

School of Management

**Moving from traditional to Agile information systems development
in a large organisation: two complementary models of organisational
Agile implementation**

Jules Vincent de Souza

**This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University**

January 2020

Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number # IS_11_28.

Date: 21/01/2020

Abstract

The transition from a traditional to an Agile information systems development (ISD) approach in an organisation involves using an Agile process, practices and tools, and an Agile transformation, that is, embracing the Agile values and principles that support them. This not only involves developers but other teams, departments, and areas within the organisation: in other words, it requires Enterprise Agility. While the number of large organisations that have adopted Agile continues to increase each year, there are still obstacles to overcome for its transition to be successful. Larger companies tend to struggle more in relation to organisational culture and the transition from the older 'Waterfall' style to Agile; however, empirical studies on Agile transformation and Enterprise Agility are lacking and there have been calls for more case studies on this topic.

This study investigated the key elements that shape the transition from a traditional to an Agile ISD approach in an organisation. The aim of this research was to develop an explanatory theory for how and why the elements identified shape the organisation's transition.

The research used an inductive approach. It was a qualitative, exploratory and explanatory in-depth study that used an embedded case research strategy. The case was a medium-to-large-sized organisation that was experiencing issues transitioning from a traditional to an Agile ISD approach. The embedded cases were a heterogeneous sample of 24 people from different roles, levels and functional areas in the organisation. To collect data, 27 in-depth, semi-structured interviews, and secondary sources were used. The analysis of the data was carried out using Template Analysis as a first cycle coding method to identify themes, and Theoretical Coding as a second cycle coding method to organise and integrate the themes and develop the theory.

The results of this study reveal that organisational change is the key element when transitioning from a traditional to an Agile ISD approach. The change process is shaped by the organisational context and the intentions and actions of key players in the transition process.

The transition to an Agile approach is more difficult than most initiatives that require organisational change. The change asks a lot of developers and affected stakeholders and is much more difficult than the organisation expects. The change is difficult as it is a radical change in culture and way of working, and involves not only systems development but other areas in the organisation. It involves moving not only to a fundamentally different system development process that includes new practices and tools, but also to a fundamentally different culture. For example, it is not just a change to rapid application development using timeboxing and prototyping. The change requires people to not only learn a new way of working but also unlearn the old way, and it involves overcoming established norms and deeply rooted work practices.

This study makes contributions to theory in the following ways:

Firstly, it provides an integrated understanding of the organisational context, causal conditions, changes in the organisation, change management strategies, and of intervening conditions and consequences of the transition to an Agile approach. This research synthesises and extends previous research by presenting the combined influence of the various challenges, success factors, and intervening conditions influencing the transition from an organisational change perspective. It presents an integrated thematic model of change, which is lacking in the current discourse on this topic. The integrated thematic model confirms the findings from previous literature and identifies new success factors and intervening conditions in the transition.

Secondly, to better understand the transition to an Agile approach, this study also examines the implementation process, implementation strategy, and the kinds of issues encountered during the process of Agile implementation, a focus which is also lacking in the current discourse on this topic. This study has also developed a theoretical process model of change in relation to transition.

Lastly, in presenting two complementary theoretical models, this research provides a more comprehensive and holistic explanation of the change surrounding the transition to an Agile approach. There has been no study to date on a transition to an Agile approach that has developed such models.

This research is also useful to organisations moving to an Agile ISD approach for the following reasons:

Firstly, organisations that are deciding whether to change to an Agile ISD approach can make a more informed decision.

Secondly, this study will help organisations that have made a decision to change to an Agile ISD approach to better manage their experience if they are aware that the transition entails not merely the implementation of a new method, but an Agile transformation, that is, the embrace of a new culture that affects the whole organisation, and that it involves a process of radical organisational change.

Lastly, this research also assists organisations in developing strategies that will manage the organisational changes and implementation issues arising from the transition to an Agile ISD approach. The findings in this study have useful implications for organisations, especially for senior management implementing an Agile ISD approach.

This study arrived at the conclusion that the transition from a traditional to an Agile ISD approach should be conceived as a form of organisational change. The transition to an Agile strategy involves a radical change in way of working, a radical change in culture, that is, an Agile transformation, and Enterprise Agility, as the change impacts not only development processes but also other areas in the organisation. The change is difficult as it requires people to not only learn a new way of working but also to unlearn the old way, and it involves overcoming established norms and deeply rooted work practices. This change should not be underestimated. The difficult job of managing and handling the change arising from an Agile transition requires continuous support from top and middle management, and other stakeholders. It would be very useful for such groups to have Enterprise Agile adoption experience, change management experience, Agile education and training, and an Agile implementation strategy based on Agile values and principles.

Acknowledgements

I would like to express my appreciation to several people. Firstly, I would like to thank the following academic staff:

- Associate Professor John Venable (my main supervisor) for his advice, guidance and help throughout this research, and for allowing me to attend a unit he taught on research methods which I found very helpful in this research;
- Associate Professor Peter Dell for stepping in to be my co-supervisor halfway through this research. As this was my first attempt at qualitative research, I am grateful to Peter for his advice on this area, and for getting me started on writing my thesis;
- Professor Vanessa Chang for helping me start this research and obtain candidacy;
- Dr Lincoln Wood and Dr Doug Atkinson who provided advice on qualitative research at various times during my research;
- Associate Professor Paul Alexander for his words of encouragement during my research.

Secondly, I would like to thank the following people at the case-study bank:

- the Chief Information Officer and the Head of Solution Delivery for supporting this research;
- the Agile Practice Manager, Agile Practice Lead and Agile Transformation Coach who were the three gatekeepers at various times during this research. They were very generous with their time, helpful and supportive, notably in their encouragement of employees to participate in this research;
- the employees who voluntarily participated in this research, without whom this research would not have been possible.

I would also like to thank my daughter Julianne de Souza who provided guidance in relation to grammar, spelling and punctuation at various times when writing this thesis. Lastly, I would like to acknowledge Ilsa Sharp, a professional editor in Perth, who provided editorial advice in the preparation of this thesis.

Table of Contents

| | |
|---|----|
| Declaration | 1 |
| Abstract | 1 |
| Acknowledgements | 4 |
| Table of Contents | 5 |
| List of Figures | 13 |
| List of Tables..... | 14 |
| List of Acronyms | 15 |
| 1. INTRODUCTION | 16 |
| 1.1 Background of study | 16 |
| 1.1.1 Problem..... | 16 |
| 1.1.2 Lack of research into Agile transformation and Enterprise Agility | 16 |
| 1.2 Purpose of study | 17 |
| 1.2.1 Aim of study..... | 17 |
| 1.2.2 Research questions for study | 17 |
| 1.2.3 Objectives of study..... | 17 |
| 1.3 Research methodology used in study..... | 18 |
| 1.4 Contribution and significance of the study | 19 |
| 1.4.1. Theory..... | 19 |
| 1.4.2 Practice..... | 22 |
| 1.5 Outline of Thesis | 23 |
| 2. LITERATURE REVIEW..... | 26 |
| 2.1 Initial Literature Review | 27 |
| 2.1.1 Agile ISD methods | 27 |
| 2.1.2 Review of studies that examined the acceptance of IT, IT innovations, traditional and Agile ISD methods..... | 28 |
| 2.1.2.1 Studies that examined constructs influencing SDM acceptance drawn from existing theories on individual acceptance of IT and innovations | 29 |
| 2.1.2.2 Studies that identified other constructs influencing the acceptance of IT and SDMs | 30 |
| 2.1.3 Summary of findings and implications of initial literature review. | 35 |
| 2.2 Subsequent literature review | 36 |
| 3. RESEARCH DESIGN | 38 |
| 3.1. Summary of approach and research design..... | 39 |
| 3.2 Approach (to theory development) | 39 |
| 3.3 Methodology | 40 |

| | |
|--|----|
| 3.4 Purpose of Research..... | 40 |
| 3.5 Research Strategy..... | 41 |
| 3.6 Data collection methods..... | 42 |
| 3.7 Sample..... | 43 |
| 3.7.2 Strategy for recruitment of sample | 43 |
| 3.7.2.1 Recruitment of case..... | 43 |
| 3.7.2.2 Recruitment of embedded cases | 44 |
| 3.7.3 Sample size..... | 46 |
| 3.7.3.1 Sample size for case | 46 |
| 3.7.3.2 Sample size for embedded cases..... | 46 |
| 3.7.4 How cases were identified..... | 48 |
| 3.7.4.1 Identification of case..... | 48 |
| 3.7.4.2 Identification of embedded cases | 49 |
| 3.8 Details of data collection methods | 50 |
| 3.8.1 Interviews | 50 |
| 3.8.1.1 Interview themes | 50 |
| 3.8.1.2 Interview guides..... | 53 |
| 3.8.2 Secondary data | 54 |
| 3.9 Access to participants..... | 56 |
| 3.9.1 Access to the organisation | 56 |
| 3.9.2 Access to participants..... | 56 |
| 3.10 Data collection | 57 |
| 3.10.1 Interview schedule..... | 57 |
| 3.10.2 Pre-Interview | 59 |
| 3.10.3 Interview | 59 |
| 3.10.4 Post interview | 60 |
| 3.11 Data analysis | 60 |
| 3.11.1 Approach to coding..... | 60 |
| 3.11.1.1 First cycle coding (using Template Analysis)..... | 61 |
| 3.11.1.2 Second cycle coding (using Theoretical Coding)..... | 64 |
| 3.11.2 Aids used in data analysis..... | 66 |
| 3.11.3 Use of qualitative research software in data analysis | 66 |
| 3.11.3.1 Development of themes | 67 |
| 3.11.3.2 Development of relationships between themes..... | 67 |
| 3.11.4 Justification for methods used and analytical techniques applied..... | 68 |
| 3.11.4.1 Justification for the use of Template Analysis..... | 68 |
| 3.11.4.2 Justification for the use of Theoretical Coding..... | 68 |

| | |
|---|-----|
| 3.12 Ethical issues..... | 69 |
| 3.12.1 Risk..... | 69 |
| 3.12.2 Informed consent..... | 69 |
| 3.12.2.1 Letter to the gatekeeper | 70 |
| 3.12.2.2 Consent form for the gatekeeper..... | 70 |
| 3.12.2.3 Letter and information sheet to the participants | 71 |
| 3.12.2.4 Consent form for the interviewees..... | 71 |
| 3.12.3 Privacy and confidentiality | 72 |
| 3.13 Research quality | 72 |
| 3.13.1 Process used to build theory in this case study research | 73 |
| 3.13.2 Quality of study..... | 74 |
| 3.14 Summary of Research Design..... | 77 |
| 4. ANALYSIS and FINDINGS..... | 80 |
| 4.1. Overview of case..... | 82 |
| 4.2 Theoretical Integrated Thematic Model..... | 85 |
| 4.2.1 Context..... | 86 |
| 4.2.1.1 Organisational size, structure and culture | 86 |
| 4.2.1.2 Competitors and customers..... | 87 |
| 4.2.1.3 External regulatory bodies..... | 87 |
| 4.2.1.4 Enterprise Services (IS Division) | 87 |
| 4.2.1.5 Summary of context..... | 90 |
| 4.2.2 Causal conditions..... | 91 |
| 4.2.2.1 Change in Organisational Strategy | 91 |
| 4.2.2.2 Identify IS Problems..... | 92 |
| 4.2.2.3 Change in IS Strategy, Agile Adoption and Implementation | 92 |
| 4.2.2.4 Summary of causal conditions | 93 |
| 4.2.3 Phenomenon of Change | 94 |
| 4.2.3.1 General changes in culture and related work practices for project teams and business | 95 |
| 4.2.3.2 Change in technical practices specific to programmers and testers..... | 100 |
| 4.2.3.3 Change in work practices specific to a business analyst (BA) | 101 |
| 4.2.3.4 Change in the role of a project manager (PM) | 101 |
| 4.2.3.5 New role of an iteration manager (IM)..... | 102 |
| 4.2.3.6 Change for stakeholders (Enterprise Agility) | 102 |
| 4.2.3.7 Summary of findings on organisational changes..... | 106 |
| 4.2.4 Action/Interaction | 109 |

| | |
|---|-----|
| 4.2.4.1 Support from top management..... | 110 |
| 4.2.4.2 Support from middle management..... | 111 |
| 4.2.4.3 Support from stakeholders | 111 |
| 4.2.4.4 External support..... | 112 |
| 4.2.4.5 Enterprise Agile adoption experience | 112 |
| 4.2.4.6 Change management expertise..... | 113 |
| 4.2.4.7 Change management activities..... | 113 |
| 4.2.4.8 Team building..... | 118 |
| 4.2.4.9 Summary of findings on action/interaction | 118 |
| 4.2.5 Consequences | 119 |
| 4.2.5.1 Reactions to general changes in culture and work practices by project teams and business | 120 |
| 4.2.5.2 Reactions to changes in technical practices specific to programmers and testers..... | 133 |
| 4.2.5.3 Reactions to change in work practices specific to a business analyst (BA) | 136 |
| 4.2.5.4 Reactions to change in the role of a project manager (PM)..... | 136 |
| 4.2.5.5 Reactions to the new role of an iteration manager (IM)..... | 138 |
| 4.2.5.6 User resistance..... | 138 |
| 4.2.5.7 Change in project team members..... | 140 |
| 4.2.5.8 Reactions to change by stakeholders | 140 |
| 4.2.5.9 Summary of findings on consequences | 145 |
| 4.2.6 Intervening conditions | 146 |
| 4.2.6.1 Characteristics of the Agile ISD method..... | 146 |
| 4.2.6.2 Individual characteristics | 149 |
| 4.2.6.3 Project characteristics and application type | 152 |
| 4.2.6.4 Group culture..... | 152 |
| 4.2.6.5 Myths and misconceptions..... | 153 |
| 4.2.6.6 Summary of findings on intervening conditions | 153 |
| 4.2.7 Summary of major elements from the integrated theoretical model | 154 |
| 4.2.7.1 Summary of the context element..... | 154 |
| 4.2.7.2 Summary of the causal conditions element..... | 155 |
| 4.2.7.3 Summary of the organisational change element | 155 |
| 4.2.7.4 Summary of the action/interaction element..... | 157 |
| 4.2.7.5 Summary of the consequences element..... | 159 |
| 4.2.7.6 Summary of the intervening conditions element..... | 161 |
| 4.3 Implementation Strategy and Issues..... | 162 |

| | |
|---|-----|
| 4.3.1 Implementation Strategy..... | 163 |
| 4.3.1.1 Implementation approach..... | 163 |
| 4.3.1.2 Transition pattern | 163 |
| 4.3.1.3 Spreading agility..... | 164 |
| 4.3.1.4 Introduction of Agile practices to teams..... | 164 |
| 4.3.2 Implementation Issues..... | 165 |
| 4.3.2.1 Following a comprehensive implementation plan | 165 |
| 4.3.2.2 Frustration of developers waiting for Agile projects | 166 |
| 4.3.2.3 Lack of Agile projects..... | 168 |
| 4.3.2.4 Middle management resistance..... | 170 |
| 4.3.2.5 Lack of stakeholder management and support..... | 170 |
| 4.3.2.6 Lack of Enterprise Agile adoption experience..... | 171 |
| 4.3.2.7 Lack of change management experience | 172 |
| 4.3.2.8 Perceived lack of awareness of the need for change..... | 173 |
| 4.3.2.9 Role and selection of iteration managers | 173 |
| 4.3.2.10 Product owner selection and commitment..... | 174 |
| 4.3.2.11 Developers working part-time on an Agile project..... | 175 |
| 4.3.2.12 Inconsistent teams..... | 175 |
| 4.3.2.13 Pressure to deliver versus upskilling team members..... | 175 |
| 4.3.2.14 Use of two approaches during transition..... | 176 |
| 5. DISCUSSION | 179 |
| 5.1 Phenomenon of Change | 181 |
| 5.1.1 General changes in culture and related work practices for project teams and business..... | 183 |
| 5.1.1.1 Teamwork..... | 183 |
| 5.1.1.2 Documentation..... | 185 |
| 5.1.1.3 Collaboration between the business customer and project team | 185 |
| 5.1.1.4 Delivering value early and frequently | 186 |
| 5.1.1.5 Response to changes in a project plan..... | 186 |
| 5.1.1.6 General change in work practices and tools for project team members | 187 |
| 5.1.2 Changes in technical practices specific to programmers and testers | 188 |
| 5.1.3 Changes in work practices specific to a business analyst (BA) | 189 |
| 5.1.4 Changes in the role of a project manager (PM) | 190 |
| 5.1.5 New role of an iteration manager (IM) | 190 |
| 5.1.6 Change for stakeholders (Enterprise Agility)..... | 190 |

| | |
|--|-----|
| 5.1.6.1 Stakeholders within the IT division affected by the change ... | 192 |
| 5.1.6.2 Stakeholders outside the IT division affected by the change.. | 195 |
| 5.1.7 Summary of organisational changes..... | 196 |
| 5.2 Action/Interaction | 197 |
| 5.2.1 Support from top management..... | 198 |
| 5.2.2 Support from middle management | 199 |
| 5.2.3 Support from stakeholders..... | 199 |
| 5.2.4 External support..... | 200 |
| 5.2.5 Enterprise Agile adoption experience..... | 200 |
| 5.2.6 Change management expertise..... | 200 |
| 5.2.7 Change management..... | 201 |
| 5.2.7.1 Awareness of need to change | 202 |
| 5.2.7.2 Knowledge (education and training) and Ability (coaching) . | 203 |
| 5.2.7.3 Reinforce change (sustain the change) | 206 |
| 5.2.8 Team building..... | 207 |
| 5.2.9 Summary of action/interaction | 207 |
| 5.3 Consequences..... | 208 |
| 5.3.1 Reactions to general changes in culture and work practices by project teams and business..... | 209 |
| 5.3.1.1 Teamwork..... | 210 |
| 5.3.1.2 Documentation..... | 212 |
| 5.3.1.3 Collaboration between the business and project teams..... | 213 |
| 5.3.1.4 Delivering value early and frequently | 213 |
| 5.3.1.5 Response to changes in a project plan..... | 214 |
| 5.3.1.6 General change in work practices and tools for project team members | 215 |
| 5.3.2 Reactions to change in technical practices specific to programmers and testers..... | 217 |
| 5.3.3 Reactions to changed work practices from a business analyst (BA) | 218 |
| 5.3.4 Reactions to the change in the role of a project manager (PM) | 219 |
| 5.3.5 Reactions to the new role of an iteration manager (IM) | 220 |
| 5.3.6 User resistance | 220 |
| 5.3.7 Change and project team members..... | 222 |
| 5.3.8 Reactions to change by stakeholders..... | 222 |
| 5.3.8.1 Reactions of stakeholders within the IT division affected by the change | 223 |
| 5.3.8.2 Stakeholders outside the IT division affected by the change.. | 226 |

| | |
|---|-----|
| 5.3.9 Summary of consequences | 227 |
| 5.4 Intervening Conditions..... | 230 |
| 5.4.1 Agile ISD method characteristics | 230 |
| 5.4.1.1 Perceived usefulness and value..... | 230 |
| 5.4.1.2 Perceived ease-of-use..... | 231 |
| 5.4.1.3 Perceived compatibility..... | 232 |
| 5.4.1.4 Result demonstrability | 232 |
| 5.4.1.5 Subjective norm..... | 232 |
| 5.4.1.6 Career consequences..... | 233 |
| 5.4.1.7 Perceived maturity..... | 233 |
| 5.4.2 Individual characteristics..... | 234 |
| 5.4.2.1 Teamwork..... | 234 |
| 5.4.2.2 Communication and Customer Relationship | 234 |
| 5.4.2.3 Self-efficacy | 235 |
| 5.4.2.4 Experience | 235 |
| 5.4.2.5 Open and adaptable | 236 |
| 5.4.3. Project characteristics and application type | 237 |
| 5.4.4 Group culture | 237 |
| 5.4.5 Misconceptions and Myths | 237 |
| 5.4.6 Summary of intervening conditions..... | 238 |
| 5.5 Implementation strategy and issues | 239 |
| 5.5.1 Implementation Strategy..... | 239 |
| 5.5.1.1 Implementation approach..... | 239 |
| 5.5.1.2 Transition pattern | 240 |
| 5.5.1.3 Spreading agility..... | 241 |
| 5.5.1.4 Introduction of Agile practices | 241 |
| 5.5.2 Implementation issues | 242 |
| 5.5.2.1 Following a comprehensive implementation plan | 242 |
| 5.5.2.2 Frustration of developers waiting for Agile projects..... | 244 |
| 5.5.2.3 Lack of Agile projects..... | 245 |
| 5.5.2.4 Middle management resistance..... | 246 |
| 5.5.2.5 Perceived lack of awareness of the need for change..... | 247 |
| 5.5.2.6 Lack of stakeholder management and support..... | 247 |
| 5.5.2.7 Lack of Enterprise Agile adoption experience..... | 248 |
| 5.5.2.8 Lack of change management experience | 248 |
| 5.5.2.9 Role and selection of an iteration managers (IM) | 249 |
| 5.5.2.10 Product owner (PO) selection and commitment | 249 |

| | |
|---|-----|
| 5.5.2.11 Developers working part-time on an Agile project..... | 250 |
| 5.5.2.12 Inconsistent teams..... | 251 |
| 5.5.2.13 Pressure to deliver versus upskilling team members..... | 252 |
| 5.5.2.14 Coexistence of two approaches during transition..... | 252 |
| 5.5.3 Summary of implementation strategy and issues | 252 |
| 5.6 Change process..... | 254 |
| 6. Conclusion | 261 |
| 6.1 Research Questions and Empirical Findings..... | 261 |
| 6.1.1 Answer to research questions (1 and 2) and outcomes of their corresponding objectives..... | 262 |
| 6.1.1.1 Phenomenon of change..... | 262 |
| 6.1.1.2 Action/interaction strategies | 263 |
| 6.1.1.3 Intervening conditions..... | 265 |
| 6.1.1.4 Change process | 265 |
| 6.1.2 Outcome of research objective 3 | 266 |
| 6.2 Contribution and significance of this research..... | 267 |
| 6.2.1 Theory..... | 267 |
| 6.2.2 Practice..... | 271 |
| 6.3 Research quality | 274 |
| 6.4 Limitations of research..... | 274 |
| 6.4.1 Generalisability/Transferability | 274 |
| 6.4.2 Potential problems with data collection and analysis | 275 |
| 6.4.2.1 Data collection methods..... | 275 |
| 6.4.2.2 Participant selection | 276 |
| 6.4.2.3 Interview bias..... | 276 |
| 6.4.2.4 Cultural differences..... | 277 |
| 6.4.2.5 Replication of study | 277 |
| 6.5 Recommendations for future research | 277 |
| REFERENCES..... | 280 |
| Appendices..... | 294 |
| Appendix A – Letter to the gatekeeper | 295 |
| Appendix B - Consent form for the gatekeeper | 297 |
| Appendix C - Letter to the participants..... | 298 |
| Appendix D - Information sheet for the participants | 299 |
| Appendix E - Consent form for the interviewees..... | 301 |
| Appendix F – Permission statement from copyright owner | 302 |

List of Figures

| | |
|---|-----|
| Figure 1. Order in which the review of literature was conducted | 26 |
| Figure 2. Grouping of themes using a hierarchical structure | 64 |
| Figure 3. Integrated theoretical model of the Change Phenomenon and its related themes | 81 |
| Figure 4. Context of the change | 86 |
| Figure 5. Enterprise Services organisational structure | 88 |
| Figure 6. Causal conditions of change | 91 |
| Figure 7. Phenomenon of change | 94 |
| Figure 8. Strategies to manage the change..... | 109 |
| Figure 9. Outcome of change..... | 119 |
| Figure 10. Conditions that influence the outcome of the change | 146 |
| Figure 11. Examples of the types of enterprise value-chain misalignment..... | 192 |
| Figure 12. Process of radical organisational change around a transition to Agile ... | 258 |
| Figure 13. Process of organisational change around Agile adoption and implementation (Key concepts from study)..... | 260 |

List of Tables

| | |
|--|-----|
| Table 1. Studies that examined constructs influencing SDM acceptance from existing theories on individual acceptance of IT and innovations. | 30 |
| Table 2. Studies that examined other constructs influencing IT and SDM acceptance. | 30 |
| Table 3. Summary of constructs influencing Agile implementation..... | 34 |
| Table 4. Summary of Approach and Research Design..... | 39 |
| Table 5. Details of participants..... | 47 |
| Table 6. Details of remaining participants | 49 |
| Table 7. Secondary data..... | 54 |
| Table 8. Details of interview rounds..... | 58 |
| Table 9. Data analysis process..... | 60 |
| Table 10. Example of a segment of text and its code | 63 |
| Table 11. Process used to build theory in this research..... | 73 |
| Table 12. Qualitative research quality assessment provisions addressed in this study | 75 |
| Table 13. Qualitative and case study research quality assessment criteria addressed in this study..... | 76 |
| Table 14. Timeline of the Agile transition process..... | 83 |
| Table 15. Organisational areas affected by the change | 94 |
| Table 16. Summary of changes for project teams and business | 107 |
| Table 17. Findings on organisational change in relation to the literature..... | 196 |
| Table 18. Findings on action/interaction strategies in relation to the literature | 208 |
| Table 19. Findings on consequences in this study in relation to the literature | 227 |
| Table 20. Findings on intervening conditions in relation to the literature..... | 238 |
| Table 21. Findings on implementation issues in relation to the literature | 253 |
| Table 22. Description of the change process associated with Agile adoption and use | 256 |
| Table 23. Findings missing from the academic literature (but reported in practitioner literature)..... | 269 |
| Table 24. Findings missing from the literature..... | 270 |
| Table 25. Findings not consistent with the literature | 270 |

List of Acronyms

| Acronym | Meaning |
|---------|---|
| AC | Agile Coach |
| ADKAR | Awareness of the need to change, Desire to participate in the change, Knowledge of how to change, Ability to implement the change, and Reinforcement to sustain the change. |
| AP | Agile Practice |
| APL | Agile Practice Lead |
| APM | Agile Practice Manager |
| APRA | Australian Prudential Regulatory Authority |
| ASIC | Australian Securities and Investments Commission |
| AT | Automated testing |
| ATC | Agile Transformation Coach |
| ATL | Agile Transformation Lead |
| BA | Business Analyst |
| BAU | Business as usual |
| CD | Continuous delivery |
| CIO | Chief Information Officer |
| CM | Change Manager |
| CML | Change Management Lead |
| CMP | Change Management Practice |
| CTO | Chief Technology Officer |
| EC | External Consultant |
| EI | Emotional intelligence |
| HR | Human Resources |
| HREC | Human Research Ethics Committee |
| HSA | Head of Solution Analysis |
| HSD | Head of Solution Delivery |
| HSE | Head of Solution Engineering |
| IS | Information systems |
| ISD | Information systems development |
| IT | Information technology |
| IM | Iteration Manager |
| KPIs | Key performance indicators |
| OO | Object-oriented (technology) |
| P | Programmer |
| PDCA | Plan, Do, Check, Adjust |
| PIR | Post-implementation review |
| PM | Project Manager |
| PMO | Project Management Office |
| PO | Product Owner (business) |
| SDM | System development method |
| T | Tester |
| TAM | Technology Acceptance Model |
| TDD | Test-driven development |
| UAT | User acceptance testing |
| XP | eXtreme Programming |

1. INTRODUCTION

The first three sections of this chapter describe the background of this study, its purpose and the research approach used. The fourth section describes the contribution and significance of the research. Finally, the last section describes the remaining chapters of this thesis.

1.1 Background of study

A Standish Group study carried out in 2015 found that out of 50,000 projects of varying sizes, 19% failed, and 52% were challenged, while only 29% were successful; they were on time and on budget, with a satisfactory result (Lynch 2015). The use of an Agile ISD approach resulted in more successful, fewer challenged or failed projects across all project sizes, compared to the traditional Waterfall method.

The transition from a traditional to an Agile ISD approach by an organisation involves changing from a traditional to an Agile process with its own practices and tools and an Agile transformation, that is, embracing the Agile values and principles that support them. An Agile transition not only involves system development project teams but also other teams, departments, and areas within the organisation to achieve Enterprise Agility.

1.1.1 Problem

The number of large enterprises that are embracing Agile continues to increase each year (VersionOne 2016). While Agile adoption is increasing, there are still obstacles to overcome for its transition to be considered successful. Larger companies tend to struggle more in the transition from Waterfall (ScrumAlliance 2017). This may be due mainly to the change in organisational culture and the change from traditional Waterfall practices to new Agile practices.

1.1.2 Lack of research into Agile transformation and Enterprise Agility

The initial literature review (carried out in 2009 before the start of data collection) found that the theory in relation to the issues influencing the transition to an Agile ISD approach was unclear. Abrahamsson, Conboy, and Wang (2009) argued for a

need to understand the implementation of Agile at the organisational level better. The subsequent literature review (carried out during data collection and analysis) discovered that the primary studies identified in the systematic literature review on Agile transformations by Dikert, Paasivaara, and Lassenius (2016) were industry experience reports. The authors identified only six case studies with a clearly defined research method. However, Agile transformation was presented only as a minor element in those six case studies. The main finding from Dikert, Paasivaara, and Lassenius (2016) was that although Agile transformation was a relevant topic for practitioners, there was a severe lag in research. The authors found that there were not enough case studies investigating Agile organisational transformations, and suggested case studies on Agile transformations and Enterprise Agility. Gregory et al. (2016) in their study on the concerns of Agile practitioners suggest that cultural change and organisational context would benefit from further research.

1.2 Purpose of study

1.2.1 Aim of study

The purpose of this research is to investigate the key elements that shape the implementation and use of an Agile ISD approach (which involves Agile transformation and Enterprise Agility) in an organisation transitioning from a traditional to an Agile ISD approach.

1.2.2 Research questions for study

The research questions for this study are:

- What are the key elements that shape the outcome of implementation and use of an Agile ISD approach by an organisation transitioning from a traditional to an Agile ISD approach?
- How and why do the elements shape the outcome of implementation and use of the Agile ISD approach?

1.2.3 Objectives of study

The objectives for this research are to:

- Identify the key elements that shape the outcome, implementation and use of an Agile ISD method by an organisation transitioning from a traditional to an Agile ISD approach.
- Develop an explanatory Type II theory (Gregor 2006) that explains how and why the elements identified shape the outcome of the transition to the Agile ISD approach. A Type II theory is a theory for understanding and explaining but not for precise prediction; for example, explaining how and why things happen in some particular real-world situation.
- Identify the implementation strategy, and the kinds of issues encountered during the process of implementation by an organisation transitioning from a traditional to an Agile ISD approach.

1.3 Research methodology used in study

The research used an inductive approach. It was a qualitative, exploratory and explanatory study. An inductive approach to theory development was used in this study, as the initial literature review (carried out before data collection) found that the theory in relation to the issues influencing the transition to an Agile ISD approach was unclear. The use of a qualitative method provided a richer understanding of the issues influencing the transition to an Agile ISD approach, the complex social process of implementation, and the variety of personal experiences and perceptions among Agile team members and stakeholders. The purpose of this research was exploratory as the exact nature of the issues concerning the transition to an Agile ISD approach was not clear at the start of this study. The purpose of this research was also explanatory as an objective of this study was to explain the key elements, implementation strategy and issues that shape the transition to an Agile ISD approach, and to develop a Type II theory (Gregor 2006).

A case study strategy was chosen for this study as it was consistent with the approach and purpose used in this research. It could answer the research questions and achieve the objectives as it provided the ability to explore, understand and explain the elements that shape the transition to an Agile ISD approach. An embedded case study strategy was used in this research. It was a single case (one organisation) with individuals within the organisation serving as the embedded cases (Yin 2014).

Purposeful sampling was used for selecting the single case. The case was a medium-to-large-sized organisation that was experiencing issues transitioning from a traditional to an Agile ISD approach, and which could provide rich information for answering the research questions. The embedded cases chosen offered a heterogeneous sample, including people from different roles, different levels and different functional areas within the organisation, and people external to the organisation that could provide different experiences and variation in the data collected.

Qualitative data were collected primarily through 27 semi-structured interviews, and secondary data sources, such as a voice recording of a presentation and a video recording by a software training company on the Agile transformation at the case-study organisation, company documents, presentations and articles. The analysis of the interviews and secondary data was carried out using Template Analysis and Theoretical Coding. Template Analysis, a style of thematic analysis, was used as a first cycle coding method to identify themes (Saldana 2009). Theoretical coding was used as a second cycle coding method to organise and integrate the themes identified to develop a coherent synthesis of the data, understand how the themes fitted together, and develop a theory (Saldana 2009).

1.4 Contribution and significance of the study

In this study, organisational change emerged as the main element in the transition from a traditional to an Agile approach. A radical change in the way of working, a radical change in culture, that is, an Agile transformation, was required not only in the development area but also in other areas within the organisation for Enterprise Agility. This research contributed to the theory and practice of an Agile transition, for the reasons specified below.

1.4.1. Theory

Misra, Kumar, and Kumar (2010) produced a descriptive empirical study using a survey strategy that specifically investigated the critical changes contingent on adopting Agile practices in projects. However, the study did not examine:

- the organisational context within which the transition occurred
- changes required outside the project teams

- strategies used to manage the change
- experiences of people in different roles affected by the change
- any intervening conditions that influenced the outcome
- the implementation process, strategy, and issues encountered during the transition.

This study addresses the areas not examined by Misra, Kumar, and Kumar (2010) and the call for research into Agile transformation and Enterprise Agility as described in section 1.1.2 Lack of research into . This study is a case study which investigates the changes that occur in an organisation moving from a traditional to an Agile ISD approach. It examines the Agile transformation, that is, the change in culture, and the change in the way of working experienced by the organisation. It also examines the nature and magnitude of the change, and the change for the different roles within an Agile project team, and for people and areas outside the project team, in working towards Enterprise Agility.

This study captures the context and conditions that led to an Agile transition in the organisation, the reactions of those affected by it, the strategies used to manage the change, and the intervening conditions that influenced the outcome. It also examines the implementation process, implementation strategy, critical events, and implementation issues to provide a more comprehensive explanation of the issues influencing the transition to an Agile ISD approach.

This research synthesises and extends previous research by examining the combined influence of various issues from an organisational change perspective. Although change theories abound that may explain a transition to an Agile approach, there is no change theory specific to an Agile transition that has been proposed to date.

Sircar, Nerur, and Mahapatra (2001) found that a change in an IS development process may involve complex organisational change phenomena. Comprehending the wide-ranging organisational consequences of a change phenomenon, as achieved in this study, is an essential step in planning and managing the change. Furthermore, Mangalaraj, Mahapatra, and Nerur (2009) state that studies that focus on clarifying issues in managing the change; for example, to conceptually different IS development approaches and the change to an Agile ISD approach, are very useful

for further understanding of the theoretical foundations of the change process that underlies software process improvements.

This research also provides a more comprehensive explanation of a transition to an Agile approach by developing two new and unique models: an integrated thematic model (Figure 3) and a process model (Figure 13). The integrated thematic model is a static model while the process model is a process-oriented model that describes and explains the change phenomenon. The two models complement each other. There has been no other study to date on a transition to an Agile ISD approach that has produced such models.

This research therefore has also provided a more holistic explanation of an Agile transition. It has combined various theories in relation to technology acceptance, innovation, organisational change, and resistance to examine the transition to an Agile ISD approach. The integrated thematic model also identifies new success factors and new intervening conditions (as shown in bold in Figure 3) found in this study that were absent from the initial literature review (as shown in Tables 1 and 2) but were present in the subsequent literature review.

Lastly, scaling Agile, which was not within the scope of this study, was one high priority research question that was identified at the workshop for XP2018 (Dingsøy, Moe, and Ohlsson 2018). These are situations where there are a large number of teams working on a big product or different products across its portfolio (Goldstein 2015). There are many scaling frameworks available. Five popular frameworks are Scrum of Scrums (SoS), Scaled Agile Framework (SAFe), Large-Scale Scrum (Less), Disciplined Agile Delivery (DAD), and Lean Scalable Agility for Engineering (LeanSAFE) (Ebert 2017). Dingsøy, Falessi, and Power (2019) state that some scaling frameworks, such as SAFe, offer extensive recommendations for many areas, while other frameworks, such as the Spotify model, offer less ceremony and suggest that self-managing teams be given more authority for making decisions. Ebert (2017) states that numerous practitioners find SAFe complicated and too heavy; SAFe attempts to incorporate all the best practices but does not offer advice on exactly how to scale down. The author further states that other frameworks, such as LeSS and LeanSAFE are less complicated; they have less restrictions and allow the liberty for tailoring. As scaling Agile was not within the scope of this study, a

description of the available frameworks is not provided in this study but can be found in many publications, such as Dingsøy, Falessi, and Power (2019) and Ebert (2017).

Dingsøy, Falessi, and Power (2019) suggest more empirical studies on large-scale Agile, for instance, the difficulties encountered when implementing scaling frameworks. The authors state that adopting a scaling framework is a significant change for an organisation, for example, the scaling frameworks introduce numerous new roles, practices and artifacts. Ebert (2017) states that scaling Agile involves a change in culture in the organisation. Changing to an Agile mindset is the main and hardest change. A change in practices alone will not make an organisation Agile if there is no change in the mindset. Dingsøy, Falessi, and Power (2019) also suggest that before an organisation tries something on a large scale, the organisation should take into account why it succeeds on a smaller scale. The two theoretical models developed in this study, which are associated with change as a result of a transition to an Agile ISD approach, would therefore be useful in further developing the theoretical foundations of the change that underlies the adoption of such scaling frameworks.

1.4.2 Practice

Organisations make substantial investments in methodologies to manage information systems development (ISD), which can be a complicated, expensive and risky undertaking (Sircar, Nerur, and Mahapatra 2001). Adopting an Agile ISD approach involves a change in the current process, practices and tools. It is essential for management to comprehend fully the nature and magnitude of the change in order to be able to handle that change. Management needs to know whether the change is incremental or radical; specifically, whether it entails expanding or modifying an existing approach, or if it requires an extensive change to the organisation's development approach and mindset. Without this deep understanding, the endeavour to adopt an Agile ISD approach could result in a costly failure or could result in the organisation not getting the full benefit from its transition. Such a perspective of this change phenomenon is essential to the implementation of organisational change, yet is absent from the current discourse on Agile transitions.

Mangalaraj, Mahapatra, and Nerur (2009) state that studies such as this one, that clarify issues encountered in managing the change to conceptually different IS

development approaches, are very useful to practitioners. Firstly, organisations deciding whether to transition to an Agile ISD approach can assess the issues they might face in making the change. Secondly, organisations that have made a decision to transition to an Agile ISD approach, will find that this study will help them better manage their experience, if they are aware that the process is not merely about the transition to a new method but also the embracement of a new culture that affects the whole organisation, and that it involves a process of radical organisational change. This research is also useful as it assists organisations in developing strategies that will manage the ensuing organisational changes and implementation issues when transitioning to an Agile ISD approach.

Lastly, more and more organisations are applying Agile practices to large-scale projects (Dingsøy et al. 2018) by adopting an Agile scaling framework. As mentioned in section 1.4.1, Dingsøy, Falessi, and Power (2019) state that adopting a scaling framework is a major change for an organisation with the introduction of many new roles, practices and artifacts. The adoption also involves a change in culture in the organisation which is the main and most difficult change (Ebert 2017). The findings in this study, such as, the organisational change, the strategies used to handle the change, the outcome of the change, and the intervening conditions that influenced the outcome would therefore be useful to organisations that have chosen to adopt a scaling framework.

1.5 Outline of Thesis

This presentation of this thesis adopts a linear-analytic approach; it is structured to reflect the research process in a logical manner (Saunders, Lewis, and Thornhill 2016). The presentation of this thesis reflects the sequencing of the literature review in the study. An initial literature review (section 2.1) was carried out before data collection. It identifies the key studies that have examined the acceptance of information technology (IT), IT innovations, traditional and Agile SDMs. A brief description of each study is provided, together with details about the authors, research strategy and constructs identified in the studies. This review was carried out before data collection to help this researcher get started with a conceptual framework. The emergence of themes during data collection and data analysis led to a subsequent review of the literature (section 2.2) to relate the emerging theory to

existing literature (Ridder, Hoon, and McCandless Baluch 2014). Many more studies on Agile SDM implementation and use were found in the subsequent literature review; they are incorporated and discussed fully in the Discussion, Chapter 5.

The remainder of this thesis is organised as follows.

Chapter 3 discusses the methodology used in this study. It explains the different components of the methodology and justifies their suitability given the nature of the research questions and objectives in this study. It provides details about the participants, sample types and size, and how and why the samples were selected. The data collection and methods are described and justified, including the procedure and timeline for collecting and recording the data. The processing and analysis of the data are discussed. Ethical issues, privacy and confidentiality are also discussed. The important topic of research quality is discussed at the end of the chapter.

The findings and analysis of the data are presented in Chapter 4. It was discovered that an Agile transition involved an Agile transformation and Enterprise Agility, which required a significant organisational change. An integrated theoretical model of change is presented in this chapter. The central theme depicted in the model is change and the major themes associated with change in the model are the context of the change, the conditions that led to the change, the actions taken to manage the change, the outcome of the change, and the conditions that affect the outcome of the change. The implementation process and associated issues are also described in order to better understand Agile transition at the case study bank.

The results are discussed (in terms of the integrated theoretical model) in Chapter 5 with reference to both the initial literature review and the subsequent literature review incorporated in the chapter, in order to relate the theory that emerged from the data analysis to existing literature. This chapter argues that the transition from a traditional to an Agile ISD approach should be conceived as a form of organisational change. It discusses the evaluation of the change as radical, states that adapting to such a radical change is difficult, and explores the difficulty in managing such a radical change. This chapter also discusses the issues interpreted as intervening conditions that influence the outcome of the change. The implementation strategy

and associated issues, the use of an implementation plan, and the change process, are also discussed. A theoretical process model of change is presented at the end of the chapter.

The Conclusion, Chapter 6, synthesises the findings in relation to the research questions, presents the significance of this research and its limitations, and makes recommendations for future research.

2. LITERATURE REVIEW

This research was an exploratory study using an inductive approach as the initial literature review carried out in 2009 before data collection (discussed in section 2.12) found that there was a lack of empirical research on the implementation and use of Agile SDMs, and that the exact nature of the issues and the theory concerning the transition to an Agile ISD approach was not clear.

Although an inductive approach was used, on the other hand Saunders, Lewis, and Thornhill (2009) believe that starting research from a theoretical perspective links research to the existing body of knowledge and helps the researcher get started with an analytical framework. An initial literature review was therefore carried out before data collection to identify literature related to Agile implementation and use, and to help this researcher get started with a conceptual framework. The emergence of themes during data collection and analysis led to a subsequent review of the literature in order to relate the emerging theory to literature gathered from both the initial and subsequent literature reviews (Ridder, Hoon, and McCandless Baluch 2014). The subsequent review of the literature is only briefly discussed in this chapter but is incorporated and discussed fully in the Discussion Chapter 5. The process used is as follows:

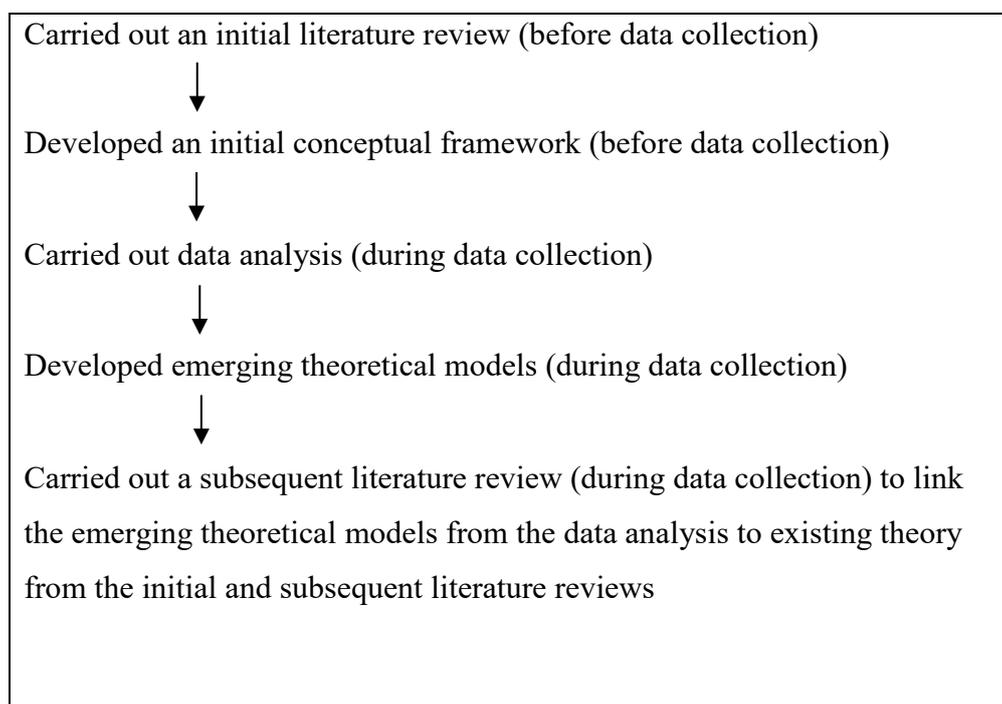


Figure 1. Order in which the review of literature was conducted

This presentation of this thesis adopts a linear-analytic approach where the structure of the thesis reflects the research process in a logical manner (Saunders, Lewis, and Thornhill 2016). This is reflected in the sequencing of the literature review in this study. The structure of this chapter is as follows. The initial review of literature and conceptual framework used at the start of this study before data collection are presented in the next section. A summary of the findings and implications of the initial literature review are then presented, followed by the research questions and objectives. The main theme identified during analysis, and the subsequent literature review related to the findings, are briefly discussed next, followed by the significance of this research.

2.1 Initial Literature Review

This section presents an overview of Agile SDMs and a review of studies identified in the initial literature review that examined the acceptance of IT, IT innovations, traditional and Agile SDMs.

2.1.1 Agile SDMs

Agile SDMs aim to better manage changing user requirements and to efficiently deliver software of high quality and business value to customers (Balijepally et al. 2009). Examples of popular Agile SDMs include Scrum, Extreme Programming (XP), Crystal methods, Lean Development, Feature-Driven Programming and Adaptive Software Development (Highsmith 2002).

Highsmith (2002, 29) one of the leaders of the Agile movement, defines agility as “the ability to rapidly respond to change in a turbulent business environment”.

Lindstrom and Jeffries (2004) state that Agile SDMs more or less adhere to a common set of values and principles as set out in the Agile Manifesto (Beck et al. 2001a). The basic principles of Agile SDMs include collaborating closely with customers, feedback, learning, continuous improvement and quality, responding to change, reducing the cost of change, and delivering value early and frequently (Broza 2012).

Agile SDMs employ practices that require major changes in the way Agile project team members go about developing information systems compared to traditional

SDMs (Misra, Kumar, and Kumar 2009). The authors states that some of the changes include:

- Close collaboration between team members and customers compared to silo development
- Face-to-face communication compared to the emphasis on written documentation
- Frequent incremental delivery and feedback compared to the delivery of the complete product at the end
- Embracing changing business requirements along the way compared to defining a fixed set of requirements at the start.

2.1.2 Review of studies that examined the acceptance of IT, IT innovations, traditional and Agile SDMs

An implementation of an SDM is a process that consists of multiple phases (Kwon and Zmud 1987). One such phase is the acceptance of the method by individuals. Therefore, being aware of the factors that influence the acceptance and use of Agile SDMs would be very useful to organisations thinking of adopting these methods (Mangalaraj, Mahapatra, and Nerur 2009).

Tables 1 and 2 present an overview of studies (identified at the time of the initial literature review) that examined the acceptance of IT, IT innovations, traditional and Agile SDMs. Each table is broken up into two parts; one part lists IT and non-Agile studies and the other part lists Agile studies. The tables provide information about the authors, description, research strategy and constructs identified in each study. The studies within each part are ordered by author name for ease of reference. All the studies cited were reviewed in Chan and Thong (2009) who carried out a critical and comprehensive review of the existing literature on the acceptance of IT, and traditional and Agile SDMs. Other studies that relate to the theory that emerged during data analysis were identified in the subsequent literature review which is incorporated in the Discussion Chapter 5.

The studies identified in the initial literature review will be discussed in the following two subsections. The first subsection will present the studies that identified constructs associated with existing theories of individual acceptance of IT and innovations. These studies were examined because Agile SDMs can be looked at as

software process innovations (SPI) (Mangalaraj, Mahapatra, and Nerur 2009) or technology innovations (Chan and Thong 2009). The second subsection will present the studies that identified the remaining constructs that influence the acceptance of IT and SDMs.

2.1.2.1 Studies that examined constructs influencing SDM acceptance drawn from existing theories on individual acceptance of IT and innovations

Career consequences, perceived compatibility, perceived ease-of-use, perceived usefulness, result demonstrability and subjective norms were identified as constructs affecting the acceptance of IT tools and innovations, drawing from theories such as the Theory of Reasoned Action (Ajzen and Fishbein 1980); Technology Acceptance Model (TAM) (Davis 1989); Theory of Planned Behaviour (Ajzen 1991); Perceived Characteristics of Innovating (Moore and Benbasat 1991); Model of Personal Computer Utilisation (Thompson, Higgins, and Howell 1991); Innovation Diffusion Theory (Rogers 1995); TAM2 (Venkatesh and Davis 2000), and Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003).

In studies that examined the above in the context of SDMs (see Table 1), Hardgrave, Davis, and Riemenschneider (2003), and Riemenschneider, Hardgrave, and Davis (2002) viewed SDMs as software process innovations and examined the acceptance of traditional SDMs using the above existing theories. The authors found perceived compatibility, perceived ease-of-use, perceived usefulness and subjective norms were significant in their studies. Mangalaraj, Mahapatra, and Nerur (2009) verified that perceived compatibility and perceived usefulness had a strong influence on the acceptance of XP.

