EA project types. [Interviewee 1: *"Digital transformation and business agility go hand in hand."*] The relation between EA project types, digital transformation and improvement of business agility is depicted in Figure 58 below.

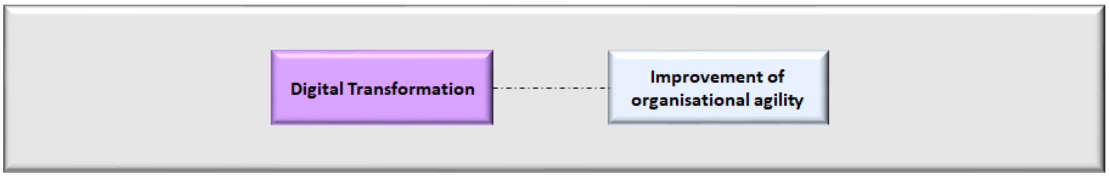


Figure 58 – Digital transformation and organisational agility relation

Cost saving on IT level relates to **business-IT alignment** as depicted in Figure 59 below, where **cost saving** on business level relates to **business transformation** as mentioned above. [Interviewee 1: *"Cost saving goes back to planning, to business-IT alignment."*]

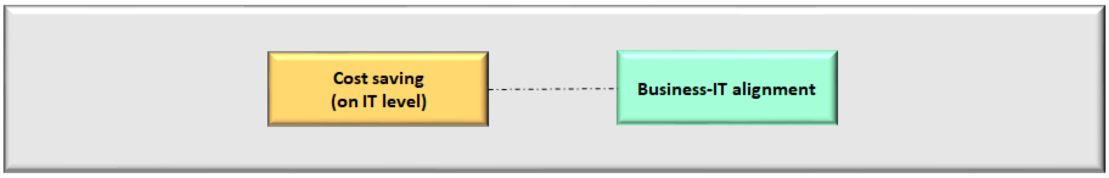


Figure 59 – Business-IT alignment relation to cost saving on IT level

A close relation between the EA project types **business transformation**, **applying EA method to understand internal business problems** and **improve organisational agility** is highlighted. **Strategy execution** is achieved through **business transformation**. Relations are depicted in Figure 60 below.

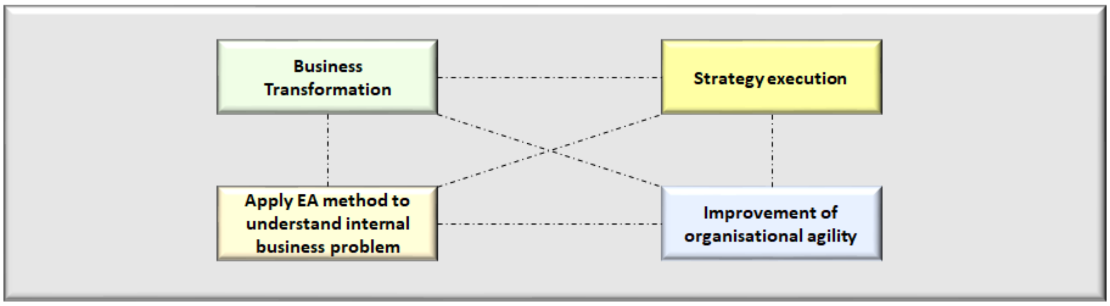


Figure 60 – Intertwinement of four EA project types

The literature review shows that organisational agility can be achieved through business-IT alignment that enables business transformation. The interview results add that organisational agility can also be achieved through business transformation without business-IT alignment.

It was emphasised that IT decision-making and digital transformation EA project types are not the same. IT decision-making is concerned with cost reduction whereas digital transformation is concerned with how to use IT in order to improve sales. IT is traditionally a cost centre, but through digital transformation IT tends to be more of a profit centre as it will be used to bring in business. **IT decision-making** is considered as a separate EA project type, but it has a strong link to the EA project type **cost saving, including reduction in IT cost**. [Interviewee 1: *"So, this, IT decision-making; it links to cost saving, including reduction in IT cost. IT decision-making normally involves cost reduction"*]. There is some overlap between **eliminate duplication of IT systems** and **standardisation**; not always, but eliminate duplicate IT systems is often a flavour of standardisation. These relations are depicted in Figure 61 below.

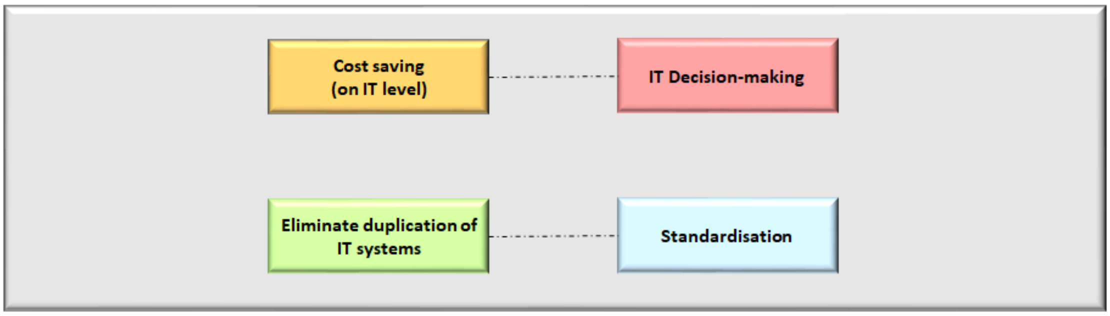


Figure 61 – Relations between EA project types

4.6 EA project type classification framework

The EA project type classification framework, described above and depicted in Figure 62 below, is a result of hermeneutic literature review and thematic analysis of interview results of 12 semi-structured interviews with EA experts. The **EA establishment** EA project type is reflected as a back layer required to any type of EA project. For purposes of determining EA profile per project type, EA establishment is categorised in the business unit perspective.

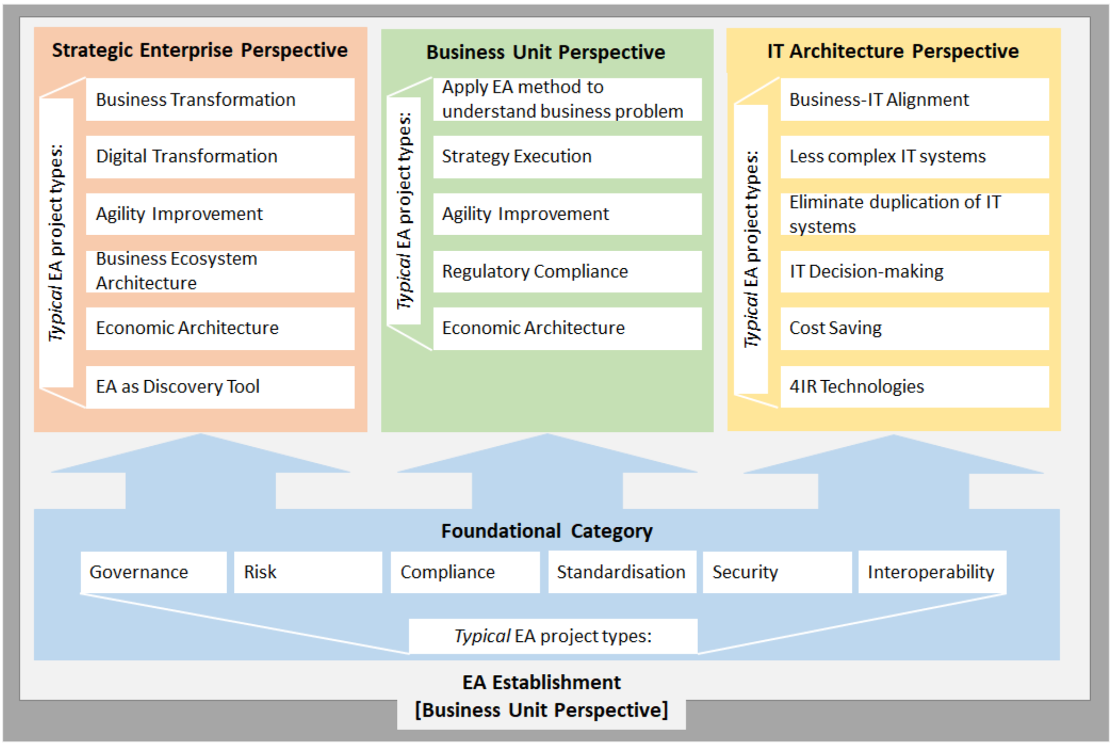


Figure 62 – EA project type classification framework

Due to the interweaving of EA project types, one EA project may have different phases that are classified in more than one category. Therefore, to categorise an EA project or an EA project phase, the different **EA project type categories** are used and **not the typical EA project types listed per category**.

Four EA project type categories were identified, namely strategic enterprise perspective, business unit perspective, IT architecture perspective and a foundational category.

Evaluation of the four EA project type categories with EA experts proved that one category serves as a foundational category. The foundational category contains EA project types that represent aspects that are addressed by all EA projects. These aspects are governance, risk, compliance, standardisation, security and interoperability. Each of the aforementioned aspects is attended to in accordance with the relevant EA project type category, namely strategic enterprise perspective, business unit perspective and IT architecture perspective. Therefore, the foundational category is embedded in each of the other three categories. An EA project type cannot be categorised in the foundational category.

Therefore, an EA project or project phase is classified as one of the following **three EA project type categories**: 1) strategic enterprise perspective; 2) business unit perspective; or 3) IT architecture perspective. The EA project type classification framework depicted in Figure 62 above is simplified to reflect the three categories of EA project types. Note that for the purpose of classifying an EA project in an EA project type category, the foundational category is not relevant and is not reflected in the simplified EA project type classification framework. Figure 63 below reflects the simplified EA project type classification framework that forms part of the methodology for the selection of enterprise architects in support of EA project execution. The EA project type classification framework provides EA project type categories as well as categorisation guidelines to be used when categorising an EA project.

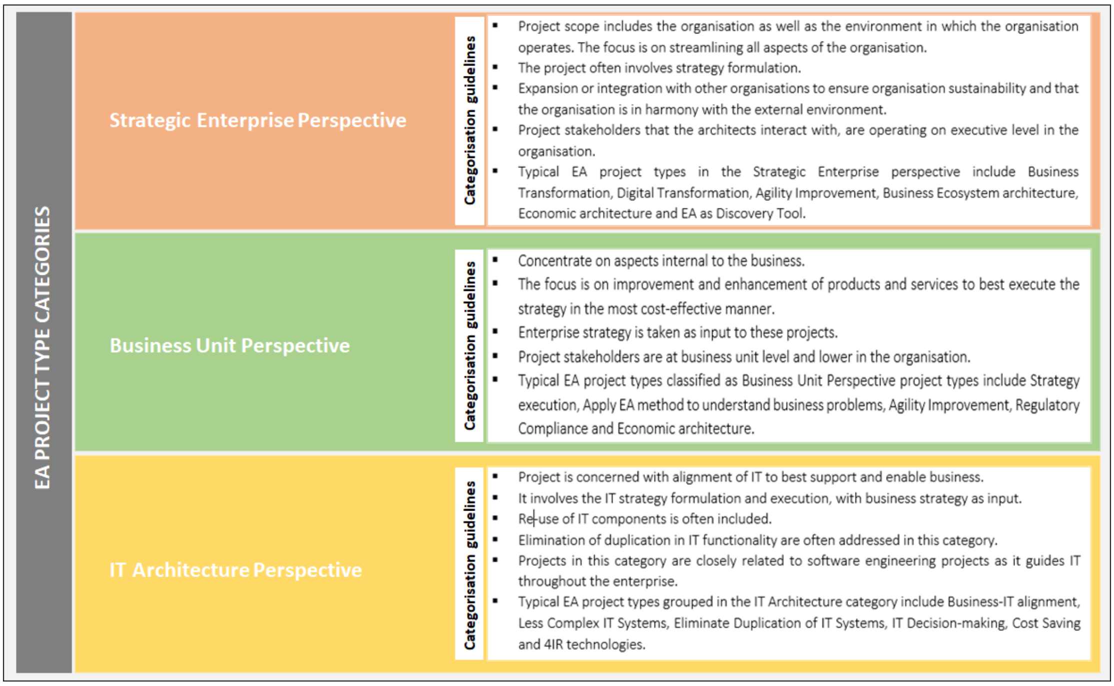


Figure 63 – EA project type classification framework (simplified for further use)

EA project type categories are based on the project stakeholder requirement that dictates the project context in terms of environments taken in consideration when doing EA work. Thus, categorisation of EA projects entails determining the scope of the project in terms of landscapes considered.

To summarise, the EA project type classification framework started with a literature review where the method to determine the type of a project was applied. The literature review delivered a preliminary list of 20 EA project types, and identified that EA project types are interweaved and that EA project types must be categorised due to the interweaving of EA project types. These three components were demonstrated to and evaluated by 12 EA experts through semi-structured interviews. The demonstration and evaluation resulted in an optimised list of 22 EA project types; the interweaving of EA project types was confirmed and the categorisation of EA project types was refined. An EA project classification framework was delivered. The EA project type classification framework was simplified to be used as part of the methodology for the selection of enterprise architects in support of EA project execution. The simplified EA project type classification framework contains guidelines for classification as well as typical EA project types per EA project type category. Guidelines are informed by the paragraphs that reflect confirmation of EA project type categories and are included per EA project type category as categorisation guidelines on the simplified EA project type classification framework. Refer to Figure 64 below for a depiction of the development of the EA project type classification framework.

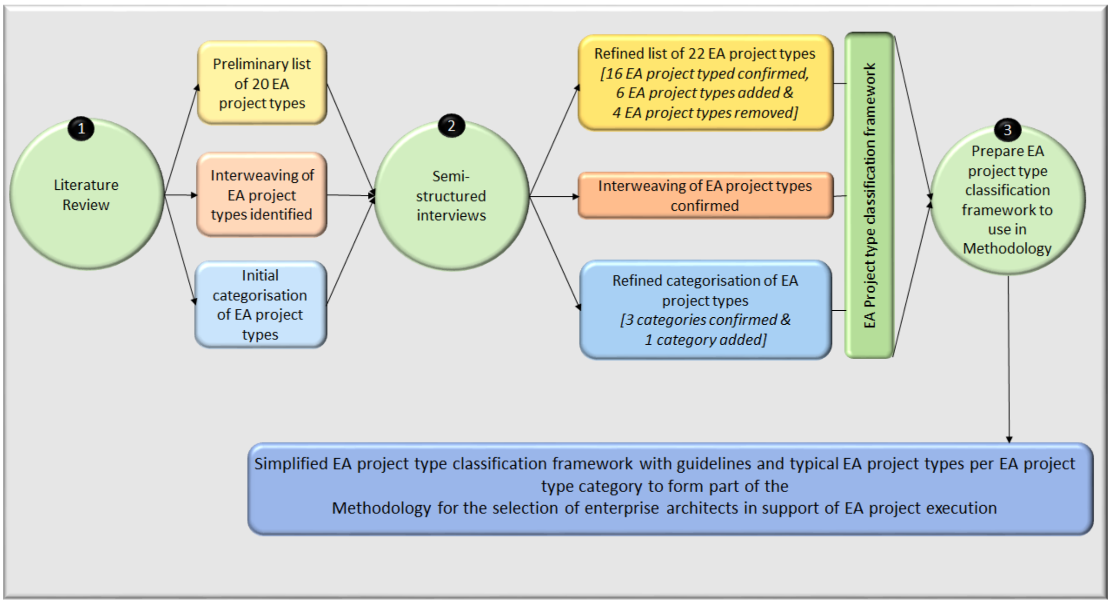


Figure 64 – EA project classification framework development

4.7 Conclusion

This chapter answers sub-research question 1, "What are the different EA project types?" The method to determine the type of a project is described as well as how the method is applied in this study to determine different types of EA projects during hermeneutic literature review. Twenty different EA project types were identified. It was found that EA project types are intertwined. An EA project can further be classified as more than one EA project type. Therefore, categorisation of EA project types was done based on the scope of the stakeholder requirement. The stakeholder requirement scope dictates which environments impact on the architecture work and determines the EA project type category. EA project types, categorisation and interweaving of EA project types were presented to 12 EA experts in individual semi-structured interviews. This chapter reflects the interview results and the thematic analysis of the interview results. The final product delivered in this chapter is the EA project type classification framework. The next chapter gives detail on different EA profiles that represent different understandings of EA, after which relevant EA profiles are linked to EA project types in Chapter 6.

5. EA profiles

Figure 65 below shows the position of Chapter 5 in relation to the rest of the thesis.

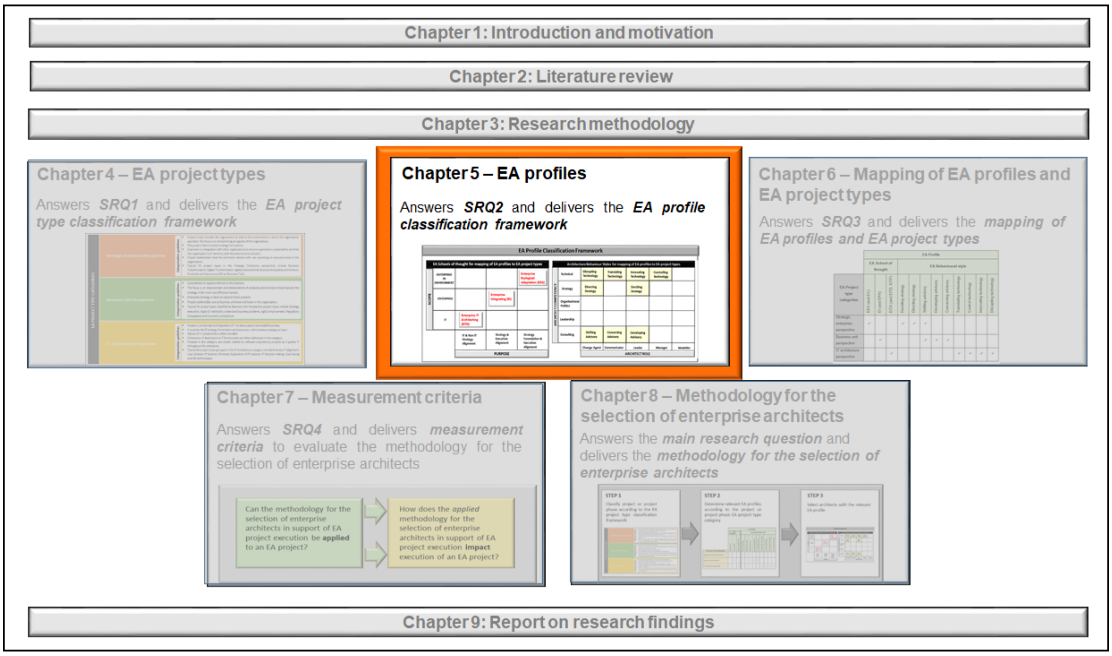


Figure 65 – Position of Chapter 5 in relation to the rest of the thesis

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Chapter 5 layout:

5.1 Introduction

5.2 EA profiles as per DIA

5.3 EA schools of thought as per DIA

5.4 EA behavioural styles as per DIA

5.5 EA profile classification framework

5.6 Conclusion

5.1 Introduction

This chapter answers sub-research question 2: "What are the different understandings that enterprise architects have of EA?"

Du Preez (2016) addresses the problem of understanding the different perceptions that enterprise architects have of EA by developing a tool, the DIA, to determine the EA profile of enterprise architects.

The rigorous methodology that was followed to develop the DIA makes the DIA a credible tool to determine enterprise architects' EA profiles. The DIA extends the theory of the three schools of thought on EA (Lapalme, 2012). The DIA is founded in the social cognitive theory, prescribing consideration of personal factors, behavioural factors and influences from the environment. The EA profile considers the personal aspects of enterprise architects through the EA school of thought indicator and architect attributes, the behavioural issues through the EA behavioural style indicator and the environmental influences through EA factors. A total of 112 architects from different countries responded to questionnaires to determine the components of the DIA; 107 responses could be used. Seen in relation to the suggested minimum sample of 35, this large number of respondents strengthens the credibility of the DIA. The sampling size was calculated as described by Salant and Dillman (1994).

The DIA is further selected as instrument to determine EA profiles to select enterprise architects in support of EA projects as it focuses on personal belief systems and personal behaviour styles. A similar approach was followed by Yilmaz, O'Connor, Colomo-Palacios and Clarke (2017) in a study to investigate the selection of software developers to enhance software development project success. Their study results show that personality traits do have an impact on effectivity. Therefore, the DIA was used to determine enterprise architects' EA profile as part of the methodology to select enterprise architects in support of EA project execution.

To answer sub-research question 2, the DIA was critically analysed. Similarities between characteristics of different EA schools of thought and discrepancies within EA schools of thought were identified. Based on these similarities and discrepancies, the number of EA schools of thought were reduced for the purpose of this study only. Further research is required before it could be proposed that the DIA should be amended. No changes to the EA behavioural style were made.

5.2 EA profiles as per DIA

A description of how the DIA was developed is provided in paragraph 2.8 of this document. An architect's EA profile is reflected through the EA behaviour style and EA school of thought that are relevant to the architect. Therefore, determining to which EA school of thought an architect belongs and what the architect's EA behavioural style is provides the architect's EA profile (Du Preez, 2016).

The DIA defines seven EA schools of thought. Three of the seven EA schools of thought were defined before by Lapalme (2012) and are referred to as the "ideal EA schools of thought" (Du Preez, 2016). Nine different EA behavioural styles are defined, therefore resulting in a possibility of 63 combinations of EA school of thought and EA behavioural styles and in 63 possible EA profiles. When an architect's EA school of thought and EA behaviour style are determined, attributes regarding the architect as depicted in Figure 66 below are understood.

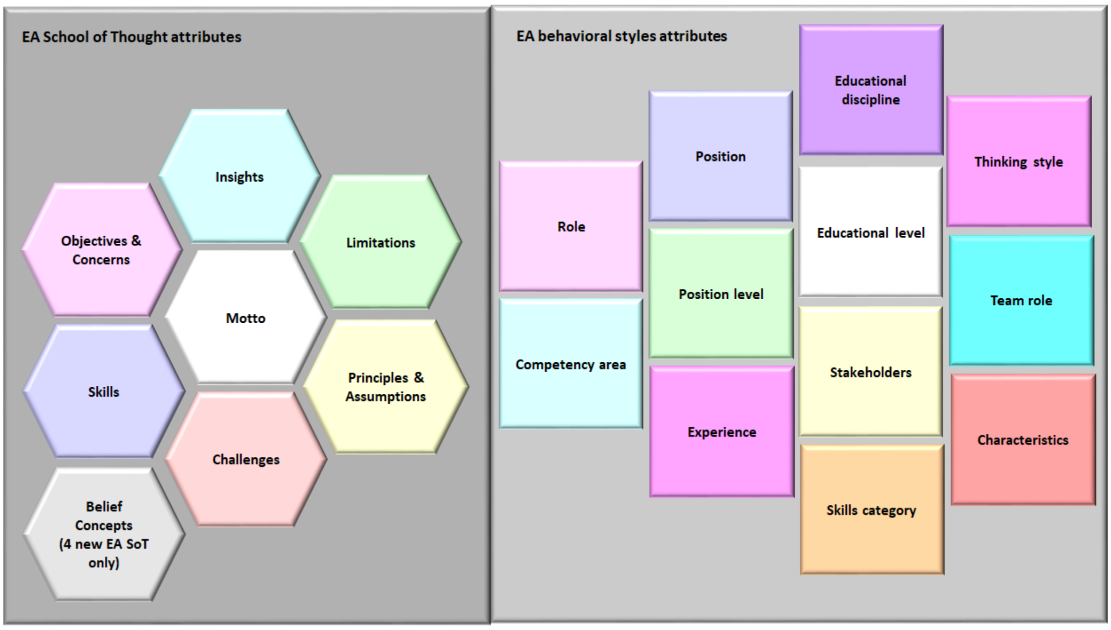


Figure 66 – Attributes known when EA profile is identified (Du Preez, 2016)

The seven EA schools of thought and their corresponding values per attribute reflected in Figure 66 above are described in the paragraphs that follow. Thereafter, the nine EA behavioural styles and values of attributes reflected in Figure 66 above are described.

5.3 EA schools of thought as per DIA

EA school of thought is influenced by the architect's understanding of EA in terms of the purpose for planning the EA initiative and the scope of the EA initiative (Lapalme, 2012). The seven EA schools of thought are depicted in Figure 67 below. There are three possible values for EA planning purpose on the horizontal side and three possible values for EA scope vertically. Lapalme's (2012) three "ideal EA schools of thought" are indicated with red squares in Figure 67 below.

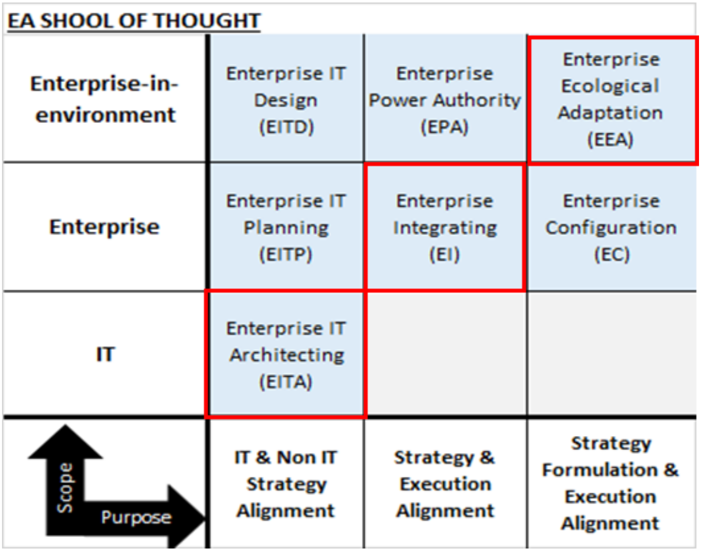


Figure 67 – Seven EA schools of thought (Du Preez, 2016)

5.3.1 Enterprise IT architecting (EITA)

The position of the EITA school of thought in terms of purpose and scope is IT scope and purpose of IT and non-IT strategy alignment.

The EITA school of thought is one of the three "ideal EA schools of thought" identified by Lapalme (2012). Architects in the EITA school of thought focus on aligning IT to business to enable correct execution of the strategic business plan through appropriate IT. EITA architects often act in senior leader roles and have postgraduate education in formal sciences as well as architecture certifications such as Zachman or TOGAF. Their architecture work is focused on the logical system level with the view to make an impact on the business level by improving business efficiency and delivering quality information. They see their ability to provide EA consulting services as valuable in their daily work where their general IT skills are often used. Architecture deliverables are mostly in the format of inventories, but they also use unified modelling language (UML) as modelling language to create composite models. These models depict future state systems from which architecture roadmaps are compiled, adding value to the architecture effort. Most of the interaction of EITA architects is with analysts and project managers. Quality work and providing the right ICT direction is high on their agenda. Their ultimate goal is to align IT with business, resulting in reduction of cost. EITA architects see the architecture function’s culture as hierarchical and as part of the CIO’s responsibilities. A metaphor for the EITA architect is “urban planner” (Du Preez, 2016). Table 31 below provides a summary of the beliefs of the EITA school of thought.