Although Hardgrave, Davis and Riemenschneider (2003), and Riemenschneider, Hardgrave and Davis (2002) did not find the construct ‘career consequence’ significant in their studies, Cohn and Ford (2003) found from experience (see Table 1) that it was a construct that could influence the acceptance of Agile SDMs. Hardgrave, Davis and Riemenschneider (2003), and Riemenschneider, Hardgrave and Davis (2002) also did not find ‘result demonstrability’ to be significant in their studies, but Chan and Thong (2009) believed that it might influence acceptance of

Agile SDMs, because frequent small releases and continuous feedback are two core practices of Agile SDMs.

Table 1. Studies that examined constructs influencing SDM acceptance from existing theories on individual acceptance of IT and innovations.

| | Authors | Study Description | Strategy | Constructs |
|------------------|---|---|-----------------|---|
| Non-Agile | Hardgrave, Davis and Riemenschneider (2003) | Investigated what determined the intentions of software developers' to follow a methodology. | Survey | Perceived compatibility; Perceived ease-of-use; |
| | Riemenschneider Hardgrave and Davis (2002) | Investigated an individual's behavioural intention to use methodologies mandated by their organisation. | Survey | Perceived usefulness. Subjective norms. Voluntariness |
| Agile | Cohn and Ford (2003) | Described common pitfalls and effective approaches in changing from a plan-driven to an Agile process. | Non-Empirical | Career consequences. |

2.1.2.2 Studies that identified other constructs influencing the acceptance of IT and SDMs

Cho and Kim (2002) found in their study of the assimilation of object-oriented technology (see Table 2) that its perceived maturity influenced its assimilation because support could be obtained from experienced developers in the community. Chan and Thong (2009) argued that developers are also more likely to accept Agile SDMs if the SDMs are perceived as being mature.

Chan and Thong (2009) also examined studies that found the characteristics of individual developers to be constructs that influenced the acceptance of IT and SDMs. The constructs identified were self-efficacy, experience, and the ability to work in a team and to communicate effectively with team members and customers (see Table 2).

Table 2. Studies that examined other constructs influencing IT and SDM acceptance.

| | Authors | Study Description | Strategy | Constructs |
|-------------------------|----------------------------|--|-----------------|------------------------------|
| IT and non-Agile | Burkhardt and Brass (1990) | Examined the result of a change in technology on organisational structure and power. | Case Study | Self-efficacy. |
| | Cho and Kim (2002) | Identified the constructs influencing the assimilation of Object Oriented (OO) technology. | Survey | Perceived maturity Training. |

| | | | | |
|--------------|--|--|----------------------|---|
| | Compeau and Higgins (1995) | Investigated the role of individuals' beliefs concerning their ability to use computers proficiently in determining the actual use of computers. | Survey | Self-efficacy. |
| | Hill et al. (1987) | Investigated the relation between people's self-efficacy with computers and their readiness to use them. | Survey | Self-efficacy. |
| | Higgins and Hogan (1999) | Analysed the key managerial constructs involved in the acceptance and diffusion of an IE SDM. | Survey | Top mgmt. support. |
| | Roberts and Hughes (1996) | Identified the obstacles that may impact implementation of a SDM. | Interview | Top mgmt. support. |
| | Roberts et al. (1998) | Identified the constructs that may impact implementation of a SDM. | Survey | Top mgmt. support Training Ext. Support. |
| | Sultan and Chan (2000) | Investigated the constructs that contribute to the acceptance of new technology by individuals. | Survey and Interview | Teamwork Communication. |
| Agile | Ceschi et al. (2005) | Investigated whether Agile SDMs change and improve project management practices. | Survey | Teamwork Customer relationship. |
| | Cockburn and Highsmith (2001) | Described the results of working in an Agile manner. | Non-Empirical | Teamwork Communication Org. culture Top mgmt. support. |
| | Cohn and Ford (2003) | Described usual hazards and effective approaches in changing from a plan driven to an Agile process. | Non-Empirical | Experience. |
| | Highsmith and Cockburn (2001) | Described the results of working in an Agile manner | Non-Empirical | Teamwork. |
| | Mangalaraj, Mahapatra and Nerur (2009) | Investigated constructs that influenced the acceptance of XP among various project groups in an organisation. | Case Study | Teamwork Training Coaching Project type Application type. |
| | McManus (2003) | Discussed the issues for people using Agile SDMs. | Non-Empirical | Experience Communication. |
| | Nerur, Mahapatra and Mangalaraj (2005) | Discussed the challenges of moving to Agile SDMs. | Non-Empirical | Management style Teamwork Customer relationship. |
| | Schatz and Abdelshafi (2005) | Described the experience in moving to Agile development. | Non-Empirical | Teamwork Ext. Support. |

Self-efficacy is believing that one has the competence to carry out a certain behaviour (Compeau and Higgins 1995). The authors found that computer self-efficacy significantly influenced the expectations of an individual of the consequences of utilising computers and their actual computer use. Burkhardt and Brass (1990) found that self-efficacy affected early implementation of computer

systems and Hill et al. (1987) found that it affected behavioural intention to utilise a technology. Chan and Thong (2009) believed that SDM self-efficacy; specifically, the belief of one's ability to use a SDM, would also influence the acceptance of Agile SDMs. They believed that developers with high self-efficacy would find it easier to accept an Agile SDM.

In software development, experience can be related to developers having previous technical knowledge and use of SDMs (Chan and Thong 2009). McManus (2003) believed that a team member working on an Agile project should have prior experience in the delivery of a major project. However, Cohn and Ford (2003) found that, in an Agile project, programmers with experience in the use of traditional SDMs were reluctant to consider or attempt anything different.

The Agile Manifesto asserts that working effectively as a team is more important than using the best tools and processes (Ambler n.d.). In their survey of project managers in software companies, Ceschi et al. (2005) found that nearly all project managers consider teamwork and the ability to work in teams as the most important ability for developers. Some non-empirical studies on Agile development (Cockburn and Highsmith 2001; Highsmith and Cockburn 2001; Nerur, Mahapatra, and Mangalaraj 2005; Schatz and Abdelshafi 2005) also highlighted the importance of the ability to work in small self-managing teams in close proximity to each other, in a barrier-free environment where intense interaction, close collaboration, trust and respect are essential. Ceschi et al. (2005) found that nearly all project managers consider teamwork and the ability to work in teams to be the most important skill set for developers. Mangalaraj, Mahapatra, and Nerur (2009) found that teamwork was essential to the success of XP practices.

Another value of the Agile Manifesto is 'working software over comprehensive documentation' (Highsmith 2002, xvii). Instead of comprehensive documentation, maximum communication between Agile team members and users is used to capture user requirements. McManus (2003) believed, from experience, that the main driver for a successful Agile project was to have team members who were 'natural communicators'.

Another value of the Agile Manifesto is ‘customer collaboration over contract negotiation’ (Highsmith 2002, xvii). In Agile development, a good working customer relationship and a shared understanding between the Agile team members and customers is critical (Ceschi et al. 2005; Nerur, Mahapatra, and Mangalaraj 2005). Ceschi et al. (2005) stated that Agile projects required increased interaction between the customer and the development team. Nerur, Mahapatra and Mangalaraj (2005) also found that the Agile team members need to be able to work very closely with customers. Customer relationship is expected to be a significant construct in the acceptance of Agile SDMs.

Other studies found that organisational culture, management support, training and external support were constructs that also influenced the implementation of SDMs (see Table 2).

Cockburn and Highsmith (2001) found through experience that an Agile team would find it difficult working in a rigid organisational culture. The authors believed that Agile organisations should have a culture that practises leadership-and-collaboration instead of command-and-control management and that Agile development would thrive in a people-centred and collaborative organisational culture. Nerur, Mahapatra, and Mangalaraj (2005) also believed that Agile ISD methods preferred a leadership-and-collaboration rather than a command-and-control style of management. Higgins and Hogan (1999), Roberts and Hughes (1996), Roberts et al. (1998), and Sultan and Chan (2000) reported that management support was an important construct in the implementation of traditional SDMs. Top management was influential in providing adequate resources, including financial support, for the implementation of an IS development approach (Higgins and Hogan 1999). From their experience with Agile SDMs, Cockburn and Highsmith (2001) also found that the lack of executive support for using an Agile ISD approach in a project could ‘kill’ the project and hinder a good Agile team. Roberts and Hughes (1996) stated that support was required from all levels of management in a major organisational change like the implementation of a SDM.

Cho and Kim (2002) and Roberts et al. (1998) reported that SDM training was an important construct in the successful implementation of traditional SDMs.

Mangalaraj, Mahapatra, and Nerur (2009) suggested that insufficient knowledge

about XP practices impeded its SDM use, as individuals would probably revert to their old way of working. Rogers (1995), cited in Chan and Thong (2009), stated that the implementation of a technological innovation raised doubts in the minds of likely adopters and training was an opportunity to alleviate that uncertainty.

External support as defined by Roberts et al. (1998) refers to the use of external consultants. The authors found that the use of external consultants was important in implementing a new SDM, especially if the organisation did not have expertise within the organisation. Schatz and Abdelshafi (2005) recommended that teams trying out an Agile process get an experienced coach to make the transition to Agile development easier. Mangalaraj, Mahapatra, and Nerur (2009) also found that a coach was important in making sure that team members followed XP practices.

Mangalaraj, Mahapatra, and Nerur (2009) found that the application type and size of a project influenced the acceptance of XP practices; for example, the relatively small size and green-field nature of a project which did not require integration with legacy applications facilitated the use of XP practices.

The constructs identified in Table 1 and Table 2 are summarised and put into four categories: SDM, individual, organisational and task, as shown in Table 3 below. They were used in data analysis as *a priori* themes in the initial coding template using Template Analysis (Brooks et al. 2013) as a first cycle coding method to identify themes.

Table 3. Summary of constructs influencing Agile implementation

| Category | Construct |
|------------|---|
| SDM | Career consequences Perceived compatibility Perceived ease of use Perceived maturity Perceived usefulness Result demonstrability Subjective norm. |
| Individual | Communication Customer relationship Experience Self-efficacy Teamwork. |

| | |
|----------------|---|
| Organisational | External support Management support Management style Organisational culture Training. |
| Task | Project type Application type. |

2.1.3 Summary of findings and implications of initial literature review

The initial review of the literature (carried out in 2009 before data collection) highlighted the following issues:

- Chan and Thong (2009), who carried out a critical and comprehensive review of the existing literature on the acceptance of IT, and traditional and Agile SDMs, found that most of the Agile studies were non-empirical. They were based on the experience or expert opinion of well-known practitioners in the field rather than academic sources.
- While some studies empirically researched some of the acceptance constructs (which are part of implementation and use) in the context of traditional SDMs, the constructs for Agile SDMs were not empirically researched (Chan and Thong 2009).
- There was no exploratory research looking for new constructs influencing the acceptance of Agile SDMs, as suggested by Hardgrave, Davis and Riemenschneider (2003) in their study (Table 1).
- Most of the studies on acceptance of SDMs focused on the technology acceptance perspective while few examined other ‘non-technology’ or social constructs such as individual and organisational characteristics, which are important in Agile development (Chan and Thong 2009).
- The research was disjointed, with no empirical study examining the combined influence of the various constructs on the acceptance of Agile SDMs (Chan and Thong 2009).
- The studies reviewed did not describe the kinds of problems encountered during the process of implementing an Agile SDM. Abrahamsson, Conboy, and Wang (2009) argue for a need to better understand the implementation of Agile at the organisational level.

2.2 Subsequent literature review

The subsequent literature review (carried out during data collection and analysis) identified many more studies on Agile SDM implementation and use since the initial literature review (carried out in 2009 before data collection). The subsequent literature review found studies that:

- researched some of the SDM acceptance constructs in the context of Agile SDMs (section 5.4 Intervening Conditions).
- identified the new constructs (shown in bold in Figure 3) found in this study (section 5.2 Action/Interaction and section 5.4 Intervening Conditions).
- examined the ‘non-technology’ constructs such as individual and organisational characteristics in relation to Agile development (section 5.3 Phenomenon of Change and section 5.4 Intervening Conditions).
- examined the implementation process, implementation strategy, and issues in Agile implementation (section 5.5 Implementation strategy and issues and section 5.6 Implementation process).

The subsequent literature review is incorporated and discussed fully in the Discussion, Chapter 5. However, the main theme identified during analysis is discussed briefly next.

Organisational change emerged during data analysis as the main element in this study. It became clear in the analysis of the data that the transition to an Agile ISD approach at the bank required a change in the way of working, a change in culture, that is an Agile transformation, and also Enterprise Agility, a change in other areas within the organisation (that were outside the development area) to support this new way of working.

Adapting to the change in moving from a traditional to an Agile ISD approach involves moving not only to a different system development process that includes new practices and tools, but also to a different culture. The change requires people to not only learn a new way of working but also overcome conventional norms and have a change in mindset. Furthermore, this not only involves system development but other areas in the organisation: in other words, it requires Enterprise Agility.

A classification found in innovation literature is that of incremental versus radical innovation (Dewar and Dutton 1986; Ettlie, Bridges, and O'Keefe 1984; Orlikowski 1993). Incremental change, which is associated with incremental innovation, is where the current situation is extended, and existing products, practices, relationships, skills, and norms are altered or fine-tuned (Orlikowski 1993). The changes are small enhancements or simple alterations (Dewar and Dutton 1986). Implicitly, they help to strengthen current knowledge and the established configuration of stakeholders. However, radical change, which is associated with radical innovation, goes further than extending the current situation (Orlikowski 1993). It calls for a move to fundamentally different practices, relationships, skills, and norms. It includes embracing a different way of thinking throughout the organisation, which usually unsettles established knowledge and the configuration of stakeholders. Finally, it involves fundamental changes that represent revolutionary change and distinct differences from current practice (Ettlie, Bridges, and O'Keefe 1984).

The constructs (that served as a guide for the data collection and data analysis) in Table 3 were revised during data collection and analysis to include change in organisational culture and change in way of working. Data was collected on details of the organisational change (which then helped determine the type of change, namely, whether it was incremental or radical); the organisational context and reasons for the change; the strategies used to manage the change; the outcome of the change; and the intervening conditions that influenced the outcome of the change.

A theoretical integrated thematic model of change was developed as a result of the analysis. The subsequent literature review made further sense of the findings and helped relate the theory represented in the model to existing literature. This approach allowed for an explanation of how the findings contributed to knowledge about the transition to an Agile approach, and the development of a theoretical model for the process of change.

3. RESEARCH DESIGN

This chapter describes the design adopted by this research to achieve the aims and objectives stated in Chapter 1, which are restated below.

The research questions for this study are:

- What are the key elements that shape the outcome of implementation and use of an Agile ISD approach by an organisation transitioning from a traditional to an Agile ISD approach?
- How and why do these elements shape the outcome of implementation and use of the Agile ISD approach?

The objectives for this research are to:

- Identify the key elements that shape the outcome of implementation and use of an Agile SDM by an organisation transitioning from a traditional to an Agile ISD approach.
- Develop an explanatory Type II theory (Gregor 2006) that explains how and why the elements identified shape the outcome of the transition to the Agile ISD approach. A theory of Type II is a theory for understanding and explaining, but not for precise prediction, explaining how and why things happen in a real-world situation.
- Identify the implementation strategy, and the kinds of issues encountered during the process of implementation by an organisation transitioning from a traditional to an Agile ISD approach.

The first section of this chapter gives a summary of the approach and research design used in this study. The second and third sections of this chapter discuss the approach and methodology used in this study; the fourth describes the purpose of the study, while the fifth and sixth sections discuss the strategy and data collection methods used; the seventh section describes the sample; the following three sections describe the procedures used to collect the data; the eleventh section describes how the data were analysed; the twelfth section discusses the ethical considerations of the research, and the final section discusses the research quality.

Two criterion proposed by Guba (1981) that need to be taken into account for a 'trustworthy' study in qualitative research are dependability (providing a reliable description of the emerging focus of the research so that others may comprehend and evaluate the research) and confirmability (showing that the findings come from the data collected and not an investigator's predispositions). The detailed description (provided in this chapter) of the methods used and the reasons for adopting them enhances the dependability and confirmability of this study (Shenton 2004).

3.1. Summary of approach and research design

The following table shows a summary of the research approach and research design used in this study.

Table 4. Summary of Approach and Research Design

| | |
|-------------------------|--|
| Approach | Induction |
| Methodology | Qualitative |
| Purpose | Exploratory and explanatory |
| Strategy | Case study (embedded) |
| Data Collection Methods | Interviews (semi-structured and in-depth) Secondary data |
| Sample | Non-probability |
| Sample type | Purposive |
| Data analysis | Thematic analysis (first cycle coding method) Theoretical coding (second cycle coding method) |

3.2 Approach (to theory development)

At the start of a study, how clear a researcher is about the theory of the phenomenon being investigated is a significant factor in the design of the research project. A deductive approach, with its roots in the natural sciences, begins with theory, often obtained from academic literature. A research strategy is then designed to test the theory (Saunders, Lewis, and Thornhill 2016). An inductive approach is one where the theory of a phenomenon is unclear at the beginning of the research, and data are gathered to explore and understand the phenomenon and generate theory. The purpose is to find out what is happening and gain a better understanding of the problem (Saunders, Lewis, and Thornhill 2016).

An inductive approach to theory development was used in this study, as the initial literature review carried out at the beginning of this study found that the theory was unclear regarding the issues influencing the transition to an Agile ISD approach.

Research and theory for this research topic were at an early stage at the start of this study, lacking a strong theoretical base. In their review of empirical studies on Agile development, Dybå and Dingsøy (2008) characterised the state of theory and research on Agile development at that time as only just nascent. As the exact nature of the issues concerning the transition to an Agile ISD approach was not clear at the start of this study, the plan for this research study was to gather data to explore and understand the issues that influence the transition, and generate theory from it.

3.3 Methodology

Qualitative research methods are intended to assist researchers in understanding people and the social and cultural contexts in which they are situated (Myers n.d.). Many types of qualitative research also employ an inductive approach in developing theory (Saunders, Lewis, and Thornhill 2016). Saunders, Lewis, and Thornhill (2016, 168) also state that ‘Qualitative research studies participants meanings and the relationships between them, using a variety of data collection techniques and analytical procedures, to develop a conceptual framework and theoretical contribution’.

A qualitative method was chosen for this study as there was a need to understand the people involved in the transition to an Agile ISD approach and the social and cultural contexts in which they were situated (Myers n.d.). The use of a qualitative method provided a richer understanding of the issues influencing the transition, the complex social process of implementation, and the variety of personal experiences and perceptions of the Agile team members and stakeholders.

3.4 Purpose of Research

A research project can pursue different objectives and these will be influenced by the research questions and objectives.

The purpose of an exploratory study is to investigate and understand a topic of interest, an issue or a phenomenon (Saunders, Lewis, and Thornhill 2016). The purpose of an explanatory study is to explain the findings from the investigation (Saunders, Lewis, and Thornhill 2016).

The purpose of this research was exploratory. The research questions and objectives for this study were designed to explore the key elements that shape the transition to an Agile ISD approach, as the initial literature review carried out at the start of this study before data collection had found that the exact nature of the issues concerning the transition to an Agile ISD approach was not clear.

This research also qualified as explanatory since its research questions and objectives aimed to explain the elements that shape the transition to an Agile ISD approach, and to develop a Type II theory.

3.5 Research Strategy

The strategies commonly used in qualitative studies are case study, ethnography, action research, and grounded theory. The choice of research strategy is guided by the research questions and objectives, and by their coherence with the approach and purpose adopted for the research study (Saunders, Lewis, and Thornhill 2016).

The case study strategy is utilised frequently in both exploratory and explanatory research (Saunders, Lewis, and Thornhill 2009). An in-depth study can be designed to discover what is happening and why, to comprehend research outcomes, and perhaps put forward suggestions for action (Dubois and Gadde 2002). A case study will be particularly applicable if a researcher wants to gain a rich understanding of the context of the research and the processes being enacted (Morris and Wood 1991). Researchers use the richly detailed descriptions from a case study for analysis and generation of theory (Ridder, Hoon, and McCandless Baluch 2014).

A case study strategy was therefore chosen for this study as it could answer the research questions and achieve the objectives. Such a strategy was also consistent with the approach and purpose adopted in this research study. It provided the ability to explore, understand and explain issues that influenced the transition to an Agile ISD approach. It allowed a deep understanding of the context of the research and the processes being performed (Morris and Wood 1991). It allowed for the investigation of what was happening and why, in relation to the transition to an Agile ISD approach, and of the effects of the transition, and also allowed for the subsequent development of theory and any implications for action. The process used to build

theory in this case study research is adapted from Eisenhardt (1989) and is described in section 3.13 Research Quality.

3.6 Data collection methods

Qualitative data from interviews, documents, and observation are used in qualitative research to comprehend and explain social phenomena. The research method used influences the way data are collected. A case study researcher primarily uses interviews and documents (Myers n.d.).

This research was a multi-method qualitative study. Qualitative data were collected via interviews and secondary data sources.

The primary source of data collected in this study was interviews. Semi-structured interviews were used in this study, since Saunders, Lewis, and Thornhill (2016) state that semi-structured interviews are suitable for exploratory and explanatory, inductive research. As for the case study strategy used in this study, this was the best way to capture the knowledge and views of those involved in the Agile transition process.

The ability to use open-ended questions in a semi-structured interview permitted the collection of rich, detailed data about the research topic as well as important background and contextual material for this study. This assisted in the understanding of relationships between themes identified in the analysis of the data collected. The rich, detailed data collected could be used to answer the ‘what’, ‘how’ and ‘why’ questions of this study but with the emphasis on the ‘why’. The ability to use open-ended questions in face-to-face interviews also permitted participants’ responses to be probed for further information or explanation.

Secondary data were collected from relevant artefacts that were not commercially sensitive and confidential and which could be released. Secondary data provide additional information, avenues for cross-checking information gathered, offer multiple perspectives on issues and also different interpretations of the data collected (Orlikowski 1993; Saunders, Lewis, and Thornhill 2016) which is useful for theory generation (Orlikowski 1993).

3.7 Sample

An embedded case study strategy was used in this research. It entailed a single case (one organisation) with individuals within the organisation as the embedded cases (Yin 2014). The use of a single embedded case study strategy dictated the use of non-probability sampling to select the sample.

The rationale for selecting a sample is that the choice of sample will allow appropriate data to be collected to meet the aims of the research and answer the research questions (Saunders 2012). For non-probability samples, ‘appropriate’ means making sure that understanding and insight can be achieved using the chosen sample. This is essential for exploratory research where a rich understanding is required, in order to generate theoretical generalisations (Saunders 2012).

3.7.1 Sample type

Purposeful sampling is about choosing information-rich cases from which a researcher can learn about the main issues related to the aim of the research (Patton 1990). In this study, that aim was to explore and understand the issues surrounding an organisation’s transition to the Agile ISD approach.

Purposive sampling is often used when working with small samples, as in case studies (Neuman 2006). In purposive sampling, a researcher needs to use his or her considered opinion in choosing cases that will best answer the research questions and meet the study’s objectives.

3.7.2 Strategy for recruitment of sample

This section discusses the recruitment of the case and its embedded cases.

3.7.2.1 Recruitment of case

As a purposeful sample was required for a single embedded case, this study needed one organisation that could provide rich information in relation to issues it experienced when transitioning from a traditional to an Agile ISD approach.

The organisation (which will be referred to as ‘ABC Bank’ to preserve its anonymity) recruited for this study was a medium-to-large-sized bank that was changing its business strategy and environment to one of business agility and growth.

One aspect of this change involved a transition from a traditional approach to a flexible, Agile approach to information systems development. An IT-led approach in 2009/2010 resulted in the formation of an Agile team and the delivery of two Agile projects. A strategic IT Agile goal was established, and an organisation-wide mobilisation was carried out in 2010. The bank organisation was experiencing issues arising from the transition. This organisation recruited for this research was therefore a purposeful sample as it was appropriate for the research aim: it could provide rich information for answering the research questions. Furthermore, it was also an organisation that was willing to share its transition experience.

3.7.2.2 Recruitment of embedded cases

In her study, Leonard-Barton (1990, 249) states, 'In order to understand all the interacting factors... it was necessary that the research methodology slice vertically through the organisation, obtaining data from multiple levels and perspectives'. So, while the primary unit of analysis in this study was the bank, the experiences of individuals within the bank, along with the organisational context, were also investigated.

The strategy used to recruit the embedded cases was to choose a heterogeneous sample, in other words one offering participants with sufficiently different traits to provide different experiences and variation in the data collected. Patton (1990) states that any shared patterns that surface from variations are noteworthy and valuable in capturing the fundamental experiences and the main, convergent viewpoints or influences bearing on a program such as the transition to an Agile ISD approach. While examining the shared viewpoints, a description and understanding of any divergent experiences within the group is also possible. This allows for a description and explanation of the central themes emerging from the data collected (Saunders, Lewis, and Thornhill 2016). This is also an effective strategy when searching for a holistic overview of the phenomenon (Kitto, Chesters, and Grbich 2008). It ensures completeness in the data collected (Speziale 2011).

Contrasting the different perspectives and viewpoints of the people involved is another form of triangulation (Patton 1999) Two criterion proposed by Guba (1981) that need to be taken into account for a 'trustworthy' study in qualitative research are credibility (where an accurate depiction of the phenomenon being investigated is

being reported) and transferability (where the investigator supplies detailed information about the context of the study so that the reader will be able to determine if the findings can be applied to another setting). The use of triangulation in this study enhances its credibility and trustworthiness (Shenton 2004).

The strategy used in the later stages of the data collection process was theoretical sampling. The participants selected for this process, which involved a more tactical choice of informants, were determined by the emerging concepts (Orlikowski 1993). Eisenhardt (1989) states that research that involves building theory from case studies depends on theoretical sampling.

To capture different experiences, perspectives and variation in the data collected, people from different roles, different levels and different functional areas within the organisation, and people external to the organisation, were selected. Part of the sample included individuals:

- from various roles directly involved in Agile projects. They were programmers (P), testers (T), business analysts (BA), project managers (PM), iteration managers (IM) and business product owners (PO). The people in the different roles were also from different functional areas within the organisation
- involved in coaching teams working on Agile projects. They were the Agile coaches (AC) and external consultants (EC).

Matched pairs were chosen when selecting the above roles. The members of the pairs were drawn from different Agile projects. The use of matched pairs ensured that direct comparisons could be drawn between participants within the same role and between participants in different roles (Saunders 2012).

The remaining sample comprised people from different levels and people from other functional areas within the organisation structure. They were the Head of Solution Engineering (HSE); Agile Practice Manager (APM); Agile Practice Lead (APL); Agile Transformation Lead (ATL); Agile Transformation Coach (ATC); Change Management Lead (CML); one participant from Customer Delivery and another from the Project Management Office (PMO).

3.7.3 Sample size

This section discusses the sample size for the case and its embedded cases.

3.7.3.1 Sample size for case

A single case was chosen for this study for three reasons:

Firstly, research and theory for this research topic were at an early stage at the start of this study. There was no strong theoretical base and Benbasat, Goldstein, and Mead (1987) state that single case study projects are most useful at the beginning of theory generation. Smith (1989) also argues that ‘the validity of an extrapolation from one or more individual cases depends not on the representativeness of such cases in a statistical sense, but on the plausibility and cogency of the logical reasoning used in describing results from the case and in drawing inferences and conclusions from those results’.

Secondly, Myers (2009) argues that using three to four cases is no better than using one case when it comes to increasing the confidence in one’s findings. First, the sample size is still far too small; second, one does not have a truly random sample in the first place.

Lastly, Saunders, Lewis, and Thornhill (2016) believe that a single case strategy is more achievable for a doctoral student. The authors also argue that a single qualitative case study which is rigorous and well planned will probably produce findings as useful as those arising from a study that researches multiple cases.

3.7.3.2 Sample size for embedded cases

As data were collected primarily through interviews with the embedded cases in this study, an important decision to be made during the research design phase was the determination of how many interviews were required to answer the research questions.

Saunders, Lewis, and Thornhill (2016) state that many research textbooks recommend collecting qualitative data until saturation is reached. Saturation is the point at which no new information is provided or no new themes are suggested by the additional data collected. This was an issue as an estimate of the number of

participants likely to be involved had to be specified at the design stage of this research (Saunders 2012).

From the limited guidance available from their own and other studies, Guest, Bunce, and Johnson (2006) suggested twelve interviews were sufficient for a fairly homogeneous group. However, the authors noted that more interviews were required for a heterogeneous group. Creswell (2007) was more conservative and suggested that the number of interviews for a general study should be twenty-five to thirty. The number of interviews conducted in this study was twenty-seven.

The table below shows the role of the participants in this study: whether they had any previous experience in using an Agile ISD approach, the number of Agile projects they were involved in at the time of the interview, and the number of interviews they participated in. The table below displays the heterogeneity of the participants.

Table 5. Details of participants

| Role | Previous experience using an Agile ISD approach | Number of Agile projects | Number of interviews | Total time for interviews (hours) | Number of pages |
|-------------|--|---------------------------------|-----------------------------|--|------------------------|
| BA1 | No | 1 | 1 | 2 | 34 |
| BA2 | No | 2 | 1 | 1.3 | 19 |
| P1 | No | 2 | 1 | 1.5 | 25 |
| P2 | No | 3 | 1 | 1.1 | 18 |
| T1 | No | 2 | 1 | 1.5 | 25 |
| T2 | No | 2 | 1 | 1.1 | 18 |
| PO1 | No | 1 | 1 | 0.5 | 12 |
| PO2 | No | 2 | 1 | 1 | 17 |
| IM1 | No | 1 | 1 | 1 | 17 |
| IM2 | No | 1 | 1 | 1 | 21 |
| PM1 | No | 2 | 1 | 1.5 | 25 |

| | | | | | |
|----------------------------|-----|---------------------------------|--------------------------|--------------|------------|
| PM2 | Yes | 3 | 2 | 2.2 | 39 |
| AC1 | Yes | 1 | 1 | 2 | 34 |
| AC2 | Yes | 1 | 1 | 1.2 | 18 |
| EC1 | Yes | 2 | 1 | 2 | 34 |
| EC2 | Yes | 2 | 2 | 1.8 | 36 |
| HSE | Yes | NA | 1 | 0.75 | 13 |
| APM | Yes | NA | 1 | 1 | 17 |
| APL | Yes | 1 | 1 | 1.25 | 18 |
| ATL and APL | Yes | 1 | 1 | 0.8 | 19 |
| ATC | Yes | NA | 2 | 2.1 | 36 |
| CML | Yes | NA | 1 | 0.7 | 13 |
| PMO | No | NA | 1 | 0.6 | 12 |
| CD | No | NA | 1 | 0.75 | 15 |
| 24 interviewees | | 9 different projects | 27 interviews | 30.65 | 535 |

Two interviews were conducted with the second project manager and the second external consultant as the interviews could not be completed in a single session. Two interviews were carried out with the Agile transformation coach to check on the progress of Enterprise Agility at ABC Bank.

3.7.4 How cases were identified

This section describes how the case and its embedded cases were identified.

3.7.4.1 Identification of case

ABC Bank was identified at a conference where there was a presentation about the bank's Agile transition journey.

3.7.4.2 Identification of embedded cases

The first thirteen participants selected for interviews were from a list of people recommended by the APM, the initial gatekeeper for ABC Bank. The recommendation was based on a discussion with the APM about interviewing people from different roles to capture diverse experiences and perspectives. The APM was requested to nominate informative people from different roles who could provide rich information in relation to the transition to an Agile ISD approach in the projects they were involved in (Guba and Lincoln 1989). Thirteen participants were recommended – they were the EC1, AC1, PO1, PM (1 and 2), BA (1 and 2), P (1 and 2), T (1 and 2), and IM (1 and 2). Except for the AC and EC, the other eleven participants were not managed by the APM.

The table below shows the roles of the remaining eleven participants in this study, the reason for their selection and their nominees. Apart from being able to provide diverse experiences and perspectives, and rich information, some of the participants were selected as they could provide information on emerging themes, for example, organisational implementation issues like organisational change. Eisenhardt (1989) states that cases can be added to explore emergent themes.

Table 6. Details of remaining participants

| Role | Reason selected | Nominated by |
|-----------------------------|---|---------------------|
| PO2 | Part of a matched pair (as described in section 3.7.2.2 Recruitment of embedded cases) that was able to provide a perspective on implementation from the business side. | PO1 |
| AC2 | Part of a matched pair. Also selected because the team being coached by the Agile Coach was having issues using an Agile approach in their project. | APL |
| EC2 | Part of a matched pair. | |
| APM | Able to provide a perspective on organisational implementation. | Researcher |
| APL (the second gatekeeper) | | APM |
| ATL | | APL |

| | | |
|-------------------------------|---|------------|
| ATC (the third gatekeeper) | Able to provide a perspective on organisational implementation. | Researcher |
| Participant from the PMO | Able to provide a stakeholder perspective on organisational implementation. | ATC |
| Participant from CD | Able to provide a stakeholder perspective on organisational implementation. | |
| CML | Able to provide a stakeholder perspective on organisational implementation, change and change management. | Researcher |
| HSE | Able to provide a management perspective on organisational implementation. | Researcher |

Participation by all twenty-four people was voluntary. There was no payment or inducement to participants. All the participants appeared to have a genuine interest in participating in the research and did not appear to have any other motives for doing so.

3.8 Details of data collection methods

Data were collected primarily through interviews and from secondary data sources in this study. Theory-building research usually employs multiple data collection methods for triangulation (Eisenhardt 1989). The author states that support for constructs and theory is increased through the use of triangulation.

3.8.1 Interviews

The interviews were semi-structured, face-to-face interviews that used open-ended questions. All interviews (except one) were one-on-one interviews.

3.8.1.1 Interview themes

Saunders, Lewis, and Thornhill (2016) state that if a study is exploratory, it is still necessary to have a rough idea of the themes the researcher intended to discuss with the participants. The interview will not have a sense of direction or reason if there is no focus at all. Interview themes may originate from the literature review, common sense, and interviews with the research participants. Therefore, to begin an interview, a researcher should start with a set of topics that suggest the themes identified in the

initial literature review, or there should be at least one general question related to the research topic.

The initial set of themes for the interviews in this study was derived from:

- the research questions and objectives
- constructs identified in the initial literature review that potentially influenced the acceptance of Agile SDMs.

Any new themes emerging from interviews with the research participants were added to the list of themes in subsequent interviews, as recommended by Guba and Lincoln (1989). Eisenhardt (1989) also states that questions can be added to an interview guide to explore emergent themes.

Data were collected on a range of elements: the organisation under study; the environment (competitors, customers, external regulatory bodies); IS division (structure, culture, staff, systems, current SDM, development projects, project teams, processes and procedures); the reasons behind the adoption of an Agile ISD approach; the Agile ISDM adopted and its implementation; changes associated with the Agile transition, in particular the culture and way of working; management support; change management; training and education, and the development team and stakeholders' experiences with Agile implementation.

It was not sensible to ask identical questions at each interview. The initial list of themes and questions varied from interview to interview depending on the role of the interviewee. However, there were some questions which were applicable to most of the different roles. Also, the questions for interviews with participants in the same role were similar, for consistency.

The questions applicable to most of the different roles focused on:

- their personal background
- their role in the Agile project
- suggestions for successful transition to an Agile ISD approach
- any issues not covered in the interview guide.

The first two questions above were asked at the beginning of an interview as it was fitting to start the interview by showing an interest in the interviewee (Saunders, Lewis, and Thornhill 2016). The last two questions above were asked at the end of the interview.

Interview themes in Rounds 1 and 2

The interviews in rounds one and two were with the BAs, Ps, Ts, POs, IMs, PMs, ACs and ECs.

For all roles in these rounds, the questions focused on the following topics:

- experience using an Agile ISD approach; that is likes and dislikes, difficulties and facilitators, and critical/significant issues encountered
- experience working in an Agile team
- personality required and personal changes experienced working in Agile teams
- motivation behind involvement in Agile project
- how the organisation introduced the use of an Agile ISD approach
- management support
- organisational culture and its effect on the transition.

The BAs, Ps and Ts were also asked about:

- agility in projects and the Agile practices used
- the effect of previous experience using a traditional approach on the use of an Agile ISD approach.

The IM, AC and EC were also asked about:

- how teams have been agile in projects and the Agile practices used
- the team's experience using an Agile ISD method
- working with the PM, PO and stakeholders on an Agile project.

The PO was also asked about:

- concerns about using an Agile ISD approach for projects
- participation in the Agile project

- how team members embraced change in requirements during projects.

Interview themes in Round 3

The interviews in round three were with the APL, ATL, ATC, CML, HSE, CD and PMO.

The questions for APL, ATL, ATC, CML and HSE focused on the following topics:

- definition and understanding of agility
- vision and reason for adopting an Agile ISD approach
- Agile ISD method and practices used
- implementation plan/strategy
- overview of actual implementation, including significant events and timeline
- implementation issues
- changes in the organisation when adopting an Agile ISD approach
- change management
- Agile project and team selection
- role of an IM and PM in an Agile project
- middle management resistance
- coaching.

The questions for CD and the PMO focused on the following topics:

- difficulties encountered in their area with the transition to an Agile ISD approach
- changes required in their area
- critical or significant issues in their area with the transition to an Agile ISD approach.

3.8.1.2 Interview guides

Interview guides were used for the different roles to provide some structure during the interviews. The interview guides contained questions related to the topics listed above. They also contained probing questions that were used to pursue initial answers and to glean more detail from the interviewee. When developing the interview guide, an attempt was made to ensure that the questions were logically ordered.

Testing the interview guides

The initial interview guides for the BA, P, T and PO roles were tested between December 2011 and February 2012. They were used in interviews with a business and test analyst, a systems analyst, a senior developer, a business analyst and a customer, none of whom were involved with ABC Bank.

The systems analyst, business analyst and customer were from a university and were working on the same Agile project. The senior developer, who also had Agile experience, was from the same university. The business and test analyst had Agile experience and were from an external government department.

3.8.2 Secondary data

The secondary data collected consisted of voice and video recordings, company documents, presentations and articles. The secondary data provided additional information and cross-checking of information. The table below provides details of the secondary data collected.

Table 7. Secondary data

| Data source | Description of secondary data | Date |
|--------------------------|---|----------------------|
| Company documents | Reports on five Agile projects | Feb 2010 to Oct 2011 |
| | Agile introduction training material | Dec 2011 |
| | One version of the Agile project selection criteria | Nov 2011 |
| | Updated version of the Agile project selection criteria | May 2012 |
| | Organisational structure charts | Mar 2012 |
| | Agile transformation timeline up to Jun 2012 | Jun 2012 |
| Presentations | Presentation by the Chief Information Officer (CIO) at the 2010 Agile Conference about the organisation's Agile journey | Sep 2010 |
| | Presentation by the Agile transformation coach to management on Enterprise Agility in the organisation | Jun 2012 |

| | | |
|------------------------|--|--|
| Voice recording | Presentation by the Agile Transformation Lead and Agile Team Lead on key learnings in relation to the Agile transformation in the organisation | Jun 2012 |
| Articles | On the presentation about the bank's Agile journey by the CIO at the Agile Conference in 2010 | Sep 2010 |
| | CIO talking about the benefits of adopting an Agile ISD approach | Nov 2010 |
| | Interview with the APM at the 2011 Agile Conference about the Agile transformation | May 2011 |
| | On a presentation by the Agile Transformation Lead and Agile Team Lead at the 2012 Agile Conference on key learnings in relation to the Agile transformation in the organisation | Jun 2012 |
| | An interview with the CIO at a conference about the future of banking and financial services | Jun 2013 |
| | Head of Solution Delivery (HSD) speaking on continuous delivery | Jun 2013 |
| | On the HSD giving a presentation at the Agile Conference on the learnings from implementing activity-based work alongside Agile at the organisation | Jun 2013 |
| | HSD talking about why Agile works | Mar 2014 |
| | HSD speaking about DevOps and continuous delivery | Mar 2014 |
| | CIO speaking about building agility and innovation in the organisation to meet the rapidly changing financial services environment | Apr 2014 |
| | CIO speaking about building a disruptive culture | Jul 2014 |
| | Video recording | Interview by a software training and development company with the APM in relation to the bank's Agile journey. |

Secondary data were also used for triangulation which enhances the credibility and trustworthiness of this study (Shenton 2004). They provided additional information, a means of cross-checking information, and multiple perspectives on issues investigated (Orlikowski 1993; Saunders, Lewis, and Thornhill 2016).

3.9 Access to participants

This section describes how access to the organisation and participants within the organisation was obtained.

3.9.1 Access to the organisation

The HSD was the initial contact at the conference, where there was a presentation about ABC Bank's recent Agile transition journey. An introductory email describing the research and requesting cooperation was sent to the HSD after the conference. The HSD agreed to cooperate and nominated the APM as the gatekeeper.

A meeting was then arranged with the APM to discuss the research in more detail and to obtain information on the Agile teams, the roles of members within the Agile teams, the Agile ISD method and Agile practices used by the teams, and Agile projects (completed, current and planned) at ABC Bank. The meeting was also used to foster a relationship and create trust with the gatekeeper. A letter describing the research and requesting formal approval was sent after the meeting.

3.9.2 Access to participants

The next meeting with the APM was held to discuss the roles of the people to be interviewed. The APM was asked to recommend people occupying different roles and complied by sending details of these people after the meeting.

The APM also sent an email to the recommended people, encouraging them to participate in the research. Participation in the study was voluntary.

The people nominated by the APM were then contacted for cognitive access; that is, their agreement to be interviewed (Saunders, Lewis, and Thornhill 2016). To mitigate any potential participation bias (Saunders, Lewis, and Thornhill 2016), these people were told that the cost to them would be minimal, and time-based. They were told that the interview was expected to be between one and two hours long and the interview interactions would be arranged around their existing commitments so that disruption to their schedules would be minimised. All the people contacted agreed to participate in the study.

The participants were then contacted to arrange a day, time and location convenient to them for the interview. Most of the participants chose a meeting room within the organisation. A few participants chose locations within and outside the organisation where the background noise made the transcription of the interviews more difficult.

Gaining access to participants was a continuing process. The gatekeeper changed three times during the research study. Furthermore, initial access was only to people within the IT function and the POs from the business. Access to stakeholders outside the IT area like the PMO, Customer Delivery and CML had to be negotiated.

Researchers were dependent on the generosity of the organisation and the participants throughout the study.

3.10 Data collection

The data were collected over a period of two and a half years, January 2012–August 2015. Twenty-one interviews were carried out in the first half of 2012, five between February and October 2013 and one in August 2015. There was a gap between October 2013 and August 2015 as the third gatekeeper had left the organisation and getting access to the last participant was difficult.

3.10.1 Interview schedule

Where possible, the first twenty interviews were scheduled about a week apart so there was time to transcribe the interview, undertake an initial analysis and write a summary of the data collected before the next interview.

The APM was interviewed first as this interviewee was due to go on extended leave. There were three rounds of interviews after that.

The circle of participants in the first round were from each of the different roles in Agile project teams: a PO, PM, BA, P, IM and T. The participants in those roles were also from different functional areas within the organisation. Also included in the first round were an AC and EC. Interviewing people from the different roles and obtaining their diverse experiences and perspectives allowed for direct comparisons to be made between the roles.

The first circle was ‘spiralled’ in the second round of interviews: it involved a set of participants in the same roles as those in the first round (Guba and Lincoln 1989).

This strategy not only brings diverse experiences and perspectives between and within roles, but it also ‘brings fresh minds to the task, enlarges the group of persons who have input into the process (increases the base of ownership, some would say)’ (Guba and Lincoln 1989, 208).

The third round involved the APL, ATL, ATC, CML and representatives from Customer Delivery, and PMO, as well as the HSE. They were selected as they were from different levels and functional areas and could also inform and ‘best serve the particular needs of the inquiry at the moment’ (Guba and Lincoln 1989, 178). The third round focused mainly on organisational implementation issues. Determining the ‘particular needs of the inquiry at the moment’ was possible as a summary of the main topics that emerged at each interview was produced after the interview (Saunders, Lewis, and Thornhill 2016) and this helped shape the direction of data collection. The table below provides a summary of the three rounds of data collection.

Table 8. Details of interview rounds

| Round | Roles | Sampling strategy | Reason for sample |
|-------|---------------------------------------|---|---|
| 1 | EC1, AC1, PO1, PM1, BA1, P1, IM1, T1. | Heterogeneous sample (different roles who were also from different functional areas within the organisation). | Different roles in an Agile team could provide diverse experiences and perspectives, so that direct comparisons could be drawn between different roles. |
| 2 | EC2, AC2, PO2, PM2, BA2, P2, IM2, T2. | | Direct comparisons could be drawn between participants within the same and different roles. Brings fresh minds to the task and enlarges the group of people who have input into the process. |
| 3 | APL, ATL, ATC, CML, | Heterogeneous sample (different | People from different levels and functional areas who could best serve the needs of the inquiry at that point in time by providing |

| | | | |
|--|---|--|--|
| | Reps from Customer Delivery and PMO, HSE. | levels and functional areas). Theoretical sampling. | information on organisational implementation issues. |
|--|---|--|--|

3.10.2 Pre-Interview

Interviewees were given an information sheet about the research before the interview. The information sheet also addressed the three main areas of risk, informed consent and privacy. The interviewees were given the opportunity to ask any questions about the research and were asked if they agreed to have the interview audio-recorded. All interviewees were given a consent form to sign before the interview. This researcher endeavoured to preserve trust and credibility through careful preparation for interviews, and by maintaining anonymity and confidentiality at all times (Myers and Newman 2007).

3.10.3 Interview

Interview guides were used during the interviews. The questions were only used as a guide. The interviewees could discuss any issues not included in the interview guide. The flexibility offered by using semi-structured interviews allowed for deviation from the list of questions when required; for example, to ask probing questions.

Although the transcription of the interviews would be time consuming, all interviews were recorded, with the permission of the interviewee, using a voice recorder. It was decided to record interviews because this:

- ensured that the record of the data collected was accurate and unbiased
- allowed the interviewer to be attentive
- allowed direct quotes to be used (Saunders, Lewis, and Thornhill 2016).

Notes were also taken during the interview.

3.10.4 Post interview

Each interview was transcribed as soon as possible after completion of the interview.

An initial analysis of the transcript was carried out and a summary of the interview was created after each interview (Saunders, Lewis, and Thornhill 2016). The summary identified the main topics that emerged at the interview. Any new emerging topics of interest from the interview were added to the agenda in subsequent interviews (Guba and Lincoln 1989). Producing a summary helped shape the direction of data collection.

3.11 Data analysis

The data analysis process was interactive. The primary and secondary data collected were analysed as they were being collected. Themes and relationships were identified as the data were collected.

Eisenhardt (1989, 539) states that analysing data while they are being collected ‘not only gives the researcher a head start in analysis, but more importantly allows researchers to take advantage of flexible data collection. Indeed, a key feature of theory-building case research is the freedom to make adjustments during the data collection process’.

3.11.1 Approach to coding

The interviews and secondary data were analysed using Template Analysis and Theoretical Coding. Template Analysis, a style of thematic analysis, was used as a first cycle coding method for the initial coding of the data where the data were split into individually coded segments (Saldana 2009). Theoretical coding was used as a second cycle coding method to organise and integrate the themes that were identified using Template Analysis. It was used to develop a coherent synthesis of the data, to understand how the themes fit together and to develop theory (Saldana 2009).

The table below presents a summary of the data analysis process.

Table 9. Data analysis process

| Step | Activity | Output |
|-------------|-----------------|---------------|
|-------------|-----------------|---------------|

| | | |
|---|--|---|
| 1 | Familiarisation with data | Contact summary sheets. |
| 2 | Coded data using Template Analysis as first cycle coding method to organise data by themes and identify relationships | Final template of themes (illustrated as a hierarchical structure). |
| 3 | Used Theoretical Coding as a second cycle coding method to integrate themes from Template Analysis <ul style="list-style-type: none"> • Identified core theme • Used paradigm model to relate other themes to core theme | Theoretical code. |

3.11.1.1 First cycle coding (using Template Analysis)

Template Analysis is a method for analysing and thematically organising qualitative data (King 2012). It has been employed extensively in organisational and management research. Template Analysis may be used for any sort of textual data (Brooks et al. 2015).

The development of a coding template consisting of themes is fundamental to Template Analysis. Themes are any repeated aspects of stories by participants describing certain perceptions and experiences that a researcher perceives as pertinent to the research question. The themes identified are organised by the researcher in a meaningful and helpful way using a hierarchical structure (Brooks and King 2014).

The hierarchical organisation of themes is a fundamental feature of Template Analysis (King 2004). Similar themes are grouped together to generate broader higher-order themes. It may also include lateral relationships across themes (Brooks et al. 2015).

A priori themes can be defined before coding starts in Template Analysis (Brooks et al. 2013). The themes reflect areas identified as relevant to the aims of the research and they usually reflect the main topic areas in an interview guide (King et al. 2002). *A priori* themes might also be used when there is current theory and existing literature related to the topic under investigation (Brooks and King 2014). Eisenhardt (1989) also believes that the initial design of theory building can be shaped by the use of *a priori* constructs which can be identified from existing literature. However,

King et al. (2002) stress that the *a priori* themes must always be looked upon as provisional. Themes could be added, deleted and merged.

The aim in this study was to investigate the issues in relation to the transition to an Agile ISD approach. The constructs (identified in the initial literature review and depicted in the initial conceptual framework) with the potential to influence the acceptance of Agile SDMs were used as *a priori* themes in the design of the initial coding template used in this study.

Structuring the data analysis initially around the constructs that could influence the acceptance of an Agile ISD method was a reasonable start for this exploratory study (Brooks et al. 2013). The *a priori* themes that were not relevant or of use to the research were redefined or removed as data were analysed, and the template revised in the process (King et al. 2002). New themes were defined and added to the template (Brooks et al. 2013).

The process followed was as suggested by Brooks and King (2014) and is described below.

Familiarisation with the data

The first step was to become familiar with the data collected. Thus, after the interviews were fully transcribed, the transcripts were checked against the recordings and any transcription errors corrected, to ensure that the transcripts were accurate.

An initial analysis of the data was then carried out and a summary of the interview was created (Saunders, Lewis, and Thornhill 2016). This helped engagement in the analytical steps that followed (Saunders, Lewis, and Thornhill 2016). The initial analysis included a summary of the answer to each question, the main issues and themes that emerged from the interview, anything that stood out at the interview, and any new questions for the next interview. The summary also recorded the job title of the interviewee and the context, location, date and time of the interview. The format used for the summary document was an adaption of the contact summary sheet suggested by Miles and Huberman (1994).

As some time elapsed between creating summaries and the coding of the data, the summary was read through before the data were coded.

Coding the data

The data were coded using the initial template (which consisted of the *a priori* themes identified in the initial literature review). Not all the data were coded. Data that were trivial and unrelated to the research questions were not coded; for example, trivia about interviewees' personal backgrounds (Miles and Huberman 1994).

The data in this study were coded by the 'level of meaning' which could be a line, sentence, chunk of sentences or a paragraph (DeCuir-Gunby, Marshall, and McCulloch 2011). In this study it was often found that coding interview transcripts by line or sentence was not meaningful. The table below provides an example of a segment of text and its code (theme).

Table 10. Example of a segment of text and its code

| Segment of text | Theme |
|---|--------------------|
| I think the behavioural cultural shift for people has made it very difficult but at the same time there is some really amazing and good things going on in ABC Bank as far as cultural behaviour goes. They are really shifting their thinking on that. | Behavioural change |

When a segment of data was coded and assigned to suitable themes in the template, the data segment was compared with previous entries assigned to that theme. An updated definition of the themes was maintained to ensure consistency when assigning data segments to themes in subsequent interviews (Urquhart 2013).

The template was modified as new themes were added, deleted, merged or moved within the template (King 2012). The themes were organised into meaningful clusters as analysis progressed. Similar themes were grouped together to generate broader higher-order themes in a hierarchical structure (King 2004). Lateral relationships across themes were also included (Brooks et al. 2015). Template Analysis does not demand that there should be a clear difference between purely descriptive and interpretive (conceptual) themes (Brooks et al. 2015). It also does not insist on a specific place for each type of theme in the template. Figure 2 shows part of the template.

1. Change
 - 1.1 Cultural change
 - 1.1.1 Mindset
 - 1.1.2 Behaviour
 - 1.2 Way of working
 - 1.2.1 Communication
 - 1.2.2 Teamwork
2. Support
 - 2.1 Management
 - 2.1.1 Middle management
 - 2.1.2 Senior
 - 2.2 Stakeholders

Figure 2. Grouping of themes using a hierarchical structure

Due to time constraints, the dataset was only coded twice. In the first round of coding, the analysis proceeded in an iterative process until all data relevant to the research question were coded (Brooks et al. 2015). It was through this initial iterative process of making changes that a template was developed (King 2004). The dataset was coded a second time to ensure that the template developed from the first round of analysis was complete. The final template was used as the basis for interpretation of the data collected (Brooks and King 2014). It contained some of the themes derived from the initial literature review and themes identified through the analysis of the data collected.

3.11.1.2 Second cycle coding (using Theoretical Coding)

In Template Analysis, the relationship between themes is illustrated in a linear fashion using a hierarchical structure. King (2004) states that the benefit of such a simple structure is clarity but it may not display the type of relationships a researcher would like to show in analysis. King (2004) states that a researcher should not hesitate to use other approaches or techniques to explore and display Template Analysis findings when interpreting the data.

Therefore, Theoretical Coding (Glaser 1978) was used to organise and integrate the higher-order themes identified from coding using Template Analysis. Theoretical Coding was used to synthesise the data in a logical manner, and in order to comprehend how the themes integrate and develop theory (Saldana 2009).

Core theme

The integration in Theoretical Coding starts by discovering the major category of the research, called the central or core category (Corbin and Strauss 2008; Saldana 2009). The core category is considered the ‘main theme’ or ‘main concern or problem’ for the research participants. It is the theme that other themes will be related to (Corbin and Strauss 2008; Saldana 2009).

The main theme is selected from the themes developed during analysis. It is seen as having the greatest explanatory relevance and as the best option for linking the other themes together (Corbin and Strauss 2008). The criteria for choosing the main theme are (Glaser 1978; Strauss and Corbin 1990):

- it must be central and related to several other major categories (beyond other choices for the core category)
- it must appear often in the data and become increasingly related to other variables
- there are signs drawing attention to that concept in almost all cases
- it links easily with other categories in a meaningful manner
- it must be logical and consistent with the data
- it should develop in depth and explanatory power as other categories are related to it.

Linking themes

Relating the high-order themes to the main theme was done in terms of the paradigm model (Strauss and Corbin 1990). It was a model that was a good fit for the themes that emerged in this study. The paradigm model is an adaption of the basic 6Cs (Context, Conditions, Causes, Contingencies, Consequences and Covariance) coding family proposed by Glaser (1978) that assists researchers in exploring the types of relationships between different concepts (Urquhart 2013).

Urquhart (2013) states that a good example of the use of the paradigm model can be found in Galal (2001). Two good examples of the use of the 6Cs coding family in the IS literature can be found in Hoda, Noble, and Marshall (2010) and van Waardenburg and van Vliet (2013).

The model developed in this study using the paradigm model is shown in Figure 3 in the next chapter (findings and analysis). This model involves, within the context of a phenomenon (main theme), making a distinction on the basis of whether a theme is a causal condition that brings about the main theme; an action/interaction to manage, handle or cope with the main theme; or an intervening condition that facilitates or constrains the actions taken; and its consequences, that is, the outcome or results of action/interaction taken (Strauss and Corbin 1990). The paradigm model is used as a tool to comprehend the situation around events and consequently enrich the analysis (Corbin and Strauss 2008). It guides researchers in labelling data at the conceptual level (Saldana 2009).

3.11.2 Aids used in data analysis

Diagrams and memos were used as aids in the data analysis. Diagrams were used to organise the data into themes, reveal their relationships with each other, and develop the integrated theoretical model in Chapter 4. The diagrams did help in describing the findings in this study to research supervisors and interviewees. Finally, the use of diagrams made this researcher reflect on the data in 'lean ways,' in ways that reduce data to their core (Corbin and Strauss 2008). The use of diagrams was complemented by memos which kept notes on this researcher's thoughts about the conceptual themes and the interrelationships that emerged as the data was analysed. A summary of the interview was created after it was completed. This was followed by the creation of memos before coding was carried out. This use of 'reflective commentary' assists in enhancing the credibility and trustworthiness of this study (Shenton 2004).

3.11.3 Use of qualitative research software in data analysis

NVivo was used to facilitate the analysis process. The interview transcripts, documentation and relevant literature were imported into NVivo and coded.

3.11.3.1 Development of themes

When the researcher identified a segment of text (in the imported documents) that related to an existing theme (represented by a node in NVivo), the segment of text was stored in that node (Bazeley 2007). Segments of text that shared similar themes were stored in the same node, allowing the researcher to make comparisons between cases within a theme (Hutchison, Johnston, and Breckon 2010). When the researcher identified a segment of text related to a new relevant theme, a new node was created, and the segment of text was stored in that new node.

The fundamental role of the hierarchical template structure in Template Analysis made it suitable for analysis facilitated through the use of NVivo (King 2004). NVivo allowed the nodes to be organised in a hierarchical manner, like the structure of the template used in Template Analysis. The use of NVivo facilitated the addition, deletion, merging and movement of codes within the hierarchy, and the maintenance of theme definitions. To assist in the analysis, memos were created and linked to nodes (Hutchison, Johnston, and Breckon 2010).

3.11.3.2 Development of relationships between themes

Use of coding stripes

More than one node could be assigned to a segment of text in NVivo which suggested a relationship between the themes represented by those nodes. A coding stripe (represented by a coloured bar next to a segment of text) represents the node to which a segment of text has been assigned. If a segment of text was assigned to two nodes, there would be two coding stripes displayed next to that segment. Therefore, coding stripes presented a visual overview of themes that might be related to each other.

Use of relationship nodes

A 'relationship' node is another type of node that can be created to represent a relationship between nodes. Segments of text that suggest a relationship between themes can be assigned to a relationship node. In this study, this process allowed different segments of text that suggested a relationship to be stored in one place, which assisted in analysis. This helped recognise the role of themes in a relationship,

for instance, whether the theme might be a condition, strategy or consequence (Hutchison, Johnston, and Breckon 2010).

3.11.4 Justification for methods used and analytical techniques applied

This section justifies the selection of the data analysis techniques used in this study.

3.11.4.1 Justification for the use of Template Analysis

Flexibility

Template Analysis is a very flexible approach that can be adapted to the requirements of most types of study. It does not come with a burdensome set of prescriptions and procedures (King 2004). It does not mention any particular methodology or defined method for analysing data. It is a practical technique that can be used within a variety of qualitative research approaches (Brooks and King 2014).

Novice researchers

Researchers new to qualitative methods, such as PhD candidates, should not have any difficulty in understanding the principles behind Template Analysis (King 2004). It can be a useful introduction to the coding and analysis of qualitative data.

Use of a priori themes

The ability to incorporate the use of *a priori* themes in Template Analysis was well suited to this study.

Structured approach

Producing a template makes a researcher use a structured approach when handling the data, which assists in creating a clear and structured final report for the study (King 2004).

3.11.4.2 Justification for the use of Theoretical Coding

The paradigm model was a good fit for the themes that emerged in this study. It is also a useful analytic tool for novice researchers (Corbin and Strauss 2008) such as a PHD candidate. Analysing qualitative data is complex as qualitative data contains many concepts with complex relationships. It is often hard extracting these concepts and relationships from the data. The use of the paradigm model is one

strategy that can assist the researcher with reflecting on those relationships. Urquhart (2013) states that a good example of the use of the paradigm model can be found in Galal (2001) who used the paradigm as a means to articulate how concepts from initial coding were related to each other, and to develop theory. Urquhart (2013) also states that the paradigm model (Strauss and Corbin 1990) used in this study is an adaption of Glaser's basic 6Cs (Context, Conditions, Causes, Contingencies, Consequences and Covariance) coding family that assists researchers to explore the types of relationships between different concepts. Glaser (1978) states that the 6Cs coding family is the first to keep in mind when analysing data. He labels the 6Cs as the 'bread and butter' coding family for sociologists. Two good examples of the use of the 6Cs coding family in the information systems (IS) literature can be found in Hoda, Noble, and Marshall (2010) and van Waardenburg and van Vliet (2013).

3.12 Ethical issues

Ethical approval of this research was obtained from the Curtin University's Human Research Ethics Committee (HREC). The main ethical issues that were addressed were risk, informed consent, privacy and confidentiality.

3.12.1 Risk

As individuals may be put at risk by a research study, a risk assessment of this research was carried out to assess any risk of harm to the participants and the community. It was identified that this research carried a low or negligible risk to the participants. No potential risk of harm to the community was identified.

3.12.2 Informed consent

Research participants must be able to formally approve their participation in research, to ensure that they are fully aware of pertinent aspects of the research and are certain when giving their permission for the research to be undertaken.

To satisfy the principle of informed consent, letters, information sheets and consent forms were sent to the gatekeeper and participants.

3.12.2.1 Letter to the gatekeeper

A formal letter seeking permission to undertake the study was sent to the gatekeeper.

The letter specified:

- the aim and objectives of the research
- that data would be collected through interviews and from organisational documentation
- the type of information that would be requested from participants at interviews
- the roles of people that would be interviewed
- that the proposed location of the interviews be on the organisation's premises to minimise disturbance to the interviewees' day-to-day activities
- that if permitted, interviews would be recorded by the interviewer
- that the cost to the organisation would be minimal and time-based
- that the time required of participants was expected to be about one and a half hours
- that the expected data collection period would be about twelve months
- that the interactions will be arranged around the participants' existing commitments so disruption should remain minimal
- that all raw data obtained during this project will remain confidential to the researcher and the researcher's supervisors
- that the research report or any conference papers or journal articles that may result from the study will not identify participants or their employer
- that participants will remain anonymous
- that the study was approved by HREC
- the contact details of the researcher, supervisor and HREC.

A copy of the letter to the gatekeeper can be found in appendix A.

3.12.2.2 Consent form for the gatekeeper

The gatekeeper was given a consent form to verify that the organisation had agreed to participate in the study for the purpose of a PhD degree and any resultant publications and conference publications. The consent form stated that the organisation understood the purpose of the study and that it could withdraw from the research at any time. This is a tactic suggested by Shenton (2004) to help ensure

honesty in informants when contributing data and would enhance the credibility of the study. A copy of the consent form for the gatekeeper can be found in appendix B.

3.12.2.3 Letter and information sheet to the participants

A formal letter was also sent to the participants before the interview. The letter specified that the study was approved by their organisation. Attached with the letter was an information sheet that specified:

- the aim of the research
- the type of information that would be requested at the interview
- that the interview was expected to be between one and two hours and that follow-up interviews might be requested if needed
- that the cost to the interviewee would be minimal and time-based
- that the interaction will be arranged around the interviewee's existing commitments so disruption should remain minimal
- that findings will be published as a PhD thesis held at the Curtin University Library and that conference and journal publications may be written based on the research
- that data will be stored for five years from completion of this study
- that all raw data obtained during this project will remain confidential to the researcher and the researcher's supervisors
- that the research report or any conference papers or journal articles that may result from the study will not identify the interviewee or their employer
- that participants will remain anonymous
- that participation in the research was voluntary and the interviewee was free to withdraw from this research at any time
- that the study was approved by Curtin University's HREC
- the contact details of the researcher, supervisor and HREC.

A copy of the letter to the participants can be found in appendix C and a copy of the information sheet to the participants can be found in appendix D.

3.12.2.4 Consent form for the interviewees

Interviewees were also given a consent form to verify that they had agreed to participate in the study, which was intended for the purpose of a PhD degree and any

resultant publications and conference publications. The consent form stated that the interviewee:

- understood the purpose of this study
- had been given an opportunity to ask questions
- understood that the interviewee could withdraw from this research at any time without prejudice
- would not be identified by any information used in published material.

The interviewees were also asked to indicate if they agreed to have the interview audio-recorded and whether they agreed to be quoted anonymously. A copy of the consent form for the interviewees can be found in appendix E.

Involvement by all participants in this study was voluntary. There was no payment or inducement to participants.

3.12.3 Privacy and confidentiality

It is essential to respect the privacy of individuals and to keep data confidential. The research must take precautions to safeguard the privacy and confidentiality of participants and the data collected.

To satisfy the principle of privacy and confidentiality, a written guarantee of privacy and confidentiality was provided to the interviewees (as stated in the previous section). Participants were informed that they would remain anonymous. Permission to be quoted was sought from the participants.

The recordings of interviews, interview transcripts and documents were kept secure (Myers and Newman 2007). They were stored in appropriate folders on secure drives accessible only to the appropriate people. The files were given appropriate names using a convention that was meaningful. Hard and soft copies of files and transcriptions were also kept secure. Data will be stored for five years from completion of this study.

3.13 Research quality

This section discusses the process used to build theory in this research and the criteria used to assess the quality of this study.

3.13.1 Process used to build theory in this case study research

The process used to build theory in this case study research was adapted from Eisenhardt (1989) and is shown in the table below. The table displays the steps in the process, their activities, and specifies where a description of each activity can be found in this study. The process is very iterative and is closely linked to the data.

Table 11. Process used to build theory in this research

| Step | Activity | Chapter and section |
|------------------------------------|--|---|
| Getting Started | Definition of the research question Use of priori constructs | 1.2.2 2.1.2.3 |
| Selecting Cases | Non-probability sample Purposeful sampling for case Heterogeneous followed by theoretical sampling for embedded cases | 3.7.2.1 3.7.2.2 |
| Crafting Instruments and Protocols | Used multiple data collection methods: Primary data - interviews Secondary data - voice and video recordings, company documents, presentations and articles | 3.8.1 3.8.2 |
| Entering the Field | Overlapped data collection and analysis, and used memos Used flexible and opportunistic data collection methods by adding questions to the interview guide, and adding embedded cases to investigate emerging themes | 3.11 3.11.2 3.8.1.1 3.7.4.2 |
| Analysing Data | Analysing within-case data - familiarity with each embedded case was achieved by transcribing the interviews, checking the accuracy of the transcripts against the recordings, and creating a summary for each case. Searching for Cross-Case Patterns was carried out by looking for similarities and differences between the embedded cases within the themes identified in the analysis of the data. | 3.11.1.1 3.11.2 |
| Shaping Hypotheses | This was carried out by constant comparison to refine the themes, and theoretical coding to synthesise the data in a logical manner, comprehend how the themes integrate, and build theory. | 3.11.1.1 (Coding the data) 3.11.1.2 |
| Enfolding Literature | The emerging theory from this study was compared with existing literature for similarities and differences | 5 |
| Reaching Closure | Theoretical saturation was not possible. | |

| | | |
|--|--|--------------------------------|
| | <p>An estimate of the number of participants likely to be involved had to be specified at the design stage of this research.</p> <p>Due to time constraints, the dataset was coded twice. The final product were two theoretical (explanatory Type II theory) models</p> | <p>3.7.3.2</p> <p>3.11.1.1</p> |
|--|--|--------------------------------|

Adapted from ‘Building Theories from Case Study Research’ by Kathleen M. Eisenhardt, 1989, *The Academy of Management Review*, 14 No. 4, P. 532.

3.13.2 Quality of study

As the frameworks, sampling approaches, sample size and goals of quantitative and qualitative research are not similar, the traditional criteria of validity, reliability and empirical generalisability used in quantitative research are generally not directly used in qualitative research (Kitto, Chesters, and Grbich 2008).

Guba (1981) put forward four criterion that needs be taken into account for a trustworthy study. They are credibility (internal validity), that is, where an accurate depiction of the phenomenon being investigated is being reported. The second is transferability (empirical generalisability), where the investigator supplies detailed information about the context of the study so that the reader will be able to determine if the findings can be applied to another setting. The third is dependability (reliability), which is about providing a reliable description of the emerging focus of the research so that others may comprehend and evaluate the research. The last is confirmability (objectivity), which is to show that the findings come from the data collected and not from the investigator's predispositions.

Shenton (2004) suggests possible provisions that a qualitative researcher may employ to meet the four criterion specified by Guba (1981). To assist readers in evaluating the quality of this study, the provisions suggested by Shenton (2004) that were used in this study is presented in the following table. The table specifies where the provisions have been addressed in this study.

Table 12. Qualitative research quality assessment provisions addressed in this study

| Criteria | Chapter and section where criteria are addressed |
|--|---|
| Credibility | |
| Triangulation via use of different methods and different types of informants | 3.7.2.2, 3.8.2 |
| Tactics to help ensure honesty in informants when contributing data | 3.10.2, 3.12.2.2, 3.12.2.3 |
| Use of 'reflective commentary' | 3.11.2 |
| Thick description of the phenomenon under scrutiny | 4.1 to 4.3 |
| Examination of previous research to frame findings | 2.1 to 2.2, 5.1 to 5.6 |
| Transferability | |
| Provision of background data to establish context of study | 4.2.1 |
| Detailed description of phenomenon in question to allow comparisons to be made | 4.1 to 4.3 |
| Dependability | |
| In-depth methodological description to allow study to be repeated | 3.3 to 3.11 |
| Confirmability | |
| Triangulation to reduce effect of investigator bias | 3.7.2.2, 3.8.2 |
| Admission of researcher's beliefs and assumptions | 3.1 to 3.5 |
| Recognition of shortcomings in study's methods and their potential effects | 6.4 |
| In-depth methodological description to allow integrity of research results to be scrutinised | 3.3 to 3.11 |

Kitto, Chesters, and Grbich (2008) also discuss the use of the criterion rigour (thoroughness and appropriateness of the use of research methods), credibility (meaningful, well presented findings), and relevance (utility of findings) to judge the quality or trustworthiness of a study. The authors identified several practical common rules that if adhered to, will permit a succinct and informative evaluation of the findings in a qualitative study. The authors state that the rules will be applicable especially to qualitative studies that use the most common qualitative data collection methods; for example, interviews and secondary data analysis, the methods used in this study. The authors state that the rules should provide reviewers with enough information on the different aspects of the research to create an awareness of rigour in the research and trustworthiness in its findings.

To further assist readers in evaluating the quality of this study, a table adapted from Kitto, Chesters, and Grbich (2008) that lists more criteria for evaluating qualitative

research quality was created. Criteria for evaluating qualitative and case study research quality from Dybå and Dingsøy (2008), Patton (1999), Guba and Lincoln (1989), Höst and Runeson (2007), Saunders, Lewis, and Thornhill (2016) and Sarker and Sarker (2009) have also been added to the table.

Table 13. Qualitative and case study research quality assessment criteria addressed in this study

| Criteria | Chapter and section where criteria are addressed |
|---|---|
| Clarification | |
| What are the aims of the research? | 1.2.1 |
| What is the research question? | 1.2.2 |
| Why the study was undertaken (Dybå and Dingsøy 2008) | 1.1, 2.1.3 |
| Justification | |
| Why a qualitative approach was the best option to answer the research question | 1.3, 3.3 |
| Why the particular qualitative research design was chosen | 1.3, 3.3 to 3.11 |
| Representativeness | |
| What sampling techniques have been used to answer the research question? | 3.7 |
| Methods for identifying the sample (Dybå and Dingsøy 2008) Selecting suitable organisation to study intensively (Sarker and Sarker 2009) | 3.7.4 |
| Methods for recruiting the sample (Dybå and Dingsøy 2008) Choice of interviewees (Sarker and Sarker 2009) | 3.7.2.1 3.7.2.2 |
| How many took part and why? (Saunders, Lewis, and Thornhill 2016) | 3.7.3 |
| Have all views been represented in this study? (E.G. Guba and Lincoln 1989) | 3.7.4.2, 3.10.1 |
| How sample relates to the research question (Saunders, Lewis, and Thornhill 2016) | 3.7 |
| Do the sampling techniques support conceptual generalisability? | 3.7, 6.4.1 |
| Procedural rigour | |
| How did the researcher gain access to the study site? (Patton 1999) | 3.9.1 |
| Entering the field with credibility (Sarker and Sarker 2009) | 3.9.1 to 3.9.2, 3.10.2, 3.10.3 |
| How were purpose-made instruments developed and why? (Saunders, Lewis, and Thornhill 2016) | 3.8.1 |
| Have the techniques of data collection been clearly documented? | 3.10 |

| | |
|--|----------------------------------|
| Are the forms of data analysis completely transparent? | 3.11 |
| Interpretive rigour | |
| Is the case adequately defined? (Höst and Runeson 2007) | 4.2.1, 4.2.2 |
| Triangulation of theory | Figure 3, Figure 13 |
| Unearthing and refining concepts through constant comparison (Sarker and Sarker 2009) | 3.11.1.1 (Coding the data) |
| Has a more conceptual discussion of the results and linkage to existing theory or new theory been developed to explain the relevance of findings to a targeted audience or discipline? | 5.1 to 5.6 |
| Are alternative perspectives and explanations used in the analysis? (Höst and Runeson 2007) | 5.3.1.4, 5.3.5, 5.4.1.6, 5.4.1.7 |
| Did the research project meet its aim, answer its questions and meet its objectives? (Saunders, Lewis, and Thornhill 2016) | 6.1 |
| Are there clearly stated findings with credible results and justified conclusions? (Dybå and Dingsøy 2008) | 4.1 to 4.3, 6.1 |
| Are there any recommendations for future action based on the conclusions? Where should the focus of future research be? (Saunders, Lewis, and Thornhill 2016) | 6.5 |
| Evaluative rigour | |
| Has an explicit evaluation of the relationship between the researcher and those under research, addressing any ethical issues, been discussed? | 3.12 |
| Has ethics approval been obtained from an appropriate institution? | 3.12 |
| Has informed consent been obtained from the organisation and individuals? (Höst and Runeson 2007) | 3.12.2 |
| Being sensitive to ethical concerns (Sarker and Sarker 2009) | 3.12.3 |
| Transferability (Conceptual generalisability). | |
| Has a full description of the research question, design, context, findings and interpretations been provided to judge the transferability of the study? (E.G. Guba and Lincoln 1989) | 1.2.2, 3, 4, 5 |
| Has the relevance of the findings to current knowledge, policy, and practice or to current research been discussed? | 1.4, 6.2 |
| Has a critical evaluation of the application of findings to other similar contexts been made? | 6.4.1 |

Adapted from ‘Quality in qualitative research’ by Simon C. Kitto, Janice Chesters and Carol Grbich, 2008, *Medical Journal of Australia*, 188 No. 4, P. 244.

3.14 Summary of Research Design

An inductive approach was used in this study. It was a qualitative exploratory and explanatory study. An inductive approach to theory development was used in this

study as the initial literature review found that the theory in relation to the issues influencing the implementation of an Agile ISD approach was unclear. The use of a qualitative method provided a richer understanding of the issues influencing the transition to an Agile ISD approach, the complex social process of implementation, and the variety of personal experiences and perceptions of Agile team members and stakeholders. The purpose of this research was exploratory as the exact nature of the issues concerning the transition to an Agile ISD approach was not clear. The purpose of this research was also explanatory as an objective of this study was to explain the major elements, implementation strategy and issues that shape the transition to an Agile ISD approach, and to develop a Type II theory.

A case study strategy was chosen for this study as it was consistent with the approach and purpose adopted in this research. This strategy could answer the research questions and achieve the study's objectives as it enabled the exploration, understanding and explanation of the major elements that shaped the transition to an Agile ISD approach. An embedded case study strategy was used in this research. A single case (one organisation) was selected, with individuals within the organisation as the embedded cases.

Purposeful sampling was used for selecting the single case. It was an organisation that was experiencing issues moving from a traditional to an Agile ISD approach and could provide rich information for answering the research questions. The embedded cases chosen formed a heterogeneous sample, comprising people from different roles, different levels and different functional areas within the organisation, and people external to the organisation who could provide different experiences and variation in the data collected.

Qualitative data were collected primarily through 27 semi-structured interviews, and secondary data sources, such as voice and video recordings, company documents, presentations and articles.

Analysis of the interviews and secondary data were carried out using Template Analysis and Theoretical Coding. Template Analysis, a style of thematic analysis, was used as a first cycle coding method to identify themes. Theoretical coding was used as a second cycle coding method to organise and integrate the themes

identified, in order to develop a coherent synthesis of the data, understand how the themes fit together, and develop a theory.

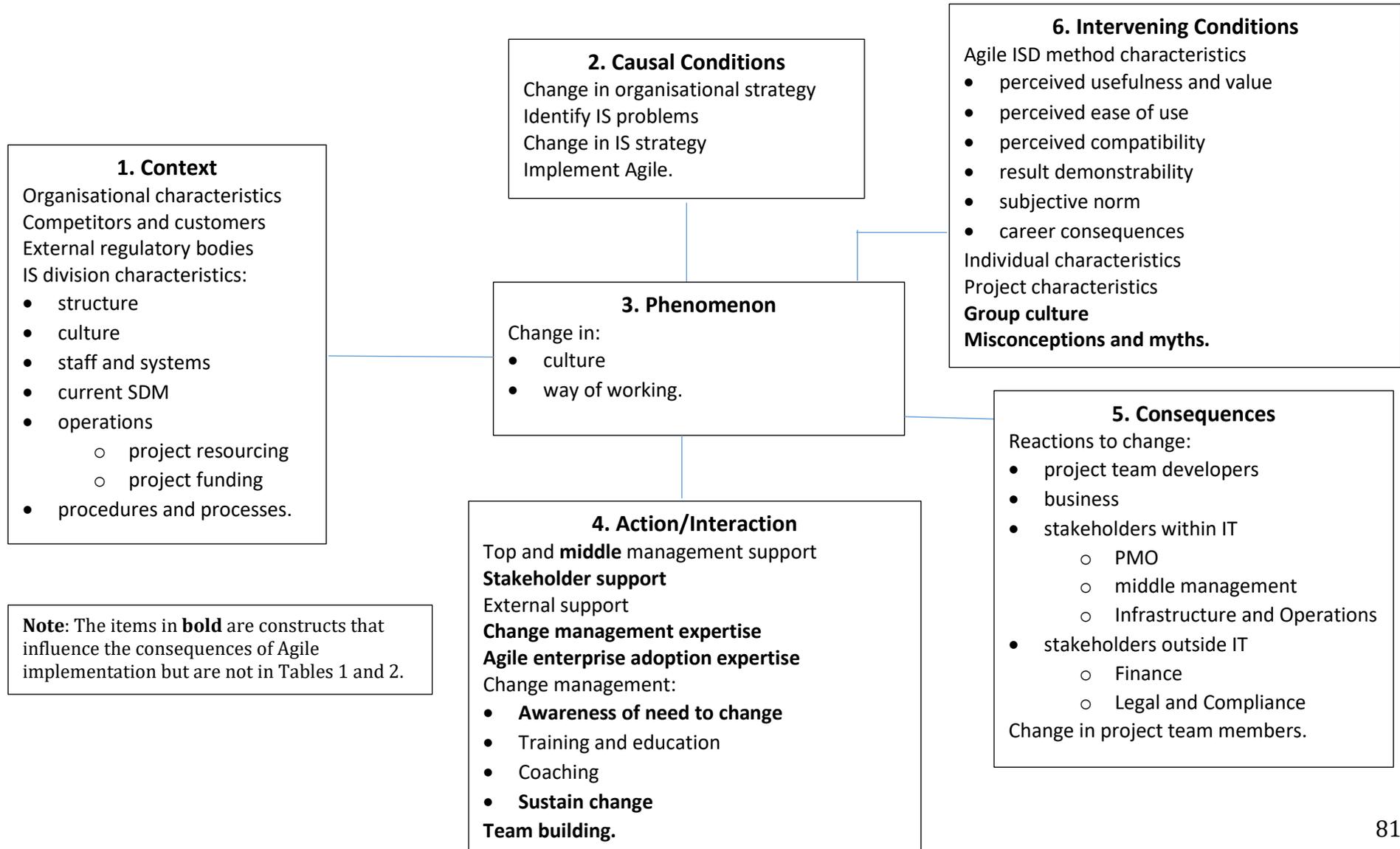
4. ANALYSIS and FINDINGS

The interviews and secondary data were analysed using Template Analysis and Theoretical Coding (as described in section 3.11.1 Approach to coding). Template Analysis was used as a first cycle coding method for identifying themes related to the research questions. Theoretical coding was then used as a second cycle coding method to analyse and understand how the themes fitted together, and to develop theory (Saldana 2009).

Theoretical Coding started with the discovery of a major theme. The major theme that emerged from this research was the phenomenon of change. The integration of other high-order themes with the major theme in order to develop a theory was carried out in terms of the paradigm model (Context, Causal Conditions, Action/Interaction, Intervening Conditions, Consequences) as described in section 3.11.1.2 Second cycle coding (using Theoretical Coding). The integrated theoretical model of the change phenomenon and its related themes are illustrated in Figure 3. Other themes not included in the model in Figure 3 are themes related to the implementation strategy, and issues encountered during the process of Agile implementation.

The first section of this chapter gives an overview of the case study. The second section describes in detail the themes shown in the theoretical integrated model (depicted in Figure 3). The themes related to the implementation strategy, and to the issues encountered during implementation, are described in the last section.

Figure 3. Integrated theoretical model of the Change Phenomenon and its related themes



4.1. Overview of case

ABC Bank is a medium-to-large-sized bank in Australia that used a Waterfall methodology before Agile adoption. The business felt that its IS projects were too slow in delivering the services and solutions required. The business' ability to respond to changing business requirements was hindered by the use of a Waterfall methodology. Management also felt that teamwork was lacking at the bank, perceiving limited collaboration among project team members, and also between the project teams and the business. The bank operated in a 'siloed' manner, against a backdrop of heavy documentation and governance precepts. Management saw the necessity to move from outdated silo-based operating models to collaborative, multi-disciplinary teams. The bank migrated to an Agile ISD approach thanks to the drive shown by an innovative HSD and CIO, and support from top management.

The transition to an Agile approach involved a fundamental change in the way people worked, and in the bank's culture, in other words a change in behaviour and values; it required an Agile transformation. The change not only affected the project teams but also areas and stakeholders outside the project teams; it involved Enterprise Agility. The changes required a big shift in mindset for those affected.

The most significant strategies used at the bank to manage the change were support from top and middle management, stakeholder support, change management and team building. The big change in culture and way of working was difficult as team members had been used to working in a certain way for a long time, and the change required them to unlearn old behaviours and habits. Although the change was difficult, team members generally embraced the new approach over time and thought it was a positive change. Getting areas outside the project teams to support Agile projects was also a big challenge. The project teams had to engage the affected stakeholders and come to a compromise to support this new way of working. The intervening conditions that appeared to influence the outcome were the characteristics of the Agile ISD method and individuals concerned.

The implementation strategy used at the bank comprised a combination of a top-down and bottom-up approach with a 'start small' transition pattern, the incremental introduction of Agile practices, a combination of coaching, and a 'split and seed' strategy to spread agility. The implementation issues encountered at the bank were: a

lack of Agile projects; the frustration of people waiting to be involved in Agile projects; middle management resistance; perceived lack of awareness of the need for change; the level of stakeholder management and support; a lack of Agile Enterprise adoption and change management experience; the role and selection of iteration managers; product owner selection and commitment; team members working part-time on an Agile project; inconsistent Agile teams; the pressure to deliver versus the need for upskilling team members; and the coexistence of two approaches (Agile and Waterfall) during the transition.

As implementation should be viewed as a dynamic phenomenon (Larsen and Myers 1999) and the process by which a new technology is adopted and used needs to be considered when explaining its consequences (Orlikowski 1993), a table that provides a summary of the Agile implementation process at the bank is shown below. As factors can have varying levels of significance at different stages of the implementation process (Larsen and Myers 1999), the summary provides a timeline which captures the influence of applicable themes from Figure 3, and themes related to the implementation strategy and implementation issues at different stages of the implementation process. The themes from Figure 3 are described in section 4.2 and the themes related to the implementation strategy and implementation issues are described in section 4.3.

Table 14. Timeline of the Agile transition process

| | |
|-------------|--|
| Sep 2009 | <p>HSD recognised problems in system development. HSD believed that the use of an Agile ISD approach would assist in handling the problems.</p> <p>Without obtaining top management support, HSD tried a bottom-up approach, attempting to sell Agile development to the development teams. The attempt was unsuccessful.</p> |
| Mar 2010 | <p>HSD used a top-down approach and obtained top management support by getting the CIO and the senior leadership team within IT to visit an organisation that had benefited from Agile adoption.</p> <p>The CIO and leadership team resolved to introduce Agile at the bank after seeing its benefits, which were speed to market and the flexibility to respond to changes in business requirements. The CIO also wanted to have a more empowered and innovative culture and a culture of collaboration, learning and continuous improvement.</p> |
| Apr 2010 | <p>Agile implementation was started using a start-small transition pattern. A pilot project was initiated.</p> <p>External consultants were engaged to coach and assist the pilot project team with the change to the Agile ISD method.</p> |

| | |
|----------|---|
| | <p>The team encountered a lack of stakeholder support during the project. The pilot team had to engage the stakeholders to gain their support for using the new Agile process.</p> <p>The CIO approved and communicated an organisation-wide mobilisation after the success of the pilot project. Agile development became one of the bank's six core business principles. The bank's executives announced its strategic IT goal that half of the bank's projects would be using an Agile approach by the end of 2012. A steering committee was formed for the Agile transformation.</p> |
| Sep 2010 | <p>An Agile Practice (AP) and the role of an APM were created to manage the Agile transition and organisational change that brought a change in the work style and culture.</p> <p>The AP started 'Project Agile' which used a comprehensive implementation plan for the Agile transition.</p> <p>Other Agile projects were started to pilot the Agile approach in more complex projects. A 'split and seed' strategy was employed to spread agility to different project teams. Coaching was used to help these project teams with the change in the development approach and to manage any resistance from team members. Agile practices were introduced to the teams in an incremental manner. Besides engaging the services of external consultants for coaching, the bank also started employing coaches with Agile experience to assist the teams with the change. Team building activities were introduced. Stakeholders were engaged to support the use of an Agile process.</p> <p>'Project Agile' floundered.</p> |
| Mar 2011 | <p>System development staff were frustrated, waiting to be assigned to Agile projects. Too few Agile projects were being initiated.</p> <p>Education and training programs were conducted to teach Agile as a culture. This resulted in cultural change as staff started applying Agile values and practices in Waterfall projects and Business as Usual (BAU) work.</p> |
| Apr 2011 | <p>A deep-dive analysis found middle management resistance to the change.</p> <p>The AP realised that it did not have the set of skills, expertise and experience to manage such a significant change for the organisation. An external change management consultant was hired to assist in change management. It was found that there was a lack of awareness of the need for change in some areas. The change management consultant and AP worked on making people more aware that people at all levels and areas of the organisation were needed to drive the change.</p> |
| Oct 2011 | <p>Middle management across the different areas was empowered to make the changes required to support the transition.</p> |

| | |
|----------|---|
| Dec 2011 | Two internal coaches with experience in Enterprise Agile adoption were employed as there was a lack of Agile adoption experience at the bank. |
| Apr 2012 | The number of Agile projects completed and in progress was fifteen. Other projects were applying Agile practices where appropriate. |
| | There was the issue of inconsistent Agile teams, that is, not keeping Agile team members working together on continuous projects, and the issue of not allocating team members full-time for the whole duration of an Agile project. The issues were being investigated by the functional leads, AP and Agile steering committee |
| Jun 2012 | The bank was planning to scale agility using the Scaled Agile Framework ¹ . |

4.2 Theoretical Integrated Thematic Model

As mentioned at the beginning of this chapter, the integration of other high-order themes with the major theme of change was carried out in terms of the paradigm model (Context, Causal Conditions, Action/Interaction, Intervening Conditions, Consequences) shown in Figure 3. The high-order themes represent the elements that shape the outcome of an Agile transition. Such a model is missing from the existing literature on an Agile transition.

This section describes the themes that capture the elements in the theoretical integrated model. The new themes (that are not part of the major elements of context and causal conditions) that emerged from the data analysis and were not identified in the initial literature review are shown in bold in Figure 3. The structure used to describe the themes is similar to the structure and presentation of findings in Hoda, Noble, and Marshall (2010) and van Waardenburg and van Vliet (2013). These authors used the 6Cs coding family (from which the paradigm model was adapted) to present their theoretical models. The first two subsections of this section describe the elements of context and causal conditions of the major element discovered in this study, which is organisational change (as described in the third subsection of this chapter). The fourth subsection describes the action/interaction, the strategies used to handle the organisational change; the fifth subsection describes the consequences, the outcome of the change; and the sixth subsection describes the intervening conditions

¹ The Scaled Agile Framework is used to coordinate alignment, collaboration, and delivery for several Agile teams (Scaled Agile n.d.). It is used for developing complex systems using a Lean-Agile approach, drawing knowledge from Agile development, systems thinking, and Lean product development.

that influence the consequences. The seventh section is a summary of the six subsections.

4.2.1 Context

Agile implementation involves humans and the reactions of people affected by Agile implementation could vary (Saunders, Lewis, and Thornhill 2016). Their reaction is influenced by their context. In her study on change as a result of the adoption and use of CASE tools, Orlikowski (1993) stated that the organisational context also needs to be considered when explaining the consequences of the adoption and use of CASE tools. A detailed description of the context would also assist readers in determining the transferability of this study, that is, if the findings can be applied to another setting (Guba 1981). To help understand and explain Agile transition at the bank, this section presents the themes (as shown in Figure 4) identified in the data analysis that describe the element of context (from Figure 3) within which the phenomenon of change occurred.

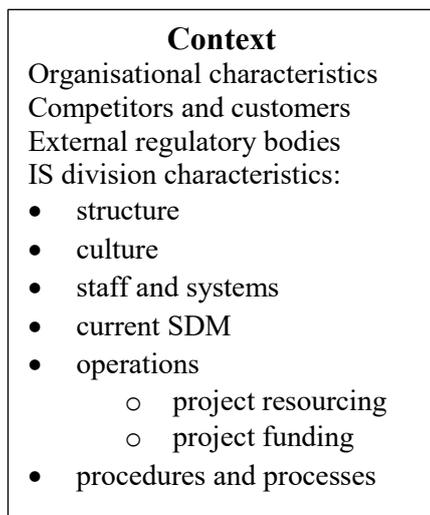


Figure 4. Context of the change

4.2.1.1 Organisational size, structure and culture

ABC Bank is a medium-to-large-sized bank in Australia. As of 2012, it had more than 1.2 million retail and business customers, 139 retail branches and 3,780 employees, with a hierarchical structure. The main divisions within the bank were Retail, Business Banking, Products and Marketing, Corporate Affairs, Finance, Enterprise Services, Human Resources and Risk. The culture was generally one of control. There was a perception of limited collaboration, which was undesirable due

to a silo-based structure and operating model. A tester commented that there was limited collaboration between the development team and the business:

‘You meet them [customers] at the beginning of the project and you meet them at the end ... then you’re trying to get them to sign this thing off at the end.’ – Tester

There was almost no culture of delivering business value through early and frequent delivery of software or of being flexible and responsive to change.

4.2.1.2 Competitors and customers

The APM commented that competition among banks was immense. Customers were in complete control as to where they banked, and the bank had to be ‘on the front foot’, offering their best to customers. The CIO also stated that changing customer preferences and the way customers interacted with organisations had become more challenging. The customers, not the bank, chose when and how they wanted to make a transaction. According to the HSE, there was also a generational change where younger-generation customers were doing business with more than one bank or had their financial needs met by a range of service providers.

4.2.1.3 External regulatory bodies

The bank has strong corporate governance mechanisms to comply with the highly regulated Australian banking environment. The bank, like other financial institutions in Australia, is regulated by the Australian Prudential Regulatory Authority (APRA) and the Australian Securities and Investments Commission (ASIC), which are the main financial regulatory bodies in Australia. Financial institutions are generally risk-averse, commented the APM. They are hesitant about migrating to an Agile ISD approach due to the difficulty and risk involved. The bank had to engage with APRA when it decided to change to an Agile information system development approach, to ensure it met APRA’s requirements, added the APM.

4.2.1.4 Enterprise Services (IS Division)

Enterprise Services was one of eight divisions within the bank. The Enterprise Services division supports the bank by developing and implementing IT and business change within the bank. It provides a huge service to the business. As of 2012, the

division supported a portfolio of about 45 million dollars (AUD) of spend and could run up to 100 projects concurrently at any time.

IS Structure

The Enterprise Services organisational structure is shown in the figure below. The areas under Enterprise Services were Strategy and Support (which included the Portfolio Management Office), Customer Delivery, Solution Delivery, IT Infrastructure Services (which included Infrastructure Delivery Services), Operations and the Chief Technology Office. The functional areas under Solution Delivery were Solution Development, Solution Analysis and Solution Testing. The PMs, BAs, programmers and testers were situated in different functional areas. The organisation had a functional silo structure where each area had its own goals and Key Performance Indicators (KPIs), which sometimes conflicted.

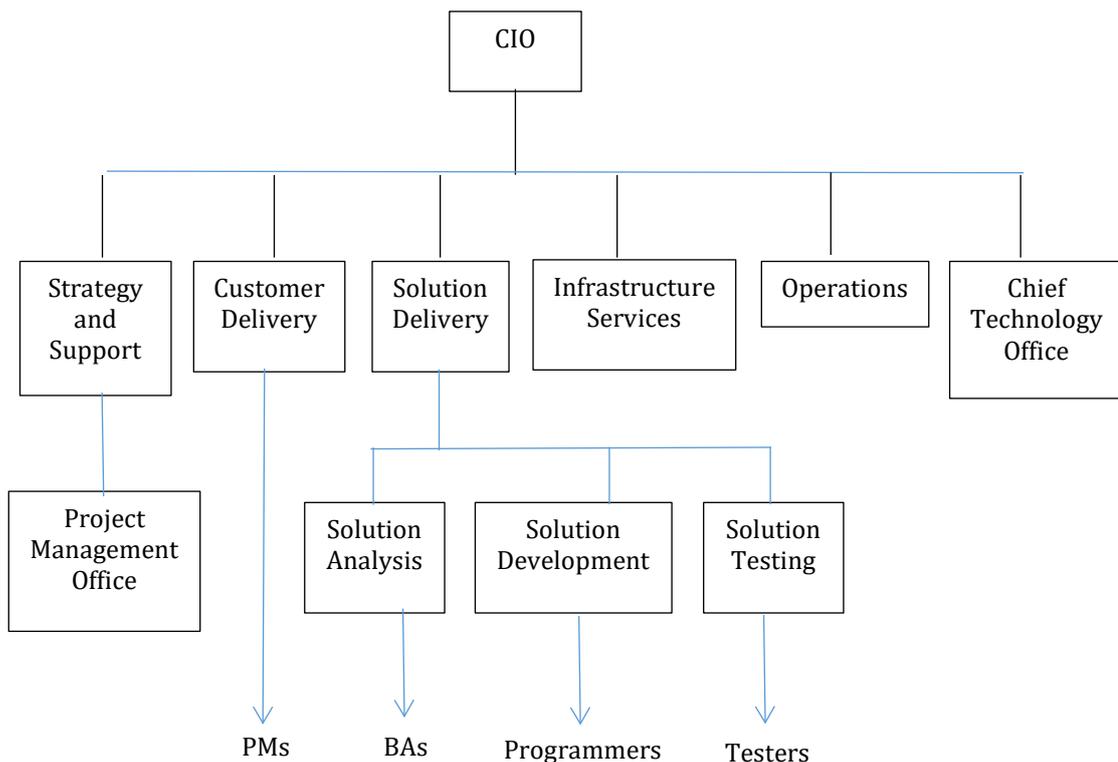


Figure 5. Enterprise Services organisational structure

IS Culture

The culture was generally one that did not promote teamwork. Echoing the perception of limited collaboration between the business and development teams, the APL said that there was also a perception of limited collaboration among analysts,

programmers and testers, which was brought about by the silo-based structure and operating model. Project team members were dispersed in different locations and they were isolated from their customers. It was about a person doing his or her part and handing it over to the next person. People were happy to sit at a computer in their cubicles, work on their own and communicate through email rather than face-to-face, commented a tester: ‘We used to in the test team and we wouldn’t even talk, see the developers or the business or the BAs.....and if you found a defect, we just raise it in a program application and it gets emailed to them. The only time they talk to us is if they do not understand and they just cannot replicate it, they might come talk to us. Or ring us up. But yeah, we never saw anyone.’

A programmer also commented that there was generally an ‘us and them’ attitude between the different functional groups. There was also a ‘hero’ culture being practised to get projects completed on time. People would often be recognised for ‘heroic’ acts which further encouraged such behaviour.

There was a very heavy reliance on documentation due to the siloed ‘hand over the fence’ approach being practised, and the heavy governance imposed by the Waterfall methodology. The culture of providing business value through frequent delivery of software had not been instilled into employees.

Staff and Systems

As of 2013 the bank had around 1,200 technologists (including IT strategists): around 600 in operations, 300 in infrastructure and security, and 300 in the solutions delivery team. Many staff had been with the bank for a long time. The bank had low staff turnover rates.

The bank had many different teams in the different functional areas. Each team in a functional area tended to take care of a system(s) within the bank, which had complex core-legacy transactional banking systems running on mainframe computers.

Current methodology

The bank previously used a Waterfall methodology. The business would firstly come up with an idea and describe it at a very high level. It would then go through an estimation process and be scheduled. Next it would be driven by a project plan and

go through the different system development phases (analysis, development and testing) where the output from one phase was passed on to the next phase. This was a siloed approach which involved people from different functional areas passing on work to each other. It was very much a ‘hand over the fence’ approach.

Processes and procedures

The IS functional area had processes and procedures that were both heavy and siloed. Being a bank, the IS area had to ensure a level of rigour and control regarding its processes; for example, the process for releasing software for production.

Resourcing and funding of projects

People from different functional areas were selected by their functional area managers to be part of a team for a project. The team members generally did not work 100% on a project. Team members could also be moved between projects. They could also be doing business as usual (BAU), still working for their functional area and reporting to their functional area manager while working on a project. Teams were disbanded at the end of the project.

The bank used the traditional IT funding process, based on the project scope, which was defined at the start of the project. This required an upfront estimation of the cost and schedule for the project. Additional funding was requested if the project exceeded its planned cost due to a change in scope or schedule.

4.2.1.5 Summary of context

ABC Bank is a medium-sized to large bank in Australia, where there is intense competition among banks. Meeting customers’ preferences and requirements was becoming more challenging for ABC Bank. To meet the regulations inherent in the Australian banking environment, the bank also required strong corporate governance mechanisms.

The bank had a functional silo structure. Its IT division had many long-term staff and was operating overly complex systems: mostly core-legacy transactional banking systems run on mainframe computers. The bank’s process for funding and resourcing projects was also essentially still traditional.

The bank previously used a Waterfall methodology. There was a perception of limited collaboration between the project teams and the business, and among project team members who were from different functional areas. The team members used a ‘hand over the fence’ approach with a very heavy reliance on documentation. The Agile principle of delivering business value through early and frequent delivery of software was absent. The Waterfall methodology hindered the bank’s ability to respond to changing business requirements. There were also behaviours and processes that were siloed, and heavy with documentation and over-prescriptive governance.