Table 31 – Summary of EITA school of thought beliefs (Du Preez, 2016)

Belief aspect	Belief of EITA school of thought
Motto	▪ “Enterprises architecture is the glue between business and IT” (Lapalme, 2012:39)
Objectives & Concerns	▪ Enable execution of the organisational strategy ▪ Aid in planning of IT and cost saving ▪ Business enablement
Principles & Assumptions	▪ Reductionism ▪ Accept business strategies as correct ▪ Organisational components are designed independently ▪ Only concerned with IT aspects of the business
Skills	▪ Technical engineering competence
Challenges	▪ Need to convince business to accept the designed IT plans
Insights	▪ Can design complex and robust technical solutions ▪ Promotes development of high-quality models and planning scenarios

Belief aspect	Belief of EITA school of thought
Limitations	▪ May deliver solutions that are not suitable for enterprise context ▪ Have difficulty with acceptance of solutions and implementation obstacles ▪ Prone to "perfect" designs for unmaintainable strategies syndrome

Enterprise integrating (EI)

The position of the EI school of thought in terms of purpose and scope is enterprise scope and purpose of strategy and execution alignment.

The EI school of thought is the second of the “ideal schools of thought” defined by Lapalme (2012). Architects in the EI school of thought typically operate as business architects at a senior level. They have postgraduate qualifications in applied sciences or in a professional discipline. The role that they often take is that of a change agent. Interestingly, they use the Gartner definition for EA, while most of them are TOGAF-certified and they use the Zachman Framework as well as TOGAF. EI architects work at the business level and mainly from a process perspective. They do not focus on the IT function only, but work on an enterprise level impacting the complete organisation. The architecture deliverables are mainly on the conceptual and logical levels. Due to their business process focus, business process modelling notation (BPMN) and UML are used to depict their EA deliverables. Architects in the EI school of thought interact with business executives and governance boards. They believe that EA deliverables must be formally accepted and signed off. These architects use their EA and strategist skills to deliver target architecture models and EA roadmaps. EI architects aim to improve business efficiency through optimisation, integration and standardisation of business processes. Their focus is on implementing the business strategy. The EI architect believes that the EA function should report to the CIO. Another way to refer to the EI architects is as an “inquiring facilitator” (Du Preez, 2016). Table 32 below provides a summary of the beliefs of the EI school of thought.

Table 32 – EI school of thought belief concepts (Du Preez, 2016)

Belief aspect	Belief of EI school of thought
Motto	▪ "Enterprise architecture is the link between strategy and execution" (Lapalme, 2012:39)
Objectives & Concerns	▪ Implement the business strategy of the enterprise successfully ▪ Promote organisational unity
Principles & Assumptions	▪ Universal approach (systemic) ▪ Accept business strategy, goals and objectives as correct ▪ Control the environment ▪ All aspects of the organisation are designed together
Skills	▪ Facilitation skills applied in small groups ▪ Systems theory
Challenges	▪ Understand enterprise systemic changing aspects ▪ Cooperation across the enterprise ▪ Promote systems theory
Insights	▪ Allows for all-inclusive designs of solutions ▪ Eliminate pointless inconsistencies and paradoxes, enhancing enterprise efficiency
Limitations	▪ Prone to "perfect" designs for unmaintainable strategies syndrome ▪ Requires a concept shift from reductionism to holism

5.3.2 Enterprise ecological adaptation (EEA)

The position of the EEA school of thought in terms of purpose and scope is enterprise-in-environment scope and purpose of strategy formulation and execution alignment.

The EEA school of thought is the third ideal school of thought defined by Lapalme (2012). Architects belonging to the EEA school of thought are concerned with designing all aspects of the enterprise, as well as the interaction with the external environment of the enterprise. EEA architects encourage innovation and adapting to the environment. These architects are involved in developing organisational strategy, while keeping the external environment in mind. EEA architects are experienced and occupy senior positions. They typically studied in a formal sciences subject area, but do not always hold an EA certification such as TOGAF certification. Their EA framework of choice is the Zachman Framework; however, they define EA according to the Archimate definition of EA. The role of the architect, according to the EEA school of thought, is that of a leader that impacts on the business component of the organisation. They model on a middle level of detail and focus on processes using organisation-specific modelling notations. The EEA architect adds value by contributing to improvement of business efficiency through standardisation and integration of business processes and business systems. They interact with governing bodies and report to the CIO. One can refer to the EEA architect as a “sense maker” (Du Preez, 2016). Table 33 below provides a summary of the beliefs of the EEA school of thought.

Table 33 – EEA school of thought belief concepts (Du Preez, 2016)

Belief aspect	Belief of EEA school of thought
Motto	▪ “Enterprise architecture is the means for organisational innovation and sustainability” (Lapalme, 2012:39)
Objectives & Concerns	▪ Innovate and modify ▪ Promote unity in the organisation ▪ Support system-in-environment co-development
Principles & Assumptions	▪ Universal approach (systemic) ▪ System-in-environment co-development ▪ The environment can be transformed ▪ All aspects of the organisation are designed together
Skills	▪ Encourage dialogue ▪ Use system and system-in-environment theory ▪ Facilitation skills applied in larger groups
Challenges	▪ Encourage sense-making ▪ Promote system theory and system-in-environment paradigm shift ▪ Cooperation across the enterprise

Belief aspect	Belief of EEA school of thought
Insights	▪ Support system-in-environment co-development and organisational consistency ▪ Promote innovation and enterprise sustainability
Limitations	▪ Is dependent on organisational prerequisites regarding strategy formulation and management

5.3.3 Enterprise configuration (EC)

The position of the EC school of thought in terms of purpose and scope is enterprise scope and purpose of strategy formulation and execution alignment. EC school of thought architects work as solution architects in a specific functional area. They are educated in formal sciences, have TOGAF certification, use TOGAF and also use The Open Group's definition of EA. EC architects have less EA experience than EITA architects, who have 5–10 years' EA experience, EI architects who have 10–15 years' EA experience and EEA architects who have 5–10 years' EA experience. EC architects typically have 1–5 to five years' EA experience. The business component of an organisation benefits from the work of EC architects that delivers logical architecture. The focus is on business-IT alignment, reduction of complexity and to standardise systems and business processes. These architects' primary skill is that of a consultant and they often work with other architects and project managers. EC architects share knowledge with fellow architects and other project team members. They see EA as aiding in transformation of business decisions and the realisation of business strategy through these decisions, by focusing on the impact of internal factors to transform. Thus, EA supports planning of the business strategy as well as execution of the business strategy by solving problems with the view to improve. As EC architects believe in continuous cycles of business transformation or improvement, it may put the organisation in a situation where design configurations constantly change. Constant change in design configurations may hamper strategy execution; therefore, EC architects develop the methodology for decision transformation to ensure that strategy formulation and execution are aligned. Architects in the EC school of thought consider the enterprise as functioning in a closed system, independent from the environment. Therefore, the environment must be open and accommodating towards the constant business transformation. EC architects can be described as "futurists", concerned about the impact of current decisions on the enterprise. Table 34 below provides a summary of the EC school of thought's beliefs.

Table 34 – EC school of thought belief concepts (Du Preez, 2016)

Belief aspect	Belief of EC school of thought
Motto	▪ "EA as a decision transformation methodology" (Du Preez, 2016:133)
Objectives & Concerns	▪ Support system-in-environment co-development ▪ Promote unity in the organisation ▪ Successful organisational strategy transformation
Principles & Assumptions	▪ Universal approach (systemic) ▪ Support system-in-environment co-development ▪ "Environment as something to transform" (They see the organisation as a closed system operating independently of the environment) ▪ All aspects of the organisation are designed together
Skills	▪ Use system and system-in-environment theory ▪ Facilitation skills applied in larger groups
Challenges	▪ Cooperation across the enterprise ▪ Promote system theory and system-in-environment paradigm shift
Insights	▪ Design solutions that transform the business ▪ Promote enterprise co-development and organisational coherency
Limitations	▪ Possibility of unrealised business strategy due to continuous design changes ▪ Dependent on an environment that can be influenced (and not taken in consideration when planning business strategy)
Additional aspect that is provided for EA school of thought that was added to the original EA schools of thought defined by Lapalme (2012)	

Belief aspect	Belief of EC school of thought
Belief concepts	▪ Universal approach (systemic) (Holism) ▪ Open system ▪ "Determinism" – all incidents are determined by things that already exist ▪ "Contextualism" – a situation is understood in terms of the context in which it occurs

5.3.4 Enterprise power authority (EPA)

The position of the EPA school of thought in terms of purpose and scope is enterprise-in-environment scope and purpose of strategy and execution alignment.

EPA architects operate at senior level as business architects; they typically have 10–15 years' EA experience and are trained in a formal science area. They have postgraduate education and are TOGAF-certified. EPA architects apply TOGAF in their architecture work; however, they define EA as per the Gartner EA definition. EPA architects consider themselves to be "change agents". Fulfilling the role of business architects, EPA architects apply a business management approach and focus on processes, utilising BPMN modelling notation. These architects work with executives and managers as well as governance entities. Architects in the EPA school of thought use their business skills, EA skills and ability to consult when performing their work. They add value by creating models that reflect the future state of the business to support business strategy execution. While concerned about organisational agility and effectiveness to realise business goals, EPA architects also believe in achieving business-IT alignment. Architects in the EPA school of thought see the EA function to be reporting to the CIO and they function normally in a hierarchical organisation. These architects find organisational politics and successful cooperation challenging. With the focus on business agility in a changing environment, EPA architects work towards standardisation, integration and elimination of duplication of business processes. They consider EA as a mechanism to use for power and negotiation and to control business strategy execution. The EPA school of thought stems from political science.

Due to their power and influence on the future environment of the enterprise, the EPA architects are inclined to self-interest and being misleading. Approval of EA deliverables receive a high priority. EA deliverables are often only conceptual and delivered following a systems thinking method. EPA architects work with small groups at a time and believe in negotiation to solve problems. It may happen that solution designs of EPA architects are politically motivated as these architects believe in eliminating conflicting situations, impacting negatively on the business strategy. An understanding of business dynamics is beneficial for the architecture work delivered by EPA architects. These architects find enterprise coherence and collaboration challenging. According to the EPA school of thought, the architect ensures strategic alignment through negotiation and EA work. EPA architects are referred to as “organisational politicians”. Table 35 below provides a summary of the beliefs of the EPA school of thought.

Table 35 – EPA school of thought belief concepts (Du Preez, 2016)

Belief aspect	Belief of EPA school of thought
Motto	▪ “EA as a tool for power and negotiation”
Objectives & Concerns	▪ Impact on organisation business strategy ▪ Enterprise control
Principles & Assumptions	▪ Practical and dealing with facts ▪ Architect can influence contents of strategic business objectives and the business strategy ▪ Can impact on environment to change it ▪ All aspects of the organisation are designed together
Skills	▪ Facilitation skills applied in small groups ▪ Systems theory
Challenges	▪ Understand enterprise systemic changing aspects ▪ Cooperation across the enterprise ▪ Organisational synchronisation

Belief aspect	Belief of EPA school of thought
Insights	▪ Allows creation of blueprints for all-inclusive solutions ▪ Disregard substitute or replacement scenarios and thereby enterprise effectiveness is not taken in consideration
Limitations	▪ Prone to provide politically correct designs for “unsustainable strategies syndrome” ▪ Specific conditions in the organisation are required for strategy development and power structure
Additional aspect that is provided for EA school of thought that was added to the original EA schools of thought defined by Lapalme (2012)	
Belief concepts	▪ Practical and dealing with facts ▪ Organisation functions as a closed system ▪ “Indeterminism” – cause of incidents is by chance and not deterministic ▪ Power

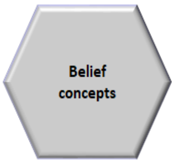
5.3.5 Enterprise IT design (EITD)

The position of the EITD school of thought in terms of purpose and scope is enterprise-in-environment scope and purpose of IT and non-IT strategy alignments.

Architects in the EITD school of thought have 5–10 years’ EA experience. EITD architects believe in certifications and qualifications. They have postgraduate qualifications in applied sciences or professional subject areas, at the level of a Master’s degree, and often EA certifications such as TOGAF certification as well. These architects are employed at executive level and they see their architect role as being change agents. The focus area of EITD architects is on alignment of business processes; therefore, BPMN is the modelling notation applied by them. Although the focus area is on business processes, EITD architects deliver target architecture for all EA viewpoints, including business, data, application and technology, with emphasis on business-IT alignment. EITD architects develop EA to enable execution of the business strategy. By valuing business-IT alignment, EITD architects add value in terms of standardisation, elimination of duplications and integration of business processes and the enabling information systems. Trends in the external IT environment are taken in consideration to ensure that the organisation's IT strategy is aligned with it. EITD architects see the organisation as an open system where the external IT environment impacts on the IT and business strategies. As the external environment is mainly considered in terms of IT, the EITD architects have good technical knowledge. EITD architects continuously monitor the external IT environment and therefore see themselves as scholars or leaners. Table 36 below provides a summary of the beliefs of the EITD school of thought.

Table 36 – EITD school of thought belief concepts (Du Preez, 2016)

Belief aspect	Belief of EITD school of thought
Motto	▪ "EA as a change agent considering external IT environment"
Objectives & Concerns	▪ Execution of IT strategy at enterprise level complements the external environment ▪ Innovation, modernisation and modification
Principles & Assumptions	▪ Reductionism ▪ IT organisation is designed with focus on external world ▪ External world is taken in consideration in development of IT strategy, including IT objectives
Skills	▪ Knowledge of engineering ▪ Technical proficiency ▪ Appropriate facilitation skills to apply in larger groups
Challenges	▪ Business understanding and approval to consider external IT environment ▪ Promote sense-making
Insights	▪ Allows the influence of the external IT environment on the design on ICT solutions ▪ Environmental impact studies are done to deliver innovative IT strategies
Limitations	▪ Acceptance of solution and implementation can be obstacles ▪ "Susceptible to 'perfect' designs for unsustainable strategies syndrome" ▪ Focus is on innovating and sustaining the IT of the organisation

Belief aspect	Belief of EITD school of thought
Additional aspect that is provided for EA school of thought that was added to the original EA schools of thought defined by Lapalme (2012)	
	▪ Reductionism ▪ Environmental determinism ▪ Contextualism ▪ Closed system

5.3.6 Enterprise IT planning (EITP)

The position of the EITP school of thought in terms of purpose and scope is enterprise scope and purpose of IT and non-IT strategy alignment.

Architects in the EITP school of thought have less EA experience than EITD architects. EITP architects typically have 1–5 years’ EA experience and work as senior architects with a bachelor’s degree in applied sciences. They focus on the organisational level and alignment of business and IT. EITP architects often act as leaders that promote appreciation of EA in the organisation. These architects mainly use the UML to model target IT architecture. Their effort is focused on the improvement of organisational IT in terms of effectiveness and efficiency. EITP architects see formal approval of architecture deliverables as a way to ensure business-IT alignment. Architects of the EITP school of thought enable business through standardisation of processes and IT systems. Insight in relationships on organisational system level and the planning process followed to plan EA are reckoned as strong points of the EITP architect. However, not much attention is given to understanding the organisation as a whole as EA work is focused on logical architecture. One can refer to EITP architects as being consultants who focus on alignment of IT strategies and non-IT strategies. Table 37 below provides a summary of the beliefs of the EITP school of thought.

Table 37 – EITP school of thought belief system (Du Preez, 2016)

Belief aspect	Belief of EITP school of thought
Motto	▪ "EA as an analysis approach to IT strategy execution"
Objectives & Concerns	▪ Analysis of IT strategy and execution of business strategy ▪ Reduction in cost and IT planning ▪ Organisational consistency
Principles & Assumptions	▪ Reductionism ▪ IT strategy confirms business strategy ▪ IT environment must be managed ▪ IT has an impact on organisational components
Skills	▪ Technical proficiency ▪ Knowledge of engineering ▪ Facilitation skills appropriate to apply in small groups
Challenges	▪ Business understanding and approval of plans ▪ Organisational cooperation
Insights	▪ Promotes development of planning scenarios and highly analytical models ▪ Allows composite analytical solutions
Limitations	▪ Acceptance of solution and implementation can be obstacles ▪ "Susceptible to 'perfect' designs for unsustainable strategies syndrome" ▪ Need to move from reductionism to holism
Additional aspect that is provided for EA school of thought that was added to the original EA schools of thought defined by Lapalme (2012)	
Belief concepts	▪ Reductionism ▪ Closed system ▪ Determinism ▪ Mechanism

5.3.7 Critical discussion of the DIA: Identifying similar EA schools of thought

Themes identified for the critical analysis of the DIA are listed below. Content per EA school of thought regarding the themes listed below was compared during the analysis.

- EA purpose; and
- EA scope.

The same principle was applied to define the four new EA schools of thought as were initially applied by Lapalme (2012), when identifying the EITA, EI and EEA schools of thought. The beliefs regarding EA scope and EA purpose were used to determine EA schools of thought (Du Preez, 2016). These two factors were addressed through two questions, namely question 6 and question 7, in the questionnaire used for data collection to develop the EA schools of thought indicator of the DIA. Figure 68 below is an extract from the questionnaire, reflecting questions 6 and 7.

6	What is the scope of EAM?	To determine in which EA school of thought an architect would be	IT Entire enterprise Enterprise in environment Other (Specify)	Opinion	(Bredemeyer & Malan, 2004; Lapalme, 2012a)
7	What is the purpose of EAM?	To determine in which EA school of thought an architect would be	IT business alignment Strategy execution Strategy Formulation Other (Specify)	Opinion	(Lapalme, 2012a)

Figure 68 – EA school of thought questionnaire – Questions 6 & 7 (Du Preez, 2016)

Responses to these two questions were used to position the EA school of thought on the matrix provided by Lapalme (2012). The response to questionnaire questions is included in Du Preez's (2016) documentation on the DIA. A discrepancy is noticed between plotting of EA schools of thought according to the published responses and the position that is reflected on the matrix in the DIA documentation. All four newly identified EA schools of thought are affected. To add to the discrepancy, the narrative descriptions of the four new EA schools of thought address a combination of the two different EA scope definitions and the two different EA purpose definitions.

5.3.7.1 EITD EA school of thought

The first discrepancy relates to the enterprise IT design (EITD) school of thought. Figure 69 below reflects the three possible positions, and thus scope and purpose combinations of the EITD school of thought when responses to questions 6 and 7 of the questionnaire, the position reflected on the matrix and the narrative for EITD are compared.

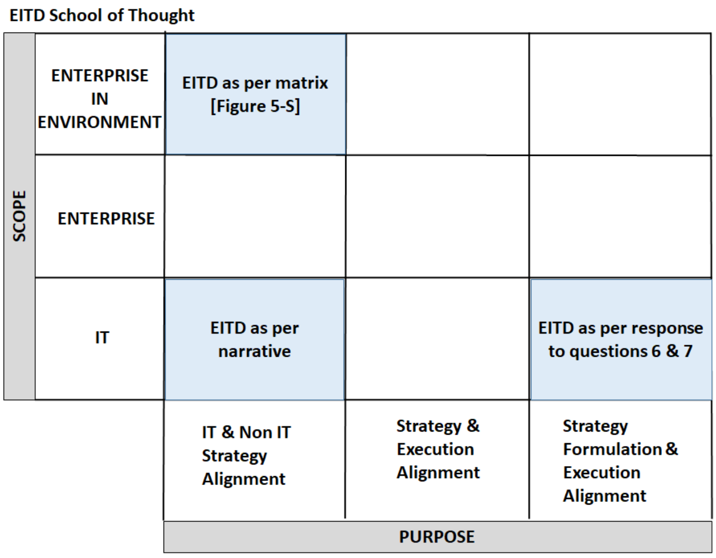


Figure 69 – Positions reflected for EITD school of thought in terms of scope and purpose (Du Preez, 2016)

Questionnaire response in terms of EA scope is “IT” (Du Preez, 2016:142) and EA purpose is “strategy formulation and execution alignment” (Du Preez, 2016:142). However, it is reflected on the matrix with EA scope of enterprise-in-environment and EA purpose as IT and non-IT strategy alignment. The narrative description of the EITD school of thought mentions that the IT strategy is designed to be aligned with the external IT environment. This is a combination of the scope as per response to question 6 of the questionnaire, which is IT, the scope as reflected on the matrix, namely enterprise-in-environment, and the purpose as reflected in the response to question 7 of the questionnaire, namely strategy formulation and execution alignment. It is further mentioned that a strength, weakness, opportunity and threat (SWOT) analysis is performed to determine the impact of the external environment on the IT and non-IT organisational environment. However, if the EA scope is IT, the external environment and non-IT strategy must not be addressed. If the EA scope is enterprise-in-environment with the EA purpose as IT and non-IT strategy alignment as per the matrix reflection, the focus should be on the enablement of the business strategy, only without aligning it to the external environment. The non-IT strategy is then seen as a given from business. It is also mentioned that the EA processes of the EITD school of thought include alignment of IT and non-IT strategies to the external environment. This implies that strategy formulation or amendments will be required but the purpose as reflected in the matrix is on strategy enablement only. Another concern is that the narrative description states that the EITD school of thought stems from open systems beliefs, but in the belief summary list of this school of thought, closed system is listed as a belief concept. Although the narrative description of the EITD school of thought addresses the combination of two EA scope statements and two EA purpose statements, there is a group of statements that address the EA scope as per response to question 6 of the questionnaire, which is IT, and the EA purpose as plotted on the matrix in the DIA documentation, which is IT and non-IT strategy alignment. These statements in terms of EA scope indicate that architects in this EA school of thought have high technical competence which relates to IT. Reference to IT strategy also relates to the scope being IT. EA purpose as plotted on the matrix in the DIA documentation is observed through statements such as business-IT alignment, integration, deduplication, enablement of the organisation strategy and IT and non-IT strategy alignment as aim of the EITD school of thought. Due to the mix-up regarding the EA scope and EA purpose of this school of thought and the identified correlation with the enterprise IT architecting (EITA) school of thought (EA scope: IT; EA purpose: IT and non-IT strategy alignment), it may be considered that architects in the EITD school of thought have the same view on EA than architects in the EITA school of thought for purposes of matching EA profiles to EA project types.

5.3.7.2 EITP EA school of thought

The next discrepancy relates to the enterprise IT planning (EITP) school of thought. Figure 70 below reflects the three possible positions, and thus scope and purpose combinations of the EITP school of thought when responses to question 6 and 7 of the questionnaire, the position reflected on the matrix and the narrative for EITP are compared.

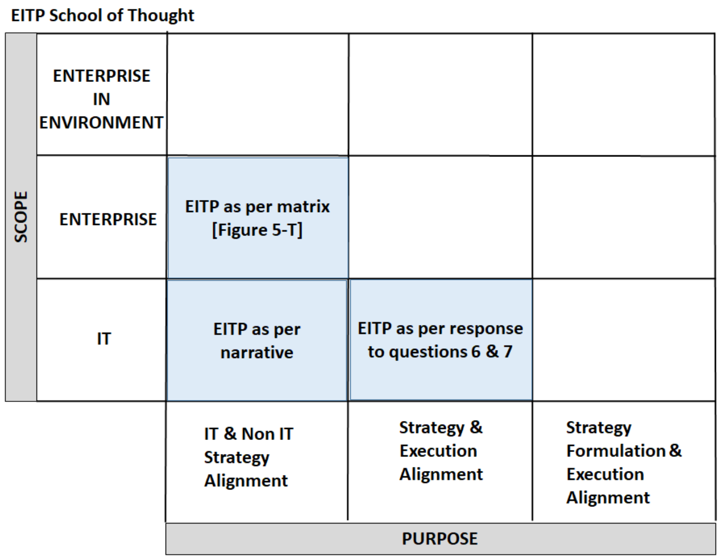


Figure 70 – Positions reflected for EITP school of thought in terms of scope and purpose (Du Preez, 2016)

Questionnaire response in terms of EA scope is "IT" (Du Preez, 2016:146) and EA purpose is "strategy and execution alignment" (Du Preez, 2016:146). However, it is reflected on the matrix with EA scope of enterprise and EA purpose as IT and non-IT strategy alignment. The narrative on EITP school of thought refers to the EA scope as per the response to question 6 of the questionnaire, which is IT and to EA purpose as per reflection on the matrix contained in the DIA documentation, which is IT and non-IT alignment. Statements regarding EA scope include reference to the focus that is on applications, the future state of IT is modelled, and the EA function is performed to enhance IT effectiveness and efficiency. Statements on EA purpose include that the emphasis is on business-IT alignment and enablement of business. It is believed that EA is concerned with IT and non-IT strategy alignment; the organisation is seen as a given that must be understood. The only reference to the EA purpose as per the response to question 7 of the questionnaire is in the summary list of EITP beliefs, where business strategy execution is included. With the majority of statements regarding the EITP school of thought relating to EA scope as IT and EA purpose as IT and non-IT strategy alignment, it is proposed that this school of thought be removed, for purposes of mapping EA profiles to EA project types, as it is already addressed by the EITA school of thought identified by Lapalme (2012). Further correlation between EITP and EITA schools of thought is objectives such as cost reduction, business enablement and eliminating of duplication. Lapalme (2012) refers to research done by the consulting organisations, Gartner and Forrester, which indicate that present-day EA practices are largely categorised in the EITA school of thought. It is interesting that a large percentage (23.36%) of respondents to the questionnaire fall in the EITP school of thought. This may be because the EITP school of thought reflects many of the EITA school of thought characteristics. For purposes of selecting EA profiles per EA project type, the views of architects on EA in the EITP and the EITA school of thought are considered as similar views.

5.3.7.3 EPA EA school of thought

The next EA school of thought with discrepancies is the Enterprise Power Authority (EPA) school of thought. Figure 71 below reflects the three possible positions, and thus scope and purpose combinations of the EPA school of thought when responses to questions 6 and 7 of the questionnaire, the position reflected on the matrix and the narrative for EPA are compared.

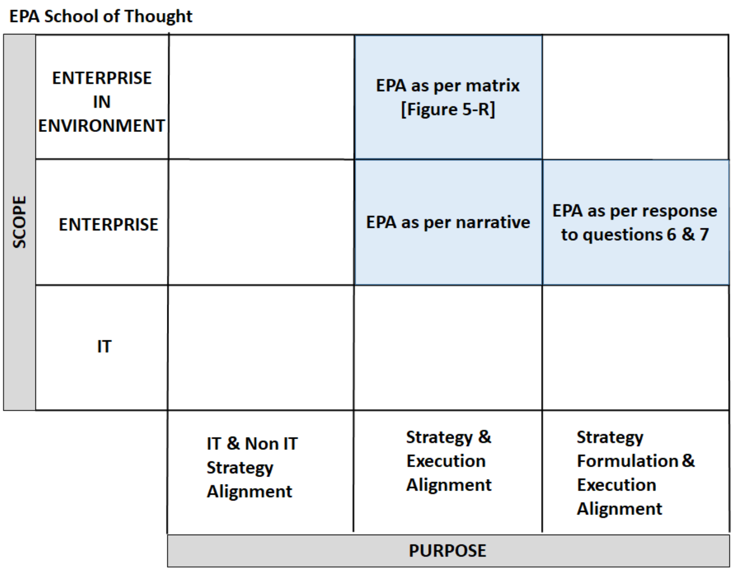


Figure 71 – Positions in terms of scope and purpose for EPA school of thought reflected (Du Preez, 2016)

The EPA school of thought is reflected in the matrix with an EA scope of enterprise-in-the-environment and EA purpose of strategy and execution alignment. However, the response to question 6 of the questionnaire that addresses the EA scope is “enterprise” (Du Preez, 2016:138) and the response to question 7 of the questionnaire that addresses EA purpose is “strategy formulation and execution alignment" (Du Preez, 2016:138). The narrative description of the EPA school of thought refers to the EA scope only once as plotted on the matrix. It is mentioned that "although the organisation is seen as operating within a greater environment, facilitation and collaboration is confined to a small group" (Du Preez, 2016:137). No further explanation of the enterprise-in-environment scope or its effect on the belief system is provided. Several statements can be linked to the EA scope as per response to question 6 of the questionnaire. These mention that the emphasis of the EA work is related to the enterprise level and that the architects in EPA school of thought operate from a business perspective. With regard to EA purpose, most statements relate to the EA purpose as plotted on the DIA matrix, namely strategy and execution alignment. It is mentioned that the future state is modelled in support of business strategy, that EA is used as a tool to control strategy execution and that business goals and strategies are provided by business. With enterprise as EA scope and strategy and execution alignment as EA purpose, the EPA school of thought has the same classification attributes as the enterprise integrating (EI) school of thought identified by Lapalme (2012). Therefore, for the purpose to map EA profiles to EA project types, the EPA and EI schools of thought are considered as the same due to similarities in EA scope and purpose.

5.3.7.4 EC EA school of thought

The fourth EA school of thought where the responses to questions 6 and 7, the position on the matrix as contained in the DIA documentation and the narrative result in different positions on the matrix is the enterprise configuration (EC) school of thought. Figure 72 below reflects the possible positions, and thus scope and purpose combinations of the EC school of thought when responses to questions 6 and 7 of the questionnaire, the position reflected on the matrix and the narrative of the EC school of thought are compared.

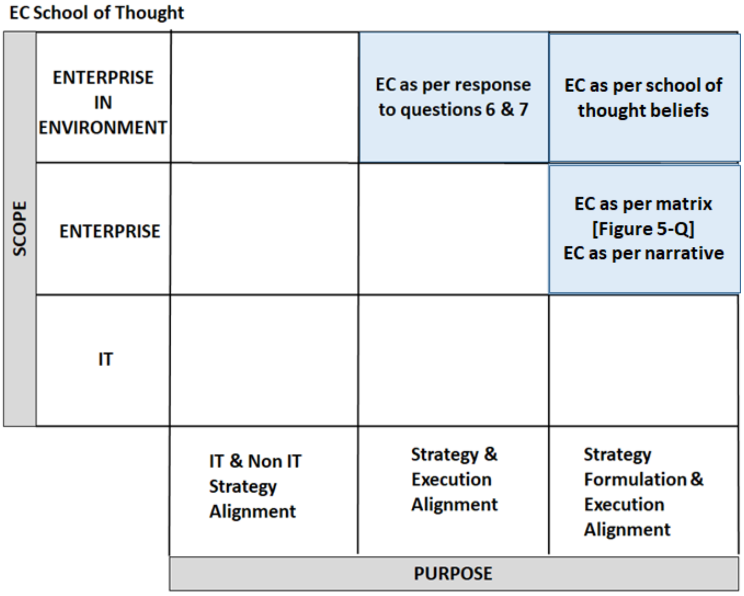


Figure 72 – Positions reflected for EC school of thought in terms of scope and purpose (Du Preez, 2016)

EA scope and EA purpose as per responses to questions 6 and 7 are “enterprise-in-environment” (Du Preez, 2016) and “strategy and execution alignment” (Du Preez, 2016) respectively. It is reflected on the matrix with EA scope as enterprise and EA purpose as strategy formulation and execution alignment. The narrative description of the EC EA school of thought points out that the EA scope and EA purpose should be as plotted on the matrix in the DIA documentation. The EA purpose is focused on strategy formulation and execution through the definition of a transformation methodology. Change in strategic direction is considered as important. It is further mentioned that EA involves the formulation or planning and execution of the business strategy. With regard to EA scope, it is stated that the organisation is seen as a closed system that operates independently from the external environment. The impact of internal factors on business decisions is considered. Although the narrative relates to EA scope of “enterprise”, one of the objectives listed for the EC school of thought implies the enterprise-in-the-environment view, namely system-in-environment co-development or co-evolution. A belief concept of “open system” and the principle that the environment is seen as something to transform strengthen the argument that the EC school of thought takes the external environment in consideration. Conflicting reflections regarding EA scope lead to comparison of the belief concepts of the EC and EEA schools of thought.

The EC school of thought and the EEA school of thought share the same EA purpose, namely strategy formulation and execution alignment. As per the discussion above, the EC school of thought takes the external environment in consideration when architecture work is performed. Notably, there is no difference between the two schools of thought in terms of EA purpose and EA scope. Other attributes that these schools of thought share are their principles and assumptions, objectives and concerns, skills and challenges. For the purpose to select architects for EA project execution, architects in the EC and EEA school of thought will be considered to have the same view on EA.

5.3.7.5 Reduced number of EA schools of thought

The four new EA schools of thought seem to be addressed by the original three EA schools of thought identified by Lapalme (2012) when comparing EA scope and EA purpose that determine an EA school of thought. The EITD and EITP schools of thought are addressed by Lapalme's (2012) EITA school of thought in terms of scope and purpose. Lapalme's (2012) EI school of thought accommodates the EPA school of thought in terms of scope and purpose. The EEA school of thought and the EC school of thought correspond in terms of EA scope and EA purpose. Figure 73 below reflects this reduction in number of EA schools of thought for purposes of mapping EA profiles to EA project types. Note that it is not proposed to remove the EC, EPA, EITP and EITD schools of thought from the DIA.

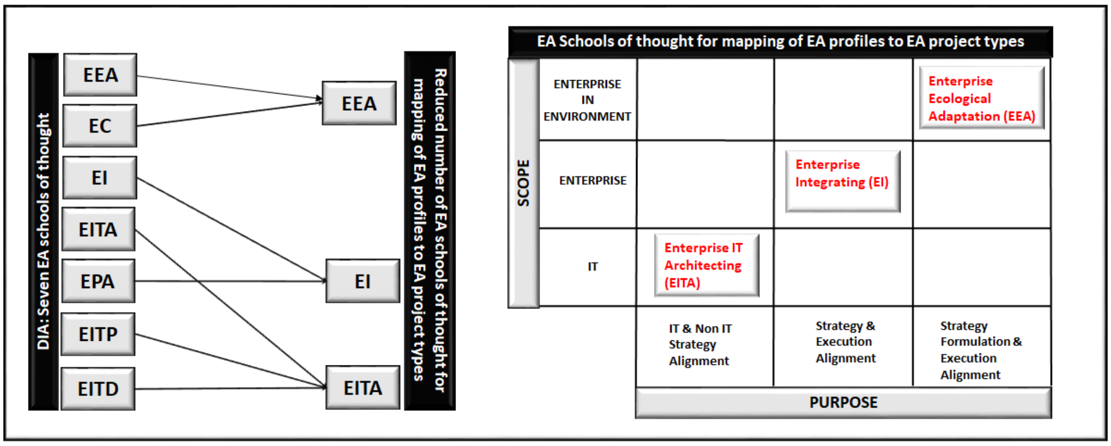


Figure 73 – Reduced number of EA schools of thought for mapping of EA profiles to EA project types

5.4 EA behavioural styles as per DIA

Understanding the architect's EA behavioural style gives insight into how an architect performs architecture work. An enterprise architect's EA behavioural style is determined by the EA role and the EA competency required to fulfil the role with which the architect associates. Du Preez (2016) identifies five EA roles and five EA competencies that architects associate with when doing EA work. The five EA roles are "change agent", "communicator", "leader", "manager" and "modeller". The five EA competencies are "technical", "strategy", "organisational politics", "leadership" and "consulting". Although there are potentially 25 different EA behavioural styles, the research work that developed the DIA eliminates 16 and finds that only 9 are relevant (Du Preez, 2016). The different EA behavioural styles as defined in the DIA are depicted in Figure 74 below, and described in the paragraphs that follow.

ARCHITECT BEHAVIOUR STYLE

Technical	Disrupting Technology	Translating Technology	Innovating Technology	Controlling Technology	
Strategy	Directing Srategy		Deciding Strategy		
Organisational Politics					
Leadership					
Consulting	Shifting Advisory	Conversing Advisory	Developing Advisory		
Competency / Role	**Change Agent**	**Communi-cator**	**Leader**	**Manager**	**Modeller**

Figure 74 – Architecture behavioural styles as per the DIA (Du Preez, 2016)

5.4.1 Disrupting technology style

Disrupting technology style in terms of architect competency and role comprises change agent as its role and technical architect as its competency.

Disrupting technology behavioural style architects use their technical competency and EA skills when performing architecture work. They are involved in establishing the technology strategies of the organisation, while fulfilling the role of change agent. It is important for disrupting technology style architects to inform EA stakeholders of new viewpoints and to encourage them to stay updated with new developments. These architects are good team workers. They are analytical, pragmatic, innovative, open-minded and can work at a high level of abstraction. Although architects with disrupting technology style are internally focused individuals, they are good listeners. They appreciate integrity and good leadership (Du Preez, 2016). Behaviour in terms of architecture attribute values is provided in Figure 75 below.

DISRUPTING TECHNOLOGY STYLE

Role	▪ Change agent	Educational level	▪ Bachelor
Competency area	▪ Technical	Stakeholders	▪ Not applicable. DIA has no values for this attribute
Position	▪ Not applicable. DIA has no values for this attribute	Skills category	▪ Enterprise architecture
Position level	▪ Not applicable. DIA has no values for this attribute	Thinking style	▪ Enterprise architecture
Experience	▪ Not applicable. DIA has no values for this attribute	Team role	▪ Team worker
Educational discipline	▪ Formal sciences	Characteristics	▪ Creative, Integrity, Leader, Openness, Opinion forming ▪ Investigative, Pragmatic, Insightful, Tolerance

Figure 75 – Attributes of disrupting technology architecture behavioural style (Du Preez, 2016)

5.4.2 Translating technology style

Translating technology style in terms of architect competency and role is communicator role and technical architect competency.

Architects with a translating technology architecture behavioural style act as communicators that explain the technology strategy to business executives, project managers and other architects for decision-making. Translating technology architects can work on conceptual system level and can handle uncertainty well. These architects are insightful, analytical, pragmatic and creative (Du Preez, 2016). Behaviour in terms of architecture attribute values is provided in Figure 76 below.

TRANSLATING TECHNOLOGY STYLE

Role	Communicator	Educational level	Bachelor
Competency area	Technical	Stakeholders	Architects, Project manager, Executives
Position	Not applicable. DIA has no values for this attribute	Skills category	Business, Enterprise architecture
Position level	Senior level	Thinking style	Not applicable. DIA has no values for this attribute
Experience	10 – 15 Years	Team role	Not applicable. DIA has no values for this attribute
Educational discipline	Professional and applied sciences	Characteristics	Not applicable. DIA has no values for this attribute

Figure 76 – Attributes of translating technology architecture behavioural style (Du Preez, 2016)

5.4.3 Innovating technology style

Position of innovating technology style in terms of architect competency and role is leader role and technical architect competency.

Innovating technology architecture behavioural style architects are leaders. They direct the realisation of the technology strategy. They are concerned with the achievement of technology goals in order to improve performance. Innovating technology style architects have qualities such as analytical skills, are pragmatic, can handle uncertainties, can work at conceptual level and are creative. These architects operate at a high organisational level and work with executives, architects, project managers and analysts. Behaviour in terms of architecture attribute values is provided in Figure 77 below.

INNOVATING TECHNOLOGY STYLE

Role	Leader	Educational level	Masters
Competency area	Technical	Stakeholders	Analyst, Project manager, Executives, other architects
Position	Enterprise architect	Skills category	Business, Enterprise architecture, General IT
Position level	Executive	Thinking style	Not applicable. DIA has no values for this attribute
Experience	Not applicable. DIA has no values for this attribute	Team role	Not applicable. DIA has no values for this attribute
Educational discipline	Professional and applied sciences	Characteristics	Not applicable. DIA has no values for this attribute

Figure 77 – Attributes of innovating technology architecture behavioural style (Du Preez, 2016)

5.4.4 Controlling technology style

Position of controlling technology style in terms of architect competency and role is manager role and technical architect competency.

Controlling technology architecture behavioural style architects act as managers. They coordinate the architecture team and are involved in ensuring resources for the architecture work. These architects focus on defining clear technology objectives, creating the plan to realise the defined objectives and monitoring and controlling the process of plan execution. Characteristics of control technology architects include having a good understanding of the business, having strong opinions, being outcome-driven, being good team workers, having analytical skills, showing understanding and being able to work on more than one level of abstraction. Behaviour in terms of architecture attribute values is provided in Figure 78 below.

CONTROL TECHNOLOGY STYLE

Role	▪ Manager	Educational level	▪ Masters
Competency area	▪ Technical	Stakeholders	▪ Not applicable. DIA has no values for this attribute
Position	▪ Enterprise architect	Skills category	▪ Enterprise architecture, General IT
Position level	▪ Not applicable. DIA has no values for this attribute	Thinking style	▪ Blue
Experience	▪ 1 – 5 Years	Team role	▪ Planter
Educational discipline	▪ Not applicable. DIA has no values for this attribute	Characteristics	▪ Organisational awareness, Persuasive, Result-driven, Self-confident, Teamwork, Written communication skills, ▪ Creative, Investigative, Pragmatic, Insightful, Tolerance, Level of abstraction

Figure 78 – Attributes of control technology architecture behavioural style (Du Preez, 2016)

5.4.5 Directing strategy style

Directing strategy style position in terms of architect competency and role is change agent role and architect competency of strategy.

Directing strategy architecture behavioural style architects are change agents. These architects are concerned with business goals and objectives when assisting business executives formulating the enterprise strategy. Directing strategy architects are normally senior and experienced architects. These architects focus on determining common interests and motivating EA participants to voice their opinions to arrive at a situation that benefits all parties. Other characteristics of directing strategy architects are strategic thinking and analytical and visionary. Behaviour in terms of architecture attribute values is provided in Figure 79 below.

DIRECTING STRATEGY STYLE

Role	▪ Change agent	Educational level	▪ Bachelor
Competency area	▪ Strategy	Stakeholders	▪ Other architects, executives, line managers
Position	▪ Enterprise architect	Skills category	▪ Enterprise architecture, General IT, Technical IT
Position level	▪ Senior level	Thinking style	▪ Yellow
Experience	▪ 10 – 15 Years	Team role	▪ Shaper
Educational discipline	▪ Not applicable. DIA has no values for this attribute	Characteristics	▪ Abstract, analytical skills, consulting, facilitation, independency, organisational awareness, sensitivity & empathy, verbal communication skills, visualization skills ▪ Visionary, Entrepreneurial

Figure 79 – Attributes of directing strategy architecture behavioural style (Du Preez, 2016)

5.4.6 Deciding strategy style

Position of deciding strategy style in terms of architect competency and role is leader role and architect competency of strategy.

Architects with deciding strategy architecture behavioural style are leaders and operate at a senior level. They interact with architects and business executives while participating in the establishment of strategic vision and inspiring others to achieve the vision. These architects direct the realisation of the technical strategy. Achievement of enterprise goals and high levels of performance are important to deciding strategy architects. Behaviour in terms of architecture attribute values is provided in Figure 80 below.

DECIDING STRATEGY STYLE

Role	▪ Leader	Educational level	▪ Masters of Doctoral
Competency area	▪ Strategy	Stakeholders	▪ Other architects, executives
Position	▪ Enterprise architect	Skills category	▪ Not applicable. DIA has no values for this attribute
Position level	▪ Senior level	Thinking style	▪ Not applicable. DIA has no values for this attribute
Experience	▪ 10 – 15 Years	Team role	▪ Not applicable. DIA has no values for this attribute
Educational discipline	▪ Formal sciences	Characteristics	▪ Not applicable. DIA has no values for this attribute

Figure 80 – Attributes of deciding strategy architecture behavioural styles (Du Preez, 2016)

5.4.7 Shifting advisory style

Position of shifting advisory style in terms of architect competency and role is change agent role and architecture competency of consulting.

Architects with shifting advisory architecture behavioural style are change agents. These architects advise business leaders on business strategy in support of organisational goals and objectives. Shifting advisory style architects have good knowledge regarding processes. They are good at mentoring and teaching. The success of the team is a high priority for these architects. However, they are sometimes slow to implement ideas. More characteristics of shifting advisory architects are having analytical skills, having consulting skills and being independent and business aware. Behaviour in terms of architecture attribute values is provided in Figure 81 below.

SHIFTING ADVISORY STYLE

Role	▪ Change agent	Educational level	▪ Masters
Competency area	▪ Consultant	Stakeholders	▪ Analysts, Other architects, executives, project manager
Position	▪ Enterprise architect	Skills category	▪ Business, enterprise architecture, general IT, project management
Position level	▪ Senior level	Thinking style	▪ Not applicable. DIA has no values for this attribute
Experience	▪ 5 – 10 Years	Team role	▪ Implementer
Educational discipline	▪ Formal sciences	Characteristics	▪ Analytical, consulting, diplomacy, facilitation, independence, listening, organisational awareness, written communication ▪ Committed to team success, Empathetic and approachable, Effective change, Mentor and teacher

Figure 81 – Attributes of shifting advisory architecture behavioural style (Du Preez, 2016)

5.4.8 Conversing advisory style

Position of conversing advisory style in terms of architect competency and role is communicator role and architecture competency of consulting.

Architects with conversing advisory architecture behavioural style are good communicators. Their focus is on the technology strategy. They help business executives, line managers, project managers and architects to properly understand the technology strategy in order to make decisions and to realise the strategy. Conversing advisory style architects easily share their knowledge and are therefore good teachers and mentors. They have good knowledge regarding processes. They have good broad general knowledge in the architecture field and seldom specialise in a specific area. These architects are good team workers; the success and efficiency of the team are important to them, although they may not have the necessary skill to motivate team members. Behaviour in terms of architecture attribute values is provided in Figure 82 below.

CONVERSING ADVISORY STYLE

Role	▪ Communicator	Educational level	▪ Masters
Competency area	▪ Consultant	Stakeholders	▪ Executives, line managers
Position	▪ Enterprise architect	Skills category	▪ General skills
Position level	▪ Senior level	Thinking style	▪ White
Experience	▪ 5 – 10 Years	Team role	▪ Monitor
Educational discipline	▪ Formal sciences	Characteristics	▪ Analytical, persuasive, result driven, team work ▪ Committed to team success, Empathetic and approachable, Effective change, Mentor and teacher

Figure 82 – Attributes of conversing advisory architecture behavioural style (Du Preez, 2016)

5.4.9 Developing advisory style

Position of developing advisory style in terms of architect competency and role is leader role and architecture competency of consulting.

Architects with developing advisory architecture behavioural style are leaders and successful consultants. They partake in developing shared enterprise vision and they direct the execution of the enterprise strategy while motivating others to work towards realising the enterprise vision. Process optimisation that improves performance is a high priority for these architects. As success of others is important to these architects, they are good mentors and teachers. They are effective consultants that bring together different interests, and stimulate opinion formulation to arrive at situations that are beneficial to all participating parties. Developing advisory style architects ensure that tasks are completed. Behaviour in terms of architecture attribute values is provided in Figure 83 below.

DEVELOPING ADVISORY STYLE

Role	▪ Communicator	Educational level	▪ Post-secondary, non-tertiary education
Competency area	▪ Consultant	Stakeholders	▪ Analyst, architects, project manager, competency lead
Position	▪ System architect	Skills category	▪ Business, Project management, general IT, Technical IT
Position level	▪ Mid level	Thinking style	▪ Yellow
Experience	▪ 1 – 5 Years	Team role	▪ Completer . Finisher
Educational discipline	▪ Professional and Applied sciences	Characteristics	▪ Consulting ▪ Committed to team success, Empathetic and approachable, Effective change, Mentor and teacher

Figure 83 – Attributes of developing advisory architecture behavioural style (Du Preez, 2016)

5.5 EA profile classification framework

The combination of the EA school of thought indicator, discussed in section 5.3, and EA behavioural style indicators, discussed in section 5.4, forms the EA profile classification framework. Figure 84 below depicts the EA profile classification framework that forms part of the methodology for the selection of enterprise architects for EA project execution.

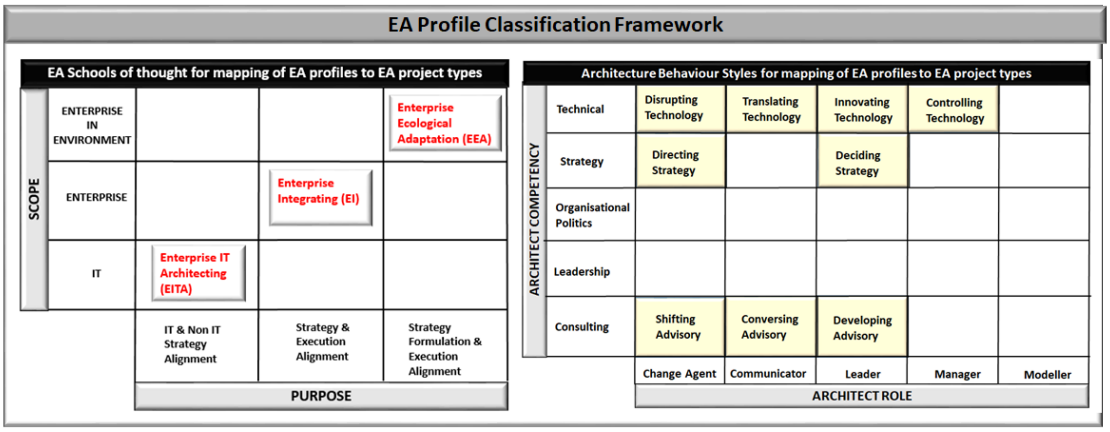


Figure 84 – EA Profile classification framework

5.6 Conclusion

This chapter describes how the individual architect's understanding of EA can be determined and what the different understandings are. Through the literature review presented in Chapter 2, the DIA is identified as a tool to discover architects' view on EA. The DIA provides different EA profiles that answer sub-research question 2. EA profiles describe the EA schools of thought and EA behavioural styles of enterprise architects. It represents the different understandings that architects have of EA. The different EA schools of thought and EA behavioural styles are described in this chapter. The DIA is critically analysed and, due to similarities and inconsistencies in descriptions in the DIA, certain EA schools of thought are combined for the use in this research study. The next chapter links the EA project type classification framework, described in Chapter 4 and EA profiles, to indicate what understanding of EA is required per EA project type and category.

6. Mapping of EA profiles and EA project types

Figure 85 below shows the position of Chapter 6 in relation to the rest of the thesis.

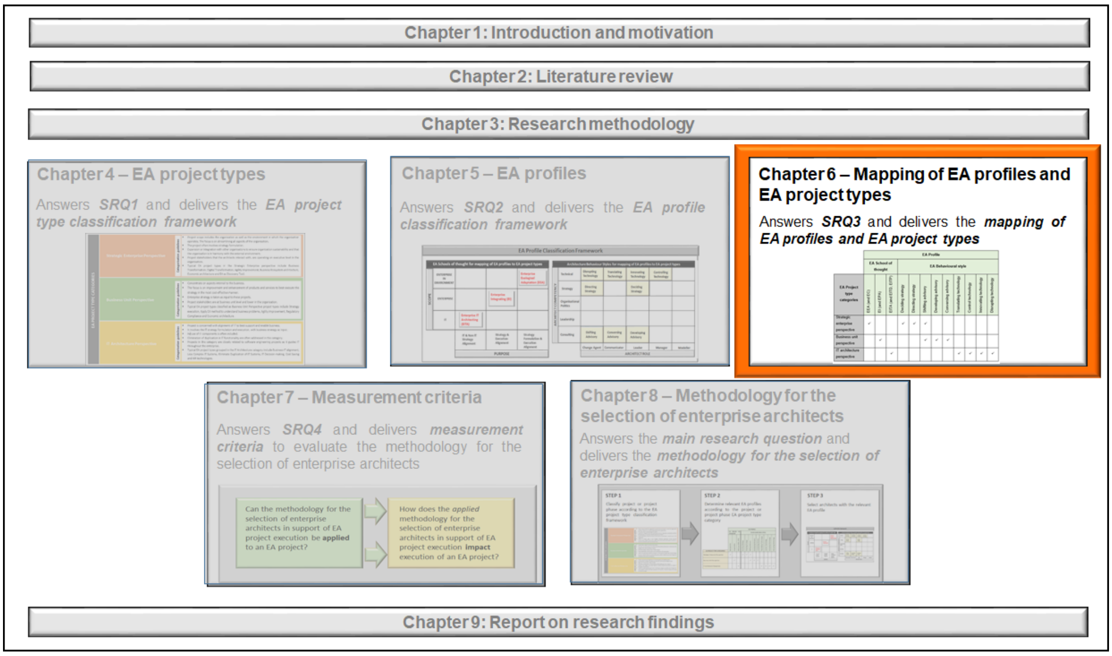


Figure 85 – Position of Chapter 6 in in relation to the rest of the thesis

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Chapter 6 layout:

6.1 Introduction

6.2 EA project type categories

6.3 EA profiles

6.4 Mapping of EA profiles to EA project type categories

6.3 Conclusion

6.1 Introduction

Sub-research question 3, “What understanding of EA is required to execute different EA project types?”, is answered in this chapter. EA project types are described in Chapter 4. The different understandings of EA are described in Chapter 5. This chapter indicates which understandings of EA are applicable to different EA project types to form part of the methodology for the selection of architects for EA project execution.

6.2 EA project type categories

The optimised list of EA project types consists of 22 EA project types. The literature review that identified the initial list of EA project types pointed out that EA project types are executed in different contexts. Thus, EA project types are classified according to the execution context. The categorisation of EA project types for the purpose of determining the understanding of EA per EA project was confirmed during semi-structured interviews with EA experts. Thus, EA profiles are mapped to EA project type categories and not to individual EA project types.

Three EA project type categories are identified, namely enterprise strategic perspective, business unit perspective and IT architecture perspective. The 22 identified EA project types are grouped according to these three categories. EA project type categories are based on the project stakeholder requirement that dictates the project context in terms of environments taken into consideration when executing EA projects. Figure 86 below reflects the simplified EA project type classification framework, described in Chapter 4, which is one component of the methodology for the selection of enterprise architects in support of EA project execution. For purposes of mapping EA project type categories and further use as part of the methodology for the selection of enterprise architects in support of EA project execution, the simplified EA project type classification framework is referred to as only the EA project type classification framework.

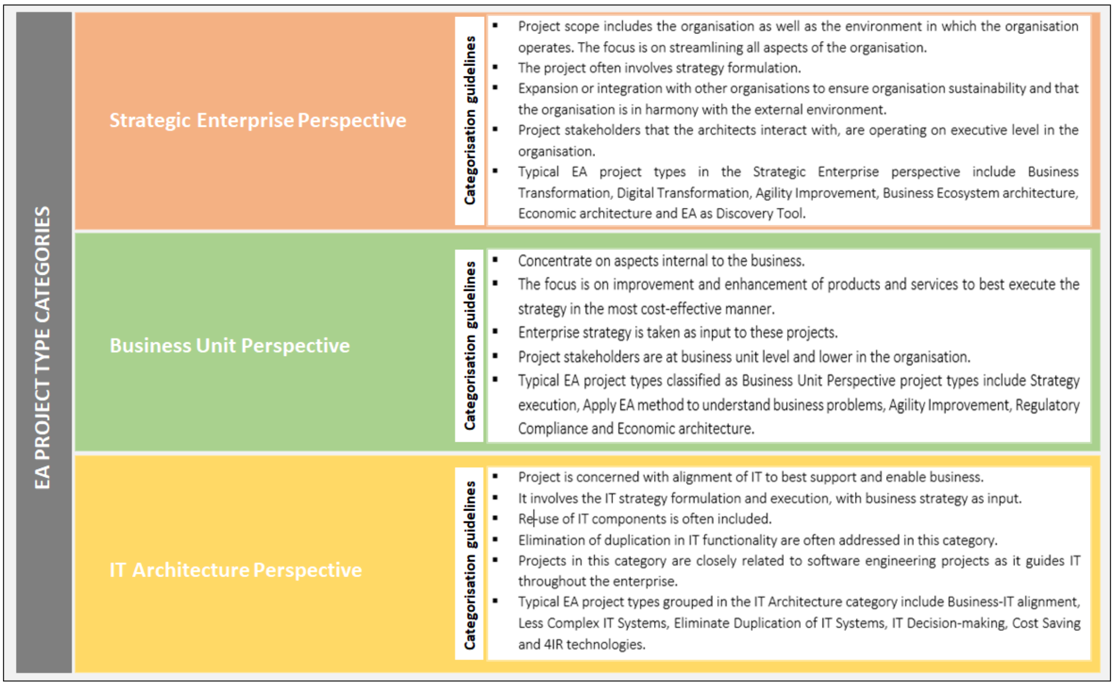

Figure 86 – EA project type classification framework

6.3 EA profiles

An architect's EA profile gives insight into the architect's view on EA in terms of EA scope, purpose, architect's role and competency.