4.2.2 Causal conditions

In her study of change as a result of the adoption and use of CASE tools, Orlikowski (1993) stated that the intentions and actions of the central players need to be taken into account to explain the consequences of the adoption. To help explain and describe Agile transition at the bank, this section presents the themes (as shown in Figure 6 below) identified in the data analysis which describe the element of causal conditions (from Figure 3) that led to the organisational change in the bank.

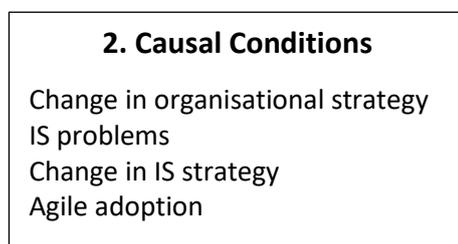


Figure 6. Causal conditions of change

4.2.2.1 Change in Organisational Strategy

In 2008, the organisation decided to change its business strategy from ‘business stability and integration’ to ‘business agility and growth’ due to a changing environment. It was strategically important for the bank to be more agile, increase its speed to market, and continue to add value without making long-term, multi-year investments. The bank had to be able to move quickly and be responsive to the needs of the business, the market and consumer demand. These needs were always changing, and more quickly than ever before.

4.2.2.2 Identify IS Problems

Under the bank's traditional Waterfall methodology, project teams were given a big set of business requirements. The requirements were delivered using a 'heavy' process that took months or years and frequently produced substandard results. There was one example where a huge sum of money was spent on just developing the requirements. Apart from the requirements, nothing was delivered to the business customer, as the business did not want to spend any more money on delivery after spending lavishly on the requirements. The feedback from the business was that the delivery of services and solutions it needed was slow. Projects were slow to start, and the business was dissatisfied with the time it took to deliver. Customers were offside and were looking to external providers to supply their services.

The ability to respond flexibly to changing business requirements was also being hampered by the Waterfall methodology and the 'heavy' change processes. Other issues with the bank's methodology were the 'heavy' governance, frequent scope creep, and over-engineering. The process was a classic relay race where there was perceived limited collaboration, characterised by information becoming distorted as it was passed on from one person to another in the process. The Waterfall method also hindered team members' ability to apply what they were learning. There was a need to switch outdated silo-based operating models to highly collaborative, multi-disciplinary teams.

4.2.2.3 Change in IS Strategy, Agile Adoption and Implementation

The HSD, the driver for introducing Agile to the bank, was a visionary, always looking for ways to innovate and continuously improve, commented the APM. The HSD believed Agile adoption would benefit the bank in delivering better solutions quicker and turning the customer experience around. The HSD convinced the CIO and the senior leadership team within IT to visit an organisation that had benefited from Agile adoption. After witnessing the culture, work environment and results emanating from Agile adoption at that organisation, the CIO and leadership team resolved to introduce it at the bank. The CIO became the sponsor and was the catalyst and driver for Agile adoption at the bank.

One aspect of the move to business agility and growth involved moving from a traditional Waterfall ISD approach towards an Agile ISD approach, as speed to market and the flexibility to respond to changes in business requirements was key to delivering business value. The reality was that the business was never going to know what it wanted because it would never have all the answers, commented the CIO. It was very difficult identifying all the desired features at the start of a project.

The CIO also wanted to have a more empowered and innovative culture, a culture of learning to embrace digital disruption and a culture of continuous improvement, all of which were cornerstones of agility, commented the HSE. Management perceived a lack of fit between the actual and desired status at the bank.

The Agile implementation at the bank started with a pilot project. The ISD method used by the pilot project team was a vanilla method introduced by an external consulting company. It was a blend of Scrum and XP. After the success of the pilot project, Agile development became one of the bank's six core business principles and the bank's executives announced a new strategic IT goal: half the bank's projects would be using an Agile ISD approach by the end of 2012. Other Agile projects were started to pilot the Agile ISD approach in more complex projects.

4.2.2.4 Summary of causal conditions

The business was unhappy with the time it took to deliver the services and solutions it needed. Governance was heavy, scope creep was common, and over-engineering was entrenched. The existing traditional development methodology limited the organisation's ability to apply learning. There was also a perception of limited collaboration; management saw a need to move from outdated silo-based operating models to highly collaborative, multi-disciplinary teams.

With the drive from an innovative HSD and CIO, and support from top management, the bank adopted and implemented an Agile ISD approach. After the success of the first pilot Agile project, the bank changed its business strategy to be more agile. It also announced that half of its IT projects would be Agile projects by 2012.

4.2.3 Phenomenon of Change

To help explain and describe the Agile transition at the bank, this section presents the element (shown in Figure 7 below) identified in the data analysis that describes the phenomenon (from Figure 3): the phenomenon being the organisational change in the bank. The outcome of the changes is described in corresponding subsections in 4.5.

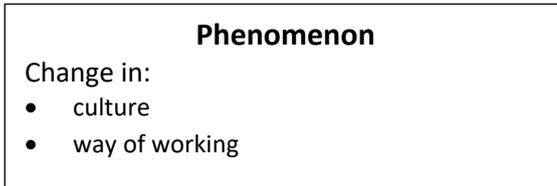


Figure 7. Phenomenon of change

The Agile transition required a major organisational change within the bank, said the APM. This caused a fundamental change in the way people worked, and a change in behaviour and values, that is an Agile transformation, to support the new way of working. The APM commented that people had to learn a new process, new practices and tools, embrace an Agile mindset, and change their behaviour to support the change in the way they worked:

‘I think that a really important thing to pull out of this is that it [Agile transition] is a cultural change exercise as much as it is about learning to use a new method. It is about learning how to work in a different way and that is a change; that is a big organisational change.’ - APM

The change in culture and way of working not only affected all the different roles in the project teams but also people outside the teams within the bank. An overview of the organisational areas affected by the change at the bank is shown in the following table.

Table 15. Organisational areas affected by the change

| | Project Team Agility | Enterprise Agility | |
|---------------------------------|--|---|---|
| Areas affected by change | IT project teams Business customers | Stakeholders within IT (outside of project teams): <ul style="list-style-type: none"> • Middle management • PMO • Infrastructure • Operations | Stakeholders outside IT: <ul style="list-style-type: none"> • Legal • Compliance • Finance |

The following subsections describe the major changes associated with Agile implementation and use. Sections 4.2.3.1 to 4.2.3.5 describe the change in culture and way of working for all the different roles in the project teams and business customers. Section 4.2.3.6 describes the changes for people outside the project teams, that is, the changes required for Enterprise Agility.

4.2.3.1 General changes in culture and related work practices for project teams and business

The new ISD method used by the Agile project teams was a vanilla method introduced by an external consulting company. It was a blend of Scrum and XP. Scrum, which is very popular in industry, is an Agile project management framework that mainly covers areas related to project management (Dybå and Dingsøyr 2008); it uses practices like time-boxing, continuous tracking of project progress, and customer centricity. XP is a suite of software development practices combined into a coherent methodology (Balijepally et al. 2009). The new method was significantly different from the established Waterfall methodology used at the bank, commented a tester:

‘I can honestly say they’re worlds apart. There’s that big divide between the two to be honest, yeah.’ – T2

The use of the Agile ISD approach involved fundamental changes in how the project teams operated. The teams had to learn a new process; in particular how to produce working software within short time-boxes. They had to learn new practices and tools, acquire new skills, learn to work as a team, and had more responsibilities. This required a change to an Agile mindset and a change in behaviour to support the new way of working, commented an external consultant:

‘There is a real shift in mindset and behaviours that is required to work in an Agile team, and the environment has been in the past, very different. So, I think culturally, for the bank, it was a really big shift...’ – EC1

Teamwork

One cultural change was the need to embrace the values of teamwork and collaboration, which is the first value in the Agile Manifesto (Beck et al. 2001a). Compared to an Agile project, working in a traditional project was a ‘solo’ exercise for team members, commented the APM.

Firstly, the project team members were now sitting together instead of sitting within their respective functional areas. In the old environment, the team members had their own desks and worked in their own six-foot cubicles within their functional area. There were no cubicles in the new Agile workspace and team members were physically close to each other in the same location. The PO was also co-located with the team where possible.

Secondly, team members had to learn to work together as a cross-functional team. An external consultant commented that the whole team now had to collaborate to complete work items together instead of handing over work tasks to each other using a sequential development process. Furthermore, the team also had to focus on completing one work item at a time instead of trying to complete multiple work items at the same time.

‘Within a Waterfall project...the analyst will work at the beginning and the functional spec is the document that is produced, and gets handed over to the development team, and then they work in that phase, and then the delivery of code gets handed to the testers at the end and that is when the testing occurs. So, the different disciplines aren’t sitting together in the same place together at the same time, working on a shared goal, and that’s probably the biggest thing’ – EC1

Although the different tasks required to complete a work item were assigned to the appropriate team members, the whole team had a shared responsibility for the completion of the whole work item, instead of team members being responsible only for the completion of their individual tasks, commented the external consultant:

‘We are all as a team responsible for the quality of what we produce...when I say all of us, I mean analysts, developers, everyone...that’s quite a mind shift.’ – EC1

Team members might need to assume different roles in the team to help each other complete work items on time, commented a tester. This was quite a shift in mindset, in the opinion of an external consultant:

‘In Agile you’re everything. You can be writing user stories, you can be like a business analyst ...you’re dealing with product owners directly...you’ve got a user acceptance role.’ – T2

Thirdly, the team had to be a self-organising team, an important principle in the Agile Manifesto (Beck et al. 2001b). The tasks for each team member were therefore not organised by a person in the team; neither was there anyone who decided how a team member was going to execute tasks. Those issues had to be decided collaboratively by the whole team, said a project manager:

‘There was no real leader. It was really just individuals that had good skills, working together for a common goal. So, there was no hierarchy. I’ve never worked in a team like that either.’ – PM1

The increased collaboration in an Agile team resulted in much more interaction and communication among team members, commented a tester:

‘...human interaction is massive because you’re in a very collaborative environment.’ – T2

One principle in the Agile Manifesto is that ‘the most efficient and effective method of conveying information to and within a development team is face-to-face conversation’ (Beck et al. 2001b). Team members spent more time conversing face-to-face and less time at their desks working on their own and communicating through email. This was a big change as project team members did not have much interaction with people outside their functional area when the organisation was using the traditional approach, commented a project manager:

‘It’s almost like we’ve created this siloed approach, where no-one wants to talk to each other because they’re happy to sit at their computer all day.’ – PM2

This change required the use of communication, negotiation, relationship-building, and conflict-resolution skills, skills not often used in teams using the traditional approach.

Documentation

There was less use of heavy documentation for Agile projects at the bank. This was in line with the second value of the Agile Manifesto, the emphasis on prioritising working software over comprehensive documentation (Beck et al. 2001a). The team had to rely on the principle of creating lighter and ‘just-enough’ documentation when it was required; for example, for governance purposes. Conversely, they had to be comfortable working with and relying on lighter and ‘just-enough’ documentation. This was a major change, particularly for BAs, testers, POs, and stakeholders in the bank.

Collaboration between the business customer and project team

Another major cultural change was the increased collaboration with the business customer, which is the third value of the Agile Manifesto (Beck et al. 2001a). A related Agile principle is ‘business people and developers must work together daily throughout the project’ (Beck et al. 2001b).

In a traditional project, the business project manager and analyst justified why the bank should fund a project and they engaged the business, commented a project manager. The business customer or company made its own decision about its level of involvement in the project. Accountability shifted in Agile projects. There was more involvement and responsibility on the part of the business customer in Agile projects. The CIO commented that the business had to commit to the project by allocating a PO to represent the business and guide the project team towards building the right product. The role of the PO was critical, as a delivery team needed a business focus. The business had to empower the PO with the authority to make decisions on behalf of the business. The PO had to be involved in the project’s inception and drive the prioritisation of the product’s features, commented a project manager:

‘The business people need to be front and centre. They are the sponsor of this project. They need to put people on their team within the team. They need to commit; they need to be part of inception; they need to drive the

prioritisation. They own it, they own effectively, in theory, what's going on.' – PM1

In the traditional approach at the bank, the business might not have even met the programmers and testers during a project. In an Agile project, the PO, as a representative of the business, had to be part of the team and be co-located with the team where possible. The business had to be hands-on and play a more collaborative and active role in an Agile project, commented a product owner:

'I think as product owner, you have to buy into that [team spirit] and you have to share the enthusiasm, share the wins and successes, you know, work through any of the challenges but do it as a member of that team rather than seeing yourself as, you know, just an observer...you have to immerse yourself in the team.' – PO1

Delivering value early and frequently

Another major change in the way project teams and the business worked in an Agile project was in the use of an incremental approach; that is, producing working software at the end of every iteration (each of which was two weeks at the bank). This change was in line with the Agile Manifesto principle of delivering value early through frequent delivery of software (Beck et al. 2001b). The team and the business had to work from a list of high-level functionality in a product backlog instead of a functional requirements document. With help from the team, in particular from the BA, the PO was responsible for the creation and maintenance of the product backlog. The PO had to prioritise the work items in the backlog to ensure that the items of most business value were delivered at the end of each iteration. Maintaining the backlog items was an ongoing process and part of it involved the PO adding, removing and changing the priority of the backlog items. The PO also had to learn the use of user stories. .

Response to changes in a project plan

Another cultural change was being flexible and responsive to change, the fourth value of the Agile Manifesto (Beck et al. 2001a). The business had to accept that things could change along the way and that it may not get all the functionality for which it had planned at the start of the project. Extending the project schedule or

increasing the budget to deliver full scope was traditionally the mindset of the business. Adjusting the scope to fit the project schedule and budget was the new mindset it had to embrace.

Work practices and tools for project team members

The Agile practices and tools were new and significantly different from those used in the Waterfall methodology. The Scrum practices that were new to the teams were iteration planning meetings, which required estimation and splitting of work, stand-ups, iteration demonstrations, and retrospectives. The tools used were product and iteration backlogs, card walls and burn-up charts.

Unlike Agile projects, dialogue and discussion with the team was not part of work estimation in traditional projects. A PM commented that the work estimation in Agile projects was carried out through collaboration between team members and the business, and the use of Agile estimation techniques like ‘planning poker’ (Mountain Goat Software n.d.). Splitting the work into small work items as part of iteration planning was a big change as teams were used to working on large work items specified in a traditional functional specification document. The increased transparency resulting from daily stand-up meetings and card walls was something new to team members. Instead of carrying out a post-implementation review after the completion of a project, a retrospective is carried out at the end of each iteration. This process adheres to the principle in the Agile Manifesto (Beck et al. 2001b) that promotes the idea that a team should reflect at regular intervals on how to become more effective and adjust behaviour accordingly.

4.2.3.2 Change in technical practices specific to programmers and testers

A principle in the Agile Manifesto is the continuous attention to technical excellence and good design in order to enhance agility (Beck et al. 2001b). The technical development practices adopted were pair programming, test-driven development (TDD), emergent design, continuous integration and automated testing (AT).

Pair programming and TDD are two XP practices that were a major change for programmers. An IM commented that TDD was a fundamental change for programmers at the bank. The programmers also had to adjust to the idea that a big upfront design was not always required. They had to come to grips with the concept

of emergent design, where they had to allow the design to emerge through TDD instead of doing a full design. A coach said that it was a huge mindset change for some programmers.

The XP practice of automated testing, specifically, using an automation tool to execute a suite of test cases, was a big change for testers. Testers had to learn a new product and a new language for automation in some projects.

4.2.3.3 Change in work practices specific to a business analyst (BA)

A BA did not produce a functional specifications document using an Agile ISD approach, commented a BA. The team started with a set of items in the product backlog that were considered priority requirements. A BA would initially start by eliciting just enough detail about a backlog item for an iteration from the PO, write a brief narrative about it, consult the team, and include test criteria for that item. The whole team and the PO would discuss the item before starting work on it, said the BA. A BA worked on progressively refining and understanding the backlog items as the project progressed, using a just-in-time and just-enough (avoiding unnecessary details until needed) approach. While doing the above for items in an iteration, a BA also had to stay slightly ahead of the team, looking at the items that were required in following iterations.

4.2.3.4 Change in the role of a project manager (PM)

One principle of the Agile Manifesto is giving Agile teams the environment and support they need and trusting them to get the job done (Beck et al. 2001b). PMs who had been working in a traditional manner had to get over their tendency to control and make decisions for the team in Agile projects, commented a PM. The PM said that a traditional PM saw a need to keep abreast of which team member was carrying out which task, and the progress of the tasks. An Agile PM had to relinquish control and needed to support and empower the team, said the PM:

‘So, I guess I was used to that command-and-control zone, so “I am the project manager...I am going to tell you what to do”. Kind of painting it in a bad way, but you controlled the people that were effectively reporting to you...trying to control every piece of work that’s going on and being across everything’. – PM1

A PM now had to trust team members to recognise the tasks required in an iteration and to complete them on time, commented the PM:

‘It all boils down to trust and confidence; confidence in your own ability to trust them’ – PM2

4.2.3.5 New role of an iteration manager (IM)

An IM helped the team in the use of Scrum practices, made sure the team was working well together, ensured it was efficient in achieving each iteration’s goals, and removed obstacles hindering the team’s progress, said an external consultant:

‘It [the role of an IM] is twofold. It’s kind of the Agile ceremony side of things ... keeping the ball rolling and you know, looking ahead, an iteration ahead, making sure stories are coming through, moving along the wall, flowing nicely, everything is working as should be. But then there is also the people side of things, making sure that people are happy and motivation is high, the team is gelling and forming, and you know that you are having the right discussions that you need to be having...you need to be a certain kind of person to do it.’ – EC1

One IM commented that the role was primarily about people leadership and team building. The IM said that the person in an IM role had to be conscious of the team, comfortable with people, sympathetic and empathetic, but be able to have a ‘difficult’ conversation with a team member when necessary. The other IM added that the role was also about securing buy-in from team members who were not open to an Agile ISD approach or did not understand the approach.

A coach also said that a particular trait of an IM was that the IM had to be strong, in other words acting as the protector and gatekeeper of an Agile team; for example, ensuring that the team did not over-commit to what it could complete during an iteration because of pressure from a PO, PM or stakeholder.

4.2.3.6 Change for stakeholders (Enterprise Agility)

This section describes the changes for stakeholders outside the project teams at the bank, that is, the changes required for Enterprise Agility.

Stakeholders were used to working in a certain way to support project teams when using the traditional development approach. The change to an Agile ISD approach required a change in the way they worked and interacted with the Agile teams and required a change in their mindset, commented the APM. The affected areas had to be compatible with the new Agile ISD method for Enterprise Agility:

‘They [support groups] will often have to work a different way to support an Agile project.’ – APM

Stakeholders within the IT division affected by the change

The stakeholders within the IT division affected by the change were middle management, and the functional areas at the front and back ends of the delivery life cycle, which were the PMO, and Infrastructure and Operations respectively.

Middle Management

The stakeholders had to embrace Agile values and principles and do very different things from what they did in the past, commented the APL. For example, the resource managers within the different functional areas had to work with the PMO in allocating their staff to projects. In a traditional system, a resource manager generally did not allocate staff from his or her area 100% to a project. The staff concerned would also be carrying out other duties; for example, doing operational work for their area or working on other projects at the same time. In contrast, the resource manager had to allocate staff 100% to Agile projects. As the change to an Agile ISD approach in this case was not a ‘big-bang’ implementation, the resource managers had to deal simultaneously with both a Waterfall and an Agile project resource model.

Furthermore, in the Waterfall model, staff allocated to traditional projects were still physically located together with their respective managers in their respective areas. In contrast, under the Agile model, the staff were co-located with the Agile team for the duration of the project. However, middle management’s personnel responsibilities did not change. For example, middle management was still responsible for performance reviews. Furthermore, any decision to remove a team member from an Agile project was the responsibility of the middle manager, not of the PM or IM for the project.

PMO

The major changes for the PMO were in the areas of project resourcing, governance and reporting.

Besides attempting to ensure that a team member allocated 100% of his or her time to an Agile project, the PMO had to ensure that the team member was available from the start to the end of the project, commented an external consultant. It was preferable that the team member not join the Agile project after it started or leave the project before it ended. For example, this was the case for a traditional project where testers joined the project later to conduct testing or an analyst left the project after the analysis phase was completed.

‘The key difference in a large, mostly Waterfall organisation, between a Waterfall project and an Agile project, to me, is the way it’s resourced. So, everyone who’s required for the project gets resourced at the beginning of the project and they are resourced until the end... So that’s probably one of the initial key differences between the Agile and Waterfall projects that happened in the bank.’ – EC2

Changes in governance were required since the traditional measures used to monitor and control projects were not suitable for projects using an Agile ISD approach. The measures in use for governance of projects were suitable for a linear and traditional Waterfall approach. Traditional projects emphasise documentation, milestones and approvals. In Agile projects, lighter and ‘just-enough’ documentation was produced when required for governance purposes. The concept that the speed typical of Agile projects could be less risky was also counter-intuitive to how governance in banking usually worked, commented the HSD.

Infrastructure and Operations

The major change in the Infrastructure and Operations areas was in continuous delivery (CD) and training.

The first Agile IS development principle in the Agile Manifesto is the continuous delivery of valuable software (Beck et al. 2001b). However, once the Agile team produced software at the end of an iteration, the release process reverted to its

traditional Waterfall process, which had barriers preventing quick and frequent software releases, commented an external consultant:

‘So, you can kind of get right the way almost to production and you need to go into a UAT environment and that has to be done completely non-Agile.’ – EC1

Hence, software was only infrequently released to production. The bank was not used to ‘big-bang’ deployments and large-scale releases as the process to release software into production was controlled and long, commented a programmer:

‘We’ve done a release; if it passes all the tests in the automated environment, it should be deployed. And they are saying, “No, it’s got to wait two weeks. It’s got to go ... through UAT and when UAT is signed off...wait a week till it’s deployed in production, because it takes a week for all the other people in all the other departments to consider the change and work out whether it affects their environments.” So, it’s very bureaucratic.’ – P1

The bank implemented CD, another major change in software deployment at the bank, so that the software developed by the Agile teams was available for more frequent releases. This was also done to reduce the risk associated with big system updates, said the HSD.

The training group created training documentation once a product was fully developed. Since a product in an Agile project was developed and released in an incremental manner, the training group had to change its process for creating training material.

Stakeholders outside the IT division affected by the change

Some of the areas outside the IT division that were affected by the new approach were Finance, and Legal and Compliance.

Finance

The bank used the traditional IT funding process, based on the project scope, which was defined at the start of the project. This required an upfront estimation of the cost

and schedule for the project. Additional funding was requested if the project exceeded its planned cost due to a change in scope or schedule.

The bank started a 'beyond budgeting' project which looked at changing the traditional annual budgeting process, commented the HSE. The bank found that, in traditional annual planning, fifty per cent of the planned annual budget changed in terms of priorities, due to the level of volatility at the front end of the business environment. Management saw no point in having staff spend two weeks developing an annual plan and then changing it a week later.

Legal and Compliance

In traditional projects the legal and compliance teams were used to receiving a functional specification at the time of engagement with the team. They were able to see the details of the final solution upfront. However, as an Agile project did not use a functional specification document, they received details of the product in increments. Furthermore, Legal and Compliance were used to receiving comprehensive documentation in traditional projects, so receiving minimal documentation in Agile projects was a big change for them, commented a PO.

4.2.3.7 Summary of findings on organisational changes

The organisational change within the bank was the biggest issue in transitioning to an Agile ISD approach. The Agile transition caused a fundamental change in the way people worked and in their culture, provoking a change in both behaviour and values: it entailed an Agile transformation. The change not only affected the project teams, but also areas and stakeholders outside the project teams: it entailed Enterprise Agility. The changes required quite a shift in mindset for those affected.

The teams had to learn a new process, practices and tools, acquire new skills, learn to work and collaborate as a team, and had more responsibility. It also required a change to an Agile mindset and a behavioural change to support the new way of working.

The table below contains a summary of the changes (and relevant sections that describe the changes) for the project teams and the business examined in this study.

Table 16. Summary of changes for project teams and business

| Agile ISD approach | Traditional Waterfall ISD approach |
|--|---|
| Iterative development model. (4.2.3.1 General changes in culture and related work practices for project teams and business – Delivering value early and frequently). | Life-cycle development model. |
| Respond to change in a project plan. (4.2.3.1 General changes in culture and related work practices for project teams and business – Response to change in a project plan). | Follow a project plan: plan the work in detail and work the plan. |
| Flexible project scope. (4.2.3.1 General changes in culture and related work practices for project teams and business – Response to change in a project plan). | Fixed project scope. |
| Top-down group estimation of work. (4.2.3.1 General changes in culture and related work practices for project teams and business –Work practices and tools for project team members) | Bottom-up individual estimation of work. |
| Team self-organised. (4.2.3.1 General changes in culture and related work practices for project teams and business – Teamwork). | Team managed by PM. |
| Leadership-and-collaboration management. (4.2.5.4 Reactions to change in the role of a project manager (PM) | Command-and-control management. |
| Team members co-located. (4.2.3.1 General changes in culture and related work practices for project teams and business – Teamwork). | Team members located in their respective functional areas. |
| BA performs just-in-time and just-enough analysis of product backlog items during project. (4.2.5.3 Reactions to change in work practices specific to a business analyst). | BA produces a Functional Requirements Specification document at the start of a project. |
| Teamwork (individuals and interactions). (4.2.3.1 General changes in culture and related work practices for project teams and business – Teamwork). | ‘Solo’ work. |
| Team collaborates to complete work items. (4.2.3.1 General changes in culture and related work practices for project teams and business –Teamwork). | Teams hand over work item tasks to each other using a sequential development process. |
| Extensive interaction and communication among team members. | Minimal interaction among team members. |

| | |
|---|--|
| (4.2.3.1 General changes in culture and related work practices for project teams and business –Teamwork). | |
| Use of ‘just-enough’ documentation. (4.2.3.1 General changes in culture and related work practices for project teams and business – Documentation). | Use of detailed documentation. |
| Work on one small work item at a time (4.2.3.1 General changes in culture and related work practices for project teams and business – Work practices and tools for project team members). | Work on large work items at a time. |
| Whole team responsible for completion of work item. (4.2.3.1 General changes in culture and related work practices for project teams and business – Teamwork). | Team member responsible for own work item task. |
| Assume other roles within the team. (4.2.3.1 General changes in culture and related work practices for project teams and business – Teamwork). | Stick to usual role in the team. |
| Extensive collaboration between business (represented by a PO) and project team. (4.2.3.1 General changes in culture and related work practices for project teams and business –Work practices and tools for project team members). | Limited collaboration between business and project team. |
| Daily stand-up meetings. (4.2.3.1 General changes in culture and related work practices for project teams and business –Work practices and tools for project team members). | Weekly ‘sit-down’ meetings. |
| More visibility. (4.2.3.1 General changes in culture and related work practices for project teams and business – Work practices and tools for project team members). | Less visibility. |
| Emergent design. (4.2.5.2 Reactions to changes in technical practices specific to programmers and testers). | Upfront design. |
| Test driven development. (4.2.5.2 Reactions to changes in technical practices specific to programmers and testers). | Traditional development. |
| Pair programming. (4.2.5.2 Reactions to changes in technical practices specific to programmers and testers). | Individual programming. |
| Automated testing during iterations. (4.2.5.2 Reactions to changes in | Traditional testing at the end of development phase. |

| | |
|--|---|
| technical practices specific to programmers and testers). | |
| Retrospectives at end of each iteration. (4.2.3.1 General changes in culture and related work practices for project teams and business – Work practices and tools for project team members). | Post-implementation review (PIR) at the end of a project. |
| New role of IM. (4.2.3.5 New role of an iteration manager). | IM role did not exist |

Project teams also required the support of stakeholders, who worked in such a way as to support teams using the traditional development approach. The change to an Agile ISD approach required a change in stakeholders' mindsets and in the way they interacted with the Agile teams. The stakeholders within the IT division affected by the change were middle management, the PMO, Infrastructure and Operations. The major changes in the PMO were in the areas of governance, reporting and project resourcing. The major change in the Infrastructure and Operations areas was in the continuous delivery of new software. Some of the areas outside the IT division that were affected by the new approach were Finance, and Legal and Compliance.

4.2.4 Action/Interaction

To help explain and describe Agile transition in the bank, this section presents the themes (as shown in Figure 8) that were interpreted as capturing the element of action/interaction (shown in Figure 3); that is the strategies employed to manage organisational change in the bank.

| |
|---|
| <p>4. Action/Interaction</p> <ul style="list-style-type: none"> ● Obtain top and middle management support ● Obtain stakeholder support ● Obtain external support ● Obtain Agile enterprise adoption expertise ● Obtain change management expertise ● Change management activities: <ul style="list-style-type: none"> ● create awareness of need to change ● provide training and education. ● provide coaching ● sustain change ● Team building |
|---|

Figure 8. Strategies to manage the change

4.2.4.1 Support from top management

In the case of organisational change, the most important thing is senior stakeholder support, commented the APM. The move to agility was a significant investment for the bank. The HSD initially tried a bottom-up approach that was not successful. What gave the adoption the momentum the second time around was the executive sponsorship and drive coming from the senior leaders. The adoption was endorsed at the highest level, by the executive committee of the bank. The HSD said support from the CIO, the sponsor for the Agile transformation, was instrumental in the success of the program. Management's courage to make the required changes was essential to the transition:

‘[CIO] got behind it three years ago. You absolutely need high-level, committed, passionate support from management. This stuff is courageous, it requires genuine courage from management. It's counter-intuitive to how governance in banking and finance usually work, the concept that speed can in fact be less risky.’ – HSD

A steering committee was formed for the Agile transformation in the bank. It comprised the CIO and the staff reporting directly to him, who represented all the disciplines within the IS division. Senior management provided support by creating an AP and hiring an APM. The APM reported to the Head of Solution Analysis (HSA), who reported to the HSD. The APM was responsible for the Agile transformation and the management and allocation of coaches to Agile projects. The AP was successful in getting Agile practices embedded in the bank and in creating the momentum the bank needed to be agile.

Senior management also provided support in hiring external consultants and internal coaches, funding training and education, and set up collaborative workspaces for staff, explained a tester:

‘I think one of the other projects, they didn't have an area to have the team together. So, he [CIO] kind of made sure that there was an area created for them; it just makes it easier knowing that the higher levels are supporting you.’ – T1

Commitment and passion were also essential to the transition, commented the HSD. For the motivation to change, staff needed confirmation from senior management that what they were doing in relation to Agile adoption was valuable, said the APM. That confirmation was encouraging and motivating, confirmed a tester:

‘I think that the project was very encouraging because we had some fairly executive kind of guys come down and start looking around the room, taking notice, interest with cameras down from the bank, all this kind of stuff and it was great. They were showing a real interest, a real appetite and interest for it and that was very encouraging. Like the CIO, he would come down and he would just talk, “How’s it going?” and stuff, taking an interest. It was good, it was motivating.’ – T2

Besides providing support, senior management also needed to practise Agile values; for example, by not making decisions that would create further silos in the organisation or not making decisions in a non-collaborative manner. The support from senior management also had to be continuous to sustain the transition, the APM pointed out: senior management underestimated how big the change would be and support therefore dipped for a period in the early stages of the transition.

4.2.4.2 Support from middle management

Middle management had to embrace Agile values and principles and do things that were very different from what they were used to. They had to progress Agile and create Agile awareness within their respective areas, as well as encourage and help their staff in the Agile transition exercise. The resource managers within the different functional areas had to work with the PMO in allocating staff full-time to Agile projects. The issue of middle management resistance is described in section 4.3.2.4 Middle management resistance.

4.2.4.3 Support from stakeholders

The changes occurring among stakeholders have been described in section 4.2.3.6 Change for stakeholders. The teams required the support of stakeholders when delivering Agile projects. The AP had to work with senior leaders and functional areas to change the way the functional areas worked in order to support the Agile teams, and also remove organisational impediments and bureaucratic processes that

would be a hindrance to future Agile projects. The issue of a lack of stakeholder management and support is described in section 4.3.2.5 Lack of stakeholder management and support.

4.2.4.4 External support

Due to the lack of Agile experience within the bank, it was critical that the bank partnered with an external consulting company to provide coaching support in its projects and help the bank start its Agile journey, reported the APM:

‘Nothing beats experience and so what the use of the consultants has given us is that experience, that experience not only in a bank like ours, but similar organisations, and that knowledge. It’s been critical to us, having that experience.’ - APM

The external consultants coached the team in the areas of Agile project management, iteration management, Agile development, and testing, as well as coaching team members in their roles as PO, PM, IM, BA, P and T.

A tester in a pilot project found the external consultants very good at mentoring and providing assistance, but said that at the same time they managed to give team members the independence they required. Besides being technical people, the testers found the consultants also to be ‘people’, people to whom the tester could relate. The consultants did not give the impression that the old way of working was wrong. They did try to introduce the new way as a different and better way of working. The tester found the use of external consultants a very good way of introducing Agile to the teams.

4.2.4.5 Enterprise Agile adoption experience

Two coaches with Enterprise (as opposed to team) Agile adoption experience were later employed to assist the bank in spreading agility to all projects and to the wider organisation, and to help the bank achieve its strategy of becoming an agile organisation.

4.2.4.6 Change management expertise

An external change management consultant was engaged to assist in change management in the early stages of Agile implementation (the issue of a lack in change management experience is described in section 4.3.2.7 Lack of change management experience). A Change Management Practice (CMP) and the role of a CML were created about two years after the start of the first Agile project. The focus of the CML was to get the bank to be more resilient to change in general, and to put in place an operating and engagement model to manage change. The CML assisted in the Agile transformation program by highlighting issues that had be considered during the transformation.

4.2.4.7 Change management activities

Becoming an Agile organisation was a big organisational change management story, commented the APM. The bank had to look at Agile transformation from an organisational change management point of view. It not only had to focus on implementation at the team level but also on the implications of the implementation at the organisation level. It was all about changing mindsets and the way people worked, and about taking appropriate steps to manage the change smoothly and effectively. Change management had to be an ongoing activity. The major activities subsumed under change management were about communicating the need for Agile adoption, training and education, coaching, and sustaining the change.

Communicating the reason and goal for Agile adoption

The CIO, the sponsor for the Agile transformation, and senior managers within the IT division circulated messages about the reasons for Agile adoption, the benefit and value of it, and the need for staff to accept and participate in the transition in order to see its benefits.

After the success of the first pilot Agile project was announced, Agile development was enshrined as one of the bank's six core business principles and the bank's executives announced a goal that half of the bank's projects would be using an Agile ISD approach within three years.

Training and Education

After the bank's second Agile project was completed, the AP started Agile training programs for the IT division, especially for staff involved in project delivery. The most successful was a grassroots program that explained the meaning of Agile, commented the APM. The trainers focused on teaching Agile as a culture and mindset rather than a method, promoting Agile practices as well as Agile values from a more holistic point of view:

‘At the bank we have seen great success through our grassroots activities of introducing Agile values, principles and techniques for colleagues to adopt and use in their everyday work.’ – APM

The grassroots program ran for five months. Every month there was a focus on an Agile value and a practice that supported the value. The trainees changed, and they became more engaged and enthusiastic, the APL noticed. They started to apply what they learnt, collaborating more instead of working in isolation. The AP said the people who attended the training wanted to learn more about Agile.

There was also a one-day introductory training session to increase staff awareness of Agile. This explained the purpose of agility and its meaning in relation to the bank and trainees. It also covered the Agile values and principles, how Agile practices related to those values and principles, how the practices complemented each other, and practices that could be used outside Agile projects; for example, stand-ups, card walls and retrospectives. Other areas covered were the differences working in an Agile compared to a Waterfall project, and the new roles of an IM and a PO. The training was another key success. Anyone going to work on an Agile project had to attend the training; some seventy per cent of people in the division attended.

The grassroots program and introductory training assisted the cultural change, said the APM. People started to apply the Agile values and principles not only in Agile projects but also in their BAU work. There was more communication within the division; people had daily stand-ups, used card walls and retrospectives. The team members interviewed said that it would be difficult working in an Agile project without any training.

A coach said functional managers and team leaders also had to be educated about Agile in order to minimise the discomfort caused by myths, misconceptions and miscommunication about Agile:

‘I think the thing that I’ve experienced here and from my previous experience that has really helped is that one is education, and that’s education at all levels. So that’s just not the education of the people who are doing it and who are actually going to be delivering the projects. It’s the people who have the people who deliver the projects, if you see what I mean. It’s the team leaders, it’s the managers; it’s the education all the way down. Because if you don’t have that, then you’ve got myths, you’ve got miscommunication, you’ve got discomfort, you’ve got incorrect assumptions being made. So, I think that education all the way through is really important.’ – AC1

The misconceptions had a negative effect on the transformation, commented a PM who had to spend time ‘myth busting’ in order to address them. Workshops were also held to debate myths and misconceptions about Agile.

Stakeholders were also educated about the Agile process, the differences between a traditional Waterfall and an Agile project, and the role of stakeholders in an Agile project, as reported by the coach:

‘We also put something together for stakeholders. So, stakeholders come along to inception, you know, as a stakeholder coming along to inception: this is what you can expect and this is why you’ve been invited. Rather than just come to your email one day and realise you’ve got a two-week block in your diary and you don’t even know what it’s there for. So that’s the sort of thing we’re trying to do now.’ – AC1

The IT division ran a program to empower its staff and to cultivate collaboration, innovation and a continuous improvement culture. It was a program where a cross-section of people from the IT division went off-site for three nights. They were involved in team-building exercises and activities designed to develop lateral thinking and problem-solving skills, to get staff thinking in different ways, and to get staff out of their comfort zone, to become agents of change.

Another initiative that contributed towards creating a more collaborative environment across the bank was the establishment of ‘hack days’. Once every quarter, staff from across the bank worked on ideas and innovations that addressed issues or created value for its customers. The initiative has resulted in many innovations that were implemented; for example, the bank’s first mobile banking application.

Coaching

The main duty of most coaches was coaching an Agile team from start-to-finish of the project. They coached the team in the use of the Agile process, in collaborating and working as a self-organising team in their different roles, and in the use of the Scrum and XP practices. They also helped teams identify problems and areas where things were not working well and got the teams to solve the problems. They encouraged and helped teams to find better and different ways of doing things so they could see the benefits, and thus created a desire in them to change. The coaches managed resistance mainly by getting team members to see the value of change, noted an external consultant:

‘So, when you do hear the “Why?” you go, “Okay, let’s talk about why you are trying to improve your process times; improve your cycle times; decrease your lead times, have a lean perspective. You’re trying to deliver higher quality software, trying to have a higher quality product, better value to customers. These are the reasons why”, versus “you should do stand-ups and retrospectives and card walls”.’ – EC2

Coaching was a critical factor in the early stages of Agile implementation at the bank. The teams found it an invaluable aid. A majority of the team members thought that having coaches who coached them in their specific roles and in the practices applicable to their roles was helpful. They said that a team new to Agile would find it very difficult without coaching. For example, a team could be working in a non-Agile manner without knowing it. The team could be just practising a ‘cargo cult’ version of Agile; that is, using Agile practices without an Agile mindset, and not understanding the reasons underlying those practices. Two examples are misusing the daily stand-up meeting to hold team members accountable for individual micro-progress, and teams working in iterations but working in a ‘mini Waterfall’ manner

instead of collaborating as a team during iterations. The APM said the benefit of coaching compared to training was that with coaching, teams were ‘trained’ in an actual development environment and they were learning on the job. Some coaches also provided coaching in areas outside IT; for example, in Human Resources (HR), helping these areas to introduce Agile values and applicable practices into their work. The coaching in the early stages of implementation was done by external coaches, said the APM. Internal coaches were used later in implementation for long-term sustainability:

‘In the beginning it was mostly [external company] coaches and now we are shifting to mostly permanent, and that is just an evolution thing. As it’s a cost to long-term sustainability, we need to be doing this ourselves, not hiring consultants.’ – APM

Sustaining the change

The CIO’s recognition of the success of the Agile projects was a key factor in sustaining the change. The communication from the CIO also included positive messages from stakeholders who were involved in the projects.

Little rewards and celebrations were a big success in an early project, commented a PM. They were random and conducted once every two weeks at different times, in celebration of an achievement. One example was the provision of Boost Juice at a retrospective meeting. The team thought it was one of the best things in an iteration. Their appreciation level was massive and this gesture clearly was a motivating factor for the team. Team members said they typically did not get anything, or any recognition, in traditional projects. They used to just sit in their functional area when working on traditional projects, without any form of recognition. They might have had a celebration at the end of the project, but many did not attend. After hearing about the success of rewards and celebrations in that project, the manager for the PM team encouraged PMs to provide little rewards during projects, not only at the end. However, a very senior BA did not understand why celebrations were required, as the BA felt completing work was just part of the job and there was no need to get excited about it.

The team also expressed positive affirmation for one another; for example, by thanking each other for assistance during the project. Team members' acknowledgement of each other's contributions created a positive environment. A tester said that because teams were delivering completed features every two weeks, it was important to maintain team morale, enthusiasm and passion.

4.2.4.8 Team building

A PM said that co-location alone did not create an Agile team. Team activities and team-building games were used to develop collaboration and trust within the team. Trust was essential to a high-performing team. Another PM encouraged the idea of having team activities for every project to improve teamwork and communication. The team activities selected included conducting the Myer Briggs personality test for team members to understand each other better, rock climbing to build trust within the team, regular team lunches, and heritage food days, to develop interpersonal relationships.

All the team members interviewed enjoyed the activities and found them very beneficial to team building. However, although a very senior BA thought the activities were useful, the BA also found them 'pathetic'. The BA preferred building relationships by just working together on a project.

4.2.4.9 Summary of findings on action/interaction

The most significant strategies used at the bank to manage the change resulting from the transition to Agile were support, change management, and team building.

Top management support was most critical in managing the organisational change. Senior management provided support by appointing an APM to manage the transformation, hiring external consultants as coaches, recruiting internal coaches, funding training and education, and setting up collaborative workspaces for staff. The CIO's recognition of the success of the Agile projects was equally important.

Support from middle management was also very important in creating an awareness of Agile within their area, encouraging and helping staff in the Agile transition, and helping to meet the resourcing requirements of Agile projects by allocating staff to them as required. Stakeholder support was essential to Enterprise Agility as well.

Enterprise (as opposed to team) Agile adoption experience and expertise was required to assist the bank in spreading agility to all projects and to the wider organisation, The bank further acquired the services of an external change management consultant in the early stages of implementation, to assist with change management.

Becoming an agile organisation was a big organisational change management experience. Change management had to be an ongoing activity. The major activities engaged in as part of the change management process were: creating an awareness of the need for Agile adoption, training and education, coaching, sustaining the change, and stakeholder management. Management support was also critical. The education and training marked the beginning of the cultural change. The teams found coaching very useful, in fact key to the effective use of the Agile ISD approach. Lastly, rewards and celebrations were important in reinforcing the change, and team building activities helped to develop collaborative teams, and trust within the teams.

4.2.5 Consequences

To help explain and describe Agile transition in the bank, this section presents the themes (shown in Figure 9) identified in the data analysis that describe the consequences (shown in Figure 3) of the changes listed in section 4.2.3 Phenomenon of Change. The consequences are expressed in terms of the experiences and reactions of project team members and stakeholders affected by the Agile transition.

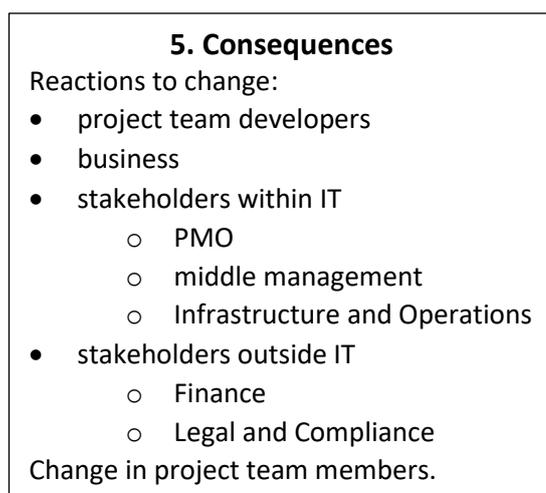


Figure 9. Outcome of change

Although the interviewees found the use of an Agile ISD approach beneficial, they generally also found the change difficult. The organisational change within the bank was the biggest issue in implementing an Agile ISD approach in the bank, commented the APM, adding that all the obstacles to the transition were a result of organisational change:

‘The biggest issue [in implementing an Agile ISD approach] is going to be organisational change.’ – APM

Although the change was difficult, the interviewees generally embraced the new approach over time. There was more teamwork, customer collaboration, trust and consensus-driven behaviour across the Agile projects. It took a while to get the ‘hang of things’ and of what one should do in certain situations, commented a developer. There is an adjustment phase. Team members learn as they get through a project. It can be extremely difficult, but the team members generally get it eventually, commented an EC. An Agile coach commented:

‘I think it’s when you almost get a penny drop. The penny drops and they’re like “Ah, okay”. Then they go onto the next project and you see such a massive difference... You know, you have people that are very quiet, very introverted, you know, not really wanting to speak up in their first inception, to the second inception, sitting on a table, writing user stories, getting in there, asking the questions, you know, completely different.’ – AC1

4.2.5.1 Reactions to general changes in culture and work practices by project teams and business

The change in the way of working was difficult for the bank, as the new way was significantly different from the old, said a programmer:

‘Anything that’s dramatically different from what you are used to doing, becomes hard and become frustrating.’ – P1

The change was also difficult because team members were used to working in a way that had been in place for a significant length of time, commented an EC:

‘They put a process in place that they have been using for a while. So, I think when you are used to that, a change like this is going to be fairly significant

but yeah, you know they are deciding to make a significant shift in the way they work and that is always going to be hard.’ – EC1

The big change in mindset and behaviour needed to support the new way of working was even more difficult for the bank itself. Embracing an Agile mindset required an organisational transformation, said the APM:

‘I have found the greatest challenge in introducing Agile to be the culture change that is needed to support the new way of working...helping people take one mindset and go to a new mindset, and that is the side of it that I had not appreciated, the full scale of how hard that was going to be, when I started.’ – APM

The change in mindset and way of working required an unlearning of old behaviours and habits. The ongoing effort and time spent on this was considerable. However, the project team members and POs interviewed generally embraced the new approach and thought it was a positive change. The APL said the culture changed as IT staff started to embrace an Agile mindset and behaviour. There was more teamwork, customer collaboration, trust and consensus-driven behaviour across the Agile projects, the APM noted. The change was evident, commented an IM.

‘Everyone can see it happening. So yeah, all the card walls, all the different projects must have their stand-ups, and how they work – they’re all sitting together. I think working in this building you’ll see a group of people huddled together with a laptop, just trying to knock something out together. I think that helps because across the bank, across a division, everyone’s got that mindset. Now it’s just becoming part of ...it’s just become part of what you do.’ – IM2

The reactions from the project team members and stakeholders interviewed to changes in the work culture and the way of working are described below.

Teamwork

It generally took about four iterations for team members to get used to working together as a team. Although the change was challenging, the team members

interviewed generally liked the co-location, collaboration, the bonding and team spirit characteristic of working in an Agile environment.

Some developers who had finished working on an Agile project were allocated in their next project to a traditional project, commented a programmer, who added that these developers then missed the team spirit of an Agile team:

‘The other guys that are not involved in Agile projects any more, they hate what they are currently doing, because they yearn to be in an Agile project where there is all this camaraderie...and all that kind of stuff. Where they are at the moment, they are in a cubicle, sit on their own all day and work, and then they go home. And it’s like, “What am I doing this for?”...’ – P1

Co-location

Being co-located was a positive change, commented a programmer. It facilitated communication and collaboration within the team and with the PO. The team could resolve problems very quickly without going back and forth with emails and waiting for responses or decisions. The proximity of the team members was a big benefit. It was difficult for the team and business when POs and stakeholders were in a different location from the project team. The people who were not co-located felt isolated from the project.

However, it emerged that a PO still had to be kept involved with the team in the PO-specific area; it was very easy for a PO to lose context and track of what was going on in the PO’s area if the PO co-located with the Agile project team.

Collaborating to complete work

However, changing to a culture of multi-disciplinary teamwork was very difficult as the IT division was structured in silos, said the APM. Each silo had its own goals and KPIs. Learning to work as a cross-functional Agile team was a big challenge for team members. For example, having to collaborate to complete work items instead of handing work item tasks over to each other using a sequential development process was difficult. The teams in the Agile projects initially tried to develop work items in a mini-Waterfall manner; in other words, using a sequential development process instead of collaborating as a team, commented a coach:

‘There’s this perception of a tester can’t start any work until the development’s finished. A developer cannot start any work until the product owner and the business owner have some narrative around the particular story and what the criteria is. So they’re almost waiting for a piece of paper to come with them with their instructions before they start.’ – AC2

The coach said that it was a challenge trying to change the habit of using a sequential process involving handovers, particularly for people who have been working that way for a long time:

‘It is a huge mindset change for some people and certainly...developers have been there for 25, 30 years, that’s all they know, that’s all they’ve done.’ – AC2

To get them collaborating and working as a team, the coach had a rule that no code could be written unless the team and the business product owner had discussed the user story they were planning to work on. Each person would then do their part at the without waiting for handovers, collaborating while completing their part.