EA scope and purpose combinations are expressed as different EA schools of thought. The ideal EA schools of thought for mapping of EA profiles to EA project type categories are EITA, EI and EEA.

The architect's role and competency combinations are reflected as architect behavioural styles. Architect behavioural styles that will be used for mapping of EA profiles to EA project type categories are disrupting technology, translating technology, innovating technology, controlling technology, directing strategy, deciding strategy, shifting advisory, conversing advisory and developing advisory. Figure 87 below depicts the EA profile classification framework, described in Chapter 5.

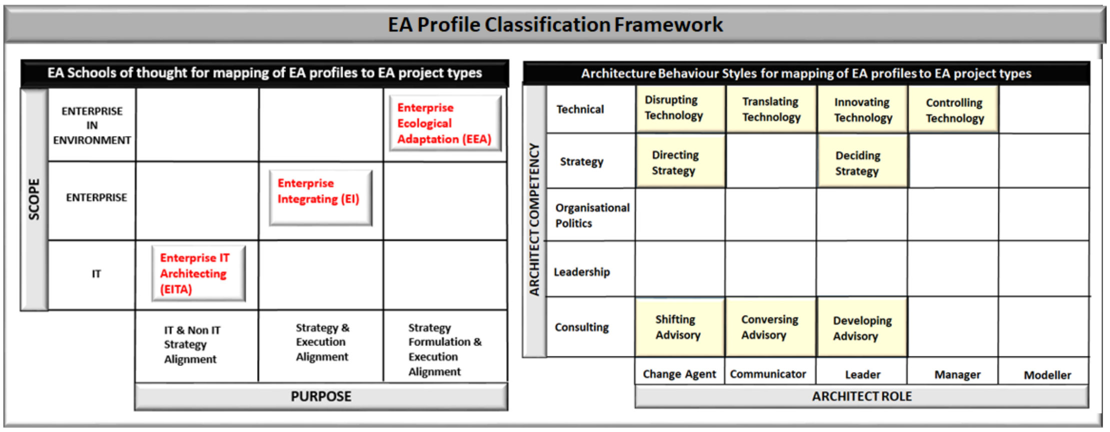

Figure 87 – EA profile classification framework

6.4 Mapping of EA profile to EA project type category

To map EA profiles to EA project categories, it is necessary to map EA schools of thought and EA behavioural styles separately as different combinations of EA schools of thought and EA behavioural styles form EA profiles.

6.4.1 Mapping EA school of thought

EA school of thought per EA project category is determined by comparing the EA school of thought beliefs in terms of EA scope and purpose to each EA project type category.

6.4.1.1 EA school of thought mapped to strategic enterprise perspective category

The strategic enterprise perspective requires architects that consider the internal organisational impact as well as the impact of the environment external to the organisation. The focus of projects in this category is enterprise-wide and may involve strategy formulation. The EEA school of thought considers EA scope as “enterprise-in-environment”, which implies that the enterprise as well as the environment in which it operates form part of the scope. The EEA school of thought is thus mapped to the strategic enterprise perspective. The view of the EEA school of thought on EA purpose, namely “strategy formulation and execution alignment”, further aligns to the strategic enterprise perspective.

6.4.1.2 EA school of thought mapped to business unit perspective category

Business unit perspective EA projects need architects that focus on the organisation without involving the external environment. Projects in this category aim to enhance and perfect services and products for the most effective execution of strategy. The emphasis is on execution of strategy that is received as input. The viewpoint on EA scope of the EI school of thought is "enterprise", which correlates to the business unit perspective requirement. Furthermore, the EI school of thought considers EA purpose as "strategy and execution alignment", which compares with the business unit perspective's focus on strategy execution and alignment for best and most cost-effective realisation of strategy.

6.4.1.3 EA school of thought mapped to IT architecture perspective category

Projects in the IT architecture perspective have the narrowest scope of all EA project type categories. Architects who believe the focus of an EA project is mainly on IT are required for projects in the IT architecture perspective. Projects in this category optimise the IT portfolio through the reuse of IT components and the elimination of duplicate IT components and functionality. IT strategy formulation to ensure business enablement is often done by projects in the IT architecture perspective. The EITA school of thought matches the requirements of the IT architecture perspective. The EA scope is considered as IT and the EA purpose as "IT and non-IT strategy alignment", where the non-IT strategy is taken as input to which the IT strategy should align.

6.4.1.4 EA school of thought mapping concluded

Figure 88 below reflects the ideal mapping of EA schools of thought to EA project type categories.

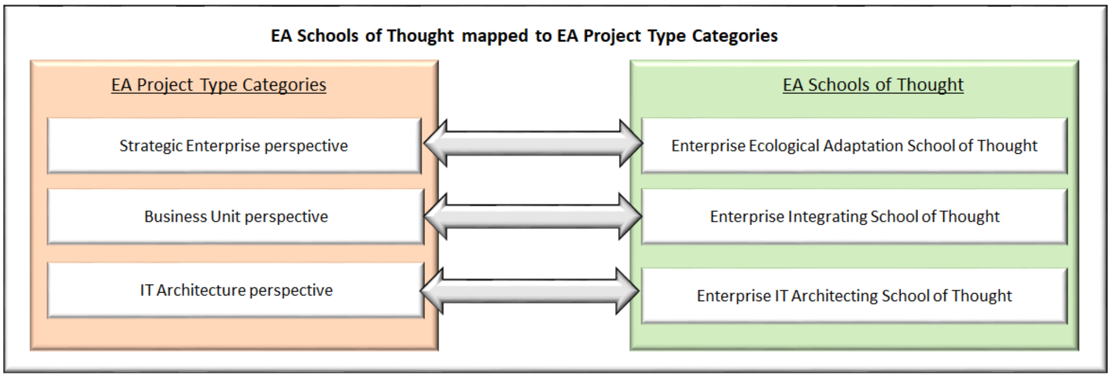

Figure 88 – EA school of thought ideally required per EA project type category

Note that where the EEA school of thought is mapped to an EA project type category, the EC school of thought is implied. For purposes of selecting EA schools of thought per EA project type category, the architect's views in terms of EA scope and purpose are considered to be alike. The same goes for the EI school of thought, which implies the EPA school of thought, and the EITA school of thought, which implies the EITP and EITD schools of thought.

6.4.2 Mapping EA behavioural style

EA behavioural styles are described in section 5.4. Du Preez (2016) identified 12 attributes that describe an EA behavioural style. In order to map EA behavioural styles to EA project type categories it is necessary to determine which attributes have values that distinguish the different EA behavioural styles from each other. Where EA behavioural styles have the same values or no value per attribute, that specific attribute does not reflect a unique quality of an EA behavioural style and therefore was not used to map EA behavioural styles to EA project type categories.

EA behavioural style attributes were scrutinised to determine the distinguishing attributes to be used when mapping EA behavioural styles to EA project categories. Table 38 below shows that only four attributes, namely role, competency area, stakeholders and skills category were considered to be useful when matching EA behavioural styles to EA project type categories. These attributes are marked with "Y" in column 4 of Table 38 below. The relevant cell in the table is coloured green to make it more visible.

Table 38 – EA behavioural style attributes applicable for determining EA profiles per EA project type category

No.	EA behaviour style attribute	Comment	Attribute considered for mapping
1.	Role	Each EA behavioural style has a value for the role attribute. Role is used in combination with competency area to determine EA behavioural style per EA project type category.	Y
2.	Competency area	Each EA behavioural style has a value for the competency area attribute. Competency area is used	Y

No.	EA behaviour style attribute	Comment	Attribute considered for mapping
		in combination with role to determine EA behavioural style per EA project type category.	
3.	Position	Six of the nine architect behavioural styles reflect the same value for position, and two behavioural styles do not have a value for the position attribute. Therefore, position attribute is not used as distinguishing attribute to map architecture behavioural styles to EA project categories.	N
4.	Position level	Five behavioural styles have the same value for position level and two do not have a value. Position level is thus not considered as a deciding factor when mapping EA behavioural styles to EA project type categories.	N
5.	Experience	It is not reflected in what area of EA experience is gained. Therefore, experience in years is not used as one of the determining factors to link a behavioural style to an EA project type.	N
6.	Educational discipline	Formal sciences and professional and applied sciences are the two values for this attribute. Four behaviour styles have formal sciences as value for this attribute and three have professional and applied sciences, while two behavioural styles do not reflect any value for this attribute. Educational discipline is not taken in consideration when EA behavioural styles are linked to EA project type categories as the values are not differentiating between the various behavioural styles.	N
7.	Educational level	Whether an architect has a bachelor's, Master's or doctor's degree is not considered a determining factor for mapping of EA behavioural style to EA project type category because it does not reflect an architect's view on EA.	N

No.	EA behaviour style attribute	Comment	Attribute considered for mapping
8.	Stakeholders	The stakeholder attribute plays a role when EA behavioural styles are linked to EA project type categories as different levels of stakeholders are involved in EA projects of different categories.	Y
9.	Skills category	The skills category attribute is important when mapping EA behavioural styles with EA project type categories because different kinds of skills are required in the different EA project type categories.	Y
10.	Thinking style	Four of the EA behavioural styles do not reflect a value for the thinking style attribute; thus, it is not used to determine EA behavioural style per EA project type category.	N
11.	Team role	A combination of team roles is required in a project team. Six different team roles are identified. Each team role is represented by another EA behavioural style, with the exception of three styles that do not reflect a value for the team role attribute. Team role is therefore not used as determining factor when selecting EA behavioural style per EA project type category.	N
12.	Characteristics	Characteristics attribute reflects soft skills such as integrity, self-confidence, independency and communication skills. These attributes are general and do not represent different characteristics for different project types.	N

6.4.2.1 EA behavioural style mapped to strategic enterprise perspective category

EA behavioural styles with strategy as competency area are suitable for projects in the strategic enterprise perspective. These EA behavioural styles are directing strategy and deciding strategy.

The visionary and entrepreneurial qualities of architects with these EA behavioural styles are valuable when executing projects categorised as strategic enterprise perspective projects. Their aim to accomplish enterprise goals and objectives puts them in a position to be able to assist with establishment of enterprise strategies. Their strategic nature is advantageous when strategies such as strategies for business transformation, agility and digital transformation need to be created. Architects with directing strategy and deciding strategy EA behavioural styles are comfortable to work with EA stakeholders at executive and management level, which is often required on strategic enterprise perspective project types. Directing strategy style architects' technical IT skills and general IT skills may be helpful in digital transformation projects. Their ability to act as change agents makes them suitable for projects that must implement change. The trait of deciding strategy EA behavioural style to provide proper direction on how to execute the strategy adds value in the form of implementation guidelines to accompany the strategy. Shifting advisory EA behavioural style may be beneficial to projects in the strategic enterprise perspective as architects with this style have the ability to advise and assist organisations to develop a strategy that leads to the realisation of business goals and objectives. These architects are comfortable to interact with a broad spectrum of stakeholders, ranging from executive leaders, project managers to analysts.

6.4.2.2 EA behavioural style mapped to business unit perspective category

Projects in the business unit perspective focus on the organisation and its products and services, which often require knowledge of processes. Shifting advisory, conversing advisory and developing advisory EA behavioural styles bring process know-how to the table, which make them suitable EA behavioural styles for projects in the business unit perspective. Business skills of the shifting advisory and developing advisory EA behavioural styles are useful in projects that focus on the organisational level. For strategy execution projects, the developing advisory EA behavioural style is proposed as this style provides proper guidance on execution of the business strategy. Shifting advisory and conversing advisory EA behavioural style architects deem organisation executives as stakeholders and should be considered for projects in the business unit perspective that require architect interaction with organisation leaders. Where the project mainly requires interaction with analysts, project managers and other architects, developing advisory and shifting advisory EA behavioural styles are applicable.

6.4.2.3 EA behavioural style mapped to IT architecture perspective category

The technical competence of architects with disrupting technology, translating technology, innovating technology and controlling technology EA behavioural styles is useful in project types classified in the IT architecture perspective. They are able to institute the organisation's technology strategy and to create a shared technology vision. The focus to set and achieve technology objectives to ensure technical performance is a further value that these behavioural styles add to IT architecture project types. Translating technology EA behavioural style ensures that detail of the technology strategy is explained to and understood by EA stakeholders at executive level as well as project team level. For projects in the IT architecture EA project type category that require business skills, the innovating technology and translating technology EA behavioural styles are suitable due to their business skills. Disrupting technology EA behavioural style is applicable to IT architecture category projects where stakeholders need to learn new things and new technology perspectives are required. For IT architecture projects where a strong architecture management role is required, the control technology EA behavioural style should be considered.

6.4.2.4 Mapping of EA behavioural style concluded

Figure 89 below depicts the mapping of EA behavioural styles to EA project type categories.

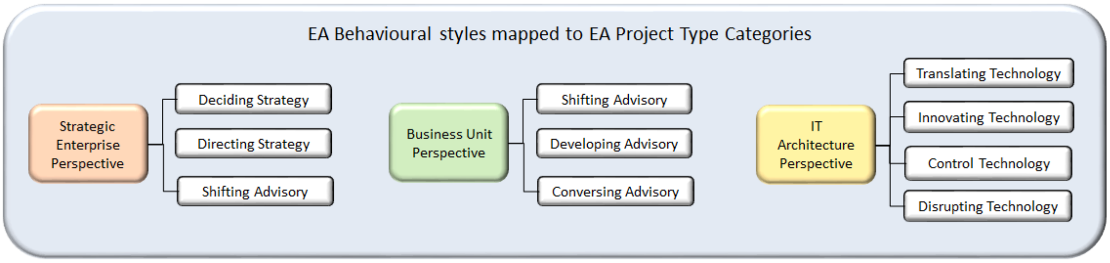

Figure 89 – EA behavioural styles mapped to EA project type categories

Table 39 below reflects EA profiles per EA project type category. For each EA project type category, one EA school of thought is identified. More than one EA behavioural style is mapped per EA project type category. Any combination of one mapped EA school of thought and one mapped EA behavioural style represents an EA profile per EA project type category. For example, EA profiles suitable for an EA project categorised in the strategic enterprise perspective would be EEA school of thought and deciding strategy EA behavioural style or EEA school of thought and directing strategy EA behavioural style.

Table 39 – EA profiles per EA project type category

	EA Profile												
	EA School of thought			EA Behavioural style									
EA Project type categories	EEA (and EC)	EI (and EPA)	EITA (and EITD, EITP)	Deciding strategy	Directing strategy	Shifting advisory	Developing advisory	Conversing advisory	Translating technology	Control technology	Innovating technology	Disrupting technology
Strategic enterprise perspective	✓			✓	✓	✓						
Business unit perspective		✓				✓	✓	✓				
IT architecture perspective			✓						✓	✓	✓	✓

Mapping of EA profiles to EA project type categories forms part of the methodology for the selection of enterprise architects in support of EA project execution. Therefore, evaluation of the mapping was done together with the evaluation of the methodology, described in Chapter 8.

6.5 Conclusion

This chapter answers sub-research question 3: "What understanding of EA is required to execute different EA project types?" A brief overview of EA project types, EA project type categories and EA profiles is provided. Mapping of EA profiles that represent the different understandings of EA is done by selecting

EA school of thought per EA project type category and EA behavioural styles per EA project type category. Selection of EA schools of thought is based on the view on EA scope and purpose and the execution context of an EA project type category. The majority of the attributes of EA behavioural styles were not used in the mapping to EA project type categories as the different EA behavioural styles share many of the attributes. Four differentiating attributes were identified for the mapping of EA behavioural styles to EA project type categories, namely role, competency area, stakeholders and skills category. The final deliverable of this chapter is a matrix reflecting the relevant EA profiles per EA project type category which forms part of the methodology for the selection of enterprise architects in support of EA project execution. The next chapter determines the criteria to measure the methodology for selection of enterprise architects in support of EA project execution.

7. Measurement criteria

Figure 90 below shows the position of Chapter 7 in relation to the rest of the thesis.

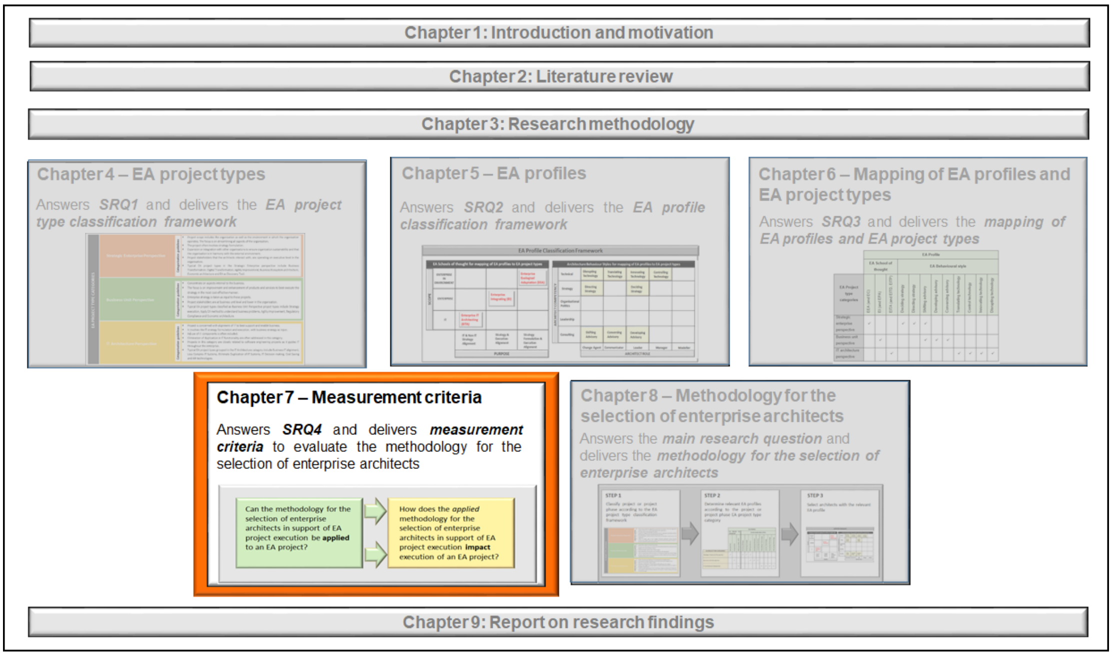

Figure 90 – Position of Chapter 7 in relation to the rest of the thesis

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Chapter 7 layout:

7.1 Introduction

7.2 Measurement criteria

7.3 Evaluating the application of the methodology for the selection of enterprise architects

7.4 Evaluating the impact on EA project execution

7.5 Interview results

7.6 Interpretation of interview results

7.7 Confirmed measurement criteria

7.8 Conclusion

7.1 Introduction

Sub-research question 4, "What are the measurement criteria to evaluate the methodology for selection of enterprise architects for EA project execution?", is answered in this chapter.

The methodology for the selection of enterprise architects in support of EA project execution consists of three parts, namely 1) EA project type classification; 2) architect EA profiling; and 3) linking of EA profiles to EA project type classifications. Evaluation of the methodology for the selection of enterprise architects addresses EA project type classification and the mapping of EA profiles to EA project type classifications. The second part, architect EA profiling, has already been evaluated through the research study done by Du Preez (2016). Therefore, measurement criteria do not include measurement of accuracy of EA profiling.

7.2 Measurement criteria

The measurement criteria are twofold. First, the criteria focus on evaluation of the application of the methodology for the selection of enterprise architects by the EA project manager, provided in paragraph 7.3. Second, they cover the evaluation of the impact of the methodology for the selection of enterprise architects on the execution of an EA project, provided in paragraph 7.4.

Evaluation criteria were confirmed with EA project managers who participated in the evaluation of the methodology for the selection of enterprise architects in support of EA project execution. Confirmation was done via semi-structured interviews where the validity of the evaluation criteria was verified.

7.3 Evaluating the application of the methodology for selection of enterprise architects

Measurement criteria to evaluate the application of the methodology for the selection of enterprise architects determine how well the categorisation of EA projects addresses the categorisation of the EA project at hand. It further determines how well the mapping of EA profiles aids in the selection of enterprise architects to work on the EA project used for the evaluation of the methodology for the selection of enterprise architects.

The methodology for the selection of enterprise architects in support of EA project execution was evaluated through implementation at an established organisation that has performed several EA projects successfully. Table 40 below contains the evaluation criteria and corresponding questions to measure the application of the methodology for the selection of enterprise architects. It addresses evaluation of categorisation of an EA project and the mapping of EA profiles to the different EA project type categories. The questions need to be answered by the EA project manager that participates in the evaluation of the methodology for the selection of enterprise architects.

Table 40 – Criteria for evaluating the application of the methodology for the selection of enterprise architects

No.	Evaluation criteria	Question
1.	Categorisation of an EA project	Could the EA project be categorised in one or more of the EA project categories provided by the EA project type classification framework?
		• If the project could be categorised, do you agree with the categorisation? If you do not agree with the categorisation, what change is proposed to the EA project type classification framework in order to categorise the relevant EA project?
		• If the project could not be categorised, what change is proposed to the EA project type classification framework in order to categorise the relevant EA project?
2.	Linking of EA profiles to the EA project category	How do the methodology-proposed EA profiles correspond to the architects that the organisation would have selected for the project execution based on organisational experience and knowledge of the employed architects?

7.4 Evaluating the impact on EA project execution

The methodology for the selection of enterprise architects in support of EA project execution is applied in a project environment. Therefore, evaluation criteria to determine the impact of the methodology for the selection of enterprise architects focus on aspects that relate to project success.

A literature review was performed to determine aspects that relate to project success. The methodology for the selection of enterprise architects in support of EA project execution identifies architects for selection for EA projects, based on mapping of the architect's view on EA, relevant to the EA project type category. This basis on which the methodology for the selection of enterprise architects in support of EA project execution maps EA profiles to EA project type categories is a further guideline that is applied during the literature review. Therefore, aspects of project success were scrutinised to find those that relate to project context, skills categories, stakeholders, architect role and competency, architect understanding of requirements and project-specific success criteria. The essence is to derive measurement criteria and corresponding questions from the literature review to determine the impact of implementing the methodology for the selection of enterprise architects on EA project execution.

For purposes of determining criteria to evaluate the methodology for the selection of enterprise architects, the terms "success criteria" and "success factors" are used interchangeably. However, in project management literature, the two terms are portrayed as two different but closely related concepts. Success criteria are stated to assess success and success factors to enable the realisation of success (Collins & Baccarini, 2004; Venczel, Berénji & Hriczó, 2021).

7.4.1 Literature review approach

A hermeneutic literature review was done. It started with searches on ProQuest and ScienceDirect databases. Search terms used for searching through title, abstract and keywords were "enterprise architecture project success", "factors for project success", "success factors", "enterprise architecture success" and "project success criteria". More than 600 papers were identified, and the first selection was made based on comprehension of the title and abstract in terms of project success. A total of 58 papers were selected and read to determine relevance. Understanding of the project success topic was gained, which led to the selection of another 29 papers from 16 online sources in several cycles of the hermeneutic circle. All selected papers were read and content relevant to project success and the basis on which the methodology for the selection of enterprise architects identifies architects per EA project type classification was extracted. In total, 18 online sources were accessed and 87 papers read of which 54 were determined to contain relevant content. Twenty-one (21) of these 54 papers were referenced as relevant content was obtained.

Online sources in addition to ProQuest and ScienceDirect that were accessed are ACM Digital Library, IEEE Xplore, EBSCOhost, SpringerLink, Taylor & Francis, ResearchGate, GrowingScience, MDPI, OPUS, EAPJ and educational institution sources such as JYU.FI, NTU.NO, UM.EDU.MY, PSU.EDU, Boksebeld.com and Radboud Repository.

It is important to note that the purpose of the literature review is not to define project success nor to provide a complete list of all project success factors. An interesting awareness during the literature review is that there is no consensus on one shared definition of project success (Bezdrob, Brkić & Gram, 2020).

7.4.2 Literature review findings

A distinction is made between project management success and project success. Project success refers to the project value, observed once the solution or product that is delivered by the project is in operation – this is also referred to as product success. Project management success refers to the ability to deliver the required results on time and within budget. Required results are agreed project objectives and stakeholder scope requirements and specifications. The time, cost and scope requirement combination is called the "Iron Triangle" (De Wit, 1988; Hussein, 2013). The "Iron Triangle" is also referred to as the "Triple Constraint" or "Golden Triangle" (Iriarte & Bayona, 2020). The Iron Triangle is widely used as criteria to determine project success as it articulates the crux of a project's objectives. Realisation of these criteria, namely cost, time and quality (stakeholder requirements satisfaction) certainly relates with success (Sebestyen, 2017; Enshassi, Mohamed & Abushaban, 2009; Otoom, Kateb, Hammad, Sweis & Hijazi, 2019). A literature study complemented with a survey under professionals, done by Shokri-Ghasabeh and Kavousi-Chabok (2009), confirms that time, cost and quality (stakeholder requirements satisfaction) are important project success criteria. The combination of control of project cost, time, quality, risk and scope is referred to as project control (Shokri-Ghasabeh & Kavousi-Chabok, 2009).

7.4.2.1 Measurement criteria derived from the Iron Triangle

The evaluation criterion derived from the Iron Triangle is in relation to the third factor in the Iron Triangle. To satisfy stakeholder requirements, it is critical that requirements are understood as intended by the stakeholder. An architect's view on EA may influence the way that they interpret stakeholder requirements. The impact of the methodology for the selection of enterprise architects may be evaluated by determining how accurate the selected architects interpreted the stakeholder requirements.

7.4.2.2 Project success and project management success used interchangeably in this study

Evaluation of the methodology for the selection of enterprise architects will focus on the impact on EA project execution. Therefore, project management success criteria may be more applicable than project success criteria. However, a project and the management of the project are indivisible (Sebestyen, 2017). According to Venczel, Berényi and Hriczó (2021), due to similarity in aspects of project management success and project success, it is not clear if separation between these concepts is really required. Therefore, for identification of criteria for evaluation of the methodology for the selection of enterprise architects, the distinction between project success criteria and project management success criteria is not taken into consideration. Rather, any success criteria that can be related to aspects considered by the methodology for the selection of enterprise architects when architects per EA project type category is selected are considered. The concepts applied by the methodology for the selection of enterprise architects are related to project context, skills categories, stakeholders, architect role, competency, architect understanding of requirements and project-specific success criteria.

7.4.2.3 Measurement criteria derived from factors that have a negative influence on project success

In addition to the Iron Triangle criteria, Hussein (2013) identifies four more factors through his research to determine factors that influence project success. The study discovered four factors that, if present during the initiation phase of a project, will cause risks during the further phases of a project. The four factors are: 1) incomplete project-specific success criteria; 2) diversity; 3) unrealistic project targets, and 4) having vague measurement criteria (Hussein, 2013).

The first factor, incomplete project-specific success criteria, is mentioned to occur when project stakeholders are not correctly understood and the project context is therefore misinterpreted (Hussein, 2013). The second factor, diversity, refers to the different views that stakeholders may have on the project scope and context (Hussein, 2012). Precise defined and understood project scope is considered as an important factor that impacts on stakeholder satisfaction, which influences project success (Collins & Baccarini, 2004). The importance of project coverage and scope as project success factor is reiterated through an SLR regarding critical success factors for EA projects (Ansyori *et al.*, 2018). The significance of a well-defined project scope with regard to project success is confirmed by Mirza, Pourzolfagar and Shahnazari (2013). Evaluation criteria derived from these factors are to determine: 1) how well the project context and scope were understood by the selected architects; 2) whether project goals and objectives were easily grasped by the selected architects without arguments to change it; 3) how easy it was to agree on the project success criteria among the architects; and 4) whether there were competing approaches to the EA work execution.

7.4.2.4 Measurement criteria derived from project success factors considered to have the largest impact on project success

Nine (9) factors for project success were identified by Davis (2014) through a thematic analysis of literature addressing project success. These factors include the Iron Triangle, namely time, cost/budget and quality/stakeholder requirement satisfaction. The other factors are agreement on project objectives; teamwork, consultation and communication; project manager's abilities;

acceptance of the project deliverables; realising of strategic benefits; and executive support. These factors, complemented with other factors obtained from industry, were used as input to determine, via a questionnaire, the five factors that have the largest impact on project success (Davis, 2014). Figure 91 below depicts, in sequence from highest impact to the lowest impact, the five project success factors with the largest impact on project success (Beleiu, Crisan & Nistor, 2015).

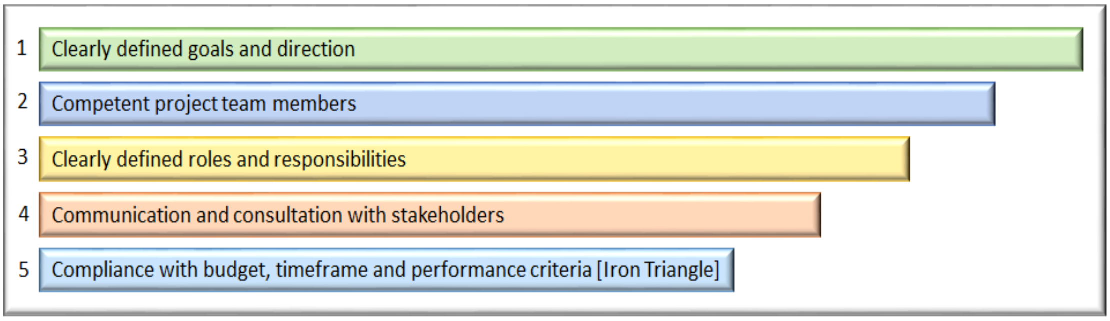

Figure 91 – Factors that have largest impact on project success (Beleiu *et al*., 2015)

Criteria for evaluating the impact of the methodology for the selection of enterprise architects on an EA project are derived from success factors 1 and 4 depicted in Figure 91 above. Evaluation criteria are: 1) how well the project goals were comprehended by architects and whether they agreed on the goals and direction; 2) how well the architects communicated and consulted with stakeholders, as different EA profiles are comfortable to work with different types of stakeholders.

Beleiu *et al*. (2015) identified that well-defined and understood project goals and direction (number 1 in Figure 91 above) lead to positive effects on several other project success criteria. For example, the likelihood that the contracted project budget, delivery schedule and stakeholder requirements will be met increases because the planning in terms of cost and time and specification of quality criteria are more accurate due to clearly stated objectives and direction. More examples of positive consequences are improvement in stakeholder communication and consultation, roles and responsibilities are better defined when project objectives and direction are well known, the possibility that project deliverables are accepted increases, and stakeholder satisfaction improves (Beleiu *et al.*, 2015). In support of comprehensibly stated goals and direction as success factor, it is stated that well-defined project objectives, confirmed at the start of the project, serve the purpose of success criteria (Marques, Varajao, Sousa & Peres, 2013; Crosby, 2017).

7.4.2.5 Communication and consultation reiterated as critical for project success

Empirical verification of critical success factors for EA projects proves that the most essential critical success factors link more to how EA project work is done than to what is done (Hope, Chew & Sharma, 2017). “Monitoring and compliance”, “commitment to the use of architecture” and “consultation and communication” are identified as factors that impact the most on EA project success (Hope *et al*., 2017). Consultation and communication success factor is similar to success factor 4 in Figure 91 above. Iriarte and Bayona (2020) confirm the importance of communication and consultation as project critical success factors.

The research study of Rouhani, Ahmad, Nikpay and Mohamaddoust (2019), performed to understand which factors impact on EA project success, reveals that communication, capability of EA team members, governance, technology and top management buy-in are success factors for EA projects. Again, communication is mentioned as a success factor.

Although Beleiu *et al.* (2015) do not identify teamwork as one of the five project success factors with the largest impact on project success, it is considered as a project success factor (Yang, Huang & Wu, 2011; Davis, 2014). Teamwork includes communication and cooperation among team members (Yang *et al*., 2011). Communication and consultation are repeated as project critical success factors (Iriarte & Bayona, 2020). Evaluation criteria derived from communication as a success factor therefore do not only address stakeholder communication but also communication within the team between project team members.

The SLR done by Ayat, Imran, Ullah and Kang (2021) to determine IT project success factors highlights six important factors. The six factors are client involvement, project stakeholder liaison, emotional intelligence of the project manager, communication, leadership and executive buy-in. When applied to determine evaluation criteria to evaluate the impact of implementation of the methodology for the selection of enterprise architects, communication and stakeholder liaison are again highlighted as success factors.

7.4.3 Evaluation criteria

Evaluation criteria to determine the impact of the methodology for the selection of enterprise architects on EA project execution, derived from the literature review, are listed in Table 41 below.

Table 41 – Criteria for evaluating the impact of the methodology for selection of enterprise architects

No.	Evaluation criteria	Question
1.	Stakeholder requirements	On a scale of 1 to 3, how well did the selected architects interpret and understand the stakeholder requirements? Response legend: 1 = did not understand the stakeholder requirements 2 = stakeholder requirements had to be explained more than once 3 = stakeholder requirements were clearly understood without many cycles of explanation Provide any additional comments.
2.	Project context	On a scale of 1 to 3, how well did the selected architects understand the project context and scope? Response legend: 1 = did not understand the project context and scope or architect disagrees with the context and scope 2 = project context and scope had to be explained/argued more than once 3 = project context and scope were clearly understood and agreed upon the first time Provide any additional comments.

No.	Evaluation criteria	Question
3.	Project goals and objectives	On a scale of 1 to 3, how easily did the selected architects grasp and agree on the project goals and objectives? Response legend: 1 = did not understand the project goals and objectives or architect disagrees with the goals and objectives 2 = project goals and objectives had to be explained/argued more than once 3 = project goals and objectives were clearly understood and agreed upon the first time Provide any additional comments.
		On a scale of 1 to 3, how easy was it to agree on the project success criteria among the architects? Response legend: 1 = did not agree at all 2 = agreed after long arguments 3 = easily agreed Provide any additional comments.
4.	Communication and consultation	Were there competing approaches to the EA work execution? Response legend: Yes, or No Provide any additional comments.
		On a scale of 1 to 3, how well did the architects communicate and consult with stakeholders? Response legend: 1 = could not communicate and consult 2 = architect had to be briefed and guided 3 = successful communication and consultation Provide any additional comments.
		On a scale of 1 to 3, how well did the architects communicate with each other?

No.	Evaluation criteria	Question
		Response legend: 1 = could not communicate constructively 2 = communication involved many arguments without adding value 3 = successful communication Provide any additional comments.

Answering of questions listed in Table 41 above was done for three EA projects. The projects have been completed and architects that were available in the organisation worked on the projects. The architects' EA profiles were determined and the measurement questions were answered, taking the EA profiles in consideration.

7.5 Interview results

In support of a constructive interview and discussion, the methodology for the selection of enterprise architects in support of EA project execution was explained to interviewees as well as the measurement criteria and how it was determined. The purpose of the interview was to determine whether the measurement criteria are appropriate to measure the *application* (Table 40) and *impact* (Table 41) of the methodology for the selection of enterprise architects in support of EA project execution.

All interviewees have performed the role of EA project manager of EA projects that have been completed successfully. All of them have also performed the role of architect on EA projects. Other experience fields of interviewees include that of SCRUM master, functional manager, business architect, business developer, actuary and client relations manager. Table 42 below reflects the role experience of each interviewee. Interviewees were nominated by the organisation that participated in the evaluation of the methodology for the selection of enterprise architects for EA project execution.

Table 42 – Interviewee role experience

Interviewee no.	Roles
1	EA project manager, EA project architect, SCRUM master, functional manager
2	EA project manager, EA project architect, actuary with business perspective
3	EA project manager, EA project architect, business developer, client relations manager, business architect

Interviews regarding the measurement criteria preceded the interviews where the methodology for the selection of enterprise architects in support of EA project execution was evaluated. Both interviews were held in one session per interviewee. Table 43 below reflects interviewee response per measurement criteria element.

Table 43 – interviewee response regarding measurement criteria

		Interviewee response		
No.	**Evaluation factor**	**Interviewee 1**	**Interviewee 2**	**Interviewee 3**
Criteria to measure the *application* of the methodology for the selection of enterprise architects in support of EA project execution:				
1.	Criteria to measure categorisation of an EA project	Agree	Agree	Agree
2.	Criteria for measurement of mapping of EA project types and EA profiles	Agree	Agree	Agree
3.	Additional measurement criteria proposed	None	None	None
Criteria to measure the impact of the methodology for the selection of enterprise architects in support of EA project execution:				
4.	Rationale to determine criteria to measure the impact of the methodology on an EA project for the selection of enterprise architects for EA project execution	Agree	Agree	Agree

		Interviewee response		
No.	**Evaluation factor**	**Interviewee 1**	**Interviewee 2**	**Interviewee 3**
5.	Stakeholder requirement	Agree	Agree	Agree
6.	Project context and scope	Agree	Agree	Agree
7.	Project goals and objectives	Agree	Agree	Agree
8.	Project success criteria	Agree	Agree	Agree
9.	Communication and consultation between architects, including approaches to EA work execution	Agree	Agree	Agree
10.	Communication and consultation with project stakeholders	Agree	Agree	Agree
11.	Additional measurement criteria proposed	None	None	None

7.6 Interpretation of interview results

Interview data related to the measurement criteria and the application of the measurement criteria is available in a separate document, where themes are highlighted. Themes used during analysis of the data are reflected in Table 44 below.

Table 44 – Themes for analysis of interview data regarding measurement criteria and its application

No.	Theme identified during thematic analysis of interview results	Theme identified during hermeneutic literature review
1.	Project classification	Project classification
2.	EA profile per EA project type category	EA profile per EA project type category
3.	Measurement criteria	Measurement criteria
4.	Stakeholder requirements	Project context and scope
5.	Project context and scope	Project context and scope
6.	Communication	Communication

Interviewees bring a broad range of experience to the table. All three interviewees have managed EA projects that were completed successfully. The opinions of these interviewees are considered credible due to their experience in various fields, depicted in Table 44 above. Specifically, their experience as EA project managers and EA project architects is valued.

All three interviewees agreed that measurement criteria should focus on elements of project success that are affected by factors such as understanding stakeholder requirements, project context, project goals and objectives as well as communication and consultation. No additional measurement criteria were proposed by interviewees.

Evaluation of the application of the methodology for selection of architects was agreed by all interviewees to be done by determining if an EA project could be categorised. Further to this, comparison of the methodology-proposed EA profiles to EA profiles that the participating organisation would have selected for its EA projects was confirmed to be included as measurement criteria.

Interviewees participated in the evaluation of the methodology for the selection of enterprise architects by responding to the measurement criteria, which further confirms their agreement on the appropriateness of the evaluation criteria. No measurement criteria were removed from the original list and none were added.

7.7 Confirmed measurement criteria

Measurement criteria did not need any optimisation or changes as interviewees agreed on the original set of evaluation criteria and the rationale for determining the criteria. It was confirmed that two aspects as depicted in Figure 92 below must be evaluated to measure the methodology for the selection of enterprise architects in support of EA project execution.

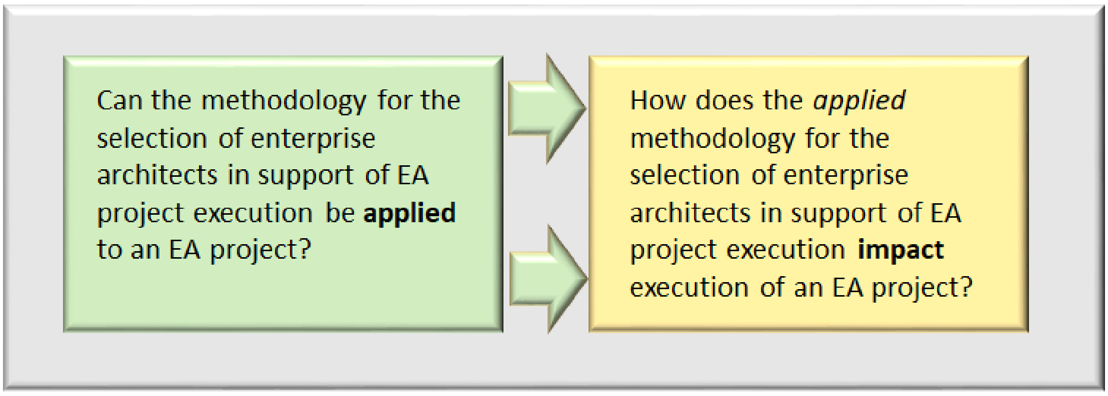

Figure 92 – Confirmed measurement criteria to evaluate the methodology for the selection of enterprise architects

The original set of evaluation criteria, reflected in tables 41 and 42 above, could be used for evaluation of the methodology for the selection of enterprise architects in support of EA project execution.

7.8 Conclusion

Chapter 7 answers sub-research question 4: "What are the measurement criteria to evaluate the methodology for selection of enterprise architects for EA project execution?" Measurement criteria were determined for a dual purpose. First, criteria to evaluate the application of the methodology for the selection of enterprise architects were described. The criteria focus on the categorisation of EA projects and the proposed EA profiles per EA project type category. Secondly, measurement criteria were provided for the evaluation of the impact of the methodology for the selection of enterprise architects. Criteria to measure the impact were obtained through literature review concentrating on elements of project success – specifically, those elements that are impacted by the architect's perception of EA. The results of interviews with EA project managers confirm that the measurement criteria are sufficient to evaluate the methodology for the selection of enterprise architects. The next chapter describes the methodology for the selection of enterprise architects and its evaluation.

8. Methodology for the selection of enterprise architects

Figure 93 below shows the position of Chapter 8 in relation to the rest of the thesis.

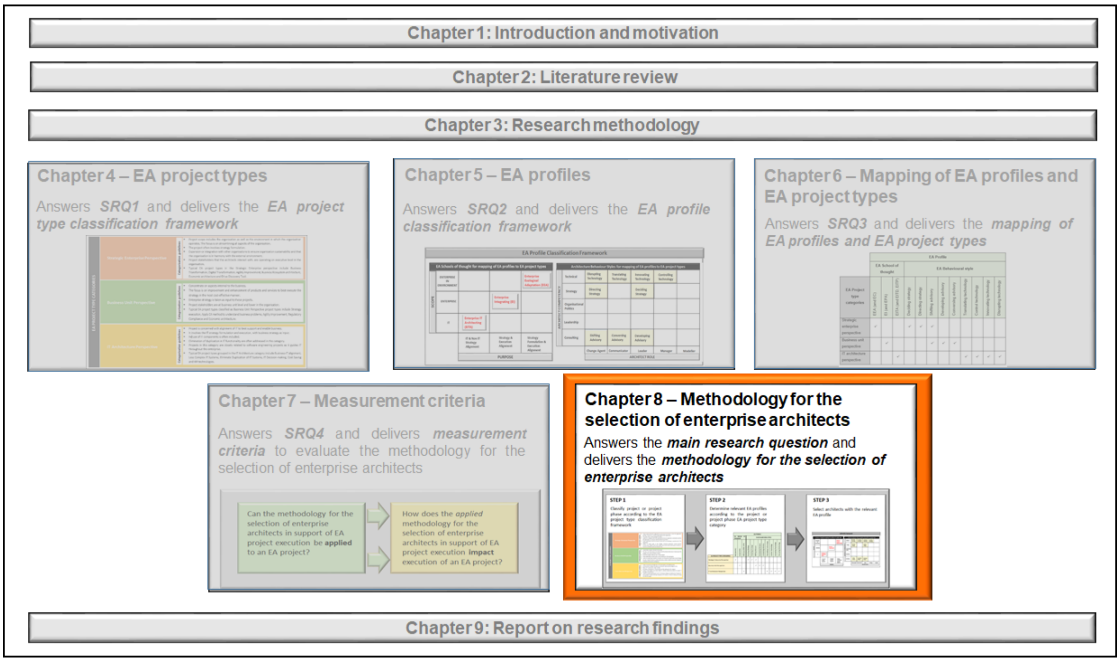

Figure 93 – Position of Chapter 8 in relation to the rest of the thesis

Chapter 8 layout:

8.1 Introduction

8.2 Methodology for the selection of enterprise architects

8.3 Evaluation of the methodology for the selection of enterprise architects

8.4 Refined methodology for the selection of enterprise architects

8.5 Conclusion

8.1 Introduction

The main research question, "How can enterprise architects be selected to support EA project execution?", is answered in this chapter.

The methodology for the selection of enterprise architects in support of EA project execution acknowledges the problem, often mentioned in literature, that there are different understandings and interpretations of EA and different approaches to EA work (Du Preez, 2016; Lapalme, 2012; Van Den Berg & Van Vliet, 2016; Iyamu, 2013; Saint-Louis & Lapalme, 2016; Korhonen & Poutanen, 2013; Lapalme, 2012; Saint-Louis & Lapalme, 2018). The methodology for the selection of enterprise architects aims to classify EA projects and to identify architect views on EA that correspond with the EA project type category. Paragraph 8.2 describes the methodology for the selection of enterprise architects. The evaluation of the methodology for the selection of enterprise architects is described in paragraph 8.3. Paragraph 8.4 contains the refined methodology for the selection of enterprise architects in support of EA project execution.

8.2 Methodology for the selection of enterprise architects

The methodology for the selection of enterprise architects in support of EA project execution consists of three steps is depicted in Figure 94 below and described in the paragraphs that follow.

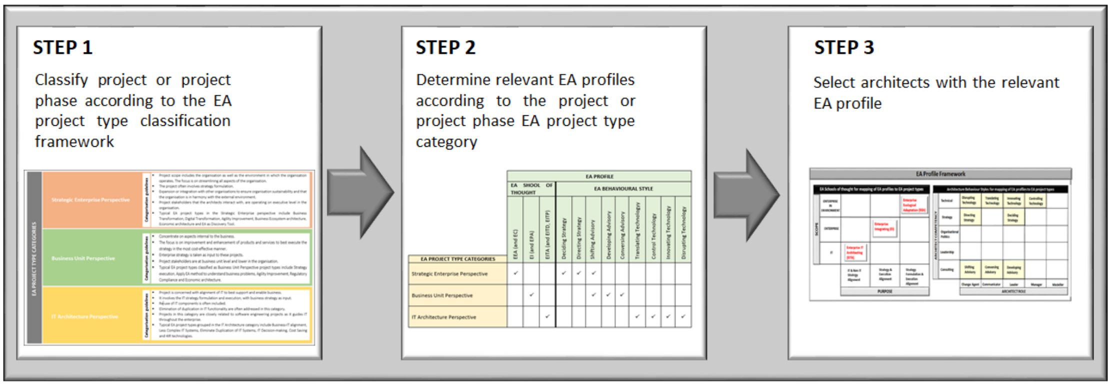

Figure 94 – Methodology for the selection of enterprise architects

8.2.1 Step 1: Classify the EA project or project phase

A project or project phase is categorised according to its scope in terms of environments to be taken in consideration and what type of strategy development and/or implementation is required. EA project type categories were determined through literature review and confirmed with 12 EA experts via semi-structured interviews. The result is the EA project type classification framework, depicted in Figure 95 below.

An EA project or project phase is classified as one of the following three EA project type categories: 1) strategic enterprise perspective; 2) business unit perspective; or 3) IT architecture perspective.

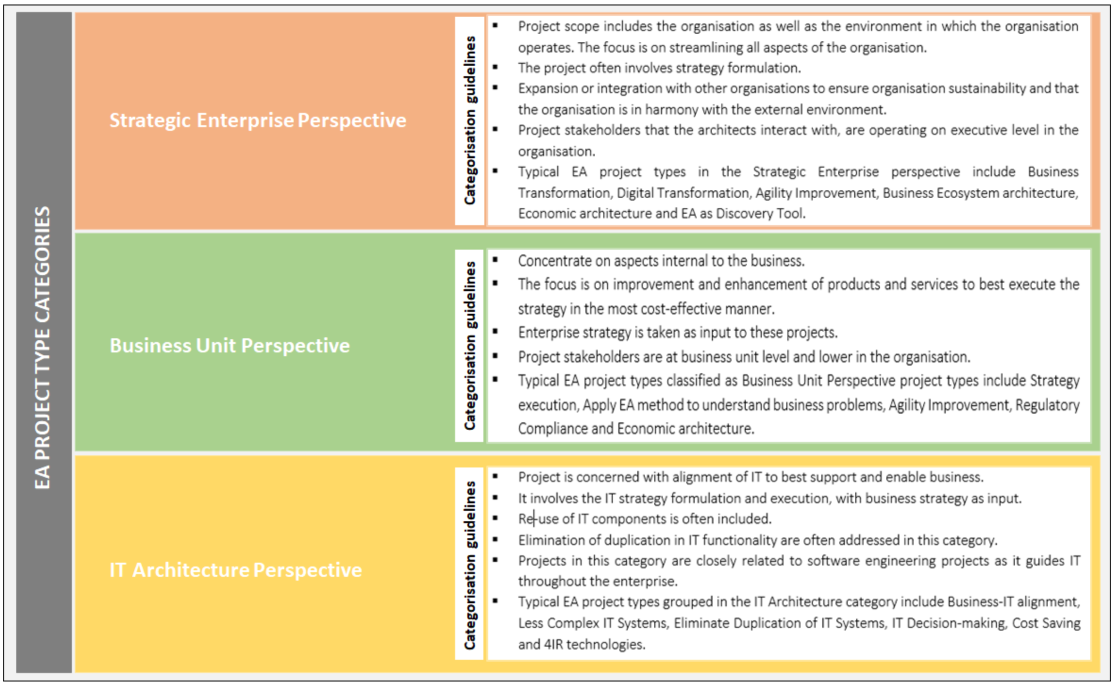

Figure 95 – EA project type classification framework

The EA project type classification framework and the scope and description of the EA project or project phase are taken in consideration when classifying an EA project or project phase. Guidelines for determining the EA project type category of an EA project or project phase are provided below.

8.2.1.1 Guidelines for categorisation of an EA project

Factors to consider when classifying an EA project or phase are:

- For strategic enterprise perspective
  - Project scope includes the organisation as well as the environment in which the organisation operates. The focus is on streamlining all aspects of the organisation.
  - The project often involves strategy formulation.
  - Expansion or integration with other organisations to ensure organisation sustainability and that the organisation is in harmony with the external environment.
  - Project stakeholders that the architects interact with are operating on executive level in the organisation.
  - Typical EA project types in the strategic enterprise perspective include business transformation, digital transformation, agility improvement,

business ecosystem architecture, economic architecture and EA as discovery tool.

- For business unit perspective
    - Project concentrates on aspects internal to the business.
    - The focus is on improvement and enhancement of products and services to best execute the strategy in the most cost-effective manner.
    - Enterprise strategy is taken as input to these projects.
    - Project stakeholders are at business unit level and lower in the organisation.
    - Typical EA project types classified as business unit perspective project types include strategy execution, apply EA method to understand business problems, agility improvement, regulatory compliance and economic architecture.
- For IT architecture perspective
    - Project is concerned with alignment of IT to best support and enable business.
    - It involves the IT strategy formulation and execution with business strategy as input.
    - Reuse of IT components is often included.
    - Elimination of duplication in IT functionality are often addressed in this category.
    - Projects in this category are closely related to software engineering projects as it guides IT throughout the enterprise.
    - Typical EA project types grouped in the IT architecture category include business-IT alignment, less complex IT systems, eliminate duplication of IT systems, IT decision-making, cost saving and 4IR technologies.

Figure 96 below depicts step 1, namely classify EA project or phase.

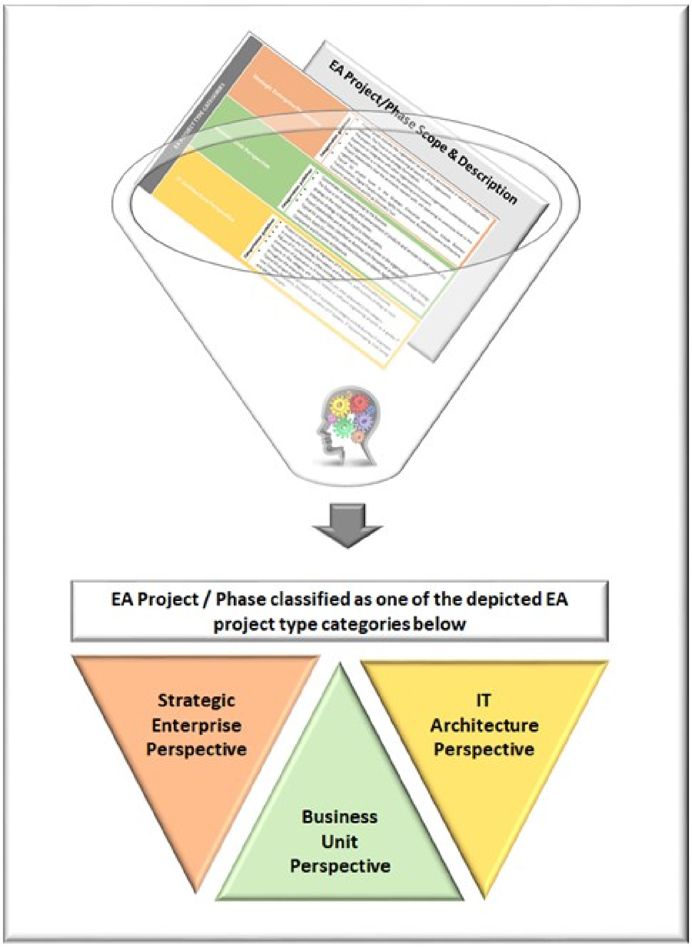

Figure 96 – Classify EA project or project phase

8.2.2 Step 2: Determine relevant EA profiles

The methodology for the selection of architects links relevant EA profiles to the different EA project type categories. Once the EA project or project phase has been classified, the matrix provided as part of the methodology for the selection of enterprise architects, and shown in Table 47 below, is used to determine the ideal EA profiles to employ on the project.

An EA profile reflects an architect's view on EA in terms of EA scope, purpose, architect role and competencies. In addition, insight regarding typical stakeholder interaction and architect's skills category is obtained through an EA profile. Figure 97 below reflects the topics on which information is known per EA profile.