Completing one work item at a time

The teams also initially struggled with working on one user story at a time in an Agile ISD approach, according to a coach. For example, a team member working on a work item would work simultaneously on related work items even though they were of low priority and could change later, said the coach:

‘The thing I’ve seen that people struggle with the most is ... only doing that piece of work [and not related pieces of work at the same time]. I’ve noticed that people in the very beginning find it very difficult.’ – AC1

The coach also said the team found it difficult as team members were used to developing all the functionality specified in a functional specification document, and applied that mindset when working with a set of work items specified in the product backlog:

‘...because they’re so used to getting a whole functional spec that has everything and they have to do everything, but they sort of apply the same thing to stories.’ – AC1

The coach had to help the team get into the mindset of working on one item at a time:

‘We literally just took everything off the wall. Everything off the card wall, we took it off and we put one story on and we said, “You are only to work on this one story...Imagine that those other cards do not exist and just do that one.” So we get that one done and then we put another one up, “Right, now do this one, just one and then get that one done”...’ – AC1

Shared responsibility and different roles

The people interviewed generally liked the idea of shared responsibility for the completion of the work items. It removed the culture of blame which could occur when there was segregation of work and when team members in the different roles were only responsible for the tasks assigned to them. It helped remove the ‘us versus them’ mentality in the team, commented an EC:

‘The next biggest accelerator [significant change] I’ve seen, when people start saying “How can we do this?” versus “How do I do this?”, from “That’s not my responsibility” to “That’s our responsibility”’ – EC2.

However, having a shared responsibility to complete work and assuming different roles when required was a difficult shift in mindset for some, an external consultant noted. Some team members were more open than others in assuming different roles. It was easier for programmers to assist with analysis and testing than for analysts and testers to do programming. Some developers also preferred just to write code, commented a BA:

‘I would love to say everybody is just another body in the project team, but the reality is the developers generally only do the development. So, you can be a dogsbody and sometimes that’s frustrating, depending on the project you’re on.’ – BA1

Self-organisation

Being part of a self-organising team was difficult for some team members, especially those who were used to a command-and-control environment where team members

were delegated work: they preferred someone telling them what to do. They were not used to making decisions, observed an EC:

‘Some of the people in the team...they were so used to just looking to someone to tell them exactly what to do.’ – EC1

A programmer who was comfortable with self-organisation said it depended on a person’s level of motivation. An external consultant said it was about team members knowing they could feel safe making decisions in an Agile environment.

Increased communication and interaction

The increased interaction was also difficult for some. A programmer said the increased interaction was good but difficult at the start; it was much easier working in front of a computer. The new Agile environment was confronting and quite uncomfortable. Dealing with people and having ‘difficult’ conversations with them was hard. There were often differences in opinion and conflict between team members. It was impossible to get away from the rest of the team even if one wanted to; they were always around. Each team member had to learn how to interact and get along with the rest of the team.

Communication was important when working in an Agile team, said an AC. A team member was taken off the team for just doing what the team member wanted to do, without communicating, thus making the rest of the team anxious as to how their work would be affected.

Most team members interviewed thought that communicating face-to-face was more beneficial and made it easier for them to collaborate, compared with their usual way of communicating via email. However, an external consultant saw that face-to-face communication was extremely difficult for some. It was difficult for people to get out of the culture of communicating through email, and for some people too, the habit of using emails to protect themselves from possible subsequent blame or criticism. They needed to break that learned behaviour, as pointed out by a project manager:

‘Some people need to break their learned behaviours, so it’s not natural behaviours. Learned behaviour of “I will just send an email to him”; “Well,

he's sitting next to you". "I will send an email out to the team"; "Talk to the team". It's almost like we've created this siloed approach, where no-one wants to talk to each other because they're happy to sit at their computer all day.' – PM2

Noise

The noise level increased with the increased communication. Some team members found the environment too noisy while others liked it, a programmer said:

'But as you can hear, like out there, the talking never stops. So, it's like everybody hears what everybody else is doing, and that's good. If you didn't like it then you wouldn't be here.' – P1

Interruptions also increased with the increased interaction. Many people in a team said they were interrupted so often that they could not get work done. The team came up with some team rules about handling interruptions at a retrospective meeting.

Documentation

The BAs in the Agile projects found it difficult dealing with documentation in general, and especially compliance documentation, as the guideline was simply that documents created should be 'fit for purpose' and 'just enough'. The BA obtained advice from previous Agile projects and had to think 'outside the square' to produce the documentation required.

The testers interviewed were comfortable with the lighter documentation required for testing. However, one of them reported that another tester was obsessed with producing more documentation than required in an Agile project, as proof that testing was done properly. This became an issue as it took up too much time.

One PO interviewed was initially concerned about the limited amount of documentation received in the Agile project as a PO would usually be inundated with documents in a traditional project. Although it was tedious, this abundance of documentation gave POs a level of comfort. The PO said that it was a matter of getting used to limited documentation. As there was limited documentation, there was also an onus on the PO to attend the daily stand-ups, or the PO had to rely on the card wall to keep abreast of what was going on. However, the limited documentation in an Agile project did not bother the other PO that was interviewed: this PO thought

a traditional functional specification document was a big document that contained too much technical detail, and consequently the PO had ended up just trusting the BA's judgment that the document reflected the PO's requirements. This PO had a better understanding of the scope in an Agile project as he was more involved and the user stories were expressed in language with which the PO was comfortable. However, there was a measure of anxiety for the PO's manager, particularly with documentation related to testing, as the people concerned would want to check who had signed off on test scenarios if there were issues with the product.

Collaboration between the business and project team

The reactions by project team members and business to the increased collaboration between them is presented below.

Project teams

Project teams generally liked the close collaboration with the business. They found they could get things done quicker and felt valued by the business. There was the opportunity for the relationship between the team and business to develop. The business became familiar with the project team members and there was better rapport between them. Working closely with the team, the business understood better what the team was doing and the problems that team members faced. Thanks to this close collaboration, the business started to see the value it was getting from team members, and developed more trust and confidence in them. Although the team found it a positive change, some programmers and testers were uncomfortable when engaging with the business and found it a big challenge. Working directly with the business was stressful for them.

Business

The POs interviewed found the increased collaboration with the team beneficial. One PO commented that there was 'a breaking down of the walls between IT and business'. The higher level of collaboration gave all parties involved a real understanding of different people's opinions. There was a more proactive dialogue with the team; for example, discussion of opportunities that the business was unaware the bank's systems could deliver. The PO also became familiar with team members, could deal with them directly, and knew their capability. This helped build trust between the PO and the team.

A PM also said that although the business generally wanted to be involved and part of the solution, some sections of the business did not necessarily want to be involved in daily project activities. They did not want to be involved at a micro-level; for example, being fully and solely accountable for all the prioritisation of product features. The business was busy with its operational work; it would rather delegate the project work to a trusted partner like a PM. The PM believed that ‘management thinking’ had taught business to ‘delegate and monitor’ rather than ‘delegate and get involved’.

Delivering value early and frequently

The reactions by project team members and the business to early and frequent delivery of software are presented below.

Project teams

The project team liked the use of an incremental approach to develop the features of most value for the business every two weeks. A programmer felt it helped the business to trust and have confidence in the team:

‘People, when they can see that you are putting out something that is of a high quality and what the business wants, I think the trust improves and they get less concerned about “crossing t’s” and “dotting i’s” and measuring everything.’ – P2

However, having to deliver software every two weeks was initially a challenge, commented a tester. The tester had to be quick and flexible and have a mindset of doing ‘just enough’ testing to ensure that software was delivered every two weeks. Some team members found it difficult solving problems encountered all the way through the project, commented an external coach. There did not appear to be any relief from such problems, as the nature of the Agile ISD method constantly brought problems to the surface, according to an external consultant:

‘The team that I was working on, that I spent the bulk of my time coaching, they went through some real pain. It was really quite uncomfortable, and they went through some real pain very early on in the project and right up to the middle of project, and some of these issues you know, when they still think about the project, they can still feel the pain.’ – EC1

Business

The business also liked the development of features that provided most business value every two weeks, commented a PO:

‘An awesome approach which delivers leading-edge software technology in good time.’ – PO

However, one dysfunction of the system was the objective that some business stakeholders set themselves to maximise the number of features delivered, rather than maximise the amount of value the bank would get from delivering features early, commented a coach. For example, releasing some completed features earlier than planned in a project would have generated revenue earlier. However, releasing those features earlier would also take up time, which could result in non-delivery of some lower priority features scheduled to be developed towards the end of the project. To maximise the number of features delivered rather than delivering features early to maximise value, the business decided not to release the completed features early. The reason was that it took an average of about four to five months before an idea generated by the business reached the development phase. Therefore, when development started, the business wanted to take full advantage of that opportunity by spending all the money allocated for the project and maximising the number of features delivered.

Response to changes in a project plan

The process for handling changes in requirements in a traditional project at the bank was quite involved. The project team and business found that the Agile ISD approach offered more flexibility in responding to change. They found the practice of prioritising any changes in requirements at the start of each iteration very helpful.

Although they liked the flexibility of an Agile ISD approach in responding to change, some business stakeholders found it difficult to adopt a mindset of having to adjust scope to meet the project schedule and budget. For example, there were instances where managers just wanted to add resources to a project without thinking of the alternative of adjusting the scope instead. There was one PO who, being used to having all features delivered in a traditional project, was disappointed that some low priority features were not delivered at the end of the Agile project due to

changes. Some business stakeholders found it difficult to accept that the team could not commit to the completion of all planned features by the end of an Agile project due to changes, explained a programmer:

‘They [business stakeholders] are saying, “I know that I’m going to pay this amount of money. What am I going to get for my money?” You say, “Well we’re going to work on what, you know, your representatives think are the best things to work on”...so we can’t give a stakeholder a big, thick document at the beginning and say this is exactly what we going to deliver.’

– P2

One PO was very anxious through the duration of the project about the uncertainty regarding completion of required features by the end of the project. This resulted in the PO wanting the team to commit to more than what the team had said it could towards the end of the project, commented an Agile coach. This reflected a mindset that if team members were given a task of completing more than they thought they could, the team would work harder and would probably achieve a little more, said the coach.

Some business stakeholders found it difficult getting used to certain Scrum practices. One example was the expectation that a team should start work on a new work item added to the product backlog without considering its priority against other work items in the backlog. Another incident was a decision made by the BA and the business to add a new work item to the iteration backlog without consulting the rest of the team. This initially caused considerable distress for the team, but the issue was finally resolved after a discussion among the parties involved.

General changes in work practices and tools

The reactions of team members to some of the Scrum practices are described below.

Estimation of work

Work estimation has always been a contentious issue in projects, said a PM. In a traditional project, the estimation done at the start of the project was usually inaccurate, as team members who were developing the product had no input in the estimation. More funding was generally required later in the project as the business was usually too far invested by then.

The PM commented that the work estimation in Agile projects was more refined and accurate because of collaboration between team members and the business, and because of the use of Agile estimation techniques like ‘planning poker’ (Mountain Goat Software n.d.). However, although the Agile estimate was more accurate, it usually came as a shock to business stakeholders, as they generally expected a lower estimate. This would end up in them being disappointed as they would have to reduce the project scope to accommodate the higher estimate. However, although business stakeholders in one Agile project thought the estimate provided by the team was double what they had expected, the project sponsor was comfortable with it as he found that estimates in previous Waterfall projects had been inaccurate and on the low side. This resulted in the sponsor having to submit a change request for more funding later in the project.

Splitting work into small work items

The teams struggled with splitting work into small work items. There was a perception that some pieces of work could not be split to fit within an iteration, a coach elaborated:

‘The perception and belief that work items can’t be broken down into smaller, more deliverable sort of stuff, so, some people believe that. "Look, there’s pieces of work here that are going to take six weeks to do and that’s just the way it is."’ – AC2

As a result, the team wanted to extend the length of the iteration instead. The coach said that the work-splitting procedure was big change in mindset for team members, in particular for programmers who had been with the bank for a very long time. The coach had to explain the reasons for splitting the work into small work items. Changing traditional perceptions was a big challenge.

Stand-up meetings

Some team members did not like the visibility of stand-ups, commented a coach. They felt uncomfortable having to provide a status update to a group at the daily stand-up. For example, some programmers felt uncomfortable giving an estimate as to how long they would take to finish their work. A team member got defensive when he failed to accomplish the work as planned. The team member felt micro-

managed and stopped attending the daily stand-up. He was quoted by the coach as saying:

‘You [IM] are my manager now and you want to know everything that I’m doing...just because I haven’t done it, doesn’t mean I can’t do it.’ – Team member

The coach commented that this reaction was caused by their failure to understand the purpose of a stand-up meeting. They had to understand that the IM was there to help them if they had any problem preventing them from completing their work. The IM was not there to micro-manage the team.

Card walls

Some team members found the visibility of card walls beneficial. Being able to view the status of user stories, and who was working on various tasks was helpful, as a tester confirmed:

‘So, you can see where things are at and how they’re going and who’s working on what. That helps.’ – T1

A BA found that the use of a physical card wall worked well as a visual display of the team’s progress during an iteration. It was satisfying seeing the progress of the team completing user stories using the card wall and being able to see where the team was in the ‘grand scheme of things’, commented a programmer:

‘We use physical card walls and I think it’s great to see these stories on cards flowing through the wall...I personally find it like you can see what you are doing rather than working away at the system for months and months and then dumping it into test – it’s hard to see where you are in the grand scheme of things. I think that is quite positive.’ – P2

The visual display of the work in progress was also useful for members outside the team, such as management.

Related to visibility was the issue of accountability, commented a PM. Some were nervous working in an Agile project, as they felt accountable for the tasks they agreed to do. Their contribution was evident at the daily stand-ups and reflected on

the card wall. People felt exposed if they were not doing what they were supposed to do.

Retrospectives

Some team members were uncomfortable discussing what did not go well at retrospectives at the end of each iteration, a coach reported. However, they found the use of retrospectives beneficial in terms of helping the team improve in the next iteration. In a traditional project, a post-implementation review was carried out a few weeks after completion of the project, said a tester. However, by that time team members would have forgotten the issues they had encountered during the project, especially if the project was long. There were also many instances where people below managerial level were not consulted during the review.

4.2.5.2 Reactions to changes in technical practices specific to programmers and testers

Some of the XP technical practices were more difficult to adopt than the Scrum management practices, commented an EC. For example, unit testing, TDD and pair programming were important practices. However, not all Agile teams adopted them. A programmer commented, ‘There’s an initial... mmm...period of frustration as you adopt new practices, particularly for developers with XP practices.’

Pair programming

There were mixed reactions to pair programming. The use of the practice varied among teams. Some liked it and used it constantly, as one programmer pointed out:

‘Some teams might do it all the time. The first team in the bank did pair programming constantly. At least one of the guys said it was fantastic and he loved it.’ – P2

Another programmer found it valuable but difficult and only did pair programming when he saw it as appropriate:

‘We certainly do pair programming. Not all the time. But we do it where we think it’s appropriate...in my experience, in the first project I did, it’s very difficult to get the hang of, but once you get the hang of it, it’s very valuable, but I don’t think it’s something that I would want to do all the time for every

single job. For some things, it is just a mundane task or something, you don't really need to be sitting there with someone else in my opinion, but everyone is different.' – P2

Another programmer who constantly used pair programming was initially afraid of the practice because of what the other programmer might think of his work:

'I was scared to death of pair programming because I was worried that the other person would be critical of what I was doing. And I kind of...I choked...I wouldn't be able to type because I would be too worried what someone was going to think of my work. But now, I can't do development without being in a pair. I can't.' – P1

The external coach commented that there were different levels of resistance to pair programming. It was quite uncomfortable at the start. The coach felt that the bank took a very pragmatic approach to pair programming. Although the bank promoted pair programming, it did not insist that programmers use it for all tasks.

Test-driven development

There was a lot of resistance from the programmers to TDD. An external coach commented that TDD could be extremely difficult. TDD required a lot of discipline and practice and could take years for programmers to 'get their heads around'. An IM pointed out that TDD was a challenge as it was a fundamental change for programmers in the bank.

A programmer opined: 'With test-driven developments, not everyone is used to writing a test before you write code. It feels strange when you are first doing it.'

One senior programmer did not want to do TDD as he did not see TDD as the right thing to do, said the IM. Apart from not seeing the benefit of TDD, the programmers in the project who were good at their job also did not like an external technical coach teaching them how to do their job using TDD.

An EC commented that practices like TDD depended on the maturity of the team and the practices they were ready to take on. The application system applied in a project also influenced programmers' use of TDD. Many projects involved working with

legacy systems where there were no unit tests, which made conducting TDD with legacy systems very difficult.

The EC also said that as Agile teams were under a lot of pressure, one had to be pragmatic about which practices were necessary and which would work for project teams. It was about getting them to see the benefit of the practice. Pushing the use of the practice made the programmers more resistant to it:

‘Enforcing practices on people who are resistant and don’t want to take it on, sometimes doesn’t get you anywhere. Because it is a lot of pressure for them and as a coach you want to try to highlight some issues where the team go, “You know if you actually did this practice that would help us in that situation”, so that people would want to do it. Rather than I suppose us, as coaches, coming into a team and saying, “Okay, we are going to do this practice and this practice and this practice”. I mean practices are tools to be used when necessary.’ – EC1

Although there was a lot of resistance from the programmers, it did not happen in every project and individuals overall were behind the idea of TDD, commented the EC.

Automated testing

A tester who found automated testing beneficial said that testers would probably need fundamental technical knowledge and an understanding of the basics of automation, as it was too much pressure to try to learn automated testing during an Agile project. However, another tester who had used automated testing previously, but had to learn a new product and a new language for automation in an Agile project, still found it challenging. This tester found it overwhelming in the beginning and might have given up if not for coaching from a technical coach later in the project:

‘I was really struggling at the beginning, it was overwhelming. So, there wasn’t really enough support at the time, and I think a few weeks in, I just said, “I don’t know what I’m doing. I cannot do this, I need help...If I had not spoken up, I think I may have actually left the bank because I was struggling

before. It was that hard for me in the beginning. Because I had no idea what I was doing.’ – T1

4.2.5.3 Reactions to change in work practices specific to a business analyst (BA)

The two BAs interviewed generally found the Agile ISD approach useful. The second BA interviewed commented that the process used in an Agile ISD approach was good and not difficult as the BA was working with one ‘small’ piece of work at a time using a just-in-time and just-enough approach:

‘You’re developing with just enough information...you’re not creating vast documents which are generally used for types of support services down the track. You are doing just enough just to get that piece of work done at a time. It can be very simple; it can be very complicated, but you’re just doing just enough.’ – BA2

However, the BA found the first Agile project difficult and stressful as it was one of the early projects and the role of a BA was not clear. He felt better in the second project as he was more prepared and understood the approach better. Both BAs interviewed struggled with documentation requirements (as described in 4.2.5.1).

The first BA commented that a BA did less analysis in an Agile project compared to a traditional project, as the rest of the Agile project team was also involved in the analysis of user stories:

‘What we did, as a team, we analysed the story and the BA would then write the story and then we would all review the story, and then as long as everybody agreed – the business stakeholders agreed – set these criteria, everybody had agreed that that was what we were building. Off it would go...I found that you used less of your analysis skills, because everybody’s doing the analysis at the same time.’ – BA1

4.2.5.4 Reactions to change in the role of a project manager (PM)

One PM interviewed was accustomed to ‘command-and-control’ leadership but had no problem supporting the team instead of telling them what to do. The focus for the PM changed from the project itself to the human behaviour and dynamics of the

team. The PM said that it was important to be prepared to change leadership style from ‘command-and-control’ to ‘servant-leadership’ and embrace it. However, it would be a challenge for PMs accustomed to controlling project teams. Another PM commented that it would be very hard for the PM to change leadership style in an Agile project if the PM had been successful using a command-and-control leadership style in traditional projects. A coach said that the command-and-control culture was the most difficult to change in an Agile transformation.

In a traditional project, a PM said there was less social interaction with the team because the focus was on delivering on time and meeting requirements. The change in effort and energy required for an Agile project was dramatic for the PM. The PM spent much more time interacting with and developing the team than just getting status updates. A PM who was not a ‘people person’ would probably not want to change. In traditional projects, the PM was not that concerned about the reason behind or the value of the project. Working on an Agile project made the PM more concerned about quality, business value and outcomes, and the PM was not worried whether the Agile project was behind schedule. The PM met the business weekly, provided updates, and was able to explain issues that affected the project scope. Furthermore, the visibility offered in Agile projects ensured that the updates were accurate and the possibility of a dramatic change affecting scope from one week to the next was minimal.

Another PM commented that some PMs at the bank who thought their role did not change took a somewhat narrow view, as they were hesitant about empowering the team and allowing the team to make decisions. They felt they were accountable for the project and were used to distrusting the team. With a command-and-control PM, the team might use Agile practices but it would not be a self-organising team, commented another PM. Instead of making its own decisions, the team would rely on the PM. The bank was trying to change that mindset. It was not about the team asking the PM what to do but about placing the onus on the team to make the decision about what it should do, commented the PM.

A coach said that some PMs at the bank felt threatened by the fact that the role of a PM did not exist in Agile projects; they were concerned for their jobs and careers.

4.2.5.5 Reactions to the new role of an iteration manager (IM)

The IMs interviewed found the use of an Agile ISD approach beneficial. One IM, who was involved in one of the early projects, was initially uncomfortable in the IM role, as the IM had not received any training for it. The IM did not know what was expected of the role and no one was able to articulate what the role involved. The use of an Agile ISD approach was still new to the bank and the IM role was still being developed. The other IM, who was involved in a later project, found that the main difficulty was getting buy-in from team members who were not open to an Agile ISD approach or did not understand the approach.

4.2.5.6 User resistance

Although the project team members and POs interviewed in this study generally embraced the new approach and thought it was a positive change, they did indicate that there was also resistance to the change. An EC said that people always go through that phase of being resistant in a transition to Agile and it was a default human position to be weary of change. The EC said that it was fine for people to be weary and question the change, provided they were willing to change if they found it to be a better way of working. Examples of resistance at the bank are described below.

A PM who was interviewed was part of a group who had worked in the bank for a number of years and were initially sceptical about the Agile transition, as the bank had attempted other initiatives which had not gone according to plan. However, the group was willing to try it so the members could form their own opinions.

This PM also witnessed resistance from others before they even experienced working in an Agile project. A BA encountered new team members joining the second phase of an Agile project who were stand-offish and passed comments like ‘It will never work’, ‘I can’t work that way’, or ‘I won’t work that way’. The BA did admit that in the first phase of the project, the team members, including the BA, felt the same way, but changed their minds after completing the first phase of the project.

A tester spoke of a few people in the testing team that were happy to maintain the current way of working. They did not want the change and were not even interested in trying an Agile ISD approach. A coach had a similar experience with team

members who were uncomfortable changing the way things were done traditionally at the bank and questioned the change. The APM said that the use of the traditional Waterfall approach was not a disaster for the bank; not many projects using the Waterfall approach were failing. This made it difficult to justify why people needed to go through the discomfort of a major change.

There were others who did not see the benefits - for example, of TDD - or who disagreed with some of the changes, such as regular software releases to production. Another BA encountered people who felt that they knew how things worked at the bank, believed that they did not need to change, and were going to maintain the status quo.

A developer felt that some people were not willing to try harder and put more effort into trying to get this new workstyle to succeed. Their reason was that Agile would only work in a 'perfect world', although the new approach had worked in previous Agile projects at the bank.

A tester spoke about several senior programmers and testers who worked together regularly in groups that tended to do things their own way. This made it difficult for them to change.

A BA believed some team members did not like the idea of external coaches teaching them how to work in a new way. This resulted in immediate resistance from the developers. An internal coach from another country who joined the bank during the implementation of the Agile ISD approach, also commented that it was difficult for people to embrace a new person from a different country trying to get them to change the way they worked.

A programmer spoke about another colleague who hated the Agile ISD approach and left the Agile team. A tester spoke about a BA who had been with the bank for a long time in a specific area; the BA also did not like the Agile ISD approach and did not want to be put on another Agile project.

The APL also spoke about two situations where people were taken out of Agile projects as they were not a 'good fit'. The APL said that such decisions were not 'kneejerk' reactions and there was always an attempt to try and make it work for the

people concerned. However, if they proved a poor fit, then other people were given the opportunity to take their place.

A coach also commented that there were people advancing their careers in the bank who did not want to take the risk of change and therefore resisted it.

4.2.5.7 Change in project team members

At least one person in each of the different roles in the Agile project teams: project manager, iteration manager, business analyst, programmer and tester, said they had changed after their experience working on Agile projects. They said that they were more:

- sociable, and less shy and reserved. One team member who was an introvert became assertive as a result of the increased interaction with team members and the business
- confident in dealing with people and accepting more responsibility. One person noted that it had become easier to ask colleagues for help
- quick in making decisions. Issues surface daily in Agile projects and the team had to be quick in making decisions, due to the impact of outstanding issues on Agile projects
- collaborative
- developed in different areas; for example, assuming multiple roles, and willing to accept responsibility as a team.

An external consultant said that an Agile ISD approach was more about values and principles. People working on Agile projects generally felt more invigorated in their work and perceived their work life to be better and more rewarding. The consultant however was not sure of the reasons behind this finding.

4.2.5.8 Reactions to change by stakeholders

The greatest challenge in early projects at the bank was pushing for change in other areas to support the Agile projects, said a PM. Working with stakeholders whose procedures still supported the traditional Waterfall approach was a significant issue.

In a traditional project, there were much longer lead times for everything, commented a PM. The analysis, build, test and deliver phases were spread out over a longer period. There was more time to engage stakeholders and the stakeholders

could plan and schedule the work the business was required to do. However, everything moved quickly in Agile projects. Things were more fluid and changed frequently. The change was more time-consuming for stakeholders as more active and regular engagement was required of the stakeholders, commented an EC.

The support from stakeholders required that they understood Agile values and principles. Compared to the IT division, it was not easy for stakeholders to see the benefits of using an Agile ISD approach in projects, observed the APM. There really was no big incentive for stakeholders to work in a different way, other than the need for them to support the Agile projects.

The teams had to engage the affected stakeholders and reach a compromise to support the new way of working. After learning from the issues that the teams encountered in the early Agile projects, the AP ensured that in subsequent projects the stakeholders knew what to expect before the project inception phase.

The HSE said that even a few years into the bank's Agile journey, there were still pockets of the business where there were different degrees of understanding and buy-in when it came to Agile values and principles. There was still too much focus on process or documentation rather than achieving the bank's business goals. There was still work to do in establishing that alignment end-to-end. However, the wider organisation had embraced agility and had started to structure its business planning and strategic initiatives around Agile principles, commented the HSE.

Reaction by stakeholders within the IT division affected by the change

The reactions by middle management, PMO, Infrastructure and Operations, are described below.

Middle management

It took a while for middle management to get used to the Agile transition, commented a programmer:

‘I think it’s the people in between that are still getting used to the idea of it. It’s presenting challenges....’ – P2

Middle management was apprehensive about the change and this resulted in a ‘frozen middle’, that is, resistance from middle management, commented the APL.

Resources were not being allocated to Agile projects by the resource managers in the different functional areas. This was due to the difficulty of dedicating team members full-time to an Agile project. Resource managers also questioned why team members had to be allocated 100% to an Agile project. There was a perception that the Agile team members were not being fully utilised and that 100% allocation cost more as all team members had to start from day one of the project, commented a coach.

However, the coach argued that a team delivered early in an Agile project and the business received a return on investment early. The people concerned about the cost were looking at the issue from a project rather than a product point of view, and that perception was difficult to change, said the coach.

Some middle managers also felt uncomfortable having their staff co-locate with the Agile team, as it was difficult managing staff working in a team at another location. Middle management was not engaged in the transition (the issue of middle management experience is described in 4.3.2.4 Middle management resistance). The bank employed an external change management consultant (as described in section 4.2.4.6 Change management expertise) who came up with strategies to get middle management onboard.

PMO

The PMO saw the benefits of using an Agile ISD approach in projects. It had to find how to change its rigidly formalised processes to be flexible and still best fulfil the functions of a PMO. The PMO officer said that it was about being less rigid but still having the required controls in place, and that the PMO had to have an open mind. For the PMO, the transition to an Agile ISD approach was ultimately just another change, and the PMO was used to change.

Simultaneously accommodating a traditional Waterfall and Agile ISD approach was the biggest challenge for the PMO. It was challenging managing two different ways of delivering projects, including also portfolio management and reporting. However, the gradual implementation process helped the PMO better understand and handle the changes required.

An external consultant commented that in a large organisation with organisational silos like the bank, resourcing was one of the most difficult and complex things to

do, as the bank was moving from a model where people from different functional areas were allocated to more than one project at the same time to a model where they were allocated 100% to an Agile project. The Agile resourcing model was also more difficult than Waterfall, as an Agile project could only start when the whole team was available.

The PMO was working with Audit to come up with the minimum controls required for an end-to-end portfolio life cycle, irrespective of the development approach used. It was a shift in mindset for both the PMO and Audit. The transition to an Agile ISD method helped the PMO shift its focus from project artefacts and milestones to the value a project was delivering.

Infrastructure and Operations

Delivery of developed software to production at the bank was very difficult. Infrastructure was the section pushing back the most in the beginning, commented the APL. Infrastructure and Operations initially felt that the use of an Agile ISD method by development teams did not involve them and so they were not concerned with it, reported a coach:

‘Infrastructure and Operations, most people couldn’t care less about Agile. In fact, they hope that, they’d much rather it all go away.’ – AC2

Infrastructure fully engaged with the development teams after about two years. It recognised the value of frequent releases for customers and became enthusiastic. The bank formed cross-functional Agile teams for IS development in order to remove silos and improve collaboration among the analysis, programming and testing areas, and similarly, also implemented DevOps, again to remove silos and foster collaboration, but this time among the development, infrastructure and operations functional areas. People from the different areas formed teams to make the end-to-end process agile.

The project team in one of the bank’s early Agile projects encountered problems when it attempted to get the training group to produce training material for the product it was developing. There was conflict between the project and training teams because the way the training team worked to support traditional projects did not meet the requirements of the Agile team, and vice versa. The usual process was for a

project team to engage training after the approval of a functional specification. This was an issue as no functional specification documents are created in Agile projects. Training also had long lead times. The training group had a process that it followed for developing training material and the time required to produce the required material did not fit the product release schedule for the project. The project team had to sell the Agile ISD approach to the training group and explain what was required so the group could change the way it worked to meet the needs of both parties.

Reaction by stakeholders outside the IT division affected by the change

The reactions by Finance, Legal and Compliance are described below.

Finance

The business was used to having a regular cadence in their traditional annual planning process. Moving to a model where planning and new initiatives could be introduced at any point in time contributed to the churn factor and constant re-prioritisation. This caused the business areas to lose their operating rhythm. The bank moved to quarterly planning, which was a good compromise as the business still had something to work towards but was not planning too far in advance. It was basic planning, and two quarters out, but it reflected the current delivery cycle. This change was possible due to the communication and trust that was built among the parties involved and the ‘delightfully open minds’ of Finance, commented the HSD.

Legal and Compliance

The project team in one of the bank’s early Agile projects also encountered issues with Legal and Compliance when their support was required. They were not forthcoming as they were used to receiving a functional specification at the time of engagement with project teams. They did not understand the Agile ISD approach; they found it bizarre that they were unable to see the details of the final solution upfront and were instead getting the product in increments. Things changing along the way and uncertainty at the start about what the end-solution was going to look like was a struggle for them and made them feel exposed. They felt that development was being done in a fragmented piecemeal fashion, and at times they even lost sight of the overall project. Working on small pieces of functionality one at a time in an incremental approach made it difficult for them to see how it all fitted within the overall context.

They had also always thrived on documentation; thus, receiving minimal documentation for an Agile project was difficult for them. The Agile practice had to work out the documentation that was required to satisfy Legal and Compliance without getting bogged down in paperwork and making it a bureaucratic process.

4.2.5.9 Summary of findings on consequences

The big change in culture and way of working was difficult as team members were used to working in a way that had been in place for a significant length of time and the change required an unlearning of old behaviours and habits. Although the change was difficult, the interviewees generally embraced the new approach over time. There was more teamwork, customer collaboration, trust and consensus-driven behaviour across the Agile projects.

The interviewees liked the co-location and collaboration, bonding and team spirit typical of working in an Agile environment. However, learning to work as a cross-functional team was a big challenge for team members. Sharing responsibility to complete work and assuming different roles when required was a difficult shift in mindset for some. Being part of a self-organising team was also difficult for some team members.

Some team members did not like the visibility of stand-ups, card walls and retrospectives. The XP technical practices were generally more difficult to adopt than the Scrum management practices.

Face-to-face communication was difficult for some team members, some finding the Agile work environment too noisy while others liked it. Project teams generally liked the close collaboration with the business. However, some programmers and testers in the bank were uncomfortable with engaging the business.

The project team and business liked the use of an incremental approach, but it was initially a challenge for some team members. One inbuilt dysfunction was the objective of some business stakeholders to maximise the number of features delivered, rather than maximise the amount of value the bank would get from delivering features early. The project team and business found that the Agile ISD approach offered more flexibility in responding to change. However, some business

stakeholders found it difficult to adopt the mindset of adjusting scope to meet the project schedule and budget.

The BAs interviewed generally found the Agile ISD approach useful. Both BAs struggled with documentation requirements in the early projects. It was a challenge for PMs accustomed to controlling project teams to change to a ‘servant-leadership’ management style, probably the most difficult change to affect in an Agile transformation.

Pushing for change in other areas to support the Agile project was another big challenge. The project teams had to engage the affected stakeholders and reach a compromise to support this new way of working. However, the wider organisation embraced it over time

4.2.6 Intervening conditions

To help explain and describe Agile transition in the bank, this section presents the themes (as shown in Figure 10 below) that were interpreted as intervening conditions (from Figure 3) that influenced the outcome (as described in section 4.2.5 Consequences).

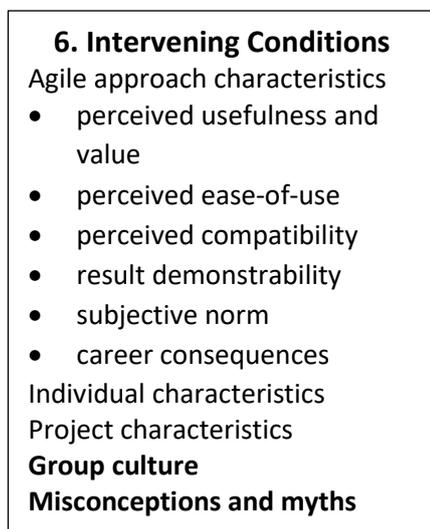


Figure 10. Conditions that influence the outcome of the change

4.2.6.1 Characteristics of the Agile ISD method

The names given to the sub-themes identified as characteristics of the Agile ISD method are the same names given to the SDM constructs in Table 3 from Chapter 2 (which were also used as *a priori* themes in the design of the initial coding template

as described in section 3.11.1.1 First cycle coding (using Template Analysis)). The characteristics of the Agile ISD method that appeared significant (in terms of the number of responses and references in NVivo) were the perceived usefulness and value in making the change and perceived ease-of-use. Of less significance were perceived compatibility, result demonstrability, subjective norm and career consequences.

Perceived usefulness and value

One characteristic of the Agile ISD method that significantly influenced its acceptance was whether affected individuals perceived switching to an Agile ISD approach was beneficial and would improve the individual's job performance. As described in section 4.2.5 Consequences, the people interviewed generally found the switch beneficial for the following reasons:

- increased collaboration with business
- quicker resolution of issues because of co-location
- more accurate estimate of time required to complete work
- producing 'just enough' documentation
- opportunity offered at retrospectives to reflect on how to improve visibility
- frequent and continuous delivery of functionality
- flexibility in managing change
- delivering what the business requested
- speed of delivery.

Although the programmers generally found the switch to an Agile ISD approach beneficial, some of them did not see any benefit in the practice of TDD, and others found the practice of pair programming beneficial only in certain circumstances (as described in section 4.2.3.2 Change in technical practices specific to programmers and testers).

Perceived ease-of-use

Another characteristic of the Agile ISD method that significantly influenced its acceptance was the level of difficulty experienced by the individuals adopting an Agile ISD approach (as described in section 4.2.5 Consequences). For example, team members generally found splitting work very difficult. Some BAs, POs and

stakeholders struggled with the use of minimal documentation. Some team members did not like the visibility, increased interaction and noise of an Agile environment. Some programmers found TDD and pair programming difficult and did not employ those practices as often as they could. A PO found the uncertainty of the functionality delivered at the end of the project very uncomfortable. Some testers struggled with automated testing. Anything that is radically different is difficult, said one programmer:

‘Anything that is dramatically different from what you are used to doing becomes hard.’ – P

Although individuals found certain aspects of the method difficult to use in the initial stages, people generally got it eventually, commented a coach. It took time but it could be very difficult for individuals in the beginning.

Perceived compatibility

Whether an Agile ISD approach was compatible or fitted well with the way people worked was another characteristic of the Agile ISD method that influenced its acceptance. An Agile coach commented:

‘I think some people, as I said, find it quite easy and they slot in because they’re like, “This is exactly how I think we should work, and this is how I like working”. Other people, “I don’t like working this way, it’s uncomfortable, why would we do it like this?” – AC1

Result demonstrability

Acceptance of the Agile ISD method at the bank was also partly dependent on the visibility of its advantages. For example, the POs and stakeholder liked it because they could see the product being developed. The POs could use and test the functionality that was developed during an iteration. They could see something of value delivered at the end of an iteration that was satisfying a business need.

Subjective norm

Colleagues’ opinions of the change to the new Agile ISD method also appeared to influence its acceptance. For example, the AP found that there were people in project delivery who were waiting to be involved in Agile projects as they had heard from

colleagues who worked in Agile projects how much they enjoyed the method, according to the APL:

‘What we were finding was that people who are in project delivery were hearing from some of their colleagues who had been on the couple of Agile projects that we’d had at the time and they were hearing some really good things. “This is the best project I’ve worked on; I never want to work on Waterfall, really enjoying this way of working.” So everyone wanted to do it, everyone wanted a piece of this Agile pie.’ – APL

Career consequences

Yet another characteristic of Agile that influenced its acceptance was whether the affected individuals perceived that it would pay off in the future. For example, many of the interviewees said they had developed useful new skills, soft skills that could be applied in any situation. A tester commented:

‘I’ve learnt so much in terms of practices, principles, people. Yeah, just a richness of learning. I think that the soft skills you develop are critical, you don’t just apply them to Agile. Agile’s fantastic but you can apply them to life and it’s just an amazing richness of learning.’ – T2

The soft skills they developed were teamwork, relationship building, communication, interaction and self-organisation skills. Other interviewees spoke about work being more meaningful; for example, being empowered by working in self-organising teams.

4.2.6.2 Individual characteristics

The characteristics of individuals was another significant intervening condition in this study. A coach commented that every team had individuals with different personalities. The traits of the different individuals influenced their acceptance of the Agile ISD method. There were a few situations where people were taken out of Agile projects because they did not fit in the Agile team.

Teamwork

Individuals working in an Agile team should like collaborating and working in a team as opposed to working on their own. They had to respect and trust team

members.

Communication and customer relationship

A programmer said that a good programmer without interpersonal skills was not of much use:

‘You get someone who is a brilliant, absolutely brilliant programmer but they cannot talk to people. What good are they? They cannot understand the requirements if they cannot talk to people and discuss things. Their value decreases even though they are a genius. You get someone who is a decent programmer, who can talk to the business and understand. That is so much better. They are the kind of people you want.’ – P2

Agile team members had to be sociable and approachable. They should feel comfortable interacting, communicating and developing a close working relationship not only with team members, but also with the business.

Self-efficacy

The change was exciting for some but stressful for others. Individuals involved had to be confident about their ability to change to a new way of working, commented an IM:

‘It’s not something I’ve done before, so it was always going to be a challenge but that’s a good thing. When I started, I thought, “There’ll be a lot of things I need to do that I don’t do, things to learn”, but it’s good. You’re always good to learn and try to rise to different challenges.’ – IM2

The staff involved in the change to an Agile ISD approach had to have a high tolerance for uncertainty, ambiguity, and a lowered expectation of detail; for example, a PO signed off on a broad vision and then followed the new Agile process where the detail was worked out only incrementally over time. All those involved in this process had to be willing to take risks, make mistakes, and learn from them.

Experience

Many staff in system development had been with the bank for a long time. They had learnt and developed a habit of doing things in the traditional way; that previous

experience made it very difficult for them to change (as described in section 4.2.5 Consequences). The majority of the interviewees commented that it took time for team members to unlearn old habits, understand the reasons behind the change and learn the new practices and tools, and gain experience using them. On the other hand, a few interns at the bank who had never experienced working in projects using the traditional approach were more open to using an Agile ISD approach.

Open and adaptable

Individuals affected by a transition to Agile had to be adaptable and open to change and attempting new ways of working, not set in their ways. For example, a PM had to be willing to be a servant-leader instead of practising command-and-control leadership. Stakeholders had to change the way they worked and interacted with Agile teams.

They had to be receptive to other ideas and not be defensive when there were disagreements with team members; for example, pair programming, retrospectives and stand-ups were Agile practices that were quite confronting, commented a programmer:

‘Sometimes you have a discussion in a retrospective and someone will say they didn’t like something you did and then you’ve got to discuss it and sometimes it gets a little bit too close to the skin. But you just work it out.’ – P1

The programmer said there was one colleague who was obstinate and would not have fitted well in an Agile team. The colleague did not like others disagreeing with the way he did things or disagreeing with his suggestions. Developers also had to be confident about expressing their opinions and be prepared to discuss and justify their work, said a programmer:

‘You also have to be prepared to get into an argument once in a while because if you’re going to back down every time someone challenges you, then you’re never going to get your ideas across.’ – P1

They had to be proactive, not waiting to be told what to do, and should not be too shy to ask for help. They had to be able to work quickly, have a sense of urgency, be

organised, focused, and do ‘just enough’, as the team had to deliver work every two weeks, commented a tester.

Lastly, the AP did not have a say as to who should be selected for Agile projects but would give a recommendation if asked, commented the APL. The AP could describe the sort of people it would like on Agile projects and expected that resource managers would take that into account when resourcing Agile projects. If they could, resource managers would accommodate people who expressed a desire to be on an Agile project. The APL did not think resource managers would put someone in who did not fit on an Agile project.

The HSE in this study found it ludicrous that some organisations would only employ people with Agile experience. He commented that it was more important that the individual was aligned to the organisational culture and would fit into the teams.

4.2.6.3 Project characteristics and application type

Adopting Agile practices in a project was more challenging for larger and complex projects, such as projects where there were multiple systems, stakeholders and external parties involved. There were also critical systems where a level of rigour and control was essential; for example, in the process of releasing to production. Adopting Agile practices in the e-commerce domain was more suitable as the projects were generally web-based, less complex, did not involve multiple systems, and they were easier to release to production.

The bank also had some complex core-legacy transactional banking systems running on mainframe computers that hindered the use of certain Agile practices like TDD.

4.2.6.4 Group culture

The bank had many different groups in the different functional areas and there was a difference in culture between some of them, said an EC. Some groups were more flexible and open to changing the way they worked; for example, having to rely more on verbal instead of written communication. A BA said that the difference in culture could be due to the type of applications on which the group usually worked, and the operating model in their work area. Different groups in a functional area tended to take care of particular application[s] within the bank; for example, some groups

usually worked with complex legacy applications and core transactional banking applications. They were used to following legacy procedures where there was a high level of rigour and control, hence making changes to those applications was difficult. This difference in culture between groups happened more in the programming functional area, commented another BA. The programming groups that usually worked on particular applications tended to work together in projects involving those applications and they had their own culture. In one Agile project, a BA observed that one programming group involved with a particular legacy application had a closed culture, while another group in the same project that worked in the e-commerce area had a more open culture.

4.2.6.5 Myths and misconceptions

Initially there were some misconceptions and myths about Agile. For example, the belief that no documentation and only a card wall were required, as reported by one PM. There was also the perception that Agile cost more than Waterfall projects because team members had to start from day one of the project but were not being fully utilised. These critics did not realise that teams delivered early in an Agile project, which meant that business received a return on investment early. The myths and misconceptions were addressed by education (as described in section 4.2.4.7 Change management activities).

4.2.6.6 Summary of findings on intervening conditions

The characteristics of the Agile ISD method, at the individual and project level, the group culture and the misconceptions and myths about an Agile ISD approach, all appeared to influence the outcome.

The characteristics of the Agile ISD method that seemed to significantly influence the outcome were the perceived benefit in making the change and ease-of-use. Perceived compatibility, result demonstrability, subjective norm and career consequences were of less significance.

The characteristics of the individuals involved significantly influenced the outcome. The Agile ISD approach appears to be suited to individuals who like to collaborate and work in a team. They had to be comfortable interacting and communicating, sociable and trusting, open, confident in voicing their opinions, not shy to ask for

help, willing to take risks, and proactive. They also had to be able to work quickly, have a sense of urgency, be focused, and do 'just enough'. They had to be adaptable, willing to assume other team roles and to share responsibility for outcomes. A PO had to have a high tolerance for uncertainty, ambiguity and lowered expectations of detail.

4.2.7 Summary of major elements from the integrated theoretical model

This section contains a summary of the elements from the integrated theoretical model shown in Figure 3.

4.2.7.1 Summary of the context element

ABC Bank is a medium-to-large-sized bank in Australia operating in an environment where competition among banks is massive, and meeting customers' preferences and requirements is becoming more challenging. The bank also requires strong corporate governance mechanisms to meet the regulations of the banking environment in Australia.

In this study, the IT division was one of eight divisions in the bank and it had a functional silo structure. Many staff within the division had been with the bank for a long time and some of the systems were complex core-legacy transactional banking systems running on mainframe computers. A traditional IT funding process was used for funding projects, and project teams were resourced in the traditional manner where members generally did not work 100% on a project.

The bank previously used a Waterfall methodology. The culture was generally one that did not promote teamwork. There was a perception of limited collaboration among team members in projects where team members from the different functional areas used a 'hand over the fence' approach, and between the team and the business. There was very heavy reliance on documentation.

The culture of delivering business value early through early and frequent delivery of software was not in place. The ability to respond to changing business requirements was also hampered by the Waterfall methodology in use. The business exhibited a set

of siloed behaviours and processes that were also very heavy; in other words, heavy in terms of documentation and governance.

4.2.7.2 Summary of the causal conditions element

Projects were slow to start, and the business was dissatisfied with the time it took to deliver the services and solutions that the business required. Other issues were the heavy governance, frequent scope creep, and over-engineering. There was also a perception of limited collaboration and a restricted ability to apply learning. The business needed to switch outdated silo-based operating models to highly collaborative, multi-disciplinary teams.

Driven by an innovative HSD and the support from top management, the bank migrated to an Agile ISD approach. After the success of the first Agile project, Agile was incorporated in the bank's strategic objectives. Next came the announcement that 50% of all bank projects would go Agile. The organisation changed its business strategy to be more agile.

4.2.7.3 Summary of the organisational change element

The organisational change within the bank was the biggest issue in transitioning to an Agile ISD approach at the bank. All the obstacles to the transition were associated with organisational change. Agile transition caused a fundamental change in the way people worked and in their culture, that is, it changed their behaviour and values; it involved an Agile transformation. The changes not only affected the project teams, but also areas and stakeholders outside the project teams; it involved Enterprise Agility, requiring quite a shift in mindset for those affected.

The new ISD method, introduced by an external consulting company, was a blend of Scrum and XP. The teams had to learn a new process, new practices and tools, acquire new skills, learn to work and collaborate as a team, and were given more responsibility. The new method also required a change to an Agile mindset and a change in behaviour to support the new way of working.

One cultural change was embracing the values of teamwork and collaboration. The project team members were now co-located instead of sitting within their respective functional areas. There were no cubicles in an Agile workspace and team members

were physically close to each other in the same location. They had to learn to work as a cross-functional team. The whole team had to collaborate to complete work items together instead of handing over work item tasks to each other using a sequential development process. Furthermore, the team also had to focus on completing one work item at a time and had a shared responsibility for the completion of the whole work item. They had to assume different roles in the team to help each other complete work items on time. The team also had to be a self-organising team; the tasks for each team member were decided collaboratively by the whole team.

There was less use of heavy documentation for Agile projects at the bank. The team had to rely on the principle of creating 'just enough' documentation, which was a major change, particularly for BAs, business product owners and stakeholders in the bank.

Another major cultural change was the increased collaboration between the teams and the business. In Agile projects, the business got more involved and assumed greater responsibility. The PO, as a representative of the business, had to be part of the team and be co-located with the team where possible.

The increased collaboration in an Agile team resulted in much more face-to-face interaction and communication among team members and with the business. This change required the use of communication, negotiation, relationship-building and conflict-resolution skills, skills not often found in teams using the traditional approach.

Another major change was the use of an incremental approach for early and frequent delivery of business value. This involved selecting the functionality that would be delivered in an iteration from a list of prioritised high-level functionality contained in product backlog. The PO was responsible for the creation, prioritisation and maintenance of the product backlog.

In being adaptable and responsive to change, business had to embrace the new mindset of adjusting the scope to fit the project schedule and budget, as opposed to extending the project schedule or increasing the budget to deliver full scope, which was the traditional mindset of the business.

The Agile practices and tools were new and significantly different from those previously used in the Waterfall methodology at the bank. These new practices and tools included iteration planning meetings, stand-ups, iteration demonstrations, retrospectives, product and iteration backlogs, card walls and burn-up charts. The technical development practices adopted from XP were pair programming, TDD, continuous integration and automated testing. There was a change in the way a BA and PM worked, including in the PM management style, and there was the new role of IM.

Agile project teams also required the support of stakeholders who were used to working in a certain way to support teams using the traditional development approach. The change to an Agile ISD approach required a change in the mindset and the way the stakeholders worked and interacted with the Agile teams. The affected areas had to be compatible with the new Agile ISD method for Enterprise Agility. The stakeholders within the IT division affected by the change were middle management, the PMO, Infrastructure and Operations. The major changes in the PMO were in the areas of governance, reporting, and project resourcing. The major change in the Infrastructure and Operations areas was in CD. Some of the areas outside the IT division that were affected by the new approach were Finance, and Legal and Compliance.

4.2.7.4 Summary of the action/interaction element

The most significant strategies used at the bank to manage the change resulting from the transition to Agile were support, change management and team building.