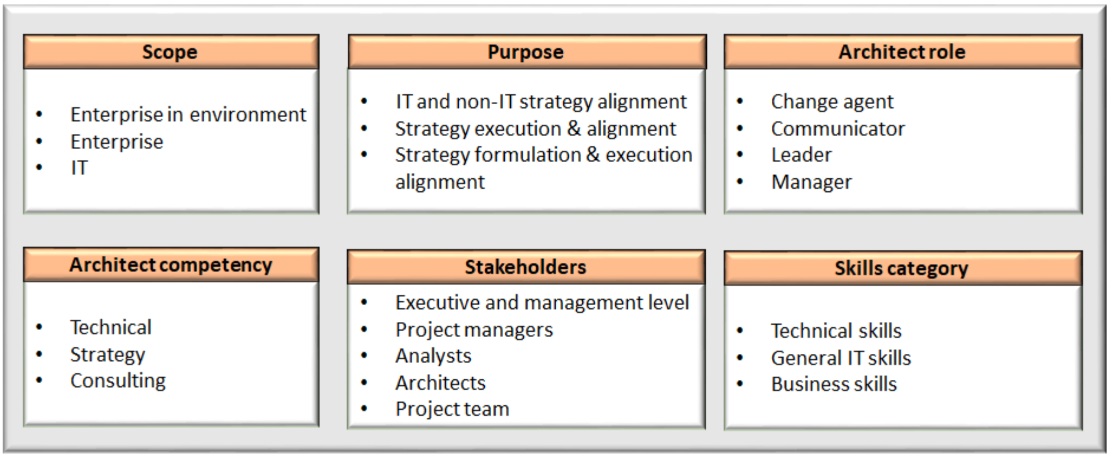

Figure 97 – Topic and information known per EA profile

The matrix that reflects EA profiles per EA project type category, as described in Chapter 6, is repeated in Table 45 below for ease of reference.

Table 45 – Mapping of EA profiles of EA project type categories

	EA Profile											
	EA School of thought			EA Behavioural style								
EA Project type categories	EEA (and EC)	EI (and EPA)	EITA (and EITD, EITP)	Deciding strategy	Directing strategy	Shifting advisory	Developing advisory	Conversing advisory	Translating technology	Control technology	Innovating technology	Disrupting technology
Strategic enterprise perspective	✓			✓	✓	✓						
Business unit perspective		✓				✓	✓	✓				
IT architecture perspective			✓						✓	✓	✓	✓

When the above matrix is applied, the ideal EA profile per EA project type is determined. For example, if an EA project is classified as strategic enterprise perspective, the proposed EA profile to employ on the project is a profile with EA school of thought of EEA (which implies EC as per discussion in Chapter 5) and any of three EA behavioural styles, namely deciding strategy, directing strategy or shifting advisory.

It is important to note that the EA profile relevant to an EA project is determined per project type category and not per type of architecture, namely business, data, application and technology architecture. This method is not meant to determine if a business, data, application or technology architect is required. Thus, this method is not linked to type of architecture (business, data, application and technology) that the architect will develop in a project, but to determine the most appropriate EA profile to achieve the result that is expected from the EA project.

8.2.3 Step 3: Select architects with relevant EA profiles

To select architects with the relevant EA profiles, it is necessary to determine the EA profiles of architects in the organisation's enterprise architecture talent pool. An EA profile consists of two indicators, namely EA school of thought and EA behavioural style.

8.2.3.1 EA school of thought

Questions 1 and 2, depicted in Figure 98 below, determine an architect's EA school of thought.

QUESTION 1

What do you believe the *scope* of enterprise architecture should be? Where scope refers to the scope under consideration to be changed as part of the EA initiative. **Only select one answer.**	
	ICT environment
	Entire enterprise
	Enterprise in its environment

QUESTION 2

What do you believe the *purpose* for planning an enterprise architecture initiative should be? **Only select one answer.**	
	ICT and business alignment
	Business strategy execution
	Business strategy formulation

Figure 98 – Questions to determine an architect's EA school of thought adapted from Du Preez (2016)

Different combinations of EA scope and purpose represent different EA schools of thought. Figure 99 below depicts the different EA schools of thought, derived from the DIA, as described in Chapter 5.

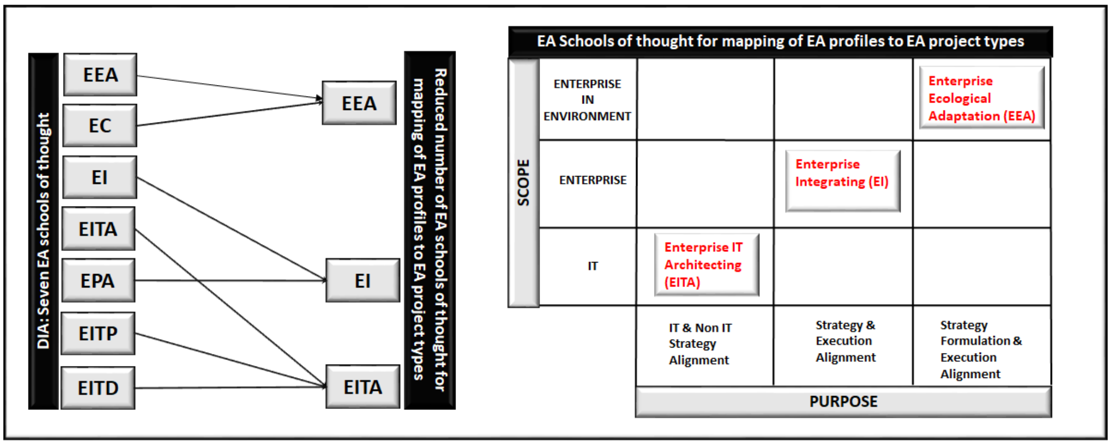

Figure 99 – EA schools of thought adapted from DIA (Du Preez, 2016)

8.2.3.2 EA behavioural style

Answers to questions 3 and 4, portrayed in Figure 100 below, reflect an architect's EA behavioural style. Different combinations of EA role and competency form the EA behavioural styles. Possible EA behavioural styles, as per the DIA and described in Chapter 5, are reflected in Figure 101 further below.

QUESTION 3

What *role* do you believe the architect should play?

Only select one answer

	Change agent
	Communicator
	Leader
	Manager

QUESTION 4

What *competency* do you believe should the architect mostly align with?

Only select one answer

	Technology
	Strategy
	Consulting

Figure 100 – Questions to determine an architect's EA behavioural style adapted from Du Preez (2016)

ARCHITECT BEHAVIOUR STYLE					
Technical	Disrupting Technology	Translating Technology	Innovating Technology	Controlling Technology	
Strategy	Directing Srategy		Deciding Strategy		
Organisational Politics					
Leadership					
Consulting	Shifting Advisory	Conversing Advisory	Developing Advisory		
Competency / Role	Change Agent	Communi-cator	Leader	Manager	Modeller

Figure 101 – EA behavioural styles (Du Preez, 2016)

Once EA profiles of architects employed by the organisation are known, architects with EA profiles that correspond to the EA profiles required for the specific EA project type category, as advised by the methodology for the selection of enterprise architects in support of EA project execution, are assigned to the project.

Note that EA profiles do not indicate whether an architect is a business architect, data architect, application architect or technology architect. The architect's aptitude, attitude, knowledge and experience in a specific functional environment, industry or technology are not known either when the EA profile of the architect is known.

8.3 Evaluation of the methodology for the selection of enterprise architects

Evaluation of the methodology for the selection of architects in support of EA project execution was done at an established South African company that performs EA projects for different clients. Three completed EA projects were used to evaluate the methodology for selection of architects to minimise the risk for the company.

All three steps of the methodology for the selection of enterprise architects were evaluated. Evaluation was done through semi-structured interviews with the managers of the three EA projects.

- Step 1: Classify the EA project or project phase

  To evaluate the classification of EA projects, the relevant EA project managers provided the project description and scope of each project selected for evaluation of the methodology for the selection of enterprise architects. Criteria as per the EA project type classification framework (refer to paragraph 8.2.1) were applied on the project description and scope to classify each project or project phase where applicable.
- Step 2: Determine relevant EA profiles

  Once the EA project type category had been determined, the mapping of EA profiles to EA project type categories, proposed by the methodology for the selection of enterprise architects, was evaluated. Interviewees were asked if the organisation would have selected architects with the view on EA as reflected by the proposed EA profile if such architects were available in the organisation.
- Step 3: Select architects with relevant EA profiles

  This step entails selecting architects with EA profiles corresponding to the methodology for the selection of enterprise architects to be assigned to the EA project. For evaluation of the relevant EA profiles per EA project type category, the EA profiles of the architects that worked on the projects were determined and compared to the EA profiles proposed by the methodology for the selection of enterprise architects. Semi-structured interviews with the project managers of the selected EA projects gathered data regarding the applicability of the proposed EA profiles per EA project type category. Data were collected by focusing on the impact that the architects had on aspects such as stakeholder requirements, project context, project goals and objectives, and communication and consultation.

8.3.1 Interview results

The methodology for the selection of enterprise architects in support of EA project execution was applied in retrospect to three EA projects. Data were collected through semi-structured interviews with the respective project managers of the selected EA projects.

All interviewees have performed the role of EA project manager in EA projects that have been completed successfully. They have all also performed the role of architect on EA projects. Other roles that interviewees have experience in are SCRUM master, functional manager, actuary with business perspective, business developer, business architect and client relations manager. Interviewees were nominated by the organisation that participated in the evaluation of the methodology for the selection of enterprise architects for EA project execution.

Interview results are provided below, per EA project.

8.3.1.1 EA Project A

The organisation provided their strategy as input to EA Project A with the instruction to achieve certain strategic goals. The project was executed in three stages. Each stage started with a phase consisting of tasks that focused on strategy execution and internal business optimisation which rippled through to a phase with tasks that addressed IT architecture. The project manager indicated that each stage was split: 60% business unit focus and 40% IT architecture focus.

EA Project A was thus classified in the business unit perspective and the IT architecture perspective. The first phase of each stage was classified as business unit perspective and the second phase as IT architecture perspective. Table 46 below reflects the project classification and the EA profiles proposed by the methodology for selection of architects.

Table 46 – EA Project A category and methodology-proposed EA profiles

Project phase:	EA Project A – Phase 1 of project stages 1, 2 and 3
EA project type category:	Business unit perspective
Methodology-proposed EA school of thought	

EA scope:	Enterprise	Represented by schools of thought: **EPA** and **EI**.
EA purpose:	Strategy and execution alignment	
Methodology-proposed EA behavioural style		
Architect competency:	Consulting	Represented by EA behavioural styles: **Shifting advisory**, **conversing advisory** and **developing advisory**.
Architect role:	Change agent, communicator or leader	
Project phase:	EA Project A – Phase 2 of project stages 1, 2 and 3	
EA project type category:	IT architecture perspective	
Methodology-proposed EA school of thought		
EA scope:	IT	Represented by schools of thought: **EITA, EITD** and **EITP**.
EA purpose:	Business-IT alignment	
Methodology-proposed EA behavioural style		
Architect competency:	Technical	Represented by EA behavioural styles: **Disrupting technology**, **translating technology**, **innovating technology** and **controlling technology**.
Architect role:	Change agent, communicator, leader or modeller	

Table 47 below depicts the EA profile of the architect employed on EA Project A.

Table 47 – EA Project A – Project Architect EA profile

Project phase of EA Project A	**Project architect**	**Project architect EA profile**	
		EA school of thought	**EA behavioural style**
Phase 1 of project stages 1, 2 and 3	Architect (Principal architect)	EI	Deciding strategy

Project phase of EA Project A	**Project architect**	**Project architect EA profile**	
		EA school of thought	**EA behavioural style**
Phase 2 of project stages 1, 2 and 3	Architect (Principal architect)	EI	Deciding strategy

Interview results in terms of evaluation of the EA project type classification, mapping of EA profiles and the impact of the architect's EA profile on the project are listed in Table 48 below.

Table 48 – EA Project A interview results per evaluation aspect

No.	**Evaluation aspect**	**Interview result**
1.	Categorisation of an EA project	The project could be categorised and the interviewee agrees with the categorisation.
2.	Linking of EA profiles to the EA project category	The EA profiles proposed by the methodology for the selection of enterprise architects correspond with the architects that the organisation would have employed. However, due to project budget constraints, they could not employ two architects on the project. The architect that was employed on the project supports the EA school of thought that corresponds with the EA profile proposed for the business unit perspective category. They have employees with IT knowledge which the project architect could consult when necessary. Further to this, an external consultant was consulted when required.
3.	Stakeholder requirements	The architect easily understood stakeholder requirements. The interviewee mentioned two aspects that influence understanding of stakeholder requirements: 1) How well the client organisation understands its own requirement. It was necessary to have several discussions with the client where the architect had to guide the client in getting to the requirement. 2) How well the architect understands the business domain and business jargon. Once the

No.	Evaluation aspect	Interview result
		requirements were clear, it was well understood by the architect.
4.	Project context	Project context and scope were clearly understood. There was an initial meeting with the client where the business problem was unpacked. A proposal was compiled and presented to the client, whereafter it was refined and confirmed. Thus, project context and scope were confirmed.
5.	Project goals and objectives	Project *goals and objectives* were clearly understood and agreed upon the first time. Project goals and objectives are confirmed with the client in the project initiation documentation. Although the project goals and objectives are confirmed with the client, it often happens that the client personnel then disagree and argue afterwards. Confusion regarding project goals and objectives are often on the client side and not on the architect side.
		Architect agreed with the *project success criteria*. Deliverables were defined and delivery was managed at project management level. Again, it is the client that deviated from the agreed project success criteria by requesting changes to the scope of the project.
6.	Communication and consultation	There were no competing *approaches to the EA work execution*. Two senior architects that could collaborate worked on the project. One of the architects was an external consultant and one was employed by the project organisation. One focused on data and other one on the other architecture components.
		Architect could *communicate and consult with stakeholders*. This was specifically necessary as the client environment had conflicting expectations from the project.
		Project architect and external consultant architect could *communicate successfully*. When they had

No.	Evaluation aspect	Interview result
		different perspectives, they documented the advantages and disadvantages of each perspective to make a decision.

8.3.1.2 EA Project B

EA Project B formulated business strategy for an organisation. It established the organisations' strategic goals and objectives and their whole organisational make-up. It included the development of the business model and business capabilities. Services and processes that support the business capabilities were also defined as phase 2 of the project. The relation between phases 1 and 2 in terms of the complete project scope was 70% for phase 1 and phase 2 covered 30%.

The first and larger phase of EA Project B was categorised as strategic enterprise perspective. The second phase of the project was categorised as business unit perspective. Table 49 below reflects the categorisation of EA Project B and the applicable EA profiles as per the methodology for the selection of enterprise architects.

Table 49 – EA Project B category and methodology-proposed EA profiles

Project:	EA Project B – Phase 1	
EA project type category:	Strategic enterprise perspective	
EA school of thought		
EA scope:	Enterprise-in-environment	Represented by schools of thought: **EEA** and **EC**
EA purpose:	Strategy formulation and execution alignment	
EA behavioural style		
Architect competency:	Strategy or consulting	Represented by EA behavioural styles: **directing strategy, deciding strategy** and **shifting advisory**.
Architect role:	Change agent or leader	
Project:	EA Project B – Phase 2	

<table>
<tr><td>EA project type category:</td><td colspan="2">Business unit perspective</td></tr>
<tr><td colspan="3">EA school of thought</td></tr>
<tr><td>EA scope:</td><td>Enterprise</td><td rowspan="2">Represented by schools of thought:
EPA and EI</td></tr>
<tr><td>EA purpose:</td><td>Strategy and execution alignment</td></tr>
<tr><td colspan="3">EA behavioural style</td></tr>
<tr><td>Architect competency:</td><td>Consulting</td><td rowspan="2">Represented by EA behavioural styles: Shifting advisory, conversing advisory and developing advisory.</td></tr>
<tr><td>Architect role:</td><td>Change agent, communicator or leader</td></tr>
</table>

Table 50 below reflects the EA profile of the architect that was assigned to phases 1 and 2 of EA Project B.

Table 50 – EA Project B – Project architect EA profile

<table>
<tr><th rowspan="2">Project phase of EA Project B</th><th rowspan="2">Project architect</th><th colspan="2">Project architect EA profile</th></tr>
<tr><th>EA school of thought</th><th>EA behavioural style</th></tr>
<tr><td>Phase 1</td><td>Architect
(Principal architect)</td><td>EEA</td><td>Developing advisory</td></tr>
<tr><td>Phase 2</td><td>Architect
(Principal architect)</td><td>EEA</td><td>Developing advisory</td></tr>
</table>

Interview results in terms of evaluation of the EA project type classification, mapping of EA profiles and the impact of the architect's EA profile on the project are listed in Table 51 below.

Table 51 – EA Project B interview results per evaluation aspect

No.	Evaluation aspect	Interview result
1.	Categorisation of an EA project	The project could be categorised and the interviewee agrees with the categorisation.

No.	Evaluation aspect	Interview result
2.	Linking of EA profiles to the EA project category	The methodology-proposed EA profiles correspond with the architects that the organisation would select for the project. The major focus of the project was on business strategy formulation with lesser focus on internal business service and business process development. As only one architect could be afforded on the project, the organisation opted to use an architect that approaches EA work from a business perspective with emphasis on business strategy.
3.	Stakeholder requirements	The architect understood the stakeholder requirement very well. The architect could understand the requirement from a business perspective as he sees EA scope as enterprise-in-environment.
4.	Project context	The architect understood the project scope and context. As the client was not familiar with EA, the architect had to empower them to understand EA and thus the project scope and context. The client needed to realise that the way in which the requirements were fulfilled was actually what they were asking for.
5.	Project goals and objectives	It was the first time that the client had an EA project. The architect clearly understood the project goals and objectives and had to help the client to understand that their requirements would be satisfied by the determined project goals and objectives.
		There was only one architect on the project. The architect agreed with the rest of the project team on the project success criteria.
6.	Communication and consultation	There were no competing approaches to execution of architecture work as only one architect was assigned to the project.
		The architect successfully communicated and consulted with the client. The architect was able to

No.	Evaluation aspect	Interview result
		explain to the client what EA entails as well as the foreseen benefits to the organisation.
		Measurement regarding communication between architects is not applicable as only one architect was assigned to the project.

8.3.1.3 EA Project C

EA Project C was performed for an organisation that already had a business strategy for the next four years. EA Project C was initiated to execute the business strategy as the organisation realised that large changes were required to implement the strategy. The focus was on internal business down to process modelling. A roadmap was delivered to guide implementation of the strategy. EA Project C was classified as business unit perspective. Table 52 below reflects the categorisation of EA Project C and the relevant EA profiles that the methodology for the selection of enterprise architects proposes for the specific EA project type category.

Table 52 – EA Project C – Category and methodology-proposed EA profiles

Project:	EA Project C	
EA project type category:	Business unit perspective	
EA school of thought		
EA scope:	Enterprise	Represented by schools of thought: **EPA** and **EI**.
EA purpose:	Strategy and execution alignment	
EA behavioural style		
Architect competency:	Consulting	Represented by EA behavioural styles: **Shifting advisory**, **conversing advisory** and **developing advisory**.
Architect role:	Change agent, communicator or leader	

Table 53 below reflects the EA profiles of the architects that were assigned to the project.

Table 53 – EA Project C – Project architects' EA profiles

Project	**Project architect**	**Project architect EA profile**	
		EA school of thought	**EA behavioural style**
EA Project C	Architect (Principal architect)	EI	Deciding strategy
	Architect Z	EEA	Developing advisory
	Architect Y	EITA	Directing strategy
	Architect X	EI	Conversing advisory
	Architect W	EPA	Deciding strategy

Interview results in terms of evaluation of the EA project type classification, mapping of EA profiles and the impact of the architect's EA profile on the project are listed in Table 54 below.

Table 54 – EA Project C interview results per evaluation aspect

No.	**Evaluation aspect**	**Interview result**
1.	Categorisation of an EA project	The project could be categorised and the interviewee agrees with the categorisation.
2.	Linking of EA profiles to the EA project category	The methodology-proposed EA profile corresponds with the type of architect that the organisation would have employed on EA Project C. This project was started off with a tender process from the client's side. The architect that prepared the proposal in response to the tender had an EA profile that corresponds with what the methodology proposes. However, the organisation does not always have enough architects with the relevant view on EA. Thus, the tender response serves as guidance to all other architects on the project team. The organisation takes the architect's experience and background in consideration, which can be enhanced by including the architect's view on EA.
3.	Stakeholder requirements	All architects interpreted and understood the stakeholder requirements. Note that the tender

No.	Evaluation aspect	Interview result
		response and consequent contracting with the client reflect the stakeholder requirements which the architects are briefed on.
4.	Project context	The architect that prepared the proposal which resulted in contracting with the client defined the project scope and context clearly. All other architects were briefed on it.
5.	Project goals and objectives	Architect that prepared the proposal which resulted in contracting with the client defined the project goals and objectives clearly. All other architects were briefed on it.
		Architect that prepared the proposal which resulted in contracting with the client defined the project success criteria clearly. All other architects were briefed on it.
6.	Communication and consultation	The project architects are driven people with strong personalities who want to make an impact on the client environment. They had different views of how the work should be done. Conflicting ideas came from architects with business perspective and architects with a technology perspective.
		Communication with stakeholders: Architects had discussions and differences amongst each other, but when communicating to stakeholders, and specifically to the client, communication was successful.
		Communication between architects: There were conflicting ideas on how the work should be done, and many discussions were held. It was constructive discussions that led to successful project execution. The project manager mentioned that if architects had been aware of each other’s view on EA, the communication between architects might have been better, with easier agreement on the way forward.

8.3.2 Interpretation of interview results

Measurement criteria for the evaluation of the methodology for the selection of enterprise architects gathered data for evaluation of the application of the methodology as well as for evaluation of the impact that implementation of the methodology has on EA project execution.

The interpretation of interview results is provided per evaluation criteria set, namely 1) application of the methodology; and 2) the impact on the EA project of implementing the methodology for the selection of enterprise architects.

Interview data related to the evaluation of the methodology for the selection of enterprise architects in support of EA project execution are provided in a separate document, where themes are highlighted. Themes used during analysis of the data are reflected in Table 55 below.

Table 55 – Themes for analysis of interview data regarding evaluation of the methodology for selection of enterprise architects in support of EA project execution

No.	Theme identified during thematic analysis of interview results	Theme identified during hermeneutic literature review
1.	Project classification	Project classification
2.	EA profile per EA project type category	EA profile per EA project type category
3.	Measurement criteria	Measurement criteria
4.	Stakeholder requirements	Project context and scope
5.	Project context and scope	Project context and scope
6.	Client understanding of own requirements	Not identified during literature review
7.	Communication	Communication
8.	Use of methodology measurement criteria by EA project manager	Not identified during literature review

NOTE applicable to paragraph 8.3.2 and sub-paragraphs:

- **The responses of all interviewees are available as a table in a separate document.**
- **Themes are highlighted and named in the comment column of the table in the abovementioned document.**

- **Extracts from interviews are provided in this paragraph in italics and smaller font size to show data that supports the statements. However, not all supporting interview responses are repeated in this paragraph.**
- **Interviews were mainly held in Afrikaans, thus extracts reflected in this section were translated from Afrikaans.**

8.3.2.1 Application of the methodology

Evaluation of the application of the methodology entails testing the **categorisation** of EA projects and the **mapping of EA profiles** to EA project type categories.

The guidelines of the EA project classification framework for determining the category of an EA project or project phase were applied and shown to be clear and easy to apply. All three EA projects could be classified without requiring an additional EA project type category. The EA project type classification framework indicates that different parts of an EA project can be classified in different EA project type categories. This was the case with two of the projects used in the evaluation.

Interpretation of the interview results reveals the common theme that the categorisation of EA project types does not need optimisation. Table 56 below shows the EA projects and phases that were categorised during semi-structured interviews with the EA project managers.

Table 56 – EA projects and phases categorised in EA project type categories

No.	EA project type category	EA Project A		EA Project B		EA Project C
		Phase 1	Phase 2	Phase 1	Phase 2	
1.	Strategic enterprise perspective			X		
2.	Business unit perspective	X			X	X
3.	IT architecture perspective		X			

The following responses from the interviewees confirm the above categorisation of EA projects:

- Interviewee 1, EA Project A:

- Interviewee 1: *"The strategy with three goals to be realised by the project was provided to the project team. To realise the strategic goals, the focus was mainly on internal business and a lesser part on IT architecture. I would say 60% business unit perspective and 40% IT architecture perspective."*

- Interviewee 2, EA Project B:
  - Interviewee 2: *"So, the project that I worked on was very much establishing of strategy, and then establishing the baseline business architecture."*
  - Interviewer: *"If we have to categorise that phase of the project, the first phase, would it fit into strategic enterprise perspective as the scope includes the organisation as well as the environment in which it operates? So, it is not just internal; it looks outside as well."*
  - Interviewee 2: *"Correct."*
  - Interviewer: *"It focuses on streamlining all aspects of the organisation, often involves business strategy formulation?"*
  - Interviewee 2: *"Yip. It is that first one, strategic enterprise perspective."*
  - Interviewer: *"So, we can then categorise the project that you described as strategic enterprise perspective?"*
  - Interviewee 2: *"Yes, as well as we started moving into business unit perspective."*
- Interviewee 3, EA Project C
  - Interviewee 3: *"The work that we did for ABC was initiated with a strategy and a 3- to 4-year roadmap. We were tasked to execute the strategy. We applied an EA approach focusing on the internal business and touched on process modelling. This project specifically was business unit perspective, but our organisation can perform projects in the other categories as well."*

Evaluation of the methodology-proposed **mapping of EA profiles** to EA project type categories entailed comparing the EA profiles proposed by the methodology to the EA profiles that the organisation would have assigned to the EA projects, selected for the evaluation, if an unlimited pool of architect talent were available.

All interviewees agreed with the methodology-proposed EA profiles for the respective EA projects. [Interviewee 3: *"Yes, we do consider the architect's profile, else you run the risk of selecting an architect that does not match the project type, which will have a negative impact on the project and ultimately damages our company's brand. So, yes, we do consider the stock on-hand as well as EA profiles that match the project type as described."*] They focused more on the applicability of the EA school of thought indicator of the EA profile than the EA behavioural style indicator. [Interviewee 1: *“Yes, I would select architects with those EA profiles. However, the challenge is to balance cost, the project could not afford two architects … The tendency of an architect to consider EA scope as business unit focused, or IT-focused or enterprise strategy focused is something that we know of our architects and do consider when selecting for projects combined with availability of architects.”* Interviewee 2: *“Absolutely. So, again, and I think it was also my additional comment that I made this … because I am an enterprise architect with a business focus, I am able to do that as part of the project. If it was an enterprise architect that had a systems background, they would not have done it.”*] The architect’s view on architect role and competency was not explicitly considered when discussing selection of suitable architects for EA project execution. Although, the architect consulting competency was mentioned as applicable to one of the projects. [Interviewee 2: *“Okay, how in context, okay, I got it. It is very much around strategy and it is very much around consulting.”*]

EA school of thought has two dimensions, namely EA scope and EA purpose. Interviewees were more concerned with the suitability of the architect’s perception of EA scope than with EA purpose. The interviewee of EA Project B emphasised the frustration of working with an IT-focused architect on a project with the scope of enterprise or enterprise-in-environment. [Interviewee 2: *“If it was an enterprise architect that had a systems background, they would not have done it. They will go to tech space. They cannot, so this is with absolute respect, they cannot think strategically from a business perspective. And for me, EA is a little bit broader than just solution architecture or technical architecting. If that make sense.”*] It causes delays on the project due to time spent on explaining and convincing the IT-focused architect that a business focus is required for the specific project.

Although interviewees agreed with the proposed EA profiles per EA project type category, all architects that were assigned to the projects used for evaluation of the methodology did not have the required EA profile. Notably, principal architects responsible for confirming stakeholder requirements, project scope, goals and objectives, performance criteria and delivery approach with the client were of the **EA school of thought** proposed by the methodology for the selection of enterprise architects for the relevant EA project type category of the EA project. Only one of the principal architects’ EA behavioural style corresponded with the methodology-proposed EA behavioural style, but it was for phase 2 of the project, which was the smaller part of the project. Refer to Table 57 below for a depiction of EA profiles of project architects and the methodology-proposed EA profiles per EA project. The green blocks show indicators that correspond with methodology-proposed indicators.

Table 57 – Methodology-proposed EA profiles and project architects' EA profiles

Project / Project phase	Project architect	Project architect EA profile	
		EA school of thought	**EA behavioural style**
EA Project A: Phase 1 of project stages 1, 2 and 3	Project A – Principal architect	EI	Deciding strategy
EA Project A: Phase 2 of project stages 1, 2 and 3	Project A – Principal architect	EI	Deciding strategy
EA Project B: Phase 1	Project B – Principal architect	EEA	Developing advisory
EA Project B: Phase 2	Project B – Principal architect	EEA	Developing advisory
EA Project C	Project C – Principal architect	EI	Deciding strategy
	Project C – Architect Z	EEA	Developing advisory
	Project C – Architect Y	EITA	Directing Strategy
	Project C – Architect X	EI	Conversing advisory
	Project C – Architect W	EPA	Deciding strategy

There were two projects that had two phases which were classified in different EA project type categories. Remarkably, for the phases that carried the most weight in terms of project scope, the organisation assigned principal architects of EA schools of thought that were also proposed by the methodology for the selection of enterprise architects.

Background of architects in terms of where they started their careers was mentioned to play a role when the organisation selects architects for EA project execution. In other words, architects who started their careers in the IT space are assigned to projects with an IT focus and architects with a business background are assigned to projects with a business perspective and EA projects where business strategy needs to be developed. This distinction correlates with the EA scope aspect of the EA school of thought indicator and explains the similarity of assigned principal architects' EA school of thought with the methodology-proposed EA schools of thought per EA project. The interview response below was provided with regard to an EA project categorised as mainly strategic enterprise perspective and to a lesser extent as business unit perspective.

It is important to note that the EA projects used for the evaluation of the methodology for the selection of enterprise architects have been successfully completed. One of the reasons for the success may be that at least principal architects on these projects supported the EA school of thought proposed by the methodology for the selection of enterprise architects.

The organisation is aware of the different views that architects may have on EA and compensates for it by assigning a principal architect with a view of EA that is applicable to the EA project. Unfortunately, this is not always feasible as the organisation performs many different EA projects for different clients simultaneously, and available architects are assigned to the EA project at hand; else the architect becomes an overhead expenditure for the organisation. Interviewees indicated that in instances where, for example, an architect with a business background works on a project where an architect with an IT background would be more suitable, they arrange internal consulting sessions with an architect with the required background. Thus, a new theme that was identified is that the EA school of thought of the EA project's principal enterprise architect should at least preferably correspond with the required EA school of thought proposed by the methodology for the selection of enterprise architects.

The above interpretation of the interview results makes it clear that it is not always possible to get a perfect match between available architects and the EA profiles proposed for the project. Of all the factors taken in consideration when selecting an architect with the relevant EA profile, the EA scope is the first priority to map which is accompanied by an EA purpose; the second priority is EA behavioural style indicator, with initial focus on architect competency and lastly on architect role.

Categorising of EA projects and mapping of architects with relevant EA profiles was acknowledged as beneficial. [Interviewee 1: "*I think this will help a lot, let's refer to it as secondary competencies or skill sets. When you do the categorisation of EA projects and determine architects' EA profiles, it will be valuable for project execution.*"]

8.3.2.2 Impact of implementation of the methodology for the selection of enterprise architects on EA project execution

The measurement of the impact of the implementation of the methodology for the selection of enterprise architects on an EA project was done in terms of factors that influence project success. If architects easily grasp scope, stakeholder requirements, project context, project goals and objectives, they agree on the delivery approach and project success factors and have constructive communication, it will have a positive impact on project execution that contributes to project success. The main findings are listed below.

- Principal architects responsible for confirming scope, stakeholder requirements, project context, goals and objectives and project success criteria understood these aspects accurately. This was found to positively impact on project success, as the EA projects were completed successfully. [Interviewee 3: *"The principal architect's work is focused on project execution. They are responsible to ensure realisation of contracted client requirements and expectations. The principal architect provides guidance to the other project architects. So, at the end of the day, the client receives what was requested and paid for."*] These architects' **EA school of thought** correlated with the methodology-proposed EA school of thought, but not always with the methodology-proposed EA behavioural style. The correlation of EA schools of thought might have contributed to the understanding of stakeholder requirements, project context, project goals and objectives and successful communication and consultation. One of the interviewees stressed that the principal architect was able to understand the stakeholder requirements precisely because the architect operates from a business perspective, and the project was classified as business unit perspective. [Interviewee 2: *"Absolutely. So, again, and I think it was also my additional comment that I made … because I am an enterprise architect with a business focus, I am able to do that as part of the project. If it was an enterprise architect that had a systems background, they would not have done it."*]

It is important to note that the organisation where the methodology for the selection of enterprise architects was evaluated follows an operating model that allows that not all architects need to have the required EA profile. The organisation performs EA projects for external clients that publish requests for proposals. Project contracting details confirm scope, stakeholder requirement, project goals, objective, success criteria and the delivery approach. Contract negotiation in terms of these aspects is done by the principal architect which, in the cases used for evaluation, were from EA schools of thought that were the same as the methodology-proposed EA schools of thought. All other architects assigned to the project were briefed. The project contract governs the EA project execution with the result that architects follow the guidance provided by the principal architect. [Interviewee 3: *"The principal architect's work is focused on project execution. They are responsible to ensure realisation of contracted client requirements and expectations. The principal architect provides guidance to the other project architects. So, at the end of the day, the client receives what was requested and paid for."*]

- An aspect not related to the selection of architects for EA projects but that influences understanding of stakeholder requirements is the degree to which the client understands its own requirement. [Interviewee 1: *"See, the confusion regarding requirements is most of the times not internally, but on the client side. It happened before that we confirmed the requirements with stakeholders and during project execution the stakeholder changed it when different client role players get involved."* Interviewee 2: *"Yes, I think what one does need to say over here* *and I don't know whether is going to be subsequent questions. Uhm, if the client understands."*]

- The architect's experience in the specific business field, for instance mining or manufacturing, plays a role when stakeholder requirements need to be understood, as mentioned by interviewees and reflected below. This type of information is not known when an architect's EA profile is known and needs to be taken into account together with the EA profile when selecting architects. [Interviewee 1: *"The second component that influences understanding of stakeholder requirements is how well the architect understands the business domain, for example mining. An architect's background and experience are also taken in consideration when assigning architects to the project."*]
- It is derived from the interview results as discussed above that the mapping of EA profiles to EA project type categories as proposed by the methodology for the selection of enterprise architects is acceptable. The EA projects used for the evaluation have all been completed successfully. Each project had at least a principal architect with a matching EA school of thought. Therefore, it is clear that when selecting architects for EA project execution, the EA school of thought indicator has priority over the EA behavioural style indicator.
- It was confirmed that knowledge of fellow architects' EA profiles would benefit communication between architects. This will specifically be valuable on projects where architects with EA profiles that correspond with the methodology-proposed EA profiles were not available to be assigned to the project. Refer to the extract from an interview below. [Interviewee 3: *"It would contribute to better communication between project architects if they are aware of each other's view on EA."*]
- An additional theme was derived from interview results: The measurement criteria used to evaluate the methodology for the selection of enterprise architects highlights the aspects where enterprise architects may have different opinions due to their EA profile. This may serve as a valuable aid for the EA project manager to ensure harmony and common understanding in support of successful project execution. [Interviewee 3: *"And project managers can use the topics of the measurement criteria to know which areas are those that architects may disagree on or battle to understand."*]

8.4 Refined methodology for the selection of enterprise architects

Evaluation of the methodology for the selection of enterprise architects in support of EA project execution confirmed its applicability. Interpretation of the evaluation results led to refinement of steps 2 and 3 of the methodology for the selection of enterprise architects as described below.

8.4.1 Step 1: Classify the EA project or EA project phase

Categorisation of EA projects in three EA project type categories and the categorisation guidelines were confirmed as useful when applied to three successfully completed EA projects. Therefore, no changes are required to step 1 of the methodology for the selection of enterprise architects.

8.4.2 Step 2: Determine relevant EA profiles

The proposed EA profiles per EA project type category were confirmed to be suitable. It was found that at least the architect's EA school of thought indicator needs to match the methodology-proposed EA school of thought indicator to benefit EA project execution. Therefore, the matrix that reflects preferred EA profiles per EA project type category had to be optimised by being split into two to make it clear that these two indicators can be used independently of each other when architects are selected.
Tables 58 and 59 below reflect the mapping of EA schools of thought and EA behavioural styles to EA project type categories respectively.

Table 58 – EA school of thought mapped per EA project type category

	EA project type category		
EA school of thought	Strategic enterprise perspective	Business unit perspective	IT architecture perspective
EEA	✓		
EI		✓	
EITA			✓

Table 59 – EA behavioural style per EA project type category

	EA project type category		
EA behavioural style	Strategic enterprise perspective	Business unit perspective	IT architecture perspective
Deciding strategy	✓		
Directing strategy	✓		
Shifting advisory	✓	✓	
Developing advisory		✓	
Conversing advisory		✓	
Translating technology			✓
Control technology			✓
Innovating technology			✓
Disrupting technology			✓

8.4.3 Step 3: Select architects with relevant EA profiles

Step 3 of the methodology entails finding architects with EA profiles that correspond with the EA profiles determined in step 2 to be assigned to the EA project.

This step is split into a part A and part B. Step 3A entails determining the EA profiles of architects that are available for selection, and will be performed only for architects whose EA profiles are not on record. Step 3B will always be performed as it involves the actual selection of architects to be assigned to the project.

8.4.3.1 Step 3A: Determine an architect's EA profile

EA profiles have already been confirmed by Du Preez (2016) with the development of the DIA. The questionnaires used during the evaluation of the methodology for the selection of enterprise architects needed to be optimised. It must only allow selection of combinations of EA scope and EA purpose, and architect role and competency that are defined in the DIA as EA schools of thought and EA behavioural styles. Figure 102 below depicts the optimised question to determine an architect's EA school of thought.

QUESTION 1

What do you believe the *scope* and *purpose* of enterprise architecture should be?

Where scope refers to the scope under consideration to be changed as part of the EA initiative.

Only mark one white block

EA SCOPE	Enterprise in its Environment			
	Entire Enterprise			
	ICT Environment			
		ICT and Business alignment	Business Strategy execution	Business strategy formulation and execution
		EA PURPOSE		

Figure 102 – Question to determine an architect's EA school of thought

Figure 103 below reflects the optimised question that determines an architect's EA behavioural style.

QUESTION 2

What *role* and *competency* combination do you believe should the architect mostly align with?

Only mark one white block

ARCHITECT COMPETENCY	Technical				
	Strategy				
	Consulting				
		Change Agent	Communicator	Leader	Modeller
		ARCHITECT ROLE			

Figure 103 – Question to determine an architect's EA behavioural style

8.4.3.2 Step 3B: Select architect based on EA profile

If architects with matching EA school of thought and matching EA behavioural style are not available, selection of architects with only a matching EA school of thought receives priority over selecting an architect with only a corresponding

EA behavioural style. A suggestion from the interviewees is that at least the EA profile of the principal architect assigned to the EA project must correspond to the EA school of thought proposed by the methodology.

It was pointed out that the measurement criteria used for evaluation can be a valuable tool for EA project managers when architects with EA profiles that do not match the methodology-proposed EA profile for the relevant EA project are assigned to the project. Therefore, the EA project manager must take note that these architects may need extra guidance in terms of the following aspects:

- Stakeholder requirements
- Project context and scope
- Project goals and objectives
- Project success criteria
- Approach to EA work
- Communication with project client and team members.

8.5 Conclusion

Chapter 8 answers the main research question, “How can enterprise architects be selected to support EA project execution?” Answers to sub-research questions led to the development of the methodology for the selection of enterprise architects in support of EA project execution, which is described in this chapter. The methodology consists of three steps:

- Step 1: Classify the EA project or project phase
- Step 2: Determine relevant EA profiles
- Step 3: Select architects with relevant EA profiles

The methodology for the selection of enterprise architects in support of EA project execution was evaluated at an established South African organisation that performs EA projects for clients. Evaluation was done by applying the methodology for selection of architects in retrospect of three successfully completed EA projects. Semi-structured interviews with the managers of the EA projects, guided by the measurement criteria, as described in Chapter 7, delivered results that were interpreted. The methodology was refined as a result of the evaluation. The methodology for the selection of enterprise architects in support of EA project execution was considered contributing to successful EA project execution.

Criteria used to evaluate the methodology for the selection of enterprise architects were considered to be useful on EA projects where enterprise architects with EA profiles other than methodology-proposed EA profiles are employed. The measurement criteria highlights to the EA project manager aspects that may need extra attention.

The next chapter concludes this research report.

9. Report on research findings

Figure 104 below shows the position of Chapter 9 in relation to the rest of the thesis.

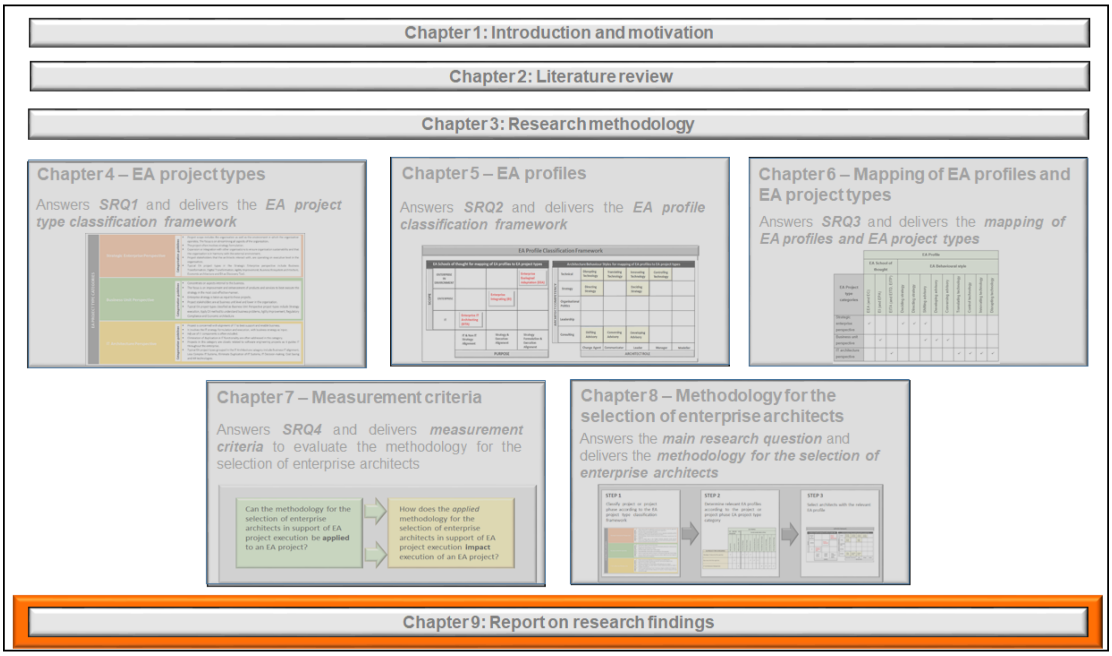

Figure 104 – Position of Chapter 9 in relation to the rest of the thesis

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Chapter 9 layout:

9.1 Introduction

9.2 Summary of research study

9.3 Summary of contributions

9.4 Recommendations

9.5 Conclusion

9.1 Introduction

EA is a discipline with several different descriptions and applications. Enterprise architects have different understandings of EA and differ in their approaches to perform EA work. Due to the different uses of EA as well as the different understandings and approaches to EA work, enterprise architects working on the same EA project often have misunderstandings and arguments regarding the EA work. This may have a negative impact on EA project delivery. As Carr (2016), editor of Enterprise Architecture Professional Journal, states in the following question and answer in a LinkedIn blog article. *"Question: What do you call a group of architects? Answer: An argument of architects!"* This research study was performed to determine a way to get to a *symphony of architects*, despite the different understandings of EA and different types of EA work in support of EA project execution.

9.1.1 Research process

The research study followed a problem-centred approach by first identifying and motivating the problem. Then, objectives of a possible solution to the problem were identified and portrayed as research objectives. Background information of the discipline applicable to the identified problem was provided through a literature review. The next step was to determine and document the research strategy and research methodology. Thereafter, the research steps as prescribed by the research methodology were executed. It entailed the design and development of the artefact proposed as solution to the identified problem. This phase consisted of two cycles of design, namely demonstrate and evaluate, to deliver the first version of the artefact. The artefact was demonstrated, evaluated and optimised as a result of the evaluation. The last step of the research process entails communication, which is contained in this chapter. Figure 105 below depicts the research process that guided the research.

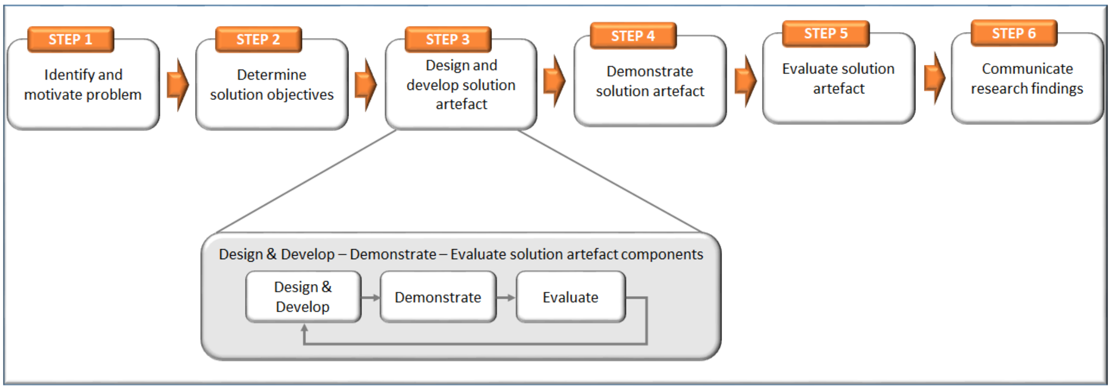

Figure 105 – Research process based on DSRP of Peffers *et al.* (2006)

9.1.2 Research contribution

This research study determined the different types of EA projects and the various understandings that architects have of EA. The various understandings that enterprise architects have of EA are referred to as an EA profile. It was then determined what EA profile is appropriate for each type of EA work. A methodology for the selection of enterprise architects was developed to support the selection of architects that suit the type of EA work to be delivered by an EA project. Criteria were developed to measure the methodology for the selection of enterprise architects.

The methodology for the selection of enterprise architects consists of an EA project type classification framework, an EA profile classification framework and a mapping of EA profiles to EA project type categories. The methodology was evaluated against measurement criteria that were determined through literature review. A second use of the criteria was identified during evaluation of the methodology for the selection of enterprise architects, namely it serves as a list with points to be addressed by and EA project manager to ensure a common understanding between enterprise architects assigned to the EA project.

This chapter concludes the research study and represents the last step in the research process, as depicted in Figure 105 above. A summary of the research is provided as well as a reflection of whether the research objectives have been realised. Next, research contribution and challenges are discussed. Finally, recommendations for future research work are provided.

9.2 Summary of research study

The summary of the research study addresses the research chapters, purpose of the research and challenges, the research rationale and the design of the delivered artefact, namely methodology for the selection of enterprise architects in support of EA project execution.

9.2.1 Research chapters

The DSRP of Peffers *et al*. (2006) was applied to this research study. The six steps of the DSRP were applied as described below and depicted in Figure 106 further down in paragraph 9.2.4.

- Chapter 1 of the thesis covers steps 1 and 2 of the DSRP. It contains the problem identification and motivation and states the objectives of a possible solution for the identified problem.

- Chapter 2 provides background information of the subject area of the research problem and is considered supportive of steps 1 and 2 of the DSRP.
- Chapter 3 spells out the research methodology applicable to this research study in order to realise the objectives of the solution.
- Chapters 4 to 7 and section 8.2 of chapter 8 address step 3 of the DSRP. Step 3 designs and develops the artefact as solution to the problems stated in step 1, with the aim to realise the objectives as determined in step 2. Within step 3, two cycles of design-and-develop-demonstrate-evaluate were performed to deliver the artefact, methodology for the selection of enterprise architects in support of EA project execution.
    - Chapter 4 describes different EA project types and the categorisation of EA project types. The final deliverable of this chapter is an EA project type classification framework.
    - Chapter 5 addresses the different understanding of EA by delivering an EA profile classification framework.
    - Chapter 6 maps the EA project type classification framework and the EA profile classification framework. This mapping of frameworks identifies relevant understandings of EA per EA project type category.
    - Chapter 7 reflects the measurement criteria used to evaluate the methodology for the selection of enterprise architects in support of EA project execution.
    - Chapter 8, section 8.2 provides the methodology for the selection of enterprise architects in support of EA project execution.
- Chapter 8, sections 8.3 and 8.4, address steps 4 and 5 of the DSRP. It reflects the demonstration and evaluation of the developed artefact. The final deliverable of this chapter is the methodology for the selection of enterprise architects in support of EA project execution, optimised as a result of the demonstration and evaluation.
- Chapter 9 covers the last step of the DSRP, namely communication, by providing a summary of the research findings and reflecting on realisation of research objectives and solution objectives.

Due to the large file size, raw data as collected during semi-structured interviews regarding EA project types and categorisation, the evaluation of the methodology for the selection of enterprise architects and the related measurement criteria are available in a separate document.

9.2.2 Research purpose and challenges

There are different types of EA work that require different delivery approaches. The delivery approach, scope, goals and objectives, success criteria and interpretation of stakeholder requirements are factors that are influenced by the view that enterprise architects have on EA.

The purpose of the research study was to determine how enterprise architects can be selected in support of EA project execution. A methodology for the selection of enterprise architects that accommodates the different types of EA work and the diverse views on EA and the consequential misunderstanding and arguments that negatively impact EA project execution was developed. Research challenges overcame during the research study include:

- An understanding of the characteristics of a project in general was required.
- A method to determine the type of project needed to the identified.
- Different types of EA projects had to be identified through hermeneutic literature review and by applying the method to determine the type of a project.
- An EA project type classification framework had to be developed.
- Different understandings that architects have of EA had to be determined.
- The relevant understandings of EA per EA project type category had to be determined.
- Aspects of an EA project that are influenced by the view that enterprise architects have on EA had to be discovered to be used as measurement criteria for evaluation of the methodology for the selection of enterprise architects in support of EA project execution.

9.2.3 Research rationale

The rationale for this research is based on the impact of EA and its important role in organisations, the large financial and time investments in EA, the different understandings of EA and different types of EA work.

Enterprise architects with different views on EA will deliver different architecture results for the same stakeholder requirement (Du Preez, 2016). Different types of EA work or stakeholder requirements do exist (Korhonen & Poutanen, 2013). It is important that organisations get optimal benefit from their EA projects by receiving EA deliverables that serve the specific stakeholder requirement. Therefore, the aim of this research study was to determine how enterprise architects can be selected in support of EA project execution.

The **main research question** for this research study was:

- *How can enterprise architects be selected to support EA project execution?*

In order to answer the main research question, *four sub-research questions* guided the study:

- SRQ1: *What are the different EA project types?*
- SRQ2: *What are the different understandings that enterprise architects have of EA?*
- SRQ3: *What understanding of EA is required to execute different EA project types?*
- SRQ4: *What are the measurement criteria to evaluate the methodology for selection of enterprise architects for EA project execution?*

9.2.4 Design of the methodology for the selection of enterprise architects

The primary objective of this research study was to determine how enterprise architects can be selected to support EA project execution by providing a methodology for utilisation in EA practice.

Fulfilment of four identified sub-objectives, listed below, resulted in the achievement of the primary research objective.

- SRO1: Determine the different EA project types;
- SRO2: Identify the different ways that enterprise architects interpret EA;
- SRO3: Provide a mapping between the different ways that enterprise architects see EA and EA project types; and
- SRO4: Determine criteria to measure the methodology for selection of enterprise architects for EA project execution.

The DSR strategy is suitable when new artefacts such as computer systems, methodologies and models are developed (Oates, 2006; Gregor & Hevner, 2013). Therefore, this research study followed the DSR strategy.

The specific DSR process that was followed to realise the research objectives is the DSRP of Peffers *et al.* (2006). It was selected as it is a practical process that consolidates other approaches to DSR (Gregor & Hevner, 2013) and it was specifically developed for IS research (Peffers *et al.*, 2008).

Alignment of the research study title, research objective, research question and research contribution ensured that the research was focused to effectively answer the main research question. Table 60 below reflects the thesis alignment.

Table 60 – Thesis alignment

Title:	Methodology for the selection of enterprise architects in support of EA project execution
Research objective:	To determine how enterprise architects can be selected to support EA project execution by providing a methodology for utilisation in EA practice
Research question:	How can enterprise architects be selected to support EA project execution?
Contribution:	Methodology for the selection of enterprise architects in support of EA project execution consisting of an EA project type classification

	framework, EA profile classification framework, mapping of the two frameworks and measurement criteria

The alignment of the thesis content as provided in Table 61 below ensured that the deliverables as a result of answering sub-research questions built up to the main deliverable that serves as solution to the research problem.

Table 61 – Thesis content alignment

No.	Sub-research question	Sub-research objective	Chapter	DSRP step	Technique	Deliverable
1.	What are the different EA project types?	To determine the different EA project types.	4	Step 3: Design and develop artefact	Hermeneutic literature review. Semi-structured interviews with EA experts. Thematic analysis of interview results. Thematic analysis in parallel with hermeneutic literature review. FEDS.	List of EA project types and EA project type categories resulting in EA project type classification framework
2.	What are the different EA profiles?	To identify the different ways that enterprise architects interpret EA.	5	Step 3: Design and develop artefact	Literature review – DIA. Thematic analysis.	EA profile classification framework
3.	What EA profiles are required to execute different EA project types?	To provide a mapping between the different ways that enterprise architects see EA and EA project types.	6 & 8	Step 3: Design and develop artefact	Semi-structured interviews with EA project managers that implemented the methodology in retrospect.	Mapping of EA profiles per EA project type category

No.	Sub-research question	Sub-research objective	Chapter	DSRP step	Technique	Deliverable
					Thematic analysis of interview results.	
4.	What are the measurement criteria to evaluate the methodology for selection of enterprise architects for EA project execution?	To determine criteria to measure the methodology for selection of enterprise architects for EA project execution.	7	Step 3: Design and develop artefact	Hermeneutic literature review. Semi-structured interviews with EA project managers that implemented the methodology in retrospect. Thematic analysis of literature and interview results. FEDS.	Criteria for evaluation of the methodology for the selection of enterprise architects for EA project execution
No.	**Main research question**	**Main research objective**	**Chapter**	**DSRP step**	**Technique**	**Deliverable**
5.	How can enterprise architects be selected in support of EA project execution?	To determine how enterprise architects can be selected to support EA project execution by providing a methodology for utilisation in EA practice.	8	Step 3: Design and develop artefact Step 4: Demonstrate Step 5: Evaluate	Retrospective implementation of methodology for the selection of enterprise architects for EA project execution on successfully completed EA projects. Semi-structured interviews with EA project managers based on measurement criteria developed to	Refined methodology for the selection of enterprise architects in support of EA project execution

No.	Sub-research question	Sub-research objective	Chapter	DSRP step	Technique	Deliverable
					evaluate the methodology. Thematic analysis of interview results. FEDS.	

Figure 106 below depicts the DSRP of Peffers *et al.* (2006) applied to develop the methodology for the selection of enterprise architects in support of EA project execution. The alignment of the DSRP steps and deliverables is reflected.