Top management support was most important in the organisational change. Support from the CIO, the sponsor for the Agile transformation, was instrumental to the success of the program. A steering committee, consisting of senior managers, was formed for the Agile transformation. Senior management provided support in creating an AP and hiring an APM to manage the transformation. Senior management also provided support in hiring external consultants as coaches, as well as internal coaches, funding training and education, and setting up collaborative workspaces for staff. The recognition of the success of Agile projects by the CIO and stakeholders was also key.

Support from middle management was also very important in creating an awareness of Agile within their area, encouraging and helping staff in the transition; middle management also assisted by allocating staff to meet the resourcing requirements of Agile projects. Stakeholder support was essential to the achievement of Enterprise Agility.

Due to the lack of Agile experience within the bank at the start of implementation, the bank partnered with an external consulting company to provide coaching support for its projects. Two coaches with experience in Enterprise (as opposed to team) Agile adoption were later employed to assist the bank with spreading agility to all projects and to the wider organisation, and to help the bank achieve its strategy of becoming an agile organisation. The Agile transition involved a significant change for the organisation that required a set of skills, expertise, and experience that the AP did not have. The bank also acquired the services of an external change management consultant in the early stages of implementation to assist with change management.

The bank had to look at the transition to Agile from an organisational change management point of view. Becoming an agile organisation was a big organisational change management exercise. It not only had to focus on implementation at the team level but also at the implication of the implementation at the organisational level. This involved changing the culture and the way people worked and taking the appropriate steps to manage the change smoothly and effectively. Change management had to be an ongoing activity. The major activities making up change management were: creating an awareness of the need for Agile adoption; training and education; coaching; sustaining the change; and stakeholder management. Management support was also critical.

The education and training provided to staff assisted the cultural change. People started to apply the Agile values and principles not only in Agile projects, but also in traditional projects, and in BAU work. There was more communication within the division; people had daily stand-ups, used card walls and held retrospectives. Coaching was a critical factor in the early stages of the bank's Agile implementation. The teams found coaching invaluable and key in the use of the Agile ISD approach.

Lastly, rewards and celebrations were key in reinforcing the change, and team building activities helped with the development of collaboration and trust within the teams.

4.2.7.5 Summary of the consequences element

The big change in culture and in the way of working was difficult as team members were used to working in a way that had been in place for a significant length of time, and it required an unlearning of old behaviours and habits. The ongoing effort and time spent on the change was considerable. Although the change was difficult, the interviewees generally embraced the new approach over time and thought it was a positive change. The culture changed as IT staff started to embrace an Agile mindset and Agile behaviour. There was more teamwork, more customer collaboration, and more trust and consensus-driven behaviour across the Agile projects.

The team members interviewed liked the co-location and collaboration, bonding and team-spirit features of working in an Agile environment. Being co-located was a positive change for them. Learning to work as a cross-functional team was a big challenge for team members. Having to collaborate to complete work items instead of handing over work item tasks to each other using a sequential development process was difficult. The team also initially struggled with the idea of working on one work item at a time.

The participants generally liked the idea of shared responsibility for the completion of the work items. This removed the culture of blame which could occur when there was segregation of work where team members in the different roles were only responsible for the tasks they were assigned. Shared responsibility helped remove the 'us versus them' mentality in the teams. However, having a shared responsibility to complete work and assuming different roles when required was a difficult shift in mindset for some. Being part of a self-organising team was also difficult for some team members who were used to a command-and-control environment where team members were delegated work and preferred being told what to do.

Although face-to-face communication was difficult for some, most team members interviewed perceived that communicating face-to-face was more beneficial and made collaboration easier. The noise level increased with the increased

communication and some team members found the environment too noisy, while others liked it.

At first, the BAs suffered from uncertainty about the documentation that had to be created in an Agile project. It was also difficult deciding what was 'just enough' and 'fit for purpose' when creating documentation. There were also mixed feelings among others working with less documentation than they were used to.

Project teams generally liked the close collaboration with the business as it helped develop the relationship and trust between them. They could get things done quickly and felt valued by the business. However, some programmers and testers in the bank were uncomfortable in engaging the business as this idea was new to them and out of their comfort zone.

The project team liked the use of an incremental approach to develop features for the business every two weeks as it helped develop the trust and confidence the business had in the team. However, having to deliver software every two weeks was initially a challenge for some team members as it was difficult to solve the problems encountered all the way through an Agile project, which constantly brought new problems to the surface. The business also liked the development of features every two weeks. The POs were comfortable with the prioritisation of backlog items and the use of user stories. However, one dysfunction was the objective of some business stakeholders to maximise the number of features delivered, rather than maximise the amount of value the bank would get from delivering features early.

The project team and business found that the Agile ISD approach offered more flexibility in responding to change. Some business stakeholders found it difficult adopting a mindset of having to adjust scope to meet the project schedule and budget. One PO was disappointed that some low-priority features were not delivered due to change, while others found it difficult to accept that the team could not commit to the completion of all planned features by the end of an Agile project due to change. One PO was very anxious during the project about the uncertainty surrounding the completion of required features by the end of the project. Some business stakeholders found it difficult getting used to some Scrum practices.

Although the work estimation for Agile projects was more accurate when using Agile estimation techniques, the results usually came as a shock to business stakeholders, who generally expected a lower estimate. They were especially disappointed as, under the Agile ISD method, they would have to reduce the project scope to accommodate the higher estimate.

The teams struggled with splitting work into small work items. Some team members did not like the visibility of stand-ups, card walls and retrospectives. The XP ‘technical’ practices were generally more difficult to adopt than the Scrum management practices. For example, although unit testing, TDD and pair programming were important practices, not all Agile teams adopted them. Testers generally found automated testing very difficult at the start as it involved learning a new tool and programming language.

The two BAs interviewed found the Agile ISD approach useful. One of them felt it was good, and not difficult, working with one ‘small’ piece of work at a time using a just-in-time and just-enough approach. Both BAs struggled with documentation requirements in the early projects. The first BA commented that a BA did less analysis in an Agile project compared to a traditional project, as the rest of the Agile project team was also involved in the analysis of user stories.

It was a challenge for PMs accustomed to controlling project teams to change to ‘servant-leadership’ management style and trust the team. The command-and-control culture was the most difficult to change in an Agile transformation

Pushing for change in other areas to support the Agile project was a big challenge. The project teams had to engage the affected stakeholders and reach a compromise to support this new way of working. In comparison with the IT division’s experience of the Agile ISD method, it was not easy for stakeholders to see the benefits of using an Agile ISD approach in projects. However, the wider organisation embraced it over time.

4.2.7.6 Summary of the intervening conditions element

The high-order themes that were interpreted as intervening conditions that appeared to influence the outcome were: the characteristics of the Agile ISD method; the

individual and the project; group culture; and misconceptions and myths about an Agile ISD approach.

The characteristics of the Agile ISD method that seemed to significantly influence the outcome were the perceived benefit of making the change and ease-of-use. Perceived compatibility, result demonstrability, subjective norm and career consequences were of less significance.

The characteristics of the individuals affected by the Agile implementation significantly influenced the outcome. The Agile ISD approach is suited for individuals who like to collaborate and work in a team as opposed to working on their own. They had to be comfortable interacting and communicating, sociable and trusting, open, confident when voicing their opinions, not shy to ask for help, willing to take risks, and proactive. They also had to be able to work quickly, have a sense of urgency, be focused, do 'just enough', be adaptable and organised, as the team had to deliver work every two weeks, which was generally the length of iterations in the method used at the bank. They had to be willing to assume other roles within the team and share responsibility for outcomes. A PO had to have high tolerance for uncertainty and ambiguity, and a lower expectation of detail.

Adopting Agile practices in a project was more challenging for larger and complex projects. Such projects involved complex core legacy transactional banking systems running on mainframe computers, and critical systems where a level of rigour and control had to be in place for processes such as releasing changes to production.

The bank had many different groups in the different functional areas and there was a difference in culture between some of them. Some teams were more flexible and more open to the change than other groups.

4.3 Implementation Strategy and Issues

In order to better understand Agile transition at the bank, Table 14 provides a timeline which captures the influence of the themes related to the implementation strategy, and implementation issues at different stages of the transition process. This section describes those themes in more detail.

4.3.1 Implementation Strategy

The implementation strategy used at the bank, comprising the approach to implementation, the transition pattern, spreading Agility and the introduction of Agile practices to project teams, is described below.

4.3.1.1 Implementation approach

The initial strategy used by the HSD when adopting Agile in 2009 was the development of an Agile manual that informed developers how to apply Agility in their project delivery. The development teams were given the manual in an attempt to sell Agile development to them. This was purely a bottom-up approach and it was not successful.

The HSD subsequently obtained support from the CIO and the senior leadership team within IT to formally adopt Agile. The CIO and leadership team were resolved to introduce the new method at the bank. The CIO became the sponsor together with the HSD, and these two positions became the catalysts and drivers of Agile adoption at the bank.

4.3.1.2 Transition pattern

As the bank had a relatively large IT division that could run up to 100 projects concurrently, it was not feasible to implement the Agile ISD approach using a ‘big-bang’ strategy. Instead, the bank selected a few pilot Agile projects and teams, built success, and grew from there.

A pilot project started in April 2010. The new systems development method used was a vanilla method that was a blend of Scrum and XP. The project was a greenfield project that facilitated the use of Agile technical practices like TDD, automated testing and continuous integration. The project team consisted of nine people from IT. The staff selected for the pilot were people in IT with the ‘right’ attitude and a sponsor from the business who would support the use of an Agile ISD approach, engage with the project team, and who had the authority to make decisions on behalf of the business.

The bank used an overlapping approach, where the second and third Agile projects at the bank started before the first project was completed.

The bank chose less difficult projects in the early stages of implementation as it was sensible not to push the boundaries too much, commented the APL. As more Agile projects were started, the bank had to prove that the Agile ISD approach would work in different types of projects.

4.3.1.3 Spreading agility

The pattern used to spread agility to the project teams at the bank was to use a combination of coaching and the strategy of getting a few members who had experienced being part of an Agile team to join new Agile project teams to share their experience and guide team members on this new approach. For example, the fourth Agile project had three team members from the second Agile project and the eighth Agile project had a few members from the third and fifth Agile project teams, said a BA:

‘This team has quite a bit of Agile experience, so not only myself, but a few developers have been on two or three projects. One of the testers has and one hasn’t. So, there’s quite a mix. So, the actual coaching comes from within the team, as well. So yeah, I think everyone is a bit more experienced, needs less coaching.’ – BA2

Among the benefits of this strategy, there was less reliance on coaches and they could coach more than one team at a time. The downside was the need to break up well-performing teams. However, the benefits of trying to spread Agility quickly outweighed the cost of breaking up well-performing teams.

4.3.1.4 Introduction of Agile practices to teams

The XP technical practices were introduced to teams by the coaches in an incremental manner. A team would start with a subset of practices that would be most beneficial to the team. As the team matured, other practices could then be introduced. The focus was on changing one thing at a time. It was too difficult to attempt to introduce all the XP practices at once in addition to the project management practices of Scrum. There was the possibility of user resistance as some technical practices like TDD and pair programming were challenging, and teams were likely to revert to old ways of working if they had problems trying to learn too many practices at one time.

4.3.2 Implementation Issues

The implementation issues are described in the sections below.

4.3.2.1 Following a comprehensive implementation plan

‘Project Agile’ was started to change the bank’s project management practices within nine months. Working groups from different areas within the bank were formed and a massive operating model to implement the changes required in IT and support areas was developed.

Project Agile floundered after a few months. Although the working groups formed for the project met on a frequent basis, they worked in a siloed fashion. They also:

- had their BAU work to do
- didn’t really understand Agile
- had never worked on an Agile project
- were trying to change the organisation based on an idealistic and purist view of Agile.

The lesson learnt was that the focus of Project Agile was too broad. The AP learnt that the model of change that it was operating was too big to implement in such a short length of time. The AP had tried to ‘bite off more than they could chew’, commented the ATL, whereas it should have taken ‘one bite at a time’ and applied the Agile principle of making incremental changes.

The AP learnt that a ‘big-bang’ approach, such as Project Agile, was not suitable for such a major cultural change at the bank. The Agile principle of iterating towards agility and making small changes along the way, was a key learning from the initial failure of Project Agile. Secondly, the AP could only do so much toward Agile implementation. There was a need to empower people at all levels and in all areas of the organisation to drive the change. It was not about the process, practices and tools, or one group of people; it was about collaboration and the empowerment of people. Thirdly, the AP found that it needed to apply Agile principles in a transition to Agile. It was also all about learning and adapting along the way, said two PMs:

‘The thing we quickly learn is that no model is perfect in this and all of them have their flaws, and all of them have their learning that we have to take and

adapt...it is very much a learn-and-adapt framework where you have to try X, X is not working, we are finding it failing and we're going to try and work to Y. So, you have to be willing to fall on your face quite a bit and we have.' – PM

'So, everything is continuously being fine-tuned. So, as we have more and more projects come through, it will continuously improve, to get to the right model.' – PM1

An example of learning was the change from a nine-month detailed implementation plan to three-month plans. Another example of learning was the change in the stakeholder engagement model in the second phase of a project. The improvement in the engagement model in the second phase was a result of retrospectives in the first phase of the project.

4.3.2.2 Frustration of developers waiting for Agile projects

An issue that surfaced during implementation was that developers who heard how other colleagues enjoyed working in Agile projects were frustrated waiting to work in Agile projects, according to the APL. There were at this stage only two completed Agile projects, and two more still in progress:

'People are saying, "When can I go on an Agile project?" And you say, well when you are starting one project every four, five months you can't put everyone on an Agile project, so you need to look at other ways to build the capability.' – APL

A BA said that with all the hype around Agile at the bank, developers waiting to be involved in Agile projects and those who could not be involved in Agile projects felt like 'second-class citizens'.

The ATL said that the AP realised that these people did not understand how Agile values and principles could be applied outside Agile projects; for example, in Waterfall projects and BAU work:

'We really hadn't shown how you could bring those Agile values and techniques into all of the projects.' – ATL

Investigations by the AP found that many staff were mentally organising their work into Agile and non-Agile processes, alternating between Agile and Waterfall behaviours. The AP realised that these people were almost forgotten in the Agile transition and there was a need to keep them engaged. The AP found that it did not do enough to manage the change, such as creating an awareness within the IT division about the value of Agile, explaining why the bank was adopting it, its benefits, and how Agile values and principles could be applied to other work besides Agile projects.

To manage the change to this new way of working and to keep these people engaged, the AP provided training and education to help them understand the Agile mindset and how they could apply Agile values, principles and appropriate practices to any work they were doing, reported the ATL:

‘It was really about giving the people the opportunity to understand what Agile was and change their mindset by applying agility to everything that they do. They didn’t have to be on an Agile project, you could apply those principles and those values and those practices to a BAU team as an individual, or even to your Waterfall project.’ – ATL

The training focused on teaching Agile as a culture rather than a method. It promoted the Agile practices as well as values and principles from a more holistic point of view. The education and training provided was a key success and it started the change in culture in the IT division, commented the APL. A wider spread of coaching was also used to support the education and training provided.

The terms ‘small A’ (hybrid projects) and ‘big A’ (fully Agile projects) were used to classify projects². For small A projects, the project team decided which Agile practices and tools could be used in the project. The AP helped them with their decision and provided coaching support if needed. For example, the team would collaborate, work iteratively, use a card wall, and have stand-ups, but might not have a showcase at the end of every iteration, or they would start with a functional requirements document and then break it down into user stories. The APL

² The terms ‘small A’ and ‘big A’ projects do not relate to the capitalisation of Agile in this document.

commented:

‘We’ve done a lot of work around how you can bring agility into everything that you do.’ – APL

The APM felt there was a risk that the Agile transition would fall somewhere in the middle and stop there with teams just employing a few practices, thinking they were agile enough and did not require any support from the AP. The AP needed constantly to bear in mind the end goal which was to make all projects big A; that is, fully Agile projects. The APL did not see small A projects as bad since experience of a small A project meant that when the same people finally did work in a fully Agile project, they would already have had some Agile experience.

A BA felt that the terminology of big A versus small A still gave the impression that one project was better than the other. The BA felt that better terminology should be used and the Agile adoption should be sold in a way that all staff felt respected and valued for what they did, even if they were not involved in Agile projects. Hence, the categorisation of projects as Agile or Waterfall, big A or small A was subsequently dropped. The term ‘fully Agile’ was still used when planning projects, since a fully Agile project was resourced differently from a traditional Waterfall project and required a coach if the team had no Agile experience.

4.3.2.3 Lack of Agile projects

Another issue was that there was not many Agile projects in the pipeline to meet the demand from IS staff. Not only were there staff never involved in an Agile project who were waiting to be assigned to one, but there were also staff in the early pilot Agile projects who perceived the new method to be of value (as described in section 4.2.6.1 Characteristics of the) and who did not want to go back to work on Waterfall projects. The latter were a ‘flight risk’, commented the CIO.

The way an Agile project was selected was very fluid. Initially it was a project:

- that ideally cost over \$500,000 to fund for at least six months, since sufficient time was needed to coach, upskill and develop the capability of the project team;
- where the scope of the project was not fixed, since adjusting the scope of a project to fit its schedule and budget (by adding, removing and changing the

priority of the project's backlog items) was the mindset that the bank was trying to instill;

- that did not touch many different systems, which would make the project more difficult;
- where a third party was not involved, as the bank wanted to try the Agile ISD approach without the complexity of involving a third party;
- where there was support and engagement from the business sponsor and stakeholders, and a dedicated PO, all of which were essential ingredients for an Agile project;
- that was in the same area as other projects; for example, in the area of e-commerce. This was to develop the capability in a single area so that area could become self-sufficient. However, it was difficult to identify a single area where there was a consistent supply of projects in the pipeline.

Furthermore, team members had to be allocated 100% to a project and had to be with the team for the whole duration of the project.

The selection criteria for Agile projects changed as the bank developed its Agile capability. The bank had to be less rigid when selecting Agile projects, in order to build a pipeline of more Agile projects coming through. The criteria where a project had to be over \$500,000 and a minimum of six months' duration were applied only to projects that had a new Agile team. If the team already had members with Agile experience, they could mentor other members without experience and less time would be needed to upskill and develop the capability of the team. The other criterion that a project should not involve third parties was dropped when the bank worked out how teams using an Agile ISD approach could work with third parties. Later, the bank also looked to projects that delivered products for competitive advantage; for example, a product that could be delivered incrementally to external customers (instead of internal ones), and provide business value, the first principle of the Agile Manifesto.

The bank chose less difficult projects in the early stages of Agile implementation, since it was sensible not to push the boundaries too far, commented the APL. As more Agile projects were started, the bank had to prove that the Agile ISD approach would work for different types of projects. Therefore, the bank chose to tackle rather

than avoid criteria that made Agile implementation more difficult for projects.

4.3.2.4 Middle management resistance

The problems encountered with middle management at the bank were not anticipated. A ‘deep dive’ analysis found that staff were not being allocated to Agile projects because middle management across different functional areas, including resource managers, was not culturally engaged with Agile adoption.

Although there was strong support from the executive and increased enthusiasm from people in project delivery who had attended the training, there was resistance from middle management, said the APL. When an organisation transforms to Agile, it can do it bottom-up, top-down, or use a combination of both, observed a coach. Invariably, it is always in middle management where most of the battles are; the transformation gets stuck in the ‘frozen middle’ area.

It was found that the training and education provided had missed the middle layer within the IT division, the APL reported. There was still some apprehension about the change at middle management level. The bank employed an external change manager who developed strategies to get middle management on board and to empower middle managers to make the required changes within their functional areas, since they knew best what to change to push the transformation forward. The KPIs for middle managers were changed to include the promotion of agility within their areas. They were accountable for it and were required to come up with ninety-day plans as to how they were going to progress Agile in their respective areas. They were required to create an awareness within their area, encourage and help staff in the transition, and assist by allocating staff to meet the resourcing requirements of Agile projects. The AP and the coaches provided any support required. A learning in the bank was that support was required at all levels of the organisation in an Agile transition.

4.3.2.5 Lack of stakeholder management and support

Managing stakeholders’ expectations across the bank was an extremely difficult task, commented the CIO. Although the teams made a lot of effort to bring stakeholders along on the Agile journey, management of their expectations did not go well in the early projects, commented the coach. The AP and Agile project teams did not expect

the impact an Agile ISD approach would have on affected stakeholders in the first few projects, commented the APM:

‘But all these early projects, they’re coming across with these problems that we almost can’t anticipate.’ – APM

The teams did not expect the issues they encountered with stakeholders, especially in projects with many stakeholders. Many areas felt unengaged. The project teams initially attempted to handle stakeholder issues but finally escalated the problem to the AP, as it took too much of the PM and IM’s time and was affecting the project. However, there was buy-in from the stakeholders when they became more engaged in the projects and saw the value of an Agile ISD approach. A lesson for PMs was that engaging stakeholders after a project had started was difficult due to time constraints while the project was running. Therefore, stakeholders had to be engaged before the project started and they had to be engaged continuously throughout the project. There had to be an agreement with stakeholders about the interaction model they preferred and about their expectations in relation to the project. A reason for the issue with stakeholder management is that stakeholders were only provided Agile education later in the piece, commented a coach:

‘We also put something together for stakeholders. So, stakeholders come along to inception, you know, as a stakeholder coming along to inception, this is what you can expect, and this is why you’ve been invited. Rather than just come to your email one day and realise you’ve got a two-week block in your diary and you don’t even know what it’s there for. So that’s the sort of thing we’re trying to do now.’ – AC1

4.3.2.6 Lack of Enterprise Agile adoption experience

There was initially a lack of Enterprise Agile adoption at the bank. Although external consultants with experience were engaged in the early projects, the focus of the consultants in the first few projects was primarily to coach teams in the use of the Agile ISD method, practices and tools. The focus was not on the organisational issues; for example, the management of stakeholders affected by the Agile adoption process.

4.3.2.7 Lack of change management experience

Another issue was the realisation by the AP that the Agile transformation program lacked a formal change management strategy. The Agile transition was a significant change for the organisation that required a set of skills, expertise and experience that the AP did not have. The AP realised that more work had to be done to communicate the value of Agile, the reason for its adoption, how it benefited staff, and the use of Agile practices and tools. So, the bank acquired the services of an external change management consultant to assist in change management. An external consultant commented:

‘That was critical [getting a Change Manager to help out with change], to really focus on the visibility of what we are doing and the reasons why we are doing what we are doing. And making sure people are aware of that, really getting their awareness up.’ – EC1

The external change manager (CM) came in after the commencement of the fourth Agile project and was with the bank for nine months. The consultant introduced the Prosci ADKAR model (Prosci n.d.-a), a goal-oriented change management model, to guide individual and organisational change. ADKAR is an acronym for the five outcomes that an individual must achieve for successful change. The outcomes are an Awareness of the need to change, Desire to participate in the change, Knowledge on how to change, Ability to implement the change, and Reinforcement to sustain the change. An APM commented that more work had to be done in the bank to create the desire in individuals to participate in the change.

There was a lot of communication and ‘good news’ stories about Agile and the ‘what’ and ‘why’ of Agile adoption. The CM conducted ADKAR sessions around the bank to help staff understand what needed to be changed.

The CM also conducted ADKAR sessions with management from the different functional areas within IT to help them understand how the change would affect them and how they could bring change into their areas.

The work done helped people affected by the Agile transition understand why they had to do it and what needed to be changed, commented the APL. It was very

important that people at all levels of the organisation were aware that they were required to drive the change.

4.3.2.8 Perceived lack of awareness of the need for change

Although the bank attempted to build an awareness of the need for Agile adoption, there was a perception that the message was not clear in certain areas of the bank. Although the awareness did improve over time, some interviewees said that the reasons and goals for Agile adoption at the bank were not clear in the early stages of transition.

The APM said that it was difficult as senior management were also new to Agile. Without having experienced Agile adoption, senior management did not have a frame of reference to know what it wanted from the adoption in the early stages; management could not picture the end goal. Senior management knew they wanted the result to be better than the current situation but relating the result to Agile adoption was difficult. Furthermore, a PM also said how well the message was received by staff depended on how well individual line managers cascaded the vision for the adoption. Lastly, a coach said that there was not a lot of work done in the early stages on communicating the value of Agile, why it was being pursued and what individuals could get out of it.

4.3.2.9 Role and selection of iteration managers

An Agile coach who joined the bank about two years after the start of implementation commented that the IM was a key role in implementation.

The coach found that there was not enough understanding of an IM's responsibility. Not enough time was spent coaching and training IMs and giving them a background on what the role involved. The coach introduced more in-depth training for iteration managers.

The bank had a few people who were able to fulfil the role, but it was not a full-time role. The IMs who were interviewed did not work full-time in their role in their projects. The IM interviewed assumed two roles in their projects. The first IM interviewed also assumed the role of a BA, while the second was a lead for the programmers in the project.

The coach also commented that the IM role entailed a lot of responsibility and required a person with certain skills and traits. This change was described in section 4.2.3.5 New role of an iteration manager and the reaction to the change was described in 4.2.5.5 Reactions to the new role of an iteration manager. People fulfilling that role had to be selected carefully, said the coach. However, the coach had found that there were initially no criteria specified for selecting IMs. There was a need to define such criteria and a job should be created for the role if the bank was serious about the Agile adoption, said the coach:

‘If you’re really serious about doing this Agile transformation and you can see this being your future world, create a job for it [IM]. It’s just not someone puts their hand up and goes “Can I be one?” It’s a really, really important thing...’ – AC

A job description was eventually created for the role and a team of dedicated IMs was formed over time.

4.3.2.10 Product owner selection and commitment

Having a PO in some areas of the bank was not difficult because the areas generally had roles built around product ownership, commented the HSE. However, there were other systems and initiatives where it was difficult finding the right person with the skills, experience and knowledge to be the PO. Getting the right kind of skill set was a challenge.

As the PO had to handle BAU work, the amount of time a PO also had to dedicate to an Agile project was the biggest difficulty, commented a PO. Some areas of the business, especially those with a small team, could not commit a PO full-time to a project due to resourcing requirements. The teams found it difficult to make decisions and move forward when the PO was not fully committed.

There were also occasions where a delegate for the PO made a decision that was not what the PO wanted. However, that did not happen often and the decisions concerned were not major. The delegate therefore had to know when to consult the PO if making decisions.

4.3.2.11 Developers working part-time on an Agile project

Getting a team member to work full-time on an Agile project was difficult at times. Team members were sometimes required to work on BAU tasks at the same time, which made it difficult for the Agile team. For example, one tester struggled having to do both, hence the velocity of the team; that is, the amount of work completed by the team in an iteration, was adversely affected. Furthermore, it was difficult for a PM to manage a project when some team members were doing BAU work while others were not. It was also awkward if a PM or IM had to sometimes question what a team member was doing when that member was not doing project-related work.

4.3.2.12 Inconsistent teams

Adding to the complexity of project resourcing was the effort needed to keep Agile teams working together on continuous projects, as it took time for people to learn to work well together and trust each other. For the team to be given the opportunity to become a high-performing team, the team had to be kept consistent, commented a coach. When a team member was moved in or out of a team, the team productivity dipped. A lot of time and energy was spent in getting a team from the formative to the performing phase of team evolution. However, teams working on Agile projects in the bank were not fixed teams. They were disbanded at the end of an Agile project and would work with new team members on the next project. The HSE said that while the bank wanted the stability provided by having fixed teams, it was an issue that had not yet been solved.

4.3.2.13 Pressure to deliver versus upskilling team members

The bank's plan in Agile projects was for team members new to Agile to learn Agile and also deliver the project, commented a BA. The former objective was sometimes lost because some PMs and team members felt that the latter objective was more important. For example, team members did not adopt pair programming as well as they should have as the view was that it took too much time, which would have been detrimental to the project schedule. There was a very fine balance between getting a team to upskill and go slower at the start and the later phase where they would consequently be able to move faster, commented a PM.

Furthermore, when the team started performing and delivering, the business wanted more from the team and was not very interested in the upskilling of team members. The business was more interested in what it could get out of the team in terms of features delivered.

4.3.2.14 Use of two approaches during transition

As the bank did not implement the use of an Agile ISD approach using a big-bang strategy, the bank had to manage the use of two different approaches during the transition, said the representative from the PMO. A PM said that having different multiple models made it quite difficult managing the bank's systems and customer expectations. The PMO representative also said that it was a big challenge managing two different ways of managing projects. However, it was better than using a big-bang approach as the change was gradual and it helped the people in the department understand the transition to change. A big-bang approach would have had a huge impact on everyone concerned.

4.3.3 Summary of implementation strategy and issues

The Agile implementation strategy involved the use of a combination of the top-down and bottom-up approaches. The Agile transition was supported by the CIO and leadership team within IT. The CIO became the sponsor and, together with the HSD, was the catalyst and driver of Agile adoption at the bank.

The bank did not use a big bang transition pattern. The bank selected a few pilot Agile projects and teams, built success and grew from there, using an overlapping approach where subsequent Agile projects were started before previous Agile projects were completed.

The pattern used to spread agility to the project teams at the bank was to use a combination of coaching, and a strategy where a few members who had experienced being part of an Agile team joined new Agile project teams to share their experience and guide the team members in this new approach.

The new ISD method used was a vanilla method that was a blend of Scrum and XP. The XP technical practices were introduced to teams in an incremental manner. A team would start with a subset of the practices that would be most beneficial to the team. As the team matured, other practices were then introduced. The focus was on

changing one thing at a time. It was too difficult attempting to introduce all the XP practices at once in addition to the project management practices of Scrum.

The findings revealed a number of implementation issues. Firstly, the use of a detailed plan was not successful in the implementation of an Agile ISD approach. The greater utility of the Agile principle of iterating towards agility, learning and adapting, and making small continuous changes along the way was a key finding at the bank. There was a need to empower people at all levels and areas in the organisation to drive the change.

Another issue during implementation was the problem of not having enough Agile projects in the pipeline to meet the demand from IS staff. To reduce the impact of this problem, the bank focused on teaching Agile as a culture, applying its values, principles and appropriate practices to non-related projects and to BAU.

The training and education provided had missed the middle layer within the IT division. Among middle management there was apprehension about the change and middle managers were not engaged in the cultural adoption of Agile. Strategies were developed to get middle management on board and to empower them to make the required changes within their functional area.

Stakeholders' expectations were not managed well in early projects. This was despite the big effort made by the teams to bring stakeholders along on the Agile journey. The AP and Agile project teams did not expect the impact an Agile ISD approach had on affected stakeholders in the first few projects. The teams did not expect the issues they encountered with stakeholders, especially in projects with many stakeholders.

There was a lack of Enterprise Agile adoption at the bank. Although experienced external consultants were engaged in the early projects, the focus of the consultants in the first few projects was primarily to coach teams in the use of the Agile ISD method, practices and tools, not on the organisational issues, such as the management of stakeholders affected by the adoption. There was also a lack of change management skills. The Agile transition was a significant change for the organisation, requiring a set of skills, expertise and experience that the AP did not have.

Although the bank attempted to build awareness of the need for Agile adoption, there was a perception in the early stages of the transition that the message, the reasons and goals for Agile adoption, was not clear in certain areas of the bank. However, the awareness did improve over time.

Another issue was the lack of understanding about the responsibilities of an IM and the skills and attributes required. It was also difficult getting an appropriate person with the skills, experience and knowledge to be a PO in certain areas of the business. Furthermore, some areas, especially those with a small team, could not commit a PO full-time to a project.

Keeping Agile teams consistent with full-time members was an issue that was difficult to address, as the requirements for resourcing Agile projects were complex. Another issue was finding the balance between getting a team to acquire Agile skills in an Agile project and also deliver the project. This was an issue because the pressure to meet project requirements was usually a higher priority than upskilling the team. Lastly, managing the use of two different approaches simultaneously during the transition from a traditional to an Agile ISD approach was difficult.

5. DISCUSSION

The purpose of this study was to explore the key elements that shape the implementation and use of an Agile ISD approach (which involves Agile transformation and Enterprise Agility) by an organisation transitioning from a traditional to an Agile ISD approach.

Abrahamsson, Conboy, and Wang (2009) argue for a need to understand better the implementation of Agile at the organisational level. As described in section 1.1.2 Lack of research into Agile transformation and Enterprise Agility, Dikert, Paasivaara, and Lassenius (2016), found in their systematic literature review on Agile transformations that the primary studies identified in their review were industry experience reports. They identified only six case studies with a clearly defined research method, but in these studies Agile transformation was presented only as a minor topic. The main finding from Dikert, Paasivaara, and Lassenius (2016) was that although Agile transformation was a relevant topic for practitioners, there was a severe lag in research. The authors found that there were too few case studies investigating Agile organisational transformations and suggested the need for more such case studies on Agile transformations and also Enterprise Agility. In their study of the concerns of Agile practitioners, Gregory et al. (2016) suggested that cultural change and organisational context were topics that would benefit from further research. The focus of this study is in this under-researched area of Agile transformation and Enterprise Agility; in particular the organisational change entailed in transitioning from a traditional to an Agile ISD approach.

The classification found in innovation literature of incremental versus radical innovation (Dewar and Dutton 1986; Ettlie, Bridges, and O'Keefe 1984; Orlikowski 1993), and their differences were discussed in section 2.2. The findings in this study suggest that the nature of the change at ABC Bank as a result of transitioning to an Agile ISD approach was radical.

Senior management attempted to transform the system development project teams by moving not only to a fundamentally different ISD process that included new practices and tools, but also to a fundamentally different culture. It was much more than a change to rapid application development using time-boxing and prototyping. It caused a change in the way people worked and a change in behaviour and values to

support the new way of working. This transformation also extended to other areas of the enterprise. The change not only affected project teams but also people outside the project teams. The transition required an Agile transformation and Enterprise Agility. While changes to ISD approaches in organisations have previously been made - for example, from structured to object-oriented, those changes were not found to be radical (Sircar, Nerur, and Mahapatra 2001). The reason for this may be that the change was far less extensive in relation to the way people worked and the culture, and to the fact that the change did not extend beyond IT to other organisational areas. Another reason why the change from a traditional to an Agile ISD approach at ABC Bank may be classified as radical is that the Agile ISD approach was new to the majority of project team members and stakeholders at ABC Bank (Daft and Becker 1978). An additional reason is that it was risky (Hage 1980). Financial institutions are generally risk-averse. An extensive change to the ISD approach and to mindset was required at ABC Bank. This change in mindset entailed embracing Agile values and principles, and the new way of working was required not only in IT but in other areas of the bank. The success of the business can be put at risk if IT and the other areas have dissimilar principles that would result in a huge disconnect (Stocks 2015). Therefore, this study argues that moving from a traditional to an Agile ISD approach should be conceived as a form of radical organisational change. This study finds that it is not merely an implementation of a new approach; it involves radical organisational change. It is vital for management to understand and appreciate the nature and magnitude of the change in moving from a traditional to an Agile ISD approach. Without this understanding, any attempt to adopt an Agile ISD approach could end in failure or in the organisation not getting the full benefit from its implementation. Understanding the nature of an innovation, such as an Agile ISD approach, is therefore essential to managing the change associated with its transition. This supports Sircar, Nerur, and Mahapatra (2001), who found that a vital first step in managing innovation-related change is comprehending the nature of the innovation.

As mentioned in Chapter 2, the emergence of themes and theory from data analysis led to a subsequent review of the literature to relate the themes and theory to the literature and explain how the findings in this study contribute to knowledge about the research topic. This chapter discusses, in relation to research reported in the

initial literature review (Chapter 2) and in the subsequent literature review (which is incorporated in this chapter), the themes related to the elements of change, action/interaction, consequences and intervening conditions, as shown in the integrated theoretical model (Figure 3). The themes are linked to existing theory, which is related to the acceptance of IT, IT innovations and SDMs, innovation, organisational change and resistance.

The first four sections (5.1 – 5.4) of this chapter discuss:

- change at the bank associated with moving from a traditional to an Agile information system development approach
- action/interaction (strategies) used to manage and handle the change
- consequences of the change
- intervening conditions that influence the consequences or outcome of the change.

The fifth section discusses the implementation strategy and issues.

The elements of context, causal conditions, change, consequences and intervening conditions that shaped the Agile transition were identified in the integrated thematic model shown in Figure 3. The integrated thematic model is a static model. As implementation should be viewed as a dynamic phenomenon (Larsen and Myers 1999), and the process by which a new technology is adopted and used in the transition needs to be considered in explaining its consequences (Orlikowski 1993), two process models, one specific to this study (Figure 12) and the other a proposed theoretical process model of change (Figure 13) for a transition to Agile, are presented in the last section. The integrated thematic model and process models complement each other and help better understanding of an Agile transition. Both types of models are missing from the literature on Agile transition.

5.1 Phenomenon of Change

This section discusses the change at ABC Bank associated with moving from a traditional to an Agile information system development approach.

The findings (as described in section 4.2.3 Phenomenon of Change) that the changes experienced in the bank resulting from the Agile transition were radical and that part of the process involved a major change in the way of working, are on the whole

consistent with the academic and practitioner literature. Nerur, Mahapatra, and Mangalaraj (2005) state that migrating from a traditional life cycle to an Agile ISD approach involves a major change in work procedures, tools and techniques, and in the roles of people.

The finding in this study that the bank had to transform and required a fundamental change in culture, a change in mindset and values, is consistent with the literature. Misra, Kumar, and Kumar (2010) also found that moving to Agile required a change in the organisational culture. Broza (2013) states that embracing Agile values and principles needs a pervasive change in organisational culture, possibly the biggest change its employees would have undergone. Broza (2012) states that the change in culture involves embracing an Agile mindset; that is embracing Agile values, principles, attitudes and beliefs. Broza (2017) argues that an Agile transition is a transformation as it is basically different in values and principles from the traditional approach. Furthermore, the finding in this study that this change to an Agile mindset is required at all levels in the enterprise for Enterprise Agility is consistent with the finding in Hastie (2015). Bart Schlatmann, a former CIO of ING Netherlands, also found that culture is possibly the most essential ingredient in Agile adoption (Jacobs and Schlatmann 2017). The culture has to be embedded and reflected in whatever the organisation does.

Denning (2019) states that while every organisation's Agile transformation journey is different, the common trait between Agile transformations is a change in mindset. This change in mindset is essential and key for a successful Agile transformation. The author states that a fundamental factor in the failure of General Electric in its Agile transformation journey was the failure of its Chief Executive Officer in understanding that the transformation required a change in mindset throughout the organisation.

The following subsections discuss:

- general changes in culture and related work practices for project teams and the business
- changes in technical practices specific to programmers and testers
- changes in work practices specific to a BA
- changes in the role of a PM

- new role of an IM
- change for stakeholders (Enterprise Agility).

5.1.1 General changes in culture and related work practices for project teams and business

The new ISD method used by the Agile project teams at ABC Bank was a blend of Scrum and XP. VersionOne in its survey, found that 70% of Agile practitioners used Scrum or Scrum/XP hybrid (VersionOne 2016). Many Agile development implementations combine the two in some way (Fitzgerald, Hartnett, and Conboy 2006). The assertion by this author that the change in culture and related work practices using the new Agile ISD approach for project teams and business is significant is consistent with the literature and is discussed in the following subsections.

5.1.1.1 Teamwork

The major cultural change at ABC Bank in relation to teamwork, which is the first value in the Agile Manifesto (Beck et al. 2001a), is on the whole consistent with prior literature.

The finding in this study that Agile development teams were co-located is reported in Livermore (2007), who found that co-location was a standard industry practice for Agile SDMs. The major change at the bank from a sequential development process featuring hand-offs between team members to collaboration as a team is also a prominent finding reported in the practitioner literature, but is largely missing from the academic literature. Similar to the findings in this study, Cohn (2010) found from experience that project teams in traditional projects are used to a sequential development process with hand-offs between team members. In contrast, the author found that handovers are minimised in Agile projects, where team members have to collaborate and work closely together on a product backlog item instead of handing off work to each other. The author further states that working in teams is the essence of every Agile process and all team members have to be active in collaborating with each other. Misra, Kumar, and Kumar (2010) found that the change from team members working independently to working as a team in Agile projects was critical.

The finding of a big change from individual to whole-team responsibility at ABC Bank is a prominent phenomenon reported in the practitioner literature but again is lacking in the academic literature. Similar to the finding at the bank, Cohn (2010) found that whole-team responsibility approach is a very different way of working for most people, particularly for those used to working in silos, such as the project teams at the bank. The author states that the Agile team must share responsibility for all aspects of product development and members are expected to change to a mindset of 'our' tasks, not 'my' or 'your' tasks. They must help each other complete work on time and are therefore required to engage in work outside their normal roles. Similar to the finding at the bank, Conboy et al. (2011) state that the boundaries among the roles of team members in an Agile environment are fuzzy and this necessitates ability across a wide range of skills, instead of just specialising in a particular skill.

Similar to the finding at the bank, Moe, Dingsøyr, and Dybå (2009) believe that the self-management required in Agile is a radically new way of working for traditional project teams used to command-and-control management. Dikert, Paasivaara, and Lassenius (2016) found that granting teams the authority to make decisions themselves was perceived to be significant in an Agile transformation. This required a culture of trust and respect among employees which could take considerable effort, time and patience to cultivate (Nerur, Mahapatra, and Mangalaraj 2005).

The dramatic increase in interaction and communication among team members at the bank is similar to a finding by Cohn (2010). The author states that traditional project team members would previously have worked in 'cubicles', having minimal interaction with other team members, which was also the case at the bank. The author verifies that moving from cubicles where there was minimal noise to an environment where there is increased interaction with team members and customers is a big change. For example, ING created more open space by removing the walls in buildings to allow for increased interaction between employees (Jacobs and Schlatmann 2017). The CIO said, 'The whole atmosphere of the organisation is much more that of a tech campus than an old-style traditional bank where people were locked away behind closed doors.' Conboy et al. (2011) further state that Agile practices increase social interaction and also the necessity for social, communication, and presentation skills.

5.1.1.2 Documentation

The fundamental change to creating ‘just enough’ documentation at ABC Bank is often anticipated in the literature. Nerur, Mahapatra, and Mangalaraj (2005) state that much documentation is produced in traditional development approaches to assure communication and traceability, which was traditionally the case at the bank. In contrast, Agile ISD approaches promote lean thinking and reduce the amount of documentation produced said the authors. One reason for this is that the primary focus in IS development should be on producing working software, as Highsmith (2002) has said. The author states that documentation should be minimal; any documentation that adds no value should not be created. However, team members need to determine and justify what documentation is needed to deliver the final product. Another reason for minimal documentation could be that there is a change from documents to discussions in Agile ISD approaches; for example, starting development without a traditional specification document, and testing without relying too much on documentation (Cohn 2010). When introducing Scrum to project teams, Cohn and Ford (2003) regularly found programmers who liked creating far more documentation than was required.

5.1.1.3 Collaboration between the business customer and project team

The increase in collaboration between the business customer and project teams at ABC Bank is quite consistent with the literature. Ceschi et al. (2005) found that a good working customer relationship and a shared understanding between the Agile team members and customers was critical to Agile development. Misra, Kumar, and Kumar (2010) also found there was a change from non-customer-centric to customer-centric development when moving to an Agile ISD approach.

Similar to the findings in this study, Hoda, Noble, and Marshall (2010) found that regular interactions between the business and the development team were limited in traditional projects. The authors found that the traditional business usually specifies its requirements at the start of the project and gives feedback towards the end. Also similar to this study was the finding by van Waardenburg and van Vliet (2013) that business involvement is critical to the effective use of Agile practices. The organisational change found in this study where a PO (who represented the business) was part of the Agile team and frequently had to prioritise features based on business

value supports Stocks (2015). The author believes that this is the biggest cultural change in Agile adoption, especially where the prioritisation of features based on business value is carried out without much documentation to rely on. The author also finds that the PO plays a much more active role as opposed to checking documented deliverables in traditional projects.

5.1.1.4 Delivering value early and frequently

The fundamental cultural change of early and frequent delivery of business value at ABC Bank is also quite consistent with prior literature. Misra, Kumar, and Kumar (2010) found that moving from a traditional to an Agile ISD approach involved a fundamental change in process, from a life cycle model to one that aided feature-based development using an iterative approach. This meant, as discussed in the previous section, that the business, represented by a PO, had to decide which features would be included in each iteration based on their priority and business value. Similar to the finding at ABC Bank, Cohn (2010) also found that having to complete functionality at the end of every iteration constituted a fundamental change for developers.

5.1.1.5 Response to changes in a project plan

The major cultural change at ABC Bank, requiring the business to be flexible and responsive to change, is prominent in the practitioner literature but lacking in the academic literature. Broza (2017) states that a basic principle of the Agile ISD method is responding to and reducing the cost of change. In contrast, the traditional method is based on principles such as ‘plan the work and work the plan’, committing early to project scope/cost/schedule, and fulfilling those commitments. With these principles come practices such as detailed upfront planning and management of change in projects, says the author. The major change at ABC Bank that required the business to change its mindset and give preference to a change in project scope over the project’s schedule, resources or quality, supports a similar finding by Cohn (2010).

5.1.1.6 General change in work practices and tools for project team members

The major changes in work practices at ABC Bank, including the estimation of work, the splitting of large work items, stand-up meetings and retrospectives, are consistent with the practitioner literature but lacking in the academic literature.

Sliger (2012) verifies that in traditional projects, work estimation is done using a ‘bottom-up’ approach, where every task needed to fulfil requirements is estimated (in hours/days), and the estimates are then used to build a project schedule. The estimation generally does not involve all project team members. Agile projects on the other hand use a ‘top-down’ approach, where gross-level estimation techniques such as ‘planning poker’ (Mountain Goat Software n.d.) are applied to product features. Planning poker considers the expert opinions of the whole project team, using the ‘wisdom of the crowd’ in estimation.

Cohn (2010) found that teams using a traditional development process are used to working on a large extent of functionality at one time. In contrast, the volume of work being done at any point in time in an Agile project generally has to be as small as possible states the author. Therefore, Agile teams need to be able to split functionality into smaller pieces of work.

In traditional projects, teams will probably meet weekly for 90 minutes to report the status of projects (Brownlee 2008). In contrast, the team in an Agile project has a daily fifteen-minute meeting, called a ‘daily scrum’ or stand-up, where the team stands in a circle and each member reports the status of the tasks they are working on (Sliger 2011). Similar to the finding at ABC Bank, the author states that the team meets in front of a card wall and cards are moved across the wall to reflect their status: what is currently being done, what has finished, and what is left to be done. The card wall and daily meeting provide more visibility, offering a transparent view of the status of the iteration.

Similar to the finding at ABC Bank, a PIR is conducted after the completion of a traditional project, partly to evaluate how effective the project management practices have been (Sliger 2011). The author states that in Agile ISD methods like Scrum, a retrospective is held at the end of each iteration for the team to learn how to improve,

which was also the case at the bank. Again similar to the finding at the bank, Sliger (2011) states that the team uses the retrospective to find out what it did well, what the issues are, and what to change in the next iteration. The changes implemented are then reviewed in the following retrospective.

5.1.2 Changes in technical practices specific to programmers and testers

Similar to the findings in this study, Cohn (2010) found that the technical practices like pair programming, TDD, emergent design, and automated testing are fundamental changes for traditional programmers and testers.

Pair programming, where two programmers share a computer to collaborate when programming, is unconventional and rarely used in traditional approaches (Choi, Deek, and Im 2008). The authors state that the characteristics of pair programming suggest a psychological and social interaction between the programmers that brings about something unique not seen in the individual programming model used in traditional approaches.

Cohn (2010) states that the steps used by traditional programmers to write code are poles apart from TDD. In the traditional approach, programmers would write code, fix any compilation errors, and step through the code with a debugger. This process would be repeated a few times a day. In TDD, failing automated tests are developed before writing just enough code to pass the test. The code is then ‘cleaned up’ through refactoring. The process is repeated a few times every hour. Nerur, Mahapatra, and Mangalaraj (2005) state that this fixed deep-rooted tradition must be overcome for TDD to be established as the norm.

The big change to emergent design found at ABC Bank is not reported in the academic literature. In a traditional approach, decisions regarding design are made upfront (Cohn 2010). In contrast, they are not made upfront in an Agile ISD approach; design is emergent and done incrementally. Programmers who have the traditional mindset that a solution can be designed before the start of any coding must change to the mindset that a fully considered design is not always required before coding.

Test automation is crucial in an Agile ISD approach for testing to keep up with the speed of development in Agile projects. Cohn (2010) found that testers often find themselves being asked to learn automation tools used by the team which might involve some programming in automated testing, which was the case at the bank.

The findings of this study in relation to the changes in technical practices specific to programmers and testers - pair programming, TDD, emergent design and automated testing - support the findings of Cohn as described above.

5.1.3 Changes in work practices specific to a business analyst (BA)

Findings at ABC Bank indicate a change in a BA's work practices when using an Agile ISD approach. The BA did not produce a functional specifications document and used a just-in-time and just-enough approach as the project progressed, to progressively refine and understand high-level product backlog items. This change in work practices for BAs at the bank is consistent with the literature. Cohn (2010) states that the job of a BA in traditional projects is to attempt to get as far ahead of the team as possible and produce a functional requirements specification document before development begins. In contrast, just-in-time and just-enough analysis is the aim of the BA in an Agile project; the BA attempts to be slightly ahead of the team, supplying information about current and near-term features. For example, the BA begins by discussing with the PO current and near-term features from a product backlog. The BA will then communicate the information to the team informally instead of using detailed documentation. The BA plays the role of a facilitator, guiding the PO and team in discussing one story at a time. In their study, Dingsøyr et al. (2019) found that a key lesson in product backlog management was that details of user stories in the product backlog was worked out two iterations ahead. Hastie (2008) also states that the BA is the 'shepherd' of stories, drives the process of discovery, and facilitates the communication within the team, including the PO.

The findings of this study in relation to the changes in work practices specific to BAs; that is, not producing the traditional functional requirements document but using a just-in-time and just-enough approach, conform with the findings of the authors, as described above.

5.1.4 Changes in the role of a project manager (PM)

The finding of this study of a major change in the role of a PM at ABC Bank supports the findings in the initial and subsequent literature reviews. The change from command-and-control management in a traditional project to leadership-and-collaboration in an Agile project supports the findings of Cockburn and Highsmith (2001) and Nerur, Mahapatra, and Mangalaraj (2005) in the initial literature review.

The finding also supports literature in the subsequent review where Misra, Kumar, and Kumar (2010) also found that a leadership-and-collaboration style of management is preferred over a command-and-control style in Agile ISD approaches. The authors state that the project manager's role is to collaborate with the team and coordinate the efforts of the team. Giving up the authority a traditional PM had is the main challenge for the PM.

The finding of this study that a PM has to learn to trust the team confirms the findings of Cohn (2010) and Sauer and Reich (2009). McHugh, Conboy, and Lang (2011b) also state that a PM has to trust team members in making decisions and completing their tasks on time.

5.1.5 New role of an iteration manager (IM)

The comments by an IM at ABC Bank that the IM role was about leadership and team building, and it required people skills are found in the practitioner literature by Cohn (2010). The comment by the IM at the bank about the need for facilitation skills supports Broza (2012), who states that facilitation is a skill that is required of Agile team leaders, such as an IM. The finding in this study that an IM has to be the 'protector' and gatekeeper of an Agile team supports Cohn (2010), who states that an IM has to push back against POs who press a team in an attempt to get more out of the team.

5.1.6 Change for stakeholders (Enterprise Agility)

The Agile transition at ABC Bank involved stakeholders outside of the project teams; it required Enterprise Agility. The assertion by this author that the changes in these areas and stakeholders outside the project teams were significant is consistent with the literature, as discussed in this section, which discusses the Agile change for stakeholders within and outside the IT organisation.

Cohn and Ford (2003) state that moving from a traditional plan-driven operation to an Agile ISD approach involves not only the project team members, but also other teams, departments, and management. The project teams have to interface with other organisational functions (Dikert, Paasivaara, and Lassenius 2016). These organisational functions are downstream or upstream of the project team and the team requires their collaboration or cooperation at a minimum (Broza 2012). Broza (2012) states that these stakeholders, who have their own needs and obligations, will probably need to change their process to meet the needs of the project team. It is not possible for Agile development teams to continue being Agile without other areas becoming, at a minimum, compatible with the Agile ISD approach (Cohn 2010). Denning (2019) states that in an Agile transformation, an organisation needs a paradigm shift in its operational model and mindset throughout the organisation. Having one area of the organisation working in an Agile manner while the other areas are not is essentially unstable. The Agile transformation will ultimately fail.

Rubin (2015) states that the organisational areas along its value chain that must work together to deliver, have to embrace Agile values and principles. The success of the business can be put at risk if IT and other areas have dissimilar principles, a situation that would result in a huge disconnect.

In this study, the other organisational areas along the value chain at the bank had to collaborate with the Agile teams for Enterprise Agility. To deliver product features continuously and respond to changing project requirements, the values and principles, in the opinion of this author, which the other organisational areas had to embrace included teamwork, the early and continuous delivery of business value, and responsiveness to change. The other areas at the bank had to trust the project teams and learn to work with 'lighter' documentation. Principles such as face-to-face communication, self-organising teams and continuous improvement can be applied in their daily work activities.

Although this study covered only some of the organisational areas in the figure below (Rubin 2015), the figure is being presented to clarify the lack of alignment in the value-chain of an organisation.

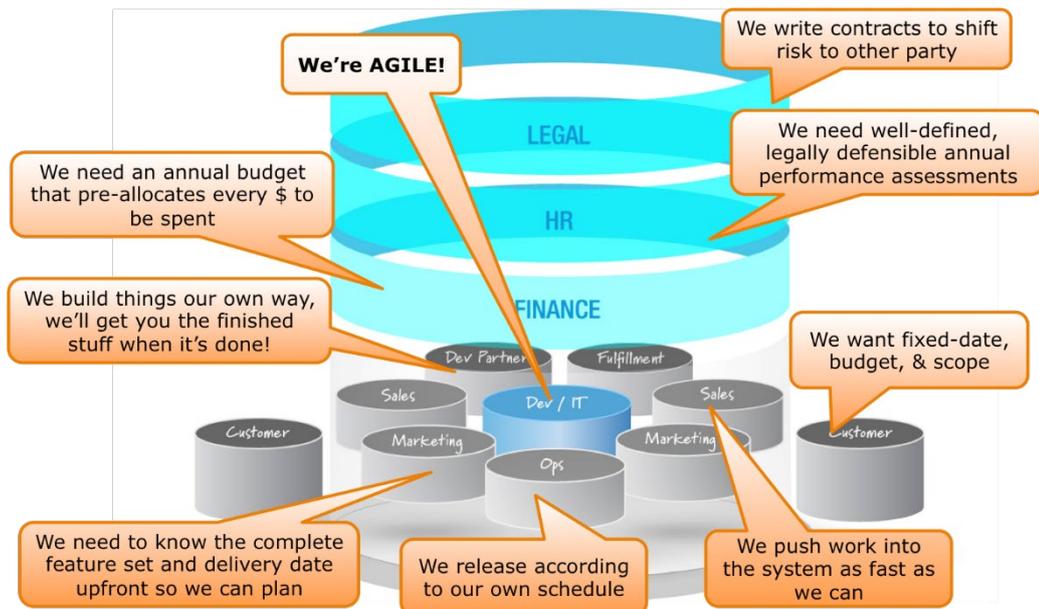


Figure 11. Examples of the types of enterprise value-chain misalignment

From Rubin, K. 2015. *Agile Misalignment Through the Enterprise Value Chain* (reproduced with permission of the publisher Innolution).

5.1.6.1 Stakeholders within the IT division affected by the change

The major changes at ABC Bank for middle management, the PMO, Infrastructure and Operations under Agile are found in the literature.

Middle management

The findings in this study on changes for middle management support the finding by Dikert, Paasivaara, and Lassenius (2016), who report that an Agile transformation causes changes in some management roles, in particular a cultural change at the middle management level. Similar to the findings in this study, the task of allocating individuals to projects in matrixed organisations is usually still carried out by the functional managers during Agile adoption (Cohn 2010). The Agile values that middle management has to embrace are however missing from the literature. In the opinion of this author, the Agile values that middle management must embrace in relation to project team resourcing in Agile implementation are the values of teamwork, and of keeping teams consistent to develop teamwork.

The change in personnel responsibility for middle managers at the bank supports the practitioner literature. Broza (2012) states that in a siloed organisation like the bank, an Agile team member not only reports to a functional manager but also to the team.

However, the functional manager is still responsible for the team member. The author states that this is a 'highly loaded' situation that needs to be managed.

PMO

This study's finding that the major change at the bank for the PMO under Agile occurs in the areas of project resourcing and governance echoes previous findings in the literature.

Project resourcing

Team members are frequently allocated concurrently to different projects in matrix organisations like the bank (Engwall and Jerbrant 2003). The authors found that the current practice in matrixed organisations where team members are allocated to multiple projects simultaneously is a major issue. Many organisations preferred to have dedicated project teams where developers were dedicated to one or possibly two projects, which was similar to the preferred requirement for dedicated teams at the bank during Agile implementation. Like middle management, the PMO has to embrace the value of teamwork and the importance of keeping teams consistent in Agile implementation.

Governance

The finding in this study that change was required in project governance supports Boehm and Turner (2005), who state that traditional contracts, milestones, and progress measurement techniques might not be sufficient when attempting to support an Agile ISD approach. Cohn (2010) also states that the governance checkpoints used for traditional projects are not suitable for the iterative development approach used in an Agile ISD approach.

Infrastructure and Operations

Similar to the findings in this study, Dikert, Paasivaara, and Lassenius (2016) report that Infrastructure and Operations are two areas that need to change as they interface with the development teams. Under these two areas, the subsets of continuous delivery and training are examples examined below.

Continuous delivery (CD)

The finding in this study that the release process contained barriers that prevented quick and frequent releases is consistent with Stocks (2015), who states that

numerous large organisations like the bank have IT operating models that do not support an Agile ISD approach. The author states that development and production teams are often separate, with separate lines of reporting that can impede Agile processes. For example, the integration team may have six-monthly production release cycles, whereas an Agile ISD approach requires more frequent continuous release of software. This is an example of the ‘Waterfall-at-end’ scenario where an Agile ISD method and traditional sequential development converge at the end of a project (Cohn 2010). Similar to the findings in this bank study, Dikert, Paasivaara, and Lassenius (2016) reported that Infrastructure and Operations teams had to change the way they operated to keep up with the increase in the speed of development. The authors state that an Agile transition would be seriously undermined and fail to achieve its full potential if these areas are not aligned with the Agile transformation; for example, leading to misalignment in the frequency of software releases.

Rigby, Sutherland, and Takeuchi (2016) report on a large financial services company that developed a mobile application using an Agile ISD method. Before it could be released, the application had to pass vulnerability testing by going through a long and drawn-out traditional Waterfall process, which had a long queue. The application then had to be integrated into the company’s core IT systems, which entailed another Waterfall process already backlogged for up to nine months. The result was a merely minimal improvement in the time it took to release the application.

The Agile values that Infrastructure and Operations have to embrace in relation to governance are missing from the academic and practitioner literature. In the opinion of this author, the main Agile value that Infrastructure and Operations must embrace is the early and continuous delivery of business value. The Agile values of teamwork and collaboration must also be embraced, as Infrastructure and Operations have to work and collaborate with Development to achieve CD.

Training

This study found that the training group in ABC Bank traditionally created training documentation only when the development of a product was complete. As a product in an Agile project was built and released in an incremental manner, the training group had to modify this process. This finding aligns with that of Boehm and Turner

(2005), who state that the documentation required for training using traditional methods is not what Agile ISD methods produce and this requires adjustments to the Agile process. The training group must appreciate the reasons behind incremental delivery if they are to adjust the way they work.

5.1.6.2 Stakeholders outside the IT division affected by the change

Similar to the findings in this study, Dikert, Paasivaara, and Lassenius (2016) report that Finance and Legal are areas that also need to change since they interface with the development teams.

Similar to the findings in this study, Thomas and Baker (2008) state that funding of IT projects for a large organisation normally happens as part of the yearly corporate budgeting process where business units create budgets before a financial year begins. Projects and funding levels are determined, and this establishes the IT plan for the upcoming year. As a lot of time and effort is put into the process, there is unwillingness to change the plan and there is an emphasis on meeting instead of changing the plan in response to any changes in conditions along the way. This restricts flexibility in managing projects to deliver the greatest business value. Rigby, Sutherland, and Takeuchi (2016) describe the process in a large financial services company (like the process used at the bank in this study) to secure approval to finance a pilot project for a mobile application using an Agile ISD method. The budget request had to join a batch of requests competing for authorisation in the following annual planning process. It took months of reviews before funding for the project was finally approved. Cao et al. (2013) state that a change in the funding process for Agile projects is required, as traditional funding in Agile projects brings about conflicts due to the fundamental difference in the two methods.

Johnson and Coombs (n.d.) state that rolling or possibly monthly budgets would make management more aware of current and possible future realities within the organisational context to better manage the response to organisational challenges. The authors state that the 'beyond budgeting' model (which the bank in this study was exploring), highlights the need for organisational, managerial and cultural changes for the model to be used successfully. This involves a substantial change in mindset and behaviour as it is a radically different approach. It needs a mindset that

steps away from control and necessitates a reduction of the internal political power of big departments.

5.1.7 Summary of organisational changes

Moving from a traditional to an Agile ISD approach should be perceived as an organisational change. It is not merely an implementation of a new approach; it involves radical organisational change. It involves moving not only to a fundamentally different ISD process that includes new practices and tools, but also to a fundamentally different culture. It causes a change in the way people work and a change in behaviour and values to support the new way of working. This transformation also extends to other areas of the enterprise, as the project teams must collaborate and get the cooperation of other organisational functions downstream or upstream of the project team. These areas need to change their process and embrace Agile values, principles and practices; for example, the early and continuous delivery of business value, responsiveness to change, self-organising teams, teamwork, ‘light’ documentation, face-to-face communication, and continuous improvement.

The finding that the above changes resulting from an Agile transition are radical and involve a major change in an organisation’s way of working and its culture is on the whole consistent with the academic and/or practitioner literature (see table below).

Table 17. Findings on organisational change in relation to the literature

| Organisational Changes | Supports academic literature | Supports practitioner literature |
|---|-------------------------------------|---|
| 5.1.1.1 Teamwork | | |
| Co-location | Y | Y |
| Collaborate to complete work | | Y |
| Whole team responsibility | | Y |
| Assume other roles within the team | Y | Y |
| Self-management | Y | Y |
| Extensive interaction and communication among team members. | Y | Y |
| 5.1.1.2 Documentation (use of minimal documentation). | Y | Y |
| 5.1.1.3 Collaboration between the business customer and project team (extensive collaboration between PO and project team). | Y | Y |
| 5.1.1.4 Delivering value early and frequently – iterative development. | Y | Y |

| | | |
|---|---|---|
| 5.1.1.5 Response to changes in a project plan – change in project scope. | | Y |
| 5.1.1.6 General change in work practices and tools for project team members: | | |
| Top-down group estimation of work | | Y |
| Work on small work items at a time | | Y |
| Daily stand-up meetings | | Y |
| More visibility | | Y |
| Retrospectives after each iteration. | | Y |
| 5.1.2 Changes in technical practices specific to programmers and testers | | |
| Test-driven development (TDD) | Y | Y |
| Emergent design | | Y |
| Pair programming | Y | Y |
| Automated testing during iterations. | | Y |
| 5.1.3 Changes in work practices specific to a business analyst (BA) (just-in-time and just-enough analysis. | Y | Y |
| 5.1.4 Changes in the role of a project manager (PM) – leadership-and-collaboration management. | Y | Y |
| 5.1.5 New role of an iteration manager (IM) | | Y |
| 5.1.6.1 Stakeholders within the IT division affected by the change | | |
| Middle management | | |
| Change in middle management role | Y | Y |
| Change in personnel responsibility for middle management | | Y |
| PMO | | |
| Project resourcing | Y | Y |
| Governance | Y | Y |
| Infrastructure and Operations | | |
| Continuous delivery | Y | Y |
| Training. | Y | Y |
| 5.1.6.2 Stakeholders outside the IT division affected by the change | | |
| Finance (Project funding) | Y | Y |
| Legal. | Y | Y |

5.2 Action/Interaction

Managing the change was the biggest challenge for the organisation in this study.

Understanding that the change is radical and widespread is critical for those managing the change in an Agile transition to prevent a failure in its implementation and to ensure that the organisation gets the full benefit from the transition.

The findings in this study suggest that it is critical for those managing the change to understand the full importance of management (top and middle) and stakeholder support. The findings in this study also suggest that Enterprise Agile adoption and change-management experience are essential success factors, as managing such a radical change is very difficult and demanding. The people in the organisation must be aware of the need to change. A huge effort is also required to change their world view, get them to embrace a new culture, and to help them adopt a new way of working. Education and training are also critical factors for assisting people in the change. The education and training needs to emphasise Agile more as a culture rather than just a method with associated practices and tools. This approach would help people apply Agile values and principles to everything they do as part of their work. The change in mindset can be accelerated further through coaching. The change needs to be sustained and team-building activities are required to develop team relationships.

The strategies used at ABC Bank to manage the change are consistent with the literature on change management in general and change management in relation to a ISD method implementation. The subsections below present a discussion of the success factors in the change management strategies used at the bank (as described in section 4.2.4 Action/Interaction) in relation to the literature.

5.2.1 Support from top management

The initial literature review found management support to be an important factor in the implementation of traditional SDMs (Higgins and Hogan 1999; Roberts and Hughes 1996; Roberts et al. 1998; Sultan and Chan 2000). This study found that it is also important in the transition to an Agile ISD approach. The finding in this study supports Livermore (2007) who found a significant correlation between the successful implementation of the Agile ISD method and management support and involvement. The State of Scrum 2017 report indicates that 66% of Agile practitioners found management support important when adopting Scrum (ScrumAlliance 2017). Dikert, Paasivaara, and Lassenius (2016) also found many cases where management support was pivotal. The authors also found, similar to this study, that visible involvement by management was reported to motivate and inspire employees to adopt the new way of working; for example, an engineering company

VP attending integration demonstrations regularly. Kim and Kankanhalli (2009) found that commitment by top management to IS implementation is significant in increasing organisational support for the change, which in turn reduces user resistance.

The finding in this study that the CIO was instrumental in the success of the program supports Van Der Vyver, Lane, and Koronios (2011), who found that Agile implementation is better accepted when it has a senior figure as the 'Agile champion'. The finding in this study that courage was required of management supports Cohn (2010), who states that the senior person, as the initiator of the transition, should be responsible for driving it, and has to be prepared to carry out the difficult organisational changes required for its success.

Senapathi and Drury-Grogan (2017) found that for sustained usage of an Agile ISD method, top management support involved more than just initiating and promoting the transition, and offering financial support and training. It also required active involvement and commitment to implementing the Agile process effectively. Dikert, Paasivaara, and Lassenius (2016) also found that managers were seen as key players in sustaining the change since they had the power to remove obstacles.

5.2.2 Support from middle management

Moitra (1998) found from experience that middle management commitment and support is required for software process improvements. Similar to the finding in this study, Roberts and Hughes (1996) found that management support is required for the supply of required resources and for promotion of the new method. Dikert, Paasivaara, and Lassenius (2016) found that middle management could disrupt an Agile transformation if it was not involved in the process. The issue of middle management resistance is discussed in section 5.5.2.4 Middle management resistance.

5.2.3 Support from stakeholders

The finding at the bank that support was required at all levels of the organisation supports Olson and Eoyang (2001), who state that creative and lasting change needs support from people at various different levels. The success of the Agile transformation depends on others within the organisation adopting the Agile ISD

method and becoming agile themselves. All functions within an organisation need to participate and be involved for successful adoption of technological innovations (Wolfe et al. 1990). The success of the Agile ISD method in any one area is significantly influenced by its interaction with other functional areas (Fleischer and Roitman 1990).

5.2.4 External support

Findings in this study support the finding in the initial literature review, in Roberts et al. (1998), that using external consultants when implementing a new SDM in an organisation is important if the organisation does not have the expertise to manage the implementation itself.

5.2.5 Enterprise Agile adoption experience

Broza (2012) suggests obtaining guidance from Agile experts to avoid obvious errors in an Agile transformation; for example, not foreseeing the organisational barriers that can be caused by stakeholders affected by the transition. The importance of having Enterprise Agile adoption experience is discussed further in section 5.5.2.7 Lack of Enterprise Agile adoption experience.

5.2.6 Change management expertise

Agile transition is a large program of change which has many aspects happening concurrently that require coordination (Baddoo and Hall 2003). In a reply to Blash (2011), Dawn Metcalfe (on 5 January 2011 at 08:10 a.m.) argues for professional change management and change managers in an organisation. Metcalfe stated that organisations were starting to acknowledge that initiatives and projects were at the risk of failure without such change management expertise. In another reply to Blash (2011), Doug Bonebrake (on 1 May 201 at 05:48) states that the size, scope and complexity of a change may necessitate that a Change Management Office be created, similar to the experience in this study. The office would be responsible for overseeing the planning, communication and education required to put in place an organisational culture that can embrace and adopt the change. The importance of having change management experience is discussed further in section 5.5.2.8 Lack of change management experience.

5.2.7 Change management

A key lesson Pries-Heje and Krohn (2017) found when moving from 'plan-driven waterfall-like software development to agile development' was to give more consideration to the changes required. Orlikowski (1993) states that although radical change provides an opportunity to initiate basic change, it also involves more risk and difficulty. The findings of this study suggest that it was very difficult managing a radical change brought about by a transition from a traditional to an Agile ISD approach in a relatively large organisation like the bank.

Roberts and Hughes (1996) found change hard and change management essential in implementing a new SDM, the key being the management of the change from the current to the new SDM. The authors state that a major commitment was required from those involved and they had to understand that the change process was continuous and involved a lot of work. Lawson and Price (2003) state that programs to improve the performance of organisations are common. However, they have been notoriously hard to execute. Such programs rely on convincing many individuals in an organisation to transform; that is, to change their mindset to accept the change in the way they work. Changing mindsets is not an easy job. VersionOne found that a crucial obstacle to Agile transition usually centred on the ability and willingness to change (VersionOne 2016). In their literature review on the experiences of large companies adopting Agile methods, Kalenda, Hyna, and Rossi (2018) found several cases that encountered significant challenges in their transformation as change management was lacking.

Although the bank did not appear to have a formal change management strategy at the start of Agile implementation, it carried out activities that were traditional change management strategies. These involved communicating the need to change, conducting education and training, providing coaching, and reinforcing the change, which are some of the ways of achieving the outcomes of the ADKAR model (Prosci n.d.-a). This process was described in the findings in section 4.2.4.7 Change management activities.

Due to lack of change management experience at the bank, it was found that more work had to be done in the bank to create the desire in individuals to participate in

the change, which is the second step in the ADKAR model. The issue of a lack of change management experience is discussed further in section 5.5.2.8 Lack of change management experience.

5.2.7.1 Awareness of need to change

The communication of the reason and goal for Agile adoption at ABC Bank, which was not a factor in Table 2 for this study, is prominent in the change management literature.

Creasey (n.d.-b) states that the top reason for employees resisting change is a lack of awareness of the need for change. Hiatt (2006) states that the first step to facilitate change is to generate that awareness. Adams, Berner, and Wyatt (2004) found in their literature review a number of researchers (Jiang, Muhanna, and Klein 2000; Lauer, Joshi, and Browdy 2000; Lorenzi et al. 1997; Worthley 2000) citing communication as one of the most critical activities for system implementation. Moitra (1998) states that a carefully thought-out vision and lucid comprehension of the context are required for implementing new processes. The author states that there must be a comprehension of the reasons behind the change in process, its long-term benefits, and how the new process fits into the business environment.

Cohn (2010, 69) states that a 'vision of the organisation's Agile future' must be communicated to employees, and employees have to be aware of the necessity to change in an Agile transition. Meaney and Pung (2008) state that change endeavours that have goals that are transformational and are defined clearly have a much higher chance of success. Dikert, Paasivaara, and Lassenius (2016) found that it was important to communicate clearly the reasons and goals behind an Agile transformation as it helped people understand the purpose of the change, and removed any confusion. The first lesson learnt in the study by Cram (2019) was the need to clearly communicate to business users and IT staff the reasons behind Agile adoption, its benefits, and how Agile should be adopted.

The use of communication events to increase awareness, such as a string of one-day, one-hundred people events arranged by an organisation to inform all IT staff of changes to its strategy, has been reported by Dikert, Paasivaara, and Lassenius (2016). Niazi, Wilson, and Zowghi (2006) also found that using awareness events to promote the long-term value of an improvement to a software process was essential

to obtaining the support of management and staff. Dikert, Paasivaara, and Lassenius (2016) found that transparency during the transformation was significant and sharing experiences and communicating the status of the transformation ensured everyone was 'on the same page'.

The use of pilot projects to assist in creating awareness is also prominent in the literature. Dikert, Paasivaara, and Lassenius (2016) found that pilot projects were reported as a major success factor, as they assisted in assuring people within the organisation that the new way of working was appropriate. The authors also found pilots were particularly notable for getting acceptance from management, which is similar to the finding in this study. Cohn (2010) states that the results of successful pilot projects make it difficult for people to dispute the change.

5.2.7.2 Knowledge (education and training) and Ability (coaching)

The use of education, training and coaching at ABC Bank is prominent in the implementation and change management literature. The use of education and training provides an individual with the knowledge required to change (Prosci n.d.-c). It also needs to be ongoing (Fruhling, McDonald, and Dunbar 2008). Coaching develops the individual's ability to demonstrate the required changes 'such that overall expected performance results are achieved' (Prosci n.d.-b). Coaching is useful in putting to use the knowledge obtained from training. Coaching can complement training to assist a team during the transition to Agile ISD methods (Conboy et al. 2011).

Cohn (2010) also states that an Agile ISD method such as Scrum generally needs training and coaching as it is very different from traditional IS development. Teams will have to learn new skills and acquire new ways of working, and team members will need to collaborate as a team. The focus of the initial training is to generate a willingness to attempt the new method and understand its core principles, followed by coaching on specific practices.

In their literature review on the experiences of large companies adopting Agile ISD methods, Kalenda, Hyna, and Rossi (2018) found the lack of training and coaching a common challenge. This contributed to other issues and difficulties. The reason for the lack of training and coaching was underestimating the effort required in an Agile

transformation, lack of management support, financial restraints or a hasty transformation.

Education

The use of education to handle myths and misconceptions at ABC Bank is consistent with Boehm and Turner (2005), who state that countering mythology through education is an old and respected practice. The finding in this study of the need to educate stakeholders is also prominent in the literature (Broza 2012; Cohn 2010; Misra, Kumar, and Kumar 2009; Boehm and Turner 2005). Cohn (2010) states that affected stakeholders have to understand Agile principles, how information system development benefits from Agile adoption, the possible conflict with development teams, and the need to make some changes in the way they interact with the development teams. For example, ING persuaded its sales force and branch network to embrace agility through the use of stand-ups and other means (Jacobs and Schlatmann 2017).

Training

The initial literature review found that SDM training was an important factor in the successful implementation of traditional SDMs (Cho and Kim 2002; Roberts et al. 1998). This study found that it is also important in the transition to an Agile ISD method. The subsequent literature review found that this finding supports Misra, Kumar, and Kumar (2009), and Mangalaraj, Mahapatra, and Nerur (2009), who found that training and learning are success factors in Agile implementation. Dikert, Paasivaara, and Lassenius (2016) also found that training was important to the success of an Agile transformation and that the change would have faltered without training. The authors report that after training, people were more positive towards the new way of working and keen to change.

The focus at the bank on teaching Agile as a culture and mindset rather than a method supports Dikert, Paasivaara, and Lassenius (2016), who found that the emphasis should be on Agile principles as opposed to Agile practices. The authors found that by understanding Agile values, people understood the reasons for the change and were more motivated. The authors also found numerous examples of problems caused by the use of Agile practices without an understanding of their purpose. Linders (2015) states that people would interpret Agile practices according

to their current frame of reference; for example, the product backlog would be regarded as another form of requirements specification document, the daily stand-up would be viewed as a form of status reporting, the IM would act as a project manager practising a command-and-control leadership style, or the retrospective would be regarded as an approval meeting.

Furthermore, Hastie and Robson (2013) argue that Agile implementation is about a change in culture and a move to more collaborative and adaptive ways of working; it is not just following a process or employing practices. Broza (2013) states that the change in culture will probably result in a deeper transformation than just adopting a process and practices. The author states that the culture change moves an organisation from 'doing Agile' to 'being Agile.' Hastie (2015) believes that the implementation of Agile practices without a culture change may result in some benefits but not an Agile transformation. Denning (2019) states that one of the main reasons why General Electric's Agile transformation failed was that process was put ahead of mindset in its Agile implementation. The transformation was implemented as a change in process; the Agile mindset was wanting. Cohn (2010) suggests that a concurrent emphasis on practices and principles has to be advocated.

Although, Dikert, Paasivaara, and Lassenius (2016) report that inexperienced coaches placed too much focus on practices, this was not evident in this study. This could be because the coaches interviewed were quite experienced.

Lastly, the strategy of running 'small A' and 'big A' projects at the bank appears to support Boehm and Turner (2005) who suggest adopting Agile practices that gel, such as prioritising requirements, test-first and continuous integration, pair programming and time-boxing, irrespective of the process used.

Coaching

The recommendation by Schatz and Abdelshafi (2005) in the initial literature review that experienced coaches can ease the transition to Agile development is supported in this study. The subsequent literature review found that this finding also aligns with the findings of Dikert, Paasivaara, and Lassenius (2016) and Cohn (2010). Dikert, Paasivaara, and Lassenius (2016) report a few cases where coaching was essential to success in transformation. The authors also found cases where the success of pilot projects that were coached could not be repeated in subsequent projects where there

was a lack of coaching. Cohn (2010) also states that coaching is extremely beneficial, beyond training, as coaches can assist teams with Agile practices and self-organisation. Senapathi and Drury-Grogan (2017) identified coaching as a major factor in cultivating and maintaining well-balanced, high-performance self-organising teams. A coach was able to challenge a team's view of what it could do and permit the team to discover its self-organising behaviour. Having coaches help team members in their different roles was also useful. For example, Cohn (2010) states that it is difficult for an IM to acquire new skills, learn how to lead without authority, get team members to adopt new practices, and know when to intercede in team decisions, without support from coaches.

Dikert, Paasivaara, and Lassenius (2016) also found that coaching could correct problems or the improper use of techniques; for example, working in a mini-Waterfall manner during an iteration. Broza (2012) states that coaches could also cultivate intrinsic motivation and help the team to develop and change. Dikert, Paasivaara, and Lassenius (2016) report that the coaching of teams in a real work environment is essential as it is hard to change mindsets through training alone. Coaches assisted in shifting the focus away from tools towards an understanding of Agile principles.

Training existing staff at ABC Bank as coaches aligns with Senapathi and Drury-Grogan (2017), who found that fostering and empowering internal coaching communities was central to attaining long-term sustainability.

5.2.7.3 Reinforce change (sustain the change)

While making a change is difficult, sustaining a change can be even harder than creating the change; it is natural for individuals to go back to the way it was before the change (Prosci n.d.-d). The recognition of success and use of positive messages, rewards and celebrations, at ABC Bank are traditional activities used to reinforce change. Similar to the finding in this study, Dikert, Paasivaara, and Lassenius (2016) found that Agile implementation was aided by making public any benefits and applauding even the smallest achievements by teams. This generated interest in other people and enhanced their eagerness to attempt the new way of working.

The attempt by the bank to get individuals to embrace an Agile mindset supports Senapathi and Drury-Grogan (2017) who found that instituting an Agile mindset as a norm in teams was critical to sustaining an Agile transformation. Without it, resistance would increase, leading to dysfunction within teams. Team members would return to their old traits, particularly in pressurised circumstances.

5.2.8 Team building

Due to the significance of teamwork in an Agile ISD approach, team building (which was not a factor identified in the initial literature review) was important in this study in developing relationships among Agile team members. The importance of team building at the bank echoes the work by Van Der Vyver, Lane, and Koronios (2011), who found team building was crucial but was often overlooked in Agile implementation. Broza (2012) also suggests cultivating teamwork and shared responsibility by making available opportunities to develop relationships among team members; that is for them to discover common ground at professional and personal levels, and to develop individual human connections. Dikert, Paasivaara, and Lassenius (2016) found, similar to the finding in this study, that a mixture of social activities was valuable to the enrichment of team bonding.

Gratton, Voigt, and Erickson (2011) suggest that teams focus on tasks in the early stages and start building interpersonal relationships at the right time. Cohn (2010) suggests introducing team building activities only after a team has completed a few iterations. The author believes that a team needs to have some shared experience before team building activities can be useful. It was not clear exactly when the teams introduced team building activities at the bank, but it was after the teams had started working on projects.

5.2.9 Summary of action/interaction

Obtaining top management support, commitment and involvement are critical factors in an Agile transition towards increasing organisational support, providing sponsorship and financial support, removing organisational obstacles during the transition, and motivating employees to embrace the change. Middle management commitment and support is also critical for providing the required resources; for example, resources for projects and promoting the use of the new approach within various internal areas. Stakeholder management, and support from the areas that have

to change the way they work and interact with the development teams, are significant and important factors for successful achievement of Enterprise Agility.

Enterprise Agile adoption experience, change management and change management experience are also essential since managing such a radical change is very difficult and demanding. The people in the organisation must be aware of the need to change. A huge effort is also required in getting them to embrace a new culture and adopt a new way of working. Education and training are required to assist people in the change, in particular the change in mindset. The change in mindset can then be accelerated through coaching. The change needs to be sustained and team building activities are required for developing team relationships.

The critical factors identified above overall supports the academic and/or practitioner literature on change management and on change management in relation to SDM implementation (see table below).

Table 18. Findings on action/interaction strategies in relation to the literature

| Factor | Supports academic literature | Supports practitioner literature |
|---|-------------------------------------|---|
| 5.2.1 Support from top management | Y | Y |
| 5.2.2 Support from middle management | Y | Y |
| 5.2.3 Support from stakeholders | Y | Y |
| 5.2.4 External support | Y | |
| 5.2.5 Enterprise Agile adoption experience | | Y |
| 5.2.6 Change management expertise | Y | Y |
| | Y | Y |
| 5.2.7.1 Awareness of need to change | | |
| 5.2.7.2 Knowledge (education and training) and Ability (coaching) | Y | Y |
| 5.2.7.3 Reinforce change (sustain the change) | Y | Y |
| 5.2.8 Team building | Y | Y |

5.3 Consequences

Organisational change was reported as the biggest issue with the Agile transition at ABC Bank. Adapting to this radical change was very difficult for a relatively large organisation like the bank. This finding supports Cohn (2010), who states that an Agile transition is more difficult than most other initiatives that require organisational change. The author states that the changes stemming from an Agile

transition are fundamental changes that require a lot from developers and affected stakeholders and are much more difficult than organisations expect. Orlikowski (1993) also states that a change that is radical is more difficult than an incremental change. Sircar, Nerur, and Mahapatra (2001) state that a radical change ‘causes the most stress on an organisation’s coping mechanisms’ and that organisations struggle in dealing with the change. About half of the Agile practitioners surveyed found that it was difficult transitioning from a traditional Waterfall-based method to one driven by Scrum practices (ScrumAlliance 2017).

The change at the bank required people to not only learn a new way of working but also unlearn the old way. The change involved overcoming established norms and deeply rooted system development work practices which required the people affected to go through a conceptual transformation in the transition. Korson and McGregor (1990) state that learning a new SDM requires a much higher cognitive burden because of the change to an individual’s world view.

Achieving Enterprise Agility at the bank made the effort even more difficult as it was hard for areas outside project teams to see the benefit of the change, apart from supporting the teams in this new way of working.

The difficulty experienced by the bank in this study when adapting to the change (as described in section 4.2.5 Consequences) is consistent with the literature and is discussed in this section.

5.3.1 Reactions to general changes in culture and work practices by project teams and business

The finding in this study that the change was difficult as people at the bank had got used to working and thinking in a very different way for a significant length of time, and that it required an unlearning of old behaviours and habits, conforms with findings in the literature. The difficulty in having to unlearn old work practices and learn new ones was also reported by Hardgrave, Davis, and Riemenschneider (2003).

One reason this might be so is the reluctance to abandon learned habits. In their literature review on the experiences of large companies adopting Agile ISD methods, Kalenda, Hyna, and Rossi (2018) found that some Agile teams were unwilling to give up their old way processes and tools. Secondly, Cohn (2010) states that moving to an Agile ISD method such as Scrum is as difficult as it is dramatically different.

The author also states that team members not only have to pick up new skills and ways of working, but also have to unlearn previous work practices. Hardgrave, Davis, and Riemenschneider (2003) further argue that the more a development method differs from the existing work process, the longer and more difficult it is for developers to unlearn old ways of working and learn new ones.

Cohn (2010) further states that ‘changing practices is one thing; changing minds is quite another’. Elleithy (2013) agrees and states that the most challenging aspect of a transformation is the change in mindset. Pries-Heje and Krohn (2017) found that implementing an Agile mindset was one of three major challenges an organisation faced in Agile adoption. Boehm and Turner (2004) also state that it is not easy changing people’s mindsets, which makes the transition to an Agile ISD method more difficult for many organisations. Van Der Vyver, Lane, and Koronios (2011) also found that individuals immersed in the traditional Waterfall mindset are not willing to adopt an Agile ISD method. VersionOne found that respondents continually named the conflict between organisational culture and core Agile values as one of the biggest obstacles to further Agile adoption (VersionOne 2016). This anxiety about organisational culture rose from 44% in 2014 to 55% in 2015.

5.3.1.1 Teamwork

The finding at the bank that co-location was a positive change and facilitated collaboration again is in line with the literature. Moe, Dingsøy, and Dybå (2009) found that with co-location, there was more frequent discussion among team members about project work. If team members were not used to speaking to other team members, they would begin speaking eventually once there was co-location. Broza (2012) states that co-location is not critical for agility but assists teamwork as it facilitates collaboration by building trust. Trust is critical to the success of Agile ISD methods (Nerur, Mahapatra, and Mangalaraj 2005), in particular with self-managing Agile teams, as the team members depend heavily on each other. Nerur, Mahapatra, and Mangalaraj (2005) believed that trusting team members may be hard for developers as they are used to working mainly on their own in traditional projects. The finding in this study that working as a cross-functional team was a big challenge is also reported in the practitioner literature but is largely missing in the academic literature. The assertion by Cockburn and Highsmith (2001) in the initial literature review is that teams used to a culture that is not people-centred and not

collaborative will find it difficult working in an Agile project. Cohn (2010) states that one of the bigger challenges in an Agile transition is ‘learning to think and work as a team’. The author states that the challenge is due to team members being used to working quietly in a cubicle with minimal collaboration, not much interaction, and without sharing the responsibility for tasks with the rest of team, which is similar to the finding in this study. Poston, Patel, and Tymchenko (2016) state that daily and active collaboration may be uncomfortable for introverted team members.

The finding that collaborating to develop functionality was difficult for teams at the bank is also found in the practitioner literature but again lacking in the academic literature. Cohn (2010) states that traditional teams are used to handing over work items among the different disciplines using a sequential development process; in other words, a process where one member finishes a work item before the next member can start work on it. An example of this is a programmer having to finish coding a work item before a tester does his or her part. The CIO at ING states that making people collaborate across silos is still a big hurdle in most traditional organisations (Jacobs and Schlatmann 2017). Cohn (2010) also finds that changing to a culture of shared and whole-team responsibility is difficult for teams.

Similar to the finding in this study, Cohn (2010) and Dikert, Paasivaara, and Lassenius (2016) report that some people are anxious about new roles and responsibilities in an Agile transition; for example, testers concerned that they will have to carry out tasks outside their usual role. The work team phenomenon has been increasing in skilled trades with regard to innovation implementation (Fleischer and Roitman 1990). The authors state that the separation of roles has become more muddled, with workers being cross trained in different roles. To make such an entrenched change successful, management must prepare for the change or else it can result in an extensive drop in morale, damaging implementation.

The finding about the difficulty of self-organisation is consistent with the literature. Moe, Dingsøyr, and Dyba (2008) found that a change from working individually to a self-managed team entails a reorientation. This takes time and self-management needs to be enabled when beginning to use an Agile ISD method. Cohn (2010) states that some people just want to be told what to do so that they cannot be sacked for doing what they were told to do.

The finding that increased interaction was difficult for some team members at the bank echoes Cohn (2010), who states that the change in communication and interaction can be worrying for programmers and testers. In their study, Conboy et al. (2011) also found that there were technically talented people with weak communication and presentation skills who were stressed about interacting in a group.

The finding in this study that a team member was taken off a project for his lack of communication is mirrored in a study by Moe, Dingsøy, and Dybå (2009), who describe a situation where a developer was doing work for future projects and not telling the other team members about it. The developer lost the trust of the team. This behaviour was an obstacle to the Agile practice of self-managing teams and the idea of shared decision-making.

The mixed reactions at the bank to the increased noise level in an Agile environment are closely reflected in Cohn (2010) and Rayhan and Haque (2008). Cohn (2010) states that some people found an Agile environment too noisy and wanted some quiet time, while Rayhan and Haque (2008) reported that most people found the benefits of increased interaction outweighed the increased noise level. However, having some quiet (Cohn 2010) and allowing team members to work without being disturbed when needed (Moe, Dingsøy, and Dybå 2009) should be requirements respected by the team. In the opinion of this author, the mixed reactions could be due to the different characteristics of the individuals concerned, a factor which is discussed in section 5.4.2 Individual characteristics.

5.3.1.2 Documentation

The findings of this study in relation to the BAs finding it difficult to decide what documentation to create is missing from the literature. This reaction, in the opinion of this author, was understandable as it was the BAs' first experience working in an Agile project, equipped with just a guideline to produce 'just enough' documentation that was 'fit for purpose'. Having to think 'outside the square' is generally challenging for most individuals. It takes time and experience to know how much is enough and fit for purpose. The second BA did find it easier the second time around working in a subsequent Agile project.

The finding in this study where some individuals at the bank were uncomfortable not having the same level of documentation that they were used to, supports the practitioner literature, where Cohn (2010) states that starting projects without a traditional specification document is uncomfortable for project team members. The author states that many stakeholder groups will also find it very unsettling, and opines that in an Agile ISD approach, the people so affected will just have to learn how to start a project without the traditional documentation. In the opinion of this author, this is another change that individuals will generally get used to over time.

5.3.1.3 Collaboration between the business and project teams

Some programmers and testers at the bank were uncomfortable with engaging the business and found it stressful. This is understandable as it was new to them and not within their comfort zone. This supports Crispin and Gregory (2009) who found that collaborating with business was new for testers and was uncomfortable for most people.

The comment by a PO in this study about ‘a breaking down of the walls between IT and business’ and discussions between the business and IT about opportunities the bank’s systems could deliver that the business was not aware of, supports Dikert, Paasivaara, and Lassenius (2016). These authors found some POs being labelled ‘Agile enthusiasts’ after they discovered how the business and IT could collaborate using an Agile ISD approach.

The comment by a PM in this study that business managers did not want to be involved in daily project activities at a micro-level and preferred to delegate the required work is not found in the Agile implementation literature, but is found in management literature. Kirwan (2013) states that for a long time, delegation has been viewed as a necessary tool for management when assistance is required to fulfil tasks. The author states that high-level experienced managers are inclined to delegate more.

5.3.1.4 Delivering value early and frequently

Nerur, Mahapatra, and Mangalaraj (2005) state that one of the biggest obstacles to the move from a traditional to an Agile ISD approach is the change in process from a

life cycle model to one that aids feature-based development using an iterative approach.

The finding in this study that delivering software every two weeks was a challenge to teams is consistent with the practitioner literature by Cohn (2010). The author states that most teams which have not worked in a manner that employs short and focused time-boxed iterations find this frequent delivery a significant challenge as it requires team members to collaborate and eliminate the handover of work. The Agile development teams work at high speed (Cohn and Ford 2003). The authors state that a worker who is not up to speed would either slow down the team or be left behind by the team.

The finding in this study that the POs interviewed were comfortable with the prioritisation of backlog items and the use of user stories is not consistent with the literature. Dikert, Paasivaara, and Lassenius (2016) report that POs grappled with producing high-level requirements. The authors reported several cases where it took a lot of learning to become proficient with the process of creating user stories at the product management and development levels. An explanation for the difference could be differences in the native ability of the individuals, or differences in how they were taught and trained to create user stories (Felder and Brent 2005).

The finding that some business stakeholders wanted to maximise the number of features instead of value delivered is not found in the literature. A possible explanation for this, as found in management literature, could be the tendency for people at times to put personal interests ahead of the group interest, in this case the interests of the organisation. In such a scenario, the manager is not adhering to the principle of 'subordination of individual interest to the general interest' (Fayol 1949 in ; Fells 2000). To handle this issue, the author suggests 'firmness and leading by example, as well as agreements where practical, and constant supervision'.

5.3.1.5 Response to changes in a project plan

The difficulty experienced by the business (the bank) in this study in adopting a mindset that can accept a change in scope in order to meet a project's schedule and budget supports Cohn (2010), who finds that it is a challenge. The disappointment displayed by POs at the bank when not all features are completed at the end of a

project because of change also concurs with the author. Although the author thinks that the disappointment is warranted, he argues that it is not the worst thing that could happen, considering that features are delivered in order of priority and a PO obtains the best achievable product given the constraints of the project. The author states that a PO has to understand that it is less difficult to fix the schedule, resources and quality of a project, than it is to fix the scope.

The finding in this study where a PO wanted a team to commit to more than what the team said it could deliver supports Broza (2012), who describes senior managers putting pressure on Agile teams to perform. The author also found managers getting anxious and annoyed when things did not turn out as planned. Dikert, Paasivaara, and Lassenius (2016) also report a case where senior management put pressure on teams to deliver what the business had planned, irrespective of the velocity of the team. The reason for this could be that managers tend to regard estimates as a commitment or guarantee (Broza 2012; Cohn 2010).

5.3.1.6 General change in work practices and tools for project team members

The reactions of project team members to splitting work, estimation, and stand-ups is discussed below.

Splitting work

The difficulty experienced at ABC Bank with splitting work into small work items supports Cohn (2010) and Dikert, Paasivaara, and Lassenius (2016). Dikert, Paasivaara, and Lassenius (2016) state that the recommendation on how to address the problem was to provide training in breaking down user stories, which is what the bank did in the form of coaching. Cohn (2010) also found that this skill usually comes with experience.

Estimation

The comments by a PM at the bank that Agile estimation is accurate supports Mahnič and Hovelja (2012) and Moløkken-Østvold, Haugen, and Benestad (2008), who found that estimates obtained through ‘planning poker’ are inclined to be more accurate compared to the statistical combination of individual estimates. Moløkken-Østvold, Haugen, and Benestad (2008) also found that the estimates from ‘planning

poker' were less optimistic. This could explain why the business stakeholders generally expected a lower estimate than the estimates provided using 'planning poker'.

Stand-ups, visibility and retrospectives

Similar to the finding in this study, Cohn and Ford (2003) found a number of developers that viewed Agile processes as a bid to micro-manage. The authors state that developers who have that view are likely to feel that interactions with their project managers are about due dates and missed deadlines. The authors suggest managers stop whining and being judgmental if a task takes too long or takes more time than planned.

The negative attitude to stand-ups at ABC Bank by some team members who viewed stand-ups as status reporting to the manager supports the finding by Stray, Sjøberg, and Dybå (2016). These authors also found that team members nonetheless also had a positive attitude towards the daily stand-up meeting, as it allowed information sharing within the team and the chance to talk about issues and resolve them. A coach at ABC Bank suggested explaining the purpose of Agile practices such as stand-ups to alleviate any negative attitude towards an Agile practice.

Similar to this study, Conboy et al. (2011) found that the visibility of using an Agile ISD approach caused discomfort for developers. Practices like stand-up meetings and tools like card walls made a team member's deficiencies evident to the team. The authors suggest having an environment where developers do not feel threatened when revealing their shortcomings; for example, a lack of progress in completing tasks.

Similar to the finding on accountability in this study, McHugh, Conboy, and Lang (2011a) found that the visibility also resulted in pressure and stress on team members as they felt accountable for delivering what they agreed to.

Similar to this study, Diebold and Mayer (2017) found that retrospectives were valued as a useful way to work on improving process. This study's findings also align with the assertion by Nerur, Mahapatra, and Mangalaraj (2005) that the notion of shared learning and group reflective meetings may be overwhelming for people used to working individually.

5.3.2 Reactions to change in technical practices specific to programmers and testers

The finding in this study that Agile technical practices like automated testing, TDD and pair programming were difficult and resisted by teams at the bank is consistent with Cohn (2010). The author states that these practices are difficult to adopt; they are prevalent throughout a developer's workday and resistance will be more as their impact is greater. The author also states that some of the practices counter training received in the past and developers must unlearn these past behaviours. People are frequently tentative about, if not resistant to, these new practices.

Pair programming

The findings at the bank that pair programming was not used extensively and that some programmers were uncomfortable using pair programming is consistent with the literature. Firstly, only about a third of the Agile practitioners surveyed said that pair programming was used in their Scrum projects (ScrumAlliance 2017). Secondly, Cohn (2010) finds it difficult to get teams to do pair programming all the time and pushes them to pair-program on a part-time basis when it comes to the riskiest features of an application. Broza (2012) does not push pair programming as a mandatory practice as the author finds it not worth the effort and frustration. Nerur, Mahapatra, and Mangalaraj (2005) state that pair programming may be overwhelming for programmers as they are used to working alone. Lastly, Conboy et al. (2011) finds that developers were afraid that the Agile process could expose their shortcomings, which was the case for a programmer using pair programming in this study.

Test Driven Development

The finding in this study that TDD was difficult and encountered a lot of resistance supports the practitioner literature but is not found in the academic literature. Only about a third of the Agile practitioners surveyed said that TDD was used in their Scrum projects (ScrumAlliance 2017). TDD being a very different way of working, Cohn (2010) also found it difficult to make programmers engage with it. It took roughly a year to make some headway. Broza (2012) also states that it can take

months. The author suggests not harassing programmers and being patient as they must develop their own thoughts and beliefs.

The finding in this study that a senior programmer at the bank did not see TDD as the right thing to do could be explained by the finding by Cohn (2010), who states that whether TDD results in more robust or better designs is disputed. The finding in this study that programmers also do not like an external technical coach teaching them to practise TDD supports Broza (2012), who states that any perception by people that they are being told by another person how to do their job will probably generate resistance. Similar to the finding in this study, Cohn (2010) found that TDD was difficult to put into practice and as a result, this technique was not used as regularly as it should be by programmers.

Automated testing

Findings in this study on the reactions to automated testing can be found in the practitioner literature but are missing from the academic literature. The differences in the experiences of the testers interviewed in this study, where one tester did not find automatic testing as difficult as another tester did, could be explained by those testers' differing technical backgrounds. The tester who seemed to have no difficulty had an undergraduate degree in computer science, a postgraduate degree in computing, and had testing experience before joining the bank at the start of the Agile transition. The other tester, who found it very difficult initially, did not have any degree related to IT; started as a teller in the bank and then moved to software testing. Cohn (2010) found that many testers are anxious about the change to automated testing. However, the author states that time, practice and training should get rid of the anxiety, which was the case for the tester in the bank who initially found it very difficult.