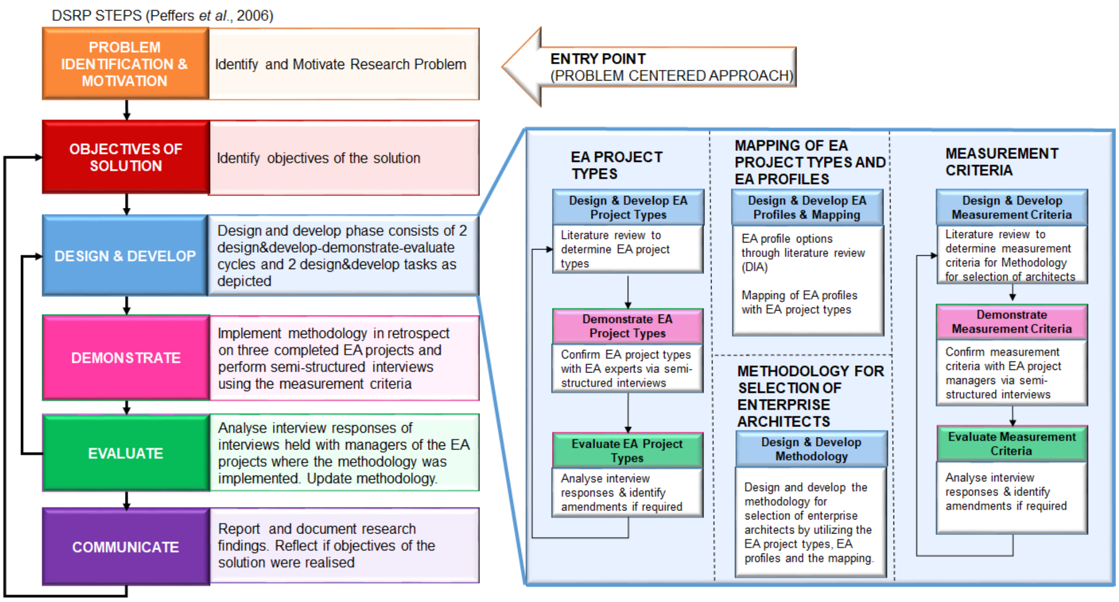

Figure 106 – DSRP for the design of the methodology for the selection of enterprise architects

Research design factors are depicted in Figure 107 below, utilising the "research onion" of Saunders and Tosey (2013). Each design factor is portrayed as a layer of the research onion. By considering each layer, a structured research design was ensured with alignment between research design factors.

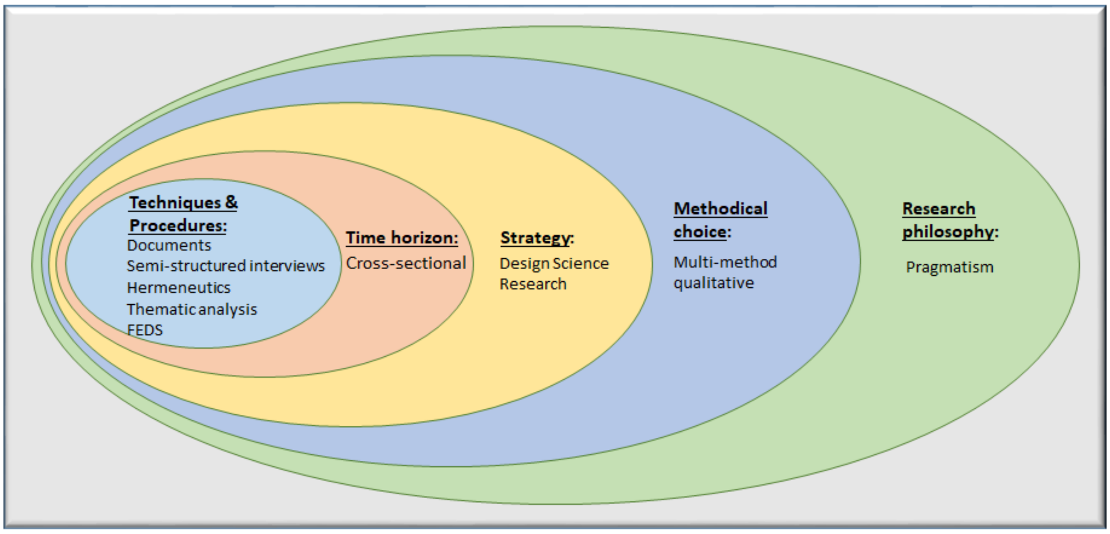

Figure 107 – Research design factors applicable to this research study

9.3 Summary of contributions

This section summarises contributions of this research study. Contributions are shown in terms of three points of view, namely the research field and research problem, the methodological perspective and the scientific perspective.

9.3.1 Research area and problem reflection

This section discusses the research results in comparison with other research studies on related topics.

The research delivered a methodology for the selection of enterprise architects in support of EA project execution. It acknowledges that there are different descriptions of EA as identified by various researchers found in literature. These authors include Kaddoumi and Watfa (2016), Lapalme (2012), Mentz, Kotzé and Van der Merwe (2012), Saint-Louis and Lapalme (2016) Gampfer, Jurgens, Muller and Buchkremer (2018) and Gong and Janssen (2019).

One of the components of the methodology for the selection of enterprise architects is the determining of the EA profile of an enterprise architect. An EA profile is made up of an EA school of thought indicator and an architect behavioural style indicator as determined by Du Preez (2016) with the development of the DIA. The DIA EA school of thought indicator extended the three EA schools of thoughts of Lapalme (2012). Analysis and comparison of characteristics of the different DIA EA schools of thought indicators revealed that the three ideal EA schools of thought, originally identified by Lapalme (2012), are applicable to the methodology for the selection of enterprise architects.

This research delivered a list of different EA project types and categorisation of the EA project types. The three EA project type categories are strategic enterprise perspective, business unit perspective and IT architecture perspective. These EA project type categories can be compared to the different groupings of EA work, "ecosystemic architecture, socio-technical architecture and technical architecture" determined by Korhonen and Poutanen (2013). The methodology for the selection of enterprise architects brings the different types of EA work and the different views on EA in relation to each other.

A study of Iyamu (2013) determines impeding factors on EA execution. One of the factors relates to the different understandings of EA and the resultant conflicting approaches to EA work. The research that develops the methodology for the selection of enterprise architects complements the study performed by Iyamu (2013) by providing a solution to overcome the identified hampering factor on execution of EA work.

9.3.2 Methodological reflection

This section reflects on the research approach followed in the research study. As described in paragraph 9.2.4, the research design of this study was well organised and all research factors were aligned as depicted in tables 55 and 56 above.

The useful structure and alignment of research factors enabled the tracing of outcomes and deliverables from evaluation through all steps back to problem identification, which was the starting point of this research study.

The design of the methodology for the selection of enterprise architects followed the DSRP described by Peffers *et al*. (2006). The process was entered at the problem identification and motivation step. Thereafter, objectives of a solution to the problem were identified, a design-and-develop-demonstrate-evaluate cycle, with two sub-cycles of design-and-develop-demonstrate-evaluate were performed to deliver the methodology for the selection of enterprise architects. The last step was the communication, which is contained in this chapter.

Table 62 below reflects the research process as executed in this study per DSR guideline provided by Hevner *et al*. (2004).

Table 62 – Research process reflected per DSR guidelines of Hevner *et al*. (2004)

No.	DSR guideline	Application of guideline	Chapter
1.	"Design as an artefact"	The artefact that was developed is the methodology for the selection of enterprise architects in support of EA project execution.	8
2.	"Problem relevance"	Various understandings and interpretations of EA lead to different approaches to EA execution resulting in diverse architecture deliverables (Du Preez, 2016). The impact of human understanding on EA deliverables contributes to the complexity of EA models and is seen as a primary challenge in EA (Lucke, Krell & Lechner in Farwick, Schweda, Breu & Janschke, 2016; Perez-Castillo *et al*., 2019). It is also the cause of misunderstandings between enterprise architects working together (Lapalme, 2012) and arguments between architects regarding which EA phases and processes must be performed (Iyamu, 2013). Enterprise architects do not have insight in the understanding and interpretation of EA of fellow architects. This is often the reason why enterprise architects find it difficult to work together (Saint-Louis & Lapalme, 2016) and one of the reasons why EA fails (Banaeianjahromi, 2018). Not all architects have the same IS background, level of education, work experience, understanding of what EA is and manner to approach an EA project; therefore, they perform EA projects differently. So, the same project requirement may result in different architecture designs depending on the enterprise architect's EA profile (Du Preez, 2016). The selection of enterprise	1

No.	DSR guideline	Application of guideline	Chapter
		architects has a critical impact on EA development and implementation (Iyamu, 2013), and on EA project success (Bakar & Hussien, 2018). A method to select enterprise architects to support EA project execution is required.	
3.	“Design evaluation”	The methodology for the selection of enterprise architects in support of EA project execution was implemented in retrospect of three EA projects. Evaluation was done against measurement criteria which were also demonstrated to and evaluated by three EA project managers.	8
4.	“Research contributions”	The research contributed to the EA discipline by providing: • A list of EA project types • EA project type categories • Mapping of relevant EA profiles to EA project type categories • Methodology for the selection of enterprise architects in support of EA project execution • Measurement criteria for the evaluation of the methodology for the selection of enterprise architects, which also highlights aspects to the EA project manager to address in order to ensure that all architects assigned to the project work towards the project goals and objectives.	4–8
5.	“Research rigour”	Methods applied in the development and evaluation phases of the methodology for the selection of enterprise architects were: • Hermeneutic literature reviews • Demonstration of the artefact by applying it to three EA projects • Semi-structured interviews with 12 EA experts • Thematic analysis of data obtained from interviews.	4–8
6.	“Design as a search process”	The design of the methodology for the selection of enterprise architects followed an iterative process	3

No.	DSR guideline	Application of guideline	Chapter
		through the DSRP in order to discover an effective answer to the research problem.	
7.	"Communication of research"	This research is communicated via this thesis, with summary provided in Chapter 9. One peer-reviewed research paper regarding this study was presented at the 5th International Conference on Digital Economy and published by Springer. Reference: Klopper A., Matthee M., Van der Merwe A. (2020) Towards Different Enterprise Architecture Project Types. In: Bach Tobji M.A., Jallouli R., Samet A., Touzani M., Strat V.A., Pocatilu P. (eds) Digital Economy. Emerging Technologies and Business Innovation. ICDEc 2020. Lecture Notes in Business Information Processing, vol 395. Springer, Cham. https://doi.org/10.1007/978-3-030-64642-4_12.	1–9

9.3.3 Scientific reflection

There are different descriptions and understandings of what EA entails. A single generally accepted definition and common understanding of EA do not exist (Kaddoumi & Watfa, 2016; Lapalme, 2012; Mentz, Kotzé & Van der Merwe, 2012; Saint-Louis & Lapalme, 2016; Gampfer, Jurgens, Muller & Buchkremer, 2018; Gong & Janssen, 2019). Examples of some of the different interpretations of EA as obtained through literature review are listed below. Refer to paragraph 1.1 of this thesis for more perceptions of EA.

- EA assists with the comprehension and management of organisational intricacies (Lange & Mendling, 2011).
- EA aids in the communication of organisational complexity and promotes effective IT management (Närman, Franke, König, Buschle & Ekstedt, 2014; Wagter, Van den Berg, Luijpers & Van Steenbergen, 2005).
- EA helps in overcoming business challenges and to organise the different enterprise components accordingly (Rajabi, Minaei & Seyyedi, 2013).
- EA is seen as a tool to ensure orchestration of IT infrastructure, information systems and the business that it supports (Alwadain,

Roseman, Fielt & Korthaus, 2011; Hiekkanen, Korhonen, Collin, Patricio, Helenius & Mykkänen, 2013).

- EA is viewed as a practice to provide thorough and agile enterprise designs (Bernard, 2012).
- EA is used to achieve business-IT alignment (Alaeddini & Salekfard, 2013; Bakar, Harihodin & Kama, 2016; Ernst, 2008; Hafsi & Assar, 2016; Rouhani, Mahrin, Nikpay & Ahmad, 2015; Bhattacharya, 2017).

To complicate the situation further, not only are there many different descriptions of EA, but enterprise architects also have different understandings of EA (Du Preez, 2016; Lapalme, 2012). An enterprise architect's view on EA influences the way that architecture work is approached. Thus, architects may have misunderstandings and arguments about what EA processes to be followed and which EA phases to be performed (Iyamu, 2013), which impacts on EA project execution.
Another aspect that adds to the complication is that there are also different types of EA work (Korhonen & Poutanen, 2013).

A research gap was recognised in terms of identifying what understanding of EA is required to perform the different types of EA work. Iyamu (2013) states that organisations must find ways to overcome the impact of different understandings that architects that work together have of EA, which lead to conflicting ideas of what EA processes and phases to be followed, but he does not provide any solutions. Korhonen and Poutanen (2013) acknowledge that there are different types of EA work and that for each type of EA work a unique approach, knowledge and skills are required. They do not provide a mechanism to determine different types of EA work nor to determine the required skills, knowledge and understanding of EA per type of EA work per individual architect.

Enterprise architects' differing understanding of EA is addressed by Du Preez (2016) through the development of an instrument to determine to which EA school of thought an enterprise architect belongs, as well as the architect's EA behavioural style. He refers to the combination of EA school of thought and EA behavioural style as EA profile. Although the instrument developed by Du Preez (2016) determines the EA profile of enterprise architects, it does not address the different types of EA work and the required understanding of EA per type of EA work.

The selection of enterprise architects has a critical impact on EA development and implementation (Iyamu, 2013) and on EA project success (Bakar & Hussien, 2018). A method to select enterprise architects to support EA project execution is required.

This research contributes to the EA discipline knowledge base as follows:

- An application of the DIA developed by Du Preez (2016) is defined as part of the methodology for the selection of enterprise architects – Chapter 4 and 8.
- A list of EA project types is provided – Chapter 4.
- An EA project type classification framework is delivered – Chapter 5.
- Relevant EA understandings per type of EA work is provided – Chapter 6.
- Criteria to evaluate the methodology for the selection of enterprise architects were provided. These criteria serve a dual purpose: 1) to evaluate the methodology for the selection of enterprise architects; and 2) to be used by EA project managers as it highlights factors impacting on EA project execution success that are affected by an enterprise architect's understanding of EA – Chapter 7.
- A methodology for the selection of enterprise architects in support of EA project execution – Chapter 8. This methodology may enhance the TOGAF Skills Framework as the TOGAF Skills Framework addresses only skills per architect role and not identification of types of EA projects and relevant EA profiles.

9.4 Recommendations

This section portrays recommendations that stemmed from the research. It is discussed under three headings, namely policy and practice, research limitation and future research.

9.4.1 Policy and practice

There is no methodology for the selection of enterprise architects in support of EA project execution that takes the different understandings of EA and the different types of EA projects in consideration. EA projects will benefit if selection of architects to be assigned to the project is complemented with the application of the methodology for the selection of enterprise architects delivered by this research.

When enterprise architects with the required EA profiles are not available, the project factors identified as measurement criteria of the methodology for the selection of enterprise architects are useful to EA project managers as it highlights areas that need to be monitored to prevent that the architects' EA profile negatively impacts on EA project execution. The TOGAF Skills Framework may be enhanced to include the methodology for the selection of enterprise architects in support of EA project execution.

9.4.2 Research limitation

The research limitations are listed below.

- Due to time limitation to conclude this study, only one organisation participated in the evaluation of the methodology for the selection of enterprise architects.
- The evaluation of the methodology for the selection of enterprise architects was done by implementing it in retrospect on three successfully completed EA projects. This was done to reduce the risk for the organisation that participated in the demonstration and evaluation phases of the research.
- Only the EA profile of an architect was taken in consideration when mapping enterprise architects to EA project type categories. An enterprise architect's industry-specific experience was not taken in consideration. Future research may determine if this would play a secondary role after EA profile when selecting enterprise architects for EA project execution.
- Literature review was limited to papers and articles written in English and that were available through the University of Pretoria library.

9.4.3 Future research

Future research possibilities include expanding the methodology for the selection of enterprise architects by adding personality types in the selection criteria to support optimal team composition as interviewees referred to difficulty of strong personalities to work together on the same project.

A common theme recognised from interview results of semi-structured interviews during the evaluation of the methodology for the selection of enterprise architects was that project sponsors or clients often do not understand their own requirements. Future research may address the impact of this phenomenon on EA project execution and ways to prevent it from happening, or to limit its impact.

9.5 Conclusion

This chapter represented the communication step of the DSRP applicable to this research study. It reported on the research study that delivered the methodology for the selection of enterprise architects in support of EA project execution. Alignment of research objectives, research questions and the research contribution were highlighted.

Evaluation of the methodology for the selection of enterprise architects in support of EA project execution showed selection of at least principal architects with relevant EA profiles and knowledge of the EA profiles of other project architects may benefit EA project execution. This could contribute to forming a *symphony of architects*, opposed to an *argument or architects*.

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Appendix A. Measurement instruments

A.1 Questions for interview with EA experts regarding EA project types

Semi-structured interviews regarding evaluation of EA project types were guided by the interview questions below.

INTERVIEWEE EA EXPERIENCE	
Number of years in EA:	
Roles:	
Industries:	

EA PROJECT TYPES IDENTIFIED THROUGH LITERATURE REVIEW TO BE CONFIRMED THROUGH INTERVIEWS					
No	**EA Project Type**	**Agree, have worked on**	**Agree, but have not worked on**	**Disagree and why**	**Comments**
1.	EA establishment project				
2.	Applying EA method to understand internal business problems				
3.	Business-IT alignment				
4.	Business transformation				
5.	Digital transformation				
6.	Improvement of organisational agility				
7.	Cost saving, including reduction in the cost of IT				
8.	Risk management				
9.	Enhance interoperability				
10.	Improvement in the results of strategic business programmes				
11.	Business process optimisation				

12.	Less complex IT systems				
13.	Higher utilisation of IT systems				
14.	Eliminate duplication of information systems				
15.	Standardisation				
16.	Governance				
17.	Regulatory compliance				
18.	Corporate strategic planning				
19.	Organisation development				
20.	IT decision-making				

ADDITIONAL PROJECT TYPES ADDED BY INTERVIEWEE

No	**EA project type added**	**Rationale**	**Have worked on such project**
1.			
2.			

CATEGORIES OF EA PROJECT TYPES TO BE CONFIRMED THROUGH INTERVIEWS

Organisational strategy perspective: Organisation strategy perspective entails considering internal and external impact on the architecture work, focusing on organisation strategy formulation.

Business perspective: The business perspective is concerned with internal business impact on the architecture work, focusing on business operations and strategy execution.

IT perspective: The IT perspective concentrates on the IT environment and strategy aligned with business strategy.

ORGANISATIONAL STRATEGY PERSPECTIVE	**BUSINESS PERSPECTIVE**	**IT PERSPECTIVE**
• Business transformation • Digital transformation • Corporate strategic planning • **Improvement of organisational agility** • **Risk management** • **Enhance interoperability**	• EA establishment • Applying EA method to understand internal business problem • Improvement in the results of strategic business programmes • Business process optimisation	• Business-IT alignment • Less complex IT systems • Eliminate duplication of information systems • IT decision-making • **Risk management** • **Enhance interoperability** • **Standardisation**

• **Standardisation** • **Governance** • **Regulatory compliance**	• Higher utilisation of IT systems • Organisation development • **Improvement of organisational agility** • **Risk management** • **Enhance interoperability** • **Standardisation** • **Governance** • **Regulatory compliance** • **Cost saving**	• **Governance** • **Regulatory compliance** • **Cost saving**
EA PROJECT TYPES ARE INTERTWINED		
Do you agree or disagree that EA project types are intertwined and this an EA project can be classified as more than one type?		

A.2 Question for evaluation of measurement criteria

Guidance for semi-structured interviews regarding evaluation of measurement criteria is provided below.

Evaluation of the measurement criteria and the methodology for the selection of enterprise architects was done during the same interview session per interviewee. Interviewer explained the methodology for the selection of enterprise architects in support of EA project execution, as well as the measurement criteria. It was then determined during application of the evaluation criteria and during discussion whether the interviewee agrees that the measurement questions will measure the effectiveness of categorising EA projects, and that an architect's view on EA will influence his or her understanding of stakeholder requirements and project context, how goals and objectives will be defined and how communication and consultation will be done.	
Interviewee response:	

A.3 Questions for evaluation of the methodology for selection of enterprise architects

Semi-structured interviews regarding evaluation of the methodology for the selection of enterprise architects for EA project execution were guided by the questions below.

No	Evaluation criteria	Question
Evaluate the application of the methodology for the selection of enterprise architects		
1.	Categorisation of an EA project.	Could the EA project be categorised in one or more of the EA project categories provided by the EA project type classification framework?
		• If yes, do you agree with the categorisation? If not, what change is proposed to the EA project type classification framework in order to categorise the relevant EA project?
		• If no, what change is proposed to the EA project type classification framework in order to categorise the relevant EA project?
2.	Linking of EA profiles to the EA project category.	How do the methodology-proposed EA profiles correspond to the architects that the organisation would have selected for the project execution based on organisational experience and knowledge of the employed architects?
Evaluate the impact on EA project execution of the methodology for the selection of enterprise architects		
1.	Stakeholder requirements	On a scale of 1 to 3, how well did the selected architects interpret and understand the stakeholder requirements? Response legend: 1 = did not understand the stakeholder requirements 2 = stakeholder requirements had to be explained more than once 3 = stakeholder requirements were clearly understood the first time Provide any additional comments.
2.	Project context	On a scale of 1 to 3, how well did the selected architects understand the project context and scope? Response legend: 1 = did not understand the project context and scope or architect disagrees with the context and scope 2 = project context and scope had to be explained/argued more than once

No	Evaluation criteria	Question
		3 = project context and scope were clearly understood and agreed upon the first time Provide any additional comments.
3.	Project goals and objectives	On a scale of 1 to 3, how easily did the selected architects grasp and agree on the project goals and objectives? Response legend: 1 = did not understand the project goals and objectives or architect disagrees with the goals and objectives 2 = project goals and objectives had to be explained/argued more than once 3 = project goals and objectives were clearly understood and agreed upon the first time Provide any additional comments.
		On a scale of 1 to 3, how easy was it to agree on the project success criteria among the architects? Response legend: 1 = did not agree at all 2 = agreed after long arguments 3 = easily agreed Provide any additional comments.
4.	Communication and consultation	Were there competing approaches to the EA work execution? Response legend: Yes or No Provide any additional comments.
		On a scale of 1 to 3, how well did the architects communicate and consult with stakeholders? Response legend: 1 = could not communicate and consult 2 = architect had to be briefed and guided 3 = successful communication and consultation

No	Evaluation criteria	Question
		Provide any additional comments.
		On a scale of 1 to 3, how well did the architects communicate with each other? Response legend: 1 = could not communicate constructively 2 = communication involved many arguments without adding value 3 = successful communication Provide any additional comments.

Appendix B. Ethical clearance documents

B.1 Faculty approval letter

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie / Lefapha la Boetšenere, Tikologo ya Kago le Theknolotši ya Tshedimošo

Reference number: EBIT/15/2018 9 May 2018

Mrs HA Klopper
Department of Informatics
University of Pretoria
Pretoria
0028

Dear Mrs Klopper

FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

Your recent application to the EBIT Research Ethics Committee refers.

Approval is granted for the application with reference number that appears above.

1. This means that the research project entitled "Methodology for the selection of enterprise architects in support of successful enterprise architecture project execution" has been approved as submitted. It is important to note what approval implies. This is expanded on in the points that follow.
2. This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Code of Ethics for Scholarly Activities of the University of Pretoria, or the Policy and Procedures for Responsible Research of the University of Pretoria. These documents are available on the website of the EBIT Research Ethics Committee.
3. If action is taken beyond the approved application, approval is withdrawn automatically.
4. According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of the EBIT Research Ethics Office.
5. The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof JJ Hanekom
Chair: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

B.2 Consent forms

B.2.1 Evaluation of EA project types

Each EA expert that participated in the evaluation of EA project types, the categorisation of EA project types and their interweaving completed and signed the informed consent form below.

Informed consent form

(Form for informant's permission)

(Must be signed by each research informant, and must be kept on record by the researcher)

1 Title of research project: **Methodology for the selection of enterprise architects in support of EA project execution**

2 I, ……………………………………………, hereby voluntarily grant my permission for participation in the project as explained to me by **Aletta Klopper**

3 The nature, objective, possible safety and health implications have been explained to me and I understand them.

Nature: Interview: Interviewee remains anonymous throughout the study. Interviewee participates in personal capacity.

Objective: Interview: To obtain interviewee's opinion on identified EA project types and categories.

Possible safety and health implications: None identified. The interview will be done at a time and place that is convenient for the interviewee.

Risks for participant: None. No names of person or organisation will be used in the research feedback.

4 I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.

5 Upon signature of this form, you will be provided with a copy.

Signed: ___________________________ Date: ________________

Witness: __________________________ Date: ________________

Researcher: ______________________ Date: ________________

B.2.2 Evaluation of methodology for selection of architects

Each EA project manager that participated in the evaluation of the *measurement criteria* and *methodology* for the selection of enterprise architects for EA project execution completed and signed the informed consent form below.

Informed consent form

(Form for informant's permission)

(Must be signed by each research informant, and must be kept on record by the researcher)

1 Title of research project: **Methodology for the selection of enterprise architects in support of EA project execution**

2 I, ……………………………, hereby voluntarily grant my permission for participation in the project as explained to me by **Aletta Klopper**

3 The nature, objective, possible safety and health implications have been explained to me and I understand them.

Nature: Interview: Interviewee remains anonymous throughout the study. The interviewee's employer gave permission for participation in the research study.

Objective: Interview: To evaluate the methodology for the selection of architects in support of EA project execution.

Possible safety and health implications: None identified. The interview will be done at a time and place that is convenient for the interviewee.

Risks for participant: None. No names of person or organisation will be used in the research feedback.

4 I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.

5 Upon signature of this form, you will be provided with a copy.

Signed: ___________________________ Date: ________________

Witness: __________________________ Date: ________________

Researcher: ________________________ Date: ________________

Each architect that completed a questionnaire as participation in the evaluation of the methodology for the selection of enterprise architects for EA project execution completed and signed the informed consent form below.

Informed consent form

(Form for informant's permission)

(Must be signed by each research informant, and must be kept on record by the researcher)

1 Title of research project: **Methodology for the selection of enterprise architects in support of EA project execution**

2 I, ……………………………………………, hereby voluntarily grant my permission for participation in the project as explained to me by **Aletta Klopper**

3 The nature, objective, possible safety and health implications have been explained to me and I understand them.

Nature: Questionnaire: Respondent remains anonymous throughout the study. The respondent's employer gave permission for participation the research study.

Objective: Questionnaire: To obtain respondent's view on enterprise architecture.

Possible safety and health implications: None identified. The questionnaire will be completed at a time and place that is convenient for the respondent.

Risks for participant: None. No names of person or organisation will be used in the research feedback.

4 I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.

5 Upon signature of this form, you will be provided with a copy.

Signed: __________________________ Date: ________________

Witness: _________________________ Date: ________________

Researcher: ______________________ Date: ________________

Appendix C. PUBLISHED PAPER

Klopper A., Matthee M., Van der Merwe A. (2020) Towards Different Enterprise Architecture Project Types. In: Bach Tobji M.A., Jallouli R., Samet A., Touzani M., Strat V.A., Pocatilu P. (eds) Digital Economy. Emerging Technologies and Business Innovation. ICDEc 2020. Lecture Notes in Business Information Processing, vol 395. Springer, Cham. https://doi.org/10.1007/978-3-030-64642-4_12