5.3.3 Reactions to changed work practices from a business analyst (BA)

A BA's reactions to a changed way of working is found in the practitioner literature but is missing from the academic literature. Similar to findings in this study, Cohn (2010) found that many analysts overall like the change to an Agile ISD approach,

although as found in this study, they might not be the sole interpreter of business requirements as they would usually be in traditional projects.

The finding in this study that the second BA interviewed saw the use of a just-in-time and just-enough approach as easy is not found in the literature. However, it does seem logical that once a BA is used to an Agile ISD approach, working on one small work item at a time with 'just enough' documentation would be less challenging than having to work on large pieces of functionality that require a large amount of documentation.

A reason for there being no mention of BAs having major issues with creating user stories in Dikert, Paasivaara, and Lassenius (2016) could be that the BAs interviewed in this study had coaches assigned to their projects and most of the BAs at the bank had received training in user stories.

5.3.4 Reactions to the change in the role of a project manager (PM)

The finding in this study that it was very difficult for the PM to change leadership style supports Mangalaraj, Mahapatra, and Nerur (2009), who state that the biggest challenge for a PM is to give up the authority the PM has enjoyed in traditional projects. Paasivaara and Lassenius (2016) found that managers, including the PMs, were micromanaging teams as they had not embraced the Agile mindset.

The finding in this study that PMs found it difficult to meet the requirement to trust the team supports Cohn (2010), who found that it was initially difficult even for a traditional PM who generally supported and enabled teams, to learn to trust team members in an Agile project. The ability to trust the Agile team occurred after the PM found that teams were able to recognise the tasks required to complete the scope for each sprint. Cohn (2010) believes that it is easier to employ PMs with the right attributes than to try to change the traditional mindset of an existing PM. Sauer and Reich (2009) found, similar to the finding in this study, that PMs were aware of the need to actively manage trust and that they had to invest energy in creating trust. The authors also found, as with the comments made by the second PM interviewed in this study, that PMs mentor and develop their team members as this might enhance their motivation and performance on current projects. This might be useful when working with the same team members on future projects. Some PMs built a personal network

established on mutual trust. The authors also found, similar to the finding in this study, that there was a shift in the PMs' focus from product creation to the creation of business value and organisational benefit as the end goal.

5.3.5 Reactions to the new role of an iteration manager (IM)

The comment by an IM in this study about the difficulty of getting buy-in from team members (as described in section 4.2.3.5 New role of an iteration manager supports Cohn (2010), who states that an IM may have to convince team members, without dictating that they attempt new practices.

Moe, Dingsøy, and Dybå (2009) found in their study that IMs made many decisions for the teams, particularly when there were issues in projects. An IM in their study commented that it was hard keeping quiet when he had a useful suggestion for the team. This was a habit that was hard to change. However, the finding in this study was not consistent with the finding by the authors. The IMs interviewed in this study did not mention that they were inclined to make decisions for the team. In the case of the first IM that was interviewed, this finding could possibly be attributed to the fact that the IM had not previously worked in a role that managed project teams, and also because this IM had made a conscious decision that the role of an IM was about team leadership and team building. Although the second IM in this study was in a management role as a development team leader, any inclination the IM may have had to make decisions for the team would probably have been discouraged by the coach that was assisting the IM and team in that project.

5.3.6 User resistance

This study found that even though the project team members interviewed generally welcomed the change, they did indicate that there was also resistance to the change. Kalenda, Hyna, and Rossi (2018) report a similar finding in their study. VersionOne (2016) found in its survey that one of five significant barriers to Agile adoption was a general resistance to change.

Cohn and Ford (2003) state that most developers react to an Agile transition with the 'appropriate combination of scepticism, enthusiasm, and cautious optimism'. Dikert, Paasivaara, and Lassenius (2016) state that the expectation should be that not everyone will be prepared to change and some will never adjust to the new way of working. Humphrey (1998) states that even smart practitioners will not use practices

that logic, experience and even proof indicate they should adopt. Subjectivity plays a role in resistance; certain individuals or groups may agree to a change while others may resist it (Collinson 1994). Creasey (n.d.-a) states that resistance is the natural and normal response to change and every individual has a limit to the amount of change they can cope with. Broza (2012, 238) also states that ‘some resistance is a normal part of being independent, intelligent human beings’.

The reasons for user resistance found in this study (as described in section 4.2.5.6 User resistance) are also prominent in the literature. The report of user resistance at the bank due to historical reasons supports Worthley (2000), who reports user resistance due to an earlier adverse experience with an IT initiative. Cohn (2010) states that many employees have been left wary after going through a myriad of change initiatives.

The term ‘status quo bias view’ refers to resistance attributable to the predilection for sticking with the current situation (Samuelson and Zeckhauser 1988). The comfort with the status quo at the bank aligns with findings by Sanders (1974), who states that if the status quo is perceived as adequate, the desired change may be difficult to achieve. Baddoo and Hall (2003) state that this principle echoes the well-known saying, ‘If it ain’t broke, don’t fix it’. Ginzberg and Reilley (1957) also found that a lot of the resistance to change is associated with an intrinsic conservatism, an unwillingness to change the status quo. Dikert, Paasivaara, and Lassenius (2016) also report an Agile transformation that was impeded by a deeply embedded status quo.

In this study, individuals resisted change at the bank because they had not been swayed by its benefits, and this reason for resistance is also reported by Sanders (1974). The influence of the perceived benefits of the Agile ISD method is discussed in section 5.4.1.1 Perceived usefulness and value. Markus and Robey (1983) state that user resistance is influenced by the fit between the characteristics of the user and the system. In this study, the fit between some staff and the new method was not good, even though an effort was made to get the staff to fit in with the method. This resulted in the staff concerned leaving the project team. The influence of the characteristics of an individual on the acceptance of Agile ISD methods is discussed in section 5.4.2 Individual characteristics. Lastly, the finding in this study that user resistance could have been generated by a perception that the individual was being

told by another how to do their job, or the perception that the other person felt they knew more about the individual's job, supports a similar finding by Broza (2012).

5.3.7 Change and project team members

The finding in this study that people generally felt more invigorated in their work and perceived their work life to be better and more rewarding in the change to an Agile ISD method is consistent with findings in the practitioner literature. Although the reasons were not provided, 43% of the Agile practitioners surveyed said there was an improvement in the quality of work life when using Scrum, while 40% said there was improvement to some extent (ScrumAlliance 2017).

5.3.8 Reactions to change by stakeholders

The issues with stakeholders in the bank support findings by Rigby, Sutherland, and Takeuchi (2016), who state that research by the Scrum Alliance found more than 70% of Agile practitioners reported tension between the rest of the organisation and their Agile teams. Similar to the finding in this study, Dikert, Paasivaara, and Lassenius (2016) also report tension and describe other functional areas as resistant and unwilling to change when exposed to the new way of working. The authors reported that the need to interface with other functional areas was challenging for the development teams. Kalenda, Hyna, and Rossi (2018) also found in their study that a challenge to the transformation process was the integration with other areas of the organisation who were still using a non-Agile development process. However, the resistance from stakeholders and unwillingness to change generally improved over time at the bank.

Similar to the findings in this study, the reasons for the tension most commonly cited in the literature were:

- development teams and other areas pursuing different 'road maps' and moving at different speeds (Rigby, Sutherland, and Takeuchi 2016)
- different groups who were used to working according to a long-term plan but were required to adapt to an incremental delivery approach at a faster speed to feed and support development (Dikert, Paasivaara, and Lassenius 2016)
- the Agile ISD approach affecting the scheduling of when development teams should interact with other functional areas during development (Dikert, Paasivaara, and Lassenius 2016)

- an upfront Agile activity feeding a downstream activity with less than the anticipated and required detail (Cohn 2010).

5.3.8.1 Reactions of stakeholders within the IT division affected by the change

The experience of the change among middle management, PMO, Infrastructure and Operations reported in this study supports the findings in the literature.

Middle management

The reaction of middle management to the change in this study is found in the literature. Hiatt (2006) states that middle management is the area where resistance is most commonly found. Kalenda, Hyna, and Rossi (2018) found that resistance to change by middle management a major issue and it was more significant in larger organisations like the bank in this study.

Cohn (2010) also states that traditionalist ‘diehards’ are frequently found in middle management as they want to retain the status they have. The author found, similar to the finding in this study, that a tactic commonly used to impede a transition to Agile is to manipulate the control of resources; for example, controlling manpower resources so that Agile project teams cannot have members who work for the duration of the project, and ensuring that team members are not available for part of a project. Broza (2012) believes that it is possible that this is done unwittingly by middle management. Creasey (n.d.-b) found that the main reason why managers resist change is a concern about losing control and authority which might explain why some middle managers in this study felt uncomfortable having their staff co-locate with the Agile team.

PMO

The change experience in the areas of project resourcing and governance reported in this study supports the literature. The finding that the PMO at the bank had to find out how to change its formalised rigid processes to be flexible and still fulfil the functions of a PMO in the best manner supports the literature. Oppong (2019) states that a PMO needs to re-examine its activities to understand their purpose, assess whether those activities are still required, and focus on what needs to be done in its place.

The PMO officer in this study said that the PMO was used to change; staff in the PMO had to have an open mind. As the PMO had to change the way it operated with Agile projects (as described in section 4.2.3.6 Change for stakeholders), a PMO, in the opinion of this author, has to embrace the Agile values of adaptability and responsiveness to change. This supports the practitioner literature where Oppong (2019) states that the PMO needs to be adaptable due to the pace of change organisations are being confronted with. A culture of embracing change has to be developed within the PMO.

Project resourcing

Similar to the findings in this study, Stettina and Hörz (2015) found that the introduction of Agile ISD methods created new challenges to current portfolio management practice, particularly in large organisations that have to cope with co-existing sequential project management approaches. As with the experience at the bank, the authors found that in a large majority of organisations, Agile ISD methods were initially used in individual projects that did not adhere to an Agile project portfolio management framework. The importance of bringing portfolio management practice into line became evident after successful use of the Agile ISD method in pilot projects. The current portfolio management practices then had to be adapted to suit the new approach. Stettina and Hörz (2015) state that Agile IS development evolves into Agility in project management. It is a learning process; getting over the challenges of resource allocation and the silo mindset takes time.

Governance

The issues emerging from this study in relation to governance for Agile projects are consistent with those found in the literature. Gregory et al. (2016) found that a challenge facing Agile practitioners is that the traditional ways of ensuring that projects comply with regulatory or legal requirements are often process-driven and bureaucratic. Boehm and Turner (2005) state that an area of concern for a mature organisation like the bank is that an Agile ISD approach may affect its ability to meet ISO or other process standards, since most Agile ISD methods do not support the level of documentation needed for lower-level certification. A PMO, in the opinion of this author, has to embrace the Agile value of using of 'light' documentation.

Similar to this study's observations of the PMO at the bank, Gregory et al. (2016) found in their study that the PMO was in the process of developing its base of Agile knowledge and beginning new processes. There was still inconsistency in reporting for different projects and project report templates were still evolving. As the traditional governance checkpoints do not fit work carried out in an iterative manner in Agile projects, Cohn (2010) suggests having checkpoints at a high level to ensure oversight while still permitting teams to run projects using an Agile ISD approach. Rautiainen, von Schantz, and Vähäniitty (2011) state that integrating Agile IS development with the phased review processes was difficult, due once again to attitudes.

Infrastructure and Operations

The change experience in the areas of CD and training found in this study supports the findings in the literature.

Continuous delivery

Leppänen et al. (2015) found, as did this study, that moving to CD was not a minor change. The authors state that this shift might need substantial process changes even when an Agile ISD method like Scrum is used. CD has to be a core part of the organisational culture if successful implementation of CD is to occur (Fitz 2009). Humble and Farley (2010) also state that, although it is known that frequent releases result in less risk in any one release, the intuitive objection is that frequent releases are too risky.

As found in this study, an organisation-wide effort is required for successful implementation of CD (Arnold 2012; Claps, Svensson, and Aurum 2015). Olsson, Alahyari, and Bosch (2012) found that it needed the involvement and collaboration of different areas within the organisational units. The authors state that it is important for product management to be engaged in the short, iterative cycle of Agile product development and for the product managers to share a common goal when moving towards continuous deployment. Fleischer and Roitman (1990) state that cross-functional implementation teams should be established to surface and handle conflict.

The finding that it was initially very difficult having frequent releases of software to production and the move to DevOps at the bank supports Hemon et al. (2019). The

authors state that many companies have moved towards DevOps as they were unable to attain more frequent releases, which resulted in lengthy delays in releasing software to clients. This was mainly due to the traditional separation between Development and Operations. The move to DevOps, that is, integrating Development and Operations, was to eliminate these two areas working in silos and make software delivery more efficient. While Agile implementation improves the collaboration among development team members, DevOps extends the collaboration to IT Operations staff and brings the goals of both areas into line (Hüttermann 2012). The DevOps community promotes the collaboration between the two areas as a way of making sure that Development appreciates the issues faced by Operations (Bass et al. 2013).

Training

Boehm and Turner (2005) state that working with different life cycles is difficult for an organisation. For example, the training group at ABC Bank in this study had to make changes to suit the new Agile process used by the project team. The authors also state that the documentation traditionally required for training purposes is not what is normally produced in Agile ISD approaches. Similar to the issue observed with the training group in this study, Dikert, Paasivaara, and Lassenius (2016) reported that some release activities unsurprisingly had long lead times. These activities needed functionality to be specified early in a project, but this was something that an Agile ISD approach could not provide due to its short iterative approach and flexible prioritisation. The authors gave the example of a marketing area which required three months to prepare a product launch and needed correct information about upcoming features of the product in order to prepare marketing material and press releases. Marketing struggled to cope with the features of the product changing along the way under the Agile ISD approach.

5.3.8.2 Stakeholders outside the IT division affected by the change

The change experience for Finance, and also Legal and Compliance in this study, aligns with findings in the literature.

Finance

Johnson and Coombs (n.d.) state that the change from a traditional to a 'beyond budgeting' model is challenging and will involve conflict. As it is a radical change,

the authors question whether managers are able make the change from a behavioural perspective. However, it appears that the managers in this study were able to make the change. This could be due to the parties involved being aware of the issues with the traditional funding process and managers in Finance being open-minded to the need to change the process.

Legal and Compliance

The reaction by Legal and Compliance in this study is similar to the reaction by a user experience and interaction designer team reported in Federoff and Courage (2009). The authors found that the user experience team struggled with the change involved in having to maintain the design’s ‘big picture’ while using the short iterative approach of Scrum. The work done by the team needed a holistic instead of an incremental view, so the time frame of an iteration did not sit well with their design process. The team was overburdened and unhappy. However, the issue was remedied by refining the scheduling of the design team’s interactions with the development teams.

5.3.9 Summary of consequences

Adapting to the radical change entailed in moving from a traditional to an Agile ISD approach was very difficult for ABC Bank. The change required people to not only learn a new way of working but also unlearn the old way. The change involved overcoming established norms and deeply rooted system development work practices. Achieving Enterprise Agility made the effort even more difficult as it was hard for areas outside the project teams to see the benefit of changing, apart from the need to support the project teams in this new way of working. Overall, the difficulty of adapting to the change found in this study is consistent with the academic and/or practitioner literature (see table below).

Table 19. Findings on consequences in this study in relation to the literature

| Organisational Changes | Supports academic literature | Supports practitioner literature | Missing from literature | Not consistent with literature |
|-------------------------------|-------------------------------------|---|--------------------------------|---------------------------------------|
| 5.3.1.1 Teamwork | | | | |
| Co-location | Y | Y | | |
| Collaborate to complete work | | Y | | |

| | | | | |
|--|---|---|---|---|
| Whole team responsibility | | Y | | |
| Assume other roles within the team | Y | Y | | |
| Self-management | Y | Y | | |
| Extensive interaction and communication among team members | Y | Y | | |
| 5.3.1.2 Documentation | | | | |
| Use of minimal documentation | | Y | | |
| Deciding what documentation to produce | | | Y | |
| 5.3.1.3 Collaboration between the business and project teams | Y | Y | | |
| 5.3.1.4 Delivering value early and frequently | | | | |
| Iterative development | Y | Y | | |
| PO difficulty with prioritisation and user stories | | | | Y |
| Maximising the number (as opposed to value) of features | | | Y | |
| 5.3.1.5 Response to changes in a project plan | Y | Y | | |
| 5.3.1.6 General change in work practices and tools for project team members | | | | |
| Splitting work | Y | Y | | |
| Top-down group estimation of work | Y | Y | | |
| Daily stand-up meetings, visibility and retrospectives | Y | Y | | |
| 5.3.2 Reactions to change in technical practices specific to programmers and testers | | | | |

| | | | | |
|---|---|---|--|---|
| Pair programming | Y | Y | | |
| Test driven development (TDD) | | Y | | |
| Emergent design | | Y | | |
| Automated testing | | Y | | |
| 5.3.3 Reactions to changed work practices from a business analyst (BA) | | | | |
| Just-in-time and just-enough analysis | | Y | | |
| 5.3.4 Reactions to the change in the role of a project manager (PM) | | | | |
| Leadership-and-collaboration management | Y | Y | | |
| 5.3.5 Reactions to the new role of an iteration manager (IM) | | Y | | |
| Getting buy-in | | Y | | |
| IM making decisions for teams | | | | Y |
| 5.3.6 User resistance | Y | Y | | |
| 5.3.7 Change and project team members | | Y | | |
| 5.3.8.1 Reactions of stakeholders within the IT division affected by the change | | | | |
| Middle management | | | | |
| Change in role | Y | Y | | |
| Change in personnel responsibility | Y | Y | | |
| PMO | | | | |
| Project resourcing | Y | Y | | |
| Governance | Y | Y | | |
| Infrastructure and Operations | | | | |
| Continuous delivery | Y | Y | | |
| Training | Y | Y | | |

| | | | | |
|---|---|---|--|--|
| 5.3.8.2 Stakeholders outside the IT division affected by the change | | | | |
| Finance (Project funding) | Y | Y | | |
| Legal | Y | Y | | |

5.4 Intervening Conditions

Although strategies (as described in section 4.2.4 Action/Interaction) were used to manage the change, the outcome of the change was also influenced by the intervening conditions (as described in section 4.2.6 Intervening conditions). The SDM, individual and task constructs in Table 3 were interpreted as intervening conditions that influenced the outcome of the Agile transition in this study. Other intervening conditions found in this study were misconceptions and myths about the Agile ISD approach, project characteristics, and group culture.

5.4.1 Agile ISD method characteristics

A discussion of the SDM themes from Table 3 (in relation to the literature) is presented below.

5.4.1.1 Perceived usefulness and value

In the initial literature review, perceived usefulness was found to be significant in the acceptance of traditional SDMs (Hardgrave, Davis, and Riemenschneider 2003; Riemenschneider, Hardgrave, and Davis 2002).

This study found that perceived usefulness also influenced the acceptance of the Agile ISD method at the bank. A majority of the interviewees in this study spoke about whether the Agile ISD method was useful and beneficial (as described in section 4.2.6.1 Characteristics of the). Some of the perceived benefits from Agile IS development at the bank resemble the benefits reported in the practitioner literature in the subsequent literature review. For example, the benefits of faster feedback, the ability to adapt to change, early identification of problems, flexibility in prioritisation, and team purpose are mentioned by CIOs, chief technology officers (CTOs), and executives from the Forbes Technology Council (Forbes Technology Council 2016). A Scrum Alliance survey found that the benefits most valued by executives were the delivery of business value to customers and the flexibility and responsiveness of the Agile ISD approach (ScrumAlliance 2017). Another survey

conducted by VersionOne found that some of the benefits cited by Agile practitioners were improved business/IT alignment, faster time to market, the ability to manage changing priorities, increased team morale/motivation, and improved project visibility (VersionOne 2016). This finding is also consistent with the academic literature in the subsequent literature review. For example, Overhage, Schlauderer, and Birkmeier (2011) found considerable support for the influence of relative advantage (which is conceptually equivalent to perceived usefulness in TAM) in Scrum projects.

This study suggests that to increase perceived value and usefulness, there needs to be constant messages from management (top and middle) to all staff about the organisational benefit and value of Agile adoption. Coaching (a change management activity used at the bank) can then be used to help individuals discover the personal benefits of using an Agile ISD method with its practices and tools.

5.4.1.2 Perceived ease-of-use

In the initial literature review, perceived ease-of-use was found to be significant in the acceptance of traditional SDMs (Hardgrave, Davis, and Riemenschneider 2003; Riemenschneider, Hardgrave, and Davis 2002).

This study found that perceived ease-of-use also influenced the acceptance of the Agile ISD method at the bank. A majority of the interviewees in this study spoke about the difficulty of using the Agile ISD method (as described in section 4.2.6.1 Characteristics of the). This finding supports literature in the subsequent literature review, where Dikert, Paasivaara, and Lassenius (2016) found that people were willing to change if the change was perceived to be easy enough.

Although the interviewees in this study generally found the use of the Agile ISD method difficult in the initial stages, the difficulty lessened over time as team members became more familiar with the method. This is consistent with Senapathi and Drury-Grogan (2017) who state that while difficulty may have some influence on the change from traditional to Agile ISD methods, it may not have a great effect in the later stages of using the Agile ISD method.

This study suggests that education, training and coaching (three change management activities used at the bank) could be used to increase ease-of-use; that is, to make it

easier for individuals to learn and use the Agile ISD method. Education and training provide individuals with the required knowledge; coaching helps develop their ability and assists them in the use of the Agile ISD method, practices and tools, especially the more difficult practices, such as TDD. Introducing Agile practices in an incremental manner could also make the transition to the new method less difficult.

5.4.1.3 Perceived compatibility

In the initial literature review, perceived compatibility was found to be significant in the acceptance of traditional SDMs (Hardgrave, Davis, and Riemenschneider 2003; Riemenschneider, Hardgrave, and Davis 2002). This study also found that perceived compatibility influenced the use of the Agile ISD method (as described in section 4.2.6.1 Characteristics of the). This finding supports literature in the subsequent literature review where Overhage, Schlauderer, and Birkmeier (2011) also found considerable support for the influence of perceived compatibility on Scrum projects.

5.4.1.4 Result demonstrability

Although Hardgrave, Davis and Riemenschneider (2003), and Riemenschneider, Hardgrave and Davis (2002) did not find result demonstrability to be significant in the acceptance of a traditional SDM, Chan and Thong (2009) believed that it might influence the acceptance of an Agile SDM. The findings in this study that the results of using the Agile ISD approach were apparent to some of the interviewees (as described in section 4.2.6.1 Characteristics of the) appear to support the view of Chan and Thong (2009).

5.4.1.5 Subjective norm

In the initial literature review, the subjective norm factor was found to be significant in the acceptance of traditional SDMs (Hardgrave, Davis, and Riemenschneider 2003; Riemenschneider, Hardgrave, and Davis 2002). The findings in this study that it was co-workers who influenced the bank staff's willingness to use the Agile ISD method (as described in section 4.2.6.1 Characteristics of the) also suggest that subjective norm may influence the use of Agile ISD methods. This finding echoes Cohn (2010) who believes that peer influence is effective and suggests opportunities

for peer-to-peer discussion in order to ensure a successful transition to an Agile method.

5.4.1.6 Career consequences

In the initial literature review, the construct ‘career consequence’ was not significant in the acceptance of traditional SDMs (Hardgrave, Davis, and Riemenschneider 2003; Riemenschneider, Hardgrave, and Davis 2002). However, Cohn and Ford (2003) believed that it was a construct that could influence the acceptance of Agile SDMs. The authors’ belief is partly consistent with the findings in this study. Some interviewees in this study (as described in section 4.2.6.1 Characteristics of the) did make comments about acquiring new relevant and useful skills, and about work being more meaningful. However, they did not mention increased chances of promotion. Neither did they mention the flexibility implied in being able to change jobs, an omission that could be explained by the fact that the bank’s employee turnover rate was relatively low. Although the opportunity to gain job security was not mentioned explicitly, some interviewees implied that everyone eventually would have to adopt the new of working in order to assure their job security in the long run.

5.4.1.7 Perceived maturity

In the initial literature review, perceived maturity was found to be significant in the assimilation of object-oriented technology (Cho and Kim 2002). Chan and Thong (2009) argued that it would also apply to the acceptance of an Agile SDM. The findings in this study do not appear to support the argument by the authors that perceived maturity influences Agile use. This could be because the use of Agile ISD methods has matured since then and they are also now widespread. Maturity might have been mentioned as an issue if Agile ISD methods were relatively new to industry and there was a concern in the community about the level of support given by developers experienced in Agile.

Lastly, the findings in this study would suggest that the characteristics of the Agile ISD method described above would influence its use not only by team members but also by anyone who had to accept a change in the way they worked due to an Agile transition.

5.4.2 Individual characteristics

The 'Individual' constructs of teamwork, communication, customer relationship, self-efficacy and experience in Table 3 have been identified in this study as intervening conditions that influence the outcome.

5.4.2.1 Teamwork

The initial literature review found that teamwork - that is, the ability to work and collaborate in a team, and trust and respect team members (Ceschi et al. 2005; Cockburn and Highsmith 2001; Highsmith and Cockburn 2001; Nerur, Mahapatra, and Mangalaraj 2005; Schatz and Abdelshafi 2005) - was required for Agile ISD methods. The findings in this study (as described in section 4.2.6.2 Individual characteristics) are consistent with the findings of the above authors. The findings in this study also support the subsequent literature review where Dikert, Paasivaara, and Lassenius (2016) found a need for collaborative people in Agile teams. Poston, Patel, and Tymchenko (2016) state that daily and active collaboration may be uncomfortable for introverted team members. Moe, Dingsøy, and Dyba (2008) found that a high degree of individual independence could lead to issues in creating a self-managing team. McHugh, Conboy, and Lang (2011b) discussed the need to identify trust as a personal characteristic when seeking people suitable for Agile IS development, since individuals with different personality types differ in their tendency to trust other individuals (Hofstede 1980).

5.4.2.2 Communication and Customer Relationship

The initial literature review also found discussion of the need for developers to be able to interact and communicate effectively with team members and customers (Cockburn and Highsmith 2001; McManus 2003) and to build a good working relationship with customers (Nerur, Mahapatra, and Mangalaraj 2005). The findings in this study (as described in section 4.2.3.1 General changes in culture and related work practices for project teams and business and in section 4.2.6.2 Individual characteristics) are consistent with the findings of the authors above. Conboy et al. (2011) also found that Agile practices increase social interaction and therefore the need for social and communication skills.

5.4.2.3 Self-efficacy

In the initial literature review, it was found that Chan and Thong (2009) believed that SDM self-efficacy would influence the acceptance of Agile SDMS; developers with high self-efficacy will find it easier to accept an Agile SDM. Some developers in this study found the change stimulating while others found it worrying. Kim and Kankanhalli (2009) found that an individual's self-efficacy for change – the individual's confidence in his or her own ability to adapt to the new way of working – indirectly influenced the individual's resistance to change. The findings in this study that individuals need to have a high tolerance for uncertainty and ambiguity (as described in section 4.2.6.2 Individual characteristics) are aligned with the findings of the authors above. The required ability to handle ambiguity and uncertainty also supports the finding by Cohn (2010).

5.4.2.4 Experience

The findings in this study support the assertion by Cohn and Ford (2003) in the initial literature review, that programmers with experience in the use of traditional SDMs are reluctant to attempt anything different. The findings in this study also suggest that this would apply to other team member roles, not only programmers. As many of the changes require team members experienced in traditional SDMs to unlearn previous behaviours, one would think that all of them would then be reluctant to try something different. Laanti, Salo, and Abrahamsson (2011) found that if someone had more than three years' experience in traditional development methods, this experience had a negative effect on their attitude toward Agile ISD methods. However, the authors found overall that actual experience with Agile ISD methods appeared to be more important than previous experience with traditional methods. This suggested that Agile ISD methods were perceived to provide more value once an individual's experience of using the method grew. The authors found that individuals' opinions about Agile ISD methods generally became more positive as their experience of them grew, which was also a finding in this study. Cohn (2010) states that people cannot be expected to fully accept an Agile ISD method like Scrum until they have been part of an Agile team and have experienced the benefits themselves. The CIO at ING surprisingly found that the 'old guard' staff were more adaptable than their younger counterparts and it was therefore important for staff to maintain an open mind (Jacobs and Schlatmann 2017).

5.4.2.5 Open and adaptable

The finding in this study that developers had to be open and adaptable was not identified in Table 3 but is in line with the subsequent literature review. Firstly, the finding in this study that developers had to be open and receptive to other ideas and not be defensive supports Van Der Vyver, Lane, and Koronios (2011) who found that it was difficult to source technically proficient developers who were open to criticism. That developers also had to be open to change supports Broza (2012), who states that developers have to be both open and flexible. This need for developers to be open and adaptable is also supported by Dikert, Paasivaara, and Lassenius (2016), and by Cohn (2010). The former authors report a need for people who are ready to abandon preconceptions and ready to attempt new ways of working. The latter research states that developers must be adaptable and be ready to attempt something different. The finding in this study that developers had to be proactive and not reticent in asking for help supports the work by Crispin and Gregory (2009), who state that testers have to get involved instead of waiting for work, and need the courage to ask for help.

Lastly, the findings in this study would suggest that the 'Individual' characteristics described above (apart from Customer Relationship) would apply not only to team members but to anyone affected by an Agile transition.

This study suggests that one way of positively influencing this significant intervening condition is to use education, training and coaching. Coaching could be used to develop the ability of individuals to work in teams, which was a strategy used at the bank. Individuals could be provided with training to develop their communication and customer relationship skills. Self-efficacy could also be developed through training (Eden and Aviram 1993; Kim and Kankanhalli 2009). Training could also be provided to develop emotional intelligence (EI). Cherniss and Adler (2000) found that there is a growing need for HR staff to provide training in social and emotional competencies linked to EI. Sony and Mekoth (2016) found that EI had a positive impact on adaptability. Initiative and being at ease with new ideas and approaches is another competency of EI. There are also training and workshops available to help individuals deal with risk and ambiguity (The Oxford Group 2018).

This study suggests that any new employees recruited should be tested for the attributes described above. The former CIO at ING stated that it had been critical in its own Agile transformation that the right people were chosen (Jacobs and Schlatmann 2017). All staff were asked to reapply for a new position in the organisation during its Agile transformation. A higher weightage was applied to culture and mindsets compared to knowledge and experience in an intense selection process. Employees who were knowledgeable but had the wrong mindset were laid off. The CIO believed that capable individuals could recover knowledge with ease.

5.4.3. Project characteristics and application type

The finding in this study that the type of project and application influenced Agile implementation supports the finding in the initial literature review where Mangalaraj, Mahapatra, and Nerur (2009) found that this factor influenced the acceptance of XP practices. Boehm and Turner (2005) also stated that there are many issues when Agile processes are applied to legacy systems within a maintenance or new development program. Refactoring or building capability in an incremental manner is difficult in the context of legacy systems, which often have cumbersome and rigid business processes that are entrenched in the culture and are difficult to change.

5.4.4 Group culture

The finding in this study that the bank had different groups in the different functional areas with differences in culture that influenced their reactions to the Agile ISD approach supports the findings reported in the literature. Schneider (1994) proposes that while most organisations have one dominant culture, the various departments or groups within the organisation usually have different subcultures. Sahota (2012) gave an example of the difference in culture between the development and operations departments within an IT unit which caused conflict.

5.4.5 Misconceptions and Myths

The influence of misconceptions and myths on the outcome in this study supports Dikert, Paasivaara, and Lassenius (2016), who found that reservations expressed about the Agile ISD method in many cases were created by misconceptions, such as the notion that an Agile ISD approach was not suitable for complex products.

Education can be used to counter misconceptions and myths, as described in section 5.2.7.2 Knowledge (education and training) and Ability (coaching).

5.4.6 Summary of intervening conditions

The outcome of an Agile transition is influenced by intervening conditions which are the characteristics of the Agile ISD method, individual and task constructs. Other intervening conditions found in this study are misconceptions and myths about the Agile ISD approach, project characteristics, and group culture. The intervening conditions identified in this study overall support the academic and/or practitioner literature (see table below).

Table 20. Findings on intervening conditions in relation to the literature

| Intervening condition | Supports academic literature | Supports practitioner literature | Not consistent with literature |
|---|-------------------------------------|---|---------------------------------------|
| 5.4.1 Agile ISD method characteristics | | | |
| 5.4.1.1 Perceived usefulness and value | Y | | |
| 5.4.1.2 Perceived ease-of-use | Y | | |
| 5.4.1.3 Perceived compatibility | Y | | |
| 5.4.1.4 Result demonstrability | Y | | |
| 5.4.1.5 Subjective norm | | Y | |
| 5.4.1.6 Career consequences | | | Y |
| 5.4.1.7 Perceived maturity | | | Y |
| 5.4.2 Individual characteristics | | | |
| 5.4.2.1 Teamwork | Y | Y | |
| 5.4.2.2 Communication and Customer Relationship | Y | Y | |
| 5.4.2.3 Self-efficacy | Y | Y | |
| 5.4.2.4 Experience | Y | Y | |
| 5.4.2.5 Open and adaptable | Y | Y | |
| 5.4.3. Project characteristics and application type | | | |
| Project characteristics | Y | | |
| Application type | Y | | |
| 5.4.4 Group culture | Y | Y | |
| 5.4.5 Misconceptions and Myths | Y | Y | |

5.5 Implementation strategy and issues

Implementation is the most difficult step in the innovation process (Fleischer and Roitman 1990). The authors state that implementation activities are complicated: having to prevail over the unavoidable inertia of both people and the organisation makes implementation the hardest step, due to the number of issues that have to be resolved and the sheer volume of work that has to be carried out. This section discusses, in relation to the literature, the implementation strategy and the implementation issues encountered at ABC Bank in transitioning from a traditional to an Agile ISD approach (as described in section 4.3 Implementation Strategy and Issues).

5.5.1 Implementation Strategy

The implementation strategy used at the bank in this study in transitioning to an Agile ISD approach – the approach to implementation, the transition pattern, the spread of agility and the introduction of Agile practices – is also reported predominantly in the practitioner literature on Agile implementation.

5.5.1.1 Implementation approach

The HSD at the bank initially tried a bottom-up approach but later also obtained top management support as the use of a solely bottom-up approach failed. The choice of this strategy supports the findings by Cohn (2010), who believes that for a change such as an Agile transition to be successful, it must incorporate aspects of both top-down and bottom-up change in implementation. The author testifies that resistance from the bottom cannot be overcome without support from above, in particular when areas outside the project teams are also affected by the implementation. Any removal of the obstacles encountered during implementation requires top-down support. Support from the bottom is required as it is the team members who must work through the problems of finding out how the Agile ISD approach would best work in the organisation. Denning (2019) states that a central factor in the failure of General Electric in its Agile transformation journey was the use of a top-down approach in its implementation. Cram (2019) found that staunch supporters at the top and bottom were needed for Agile adoption to be successful in an organisation.

5.5.1.2 Transition pattern

The transition pattern used at ABC Bank was ‘start small’, which is frequently used in organisations moving to an Agile ISD approach (Cohn 2010). ‘Start small’ is where a transition begins with a pilot project, lessons are learned from it, and Agile is then spread throughout the organisation as new Agile teams gain from the experience and learning of earlier teams. The bank used an ‘overlapping’ approach (Cohn 2010) which is one of the approaches used in a ‘start small’ transition. An example of the use of the overlapping approach in the bank can be seen in the way that the second and third Agile projects at the bank started before the first project was completed.

Some organisations prefer a ‘go all-in’ instead of a ‘start small’ transition; for example, Salesforce.com moved thirty teams from Waterfall to Agile development in three months (Fry and Greene 2007). Deciding whether to pursue a ‘go all-in’ approach depends on the context. Cohn (2010, 44) states that the all-in approach worked for Salesforce.com as the company had a ‘hard-driving, aggressive, achievement-driven’ culture that would not have suited a ‘start small’ approach.

The ‘start small’ approach appears to have been a suitable approach for the bank as it did not have a culture like that of Salesforce.com. The advantages of using a ‘start small’ pattern listed by Cohn (2010) were applicable to the bank. Firstly, there was less dependence on external coaches (which was costly). Secondly, the slower speed of the approach (compared to ‘go all-in’) helped the organisation with its strategy to develop its Agile capability internally, which was then used to assist teams in Agile projects that started later. Thirdly, it also allowed the bank to start with a suitable pilot project: a ‘green field’ project that facilitated the use of Agile technical practices as found in Mangalaraj, Mahapatra, and Nerur (2009), and the choice of the right project team members as suggested by Boehm and Turner (2005), which in turn ensured the success of the project. This success was then used to obtain buy-in from those affected by the transition. It also allowed the bank to prove in the early stages of implementation that the Agile ISD approach could work in different types of projects. It further allowed the bank to solve certain issues, such as stakeholder resistance that occurred in early projects and would have affected many projects at the same time if a ‘go all-in’ approach were used. As a less risky approach, this was suitable for financial institutions which were generally risk-averse. Lastly, as the

change associated with the transition was radical and difficult, 'start small' was a better option.

5.5.1.3 Spreading agility

The selection of a pattern to spread agility in the process of Agile implementation is also missing from the academic literature but found in the practitioner literature. The pattern used to spread agility to the project teams at the bank was to use a combination of coaching and the 'split and seed' strategy. The 'split and seed' strategy as described by Cohn (2010) involves a functioning Agile team being broken into two teams which new members without Agile experience then join. The new team members receive guidance from the experienced members. The author states that this strategy allows for a quick spread of agility to project teams, but also acknowledges the downside of breaking up well-performing teams, a downside which was experienced at the bank in this study. To avoid this issue, a 'grow and split' pattern can be used. This is where team members are added to a team until the team attains a size where the team can be split into two small teams; for example, growing a team of six to ten, which is then split into two teams of five. This pattern however might not have been suitable for the bank as it is slower to spread agility to other teams. It also seems a difficult pattern to adopt, for practical/operational reasons.

5.5.1.4 Introduction of Agile practices

Introducing XP technical practices to teams in this study in an incremental manner supports Beck and Andres (2005), who argue that it is too difficult to attempt all practices, embracing the Agile values and applying all the principles all at once. The authors recommend attempting some of the practices and improving one thing at a time. Cohn and Ford (2003) also state that the change for the development team will be less difficult if the transition is gradual. The author found that some teams who started using Scrum were overcome by the change to a point of inaction. Toffler (1970) states that people stop due to the stress and disorientation when asked to make too many changes concurrently. Gandomani and Nafchi (2015) also suggest selecting some Agile practices for an iteration, learning and adjusting the practices over a period, and repeating this process for other practices.

5.5.2 Implementation issues

The issues encountered during implementation at the bank were issues that are found in the literature. Therefore, organisations in a similar situation to that of the bank would probably face all or most of the issues. A majority of the issues encountered were not anticipated at the bank; they were dealt with as they emerged. It appears that in the initial stages of implementation, the bank was unintentionally using a 'firefighting' approach (Baddoo and Hall 2003) to tackle problems. Wolfe et al. (1990) state, 'Adoption decisions may occur with little or no knowledge of their long or short-term consequences. Ignorance of this type is especially likely when the innovation is defined mostly in terms of an overall policy commitment', which appears to have been the case at the bank.

The implementation issues are discussed in the following subsections.

5.5.2.1 Following a comprehensive implementation plan

Roberts and Hughes (1996) found that the successful implementation of a traditional SDM required a detailed plan specifying precisely how the SDM would be implemented in the organisation. Although Project Agile at the bank had a detailed implementation plan, the project floundered after a few months (as described in 4.3.2.1 Following a comprehensive implementation plan). Livermore (2007) found in a survey no significant correlation between possessing a comprehensive implementation plan and the successful implementation of an Agile SDM. The author argues that it could be due to the very nature of Agile SDMs. One of the survey respondents said that the oxymoronic nature of possessing a comprehensive plan to implement an Agile SDM beforehand conflicts with the spirit of an Agile ISD approach. The organisation in that study had a general understanding of what was required and made weekly improvements.

The Agile principle of iterating towards agility and making small changes along the way was a key learning from Project Agile. The AP found that one needed to apply the Agile principles in a transition to Agile. It was also about learning and adapting along the way.

What the bank learned from Project Agile was to use an Agile ISD approach in implementation, which supports Cohn (2010) who states that an iterative transition process should be used; that is, making small continuous changes. Avery (2005) also

states that organisations need to be in a position to digest smaller changes continuously, as traditional change programs will not be able to cope with the speed and ferocity of changes due to global competition. Barnett (2008) in Cohn (2010) states that incremental implementation is the most practical approach and is the Agile way of becoming agile. Quinn (1980) also argues, using examples of case studies, for incremental change. The author proposes that it is very hard to plan and manage large and radical change processes and that they are almost unachievable.

Cohn (2010) suggests using Scrum and a community-driven approach when adopting an Agile ISD method. The author states that an Enterprise Transition Community, similar to the AP at the bank, should carry out some of the work required, but it is essential to set up an environment which fosters the creation of other improvement communities in becoming an Agile organisation. However, the author states that the approach suggested may have to be adjusted depending on the nature of the organisation.

The 'learn and adapt' approach used at the bank is also supported by Cohn (2010), who believes that it is very hard and impractical to foresee people's reactions to the many changes required moving to Agile. The author believes that adopting the 'provoke and observe' approach proposed by Avery (2005) is the best that can be done. This involves attempting something and observing and carrying out more of it if the action achieves an intermediate improved state. However, the 'poking and prodding' of the organisation is not arbitrary, states Cohn (2010); it is prudently chosen based on experience, good sense and instinct. The learn and adapt approach is also similar to the PDCA (Plan, Do, Check, Adjust) approach suggested by Gandomani and Nafchi (2015) in their study on developing a framework for a transition to Agile. The authors state that this approach can assist organisations and teams in overcoming barriers during transition.

Lastly, Cohn (2010) argues that the implementation of an Agile ISD approach is a continuous improvement process; there is no end state that can be predefined. The author further states that it is incorrect to say that an Agile implementation is complete. Avery (2005) also believes that 'programmed' change with a start and end is not workable. Cohn (2010) also states that it is incorrect to say that the process of

change is too slow and takes a long time. The author believes that change is something that happens continuously in our current environment.

Bart Schlatmann, a former CIO of ING Netherlands, stated, ‘We have been on a transformation journey for around ten years now, but there can be no let up. Transformation is not just moving an organisation from A to B, because once you hit B, you need to move to C, and when you arrive at C, you probably have to start thinking about D.’ (Jacobs and Schlatmann 2017).

5.5.2.2 Frustration of developers waiting for Agile projects

The implementation issue of developers being frustrated, waiting to be involved in Agile projects (as described in 4.3.2.2 Frustration of developers waiting for Agile projects) is not found in the literature. The strategy used by the bank in providing training that was focused on teaching Agile as a culture rather than a method was, in the opinion of this author, a good strategy to deal with the issue. As the opportunity to be involved in Agile projects was small at the start of implementation, teaching team members how to apply the Agile values, principles and appropriate practices to traditional projects and BAU work allowed them to be agile where possible, and be part of the transformation. Furthermore, it is very important to understand and embrace Agile values and principles. However, the training at the bank was only initiated when the issue was recognised. A coach commented:

‘Yeah, for teams, not really in the beginning. I mean, I wasn’t here when the very first Agile project started. But from the ones that happened soon after that, I think what happened is people were told they were going on this project and it would be an Agile project and then they would rock up to inception. So, they wouldn’t really know necessarily what Agile is, what inception is. They just know they’ve got two weeks booked up from their diary and from then on they’re going to be on a project. But we do things very differently now, understandably. We have a one-day training course that we’ve developed like here, in-house.’ – AC1

This could be due to the lack of Enterprise Agile adoption and change management experience at the bank (as described in section 4.3.2.6 Lack of Enterprise Agile adoption experience and section 4.3.2.7 Lack of change management experience) and discussed below (in section 5.5.2.7 Lack of Enterprise Agile adoption experience and

section 5.5.2.8 Lack of change management experience). It might have helped if the training was provided before the commencement of the implementation or at least after the completion of the first pilot Agile project. Fry and Greene (2007) also suggest providing training early in implementation.

The feeling among staff not involved in Agile projects that they were second-class citizens supports Nerur, Mahapatra, and Mangalaraj (2005), who state that being part of an Agile team could develop a culture of elitism which could have an effect on the morale of those who are not part of Agile teams.

5.5.2.3 Lack of Agile projects

The implementation issue of a lack of Agile projects in the pipeline described in this study (in 4.3.2.3 Lack of Agile projects) is not found in the literature. There appears to be three reasons for there not being enough Agile projects started in the early stages of implementation to meet the demands of IS development staff. One of the reasons was the use of a ‘start small’ transition pattern, which appears to be a suitable approach for the bank (as discussed in section 5.5.1.2 Transition pattern). The ‘start small’ transition pattern is safe but slow (Cohn 2010).

The second reason was the initially rigid selection criteria for Agile projects (as described in section 4.3.2.3 Lack of Agile projects). One of these criteria was to start with less difficult projects in the early stages of implementation so as not to ‘push the boundaries’ too much. Once the bank was comfortable that the method worked in these projects, it could then select more challenging projects to prove that the Agile ISD method could work in different types of projects.

The third reason was the difficulty of allocating staff 100% to an Agile project and committing them for the duration of the project before the project could get started. The resourcing requirements for Agile projects is a complex issue (as described in subsection Reaction by stakeholders within the IT division affected by the change in section 4.2.5.8 Reactions to change by stakeholders) and discussed in section 5.3.8.1 Reactions of stakeholders within the IT division affected by the change.

The possibility of staff who did not want to go back to work in a Waterfall project (but had to) becoming a ‘flight risk’ has not been reported in the academic literature. Teaching Agile as a culture and covering how to apply the Agile values, principles

and appropriate practices to traditional projects and BAU work, and therefore allowing staff to be agile in whatever they do (as discussed in section 5.5.2.2 Frustration of developers waiting for Agile projects) is, in the opinion of this author, a good strategy for dealing with this issue.

5.5.2.4 Middle management resistance

Although there was literature on the effect of major organisational changes on middle management, the problems encountered with middle management at the bank were not anticipated. This could be due to the lack of change management experience at the bank (as described in section 4.3.2.7 Lack of change management experience and discussed in section 5.5.2.8 Lack of change management experience).

Moitra (1998) found from experience that middle management commitment and support is required for software process improvements, and suggests engaging and involving middle management as stakeholders in implementation. Similar to the bank's experience, Roberts and Hughes (1996) found that the supply of the required resources and pushing the use of the new method would be non-existent without management support. Dikert, Paasivaara, and Lassenius (2016) also found that the lack of middle management support for change should be regarded as a very serious issue in an Agile transformation. The authors found that middle management could disrupt an Agile transformation if they were not involved. Middle management had to understand Agile because they felt left out if their understanding of Agile development was inadequate.

As Dikert, Paasivaara, and Lassenius (2016) found that the role of middle management was not clear in an Agile transformation, so this level of management needs to be educated about its role in a transformation. Broza (2012) also states that middle managers should be given a basic education in Agile and be assisted in understanding its values and principles. They have to be convinced of the organisational benefits of Agile; for example, the benefits of allocating team members full-time to a project because multi-tasking, as in allocating staff to more than one project or getting team members to work on other things besides project work, adversely affects the performance of the team (Cohn 2010). The author states that one of the main reasons for this adverse effect is the switching cost involved; specifically, the high cost of beginning one task, switching to another and then

switching back to the first task. This issue is discussed further in section 5.5.2.11 below. Multi-tasking should generally not be promoted unless an individual cannot be used fully on a single project. Middle management also needs to be convinced of keeping teams' composition consistent. The issue of inconsistent teams is discussed further in section 5.5.2.12 Inconsistent teams.

5.5.2.5 Perceived lack of awareness of the need for change

Although there was a perception at ABC Bank that the need for Agile adoption was not clear to all areas in the early stages of the transition, the strategy used at the bank to communicate awareness through a variety of means supports Cohn (2010), who states that most people need to receive a message many times and in different ways before they can absorb and understand it. Hiatt (2006) also states that although staff want to receive messages from senior management about the reasons for change, they would rather hear from their immediate supervisor about how they will be affected by the change. The resistance from middle managers at the bank in the early stages of implementation could be why the change was not clear to some.

5.5.2.6 Lack of stakeholder management and support

Although there was literature on the effect of Agile adoption on stakeholders, the problems encountered with stakeholders in the initial stages of adoption at ABC Bank were not expected. Cohn (2010) states that a group like the AP at the bank is limited in what it can achieve on its own. Cohn (2010) states that the group that supports the Agile adoption must depend on others within the organisation when implementing and becoming Agile. It should attempt to foresee organisational barriers before they create problems. The organisational areas outside development that are touched by the implementation have to be notified and consulted (Cohn and Ford 2003; Lindvall et al. 2004). Fleischer and Roitman (1990) state that all stakeholders affected by an innovation should be involved in its implementation as early as possible.

One reason for this problem at the bank could be the failure to provide education early in the piece. Stakeholders need to be convinced of the benefits of the change; for example, the PMO and middle management need to be convinced of the benefits of allocating people full-time to projects and keeping project teams consistent.

5.5.2.7 Lack of Enterprise Agile adoption experience

The finding at ABC Bank that a lack of Enterprise Agile adoption experience was an issue in Agile implementation is missing from the academic literature. This lack of Enterprise Agile adoption could be another reason for inadequate stakeholder management at the bank (as described in section 4.3.2.5 Lack of stakeholder management and support). Although external consultants with experience were engaged in the early Agile projects at the bank, the focus of the consultants in those first few projects was primarily to coach teams in the use of the Agile ISD method, practices and tools. The focus was not on the organisational issues, such as management of stakeholders affected by the transition. It would therefore be advisable for an organisation to get coaching at the start of the transition on how to spread agility to the wider organisation, and not just to the project teams. Broza (2012) suggests obtaining guidance from Agile experts to avoid obvious errors in an Agile transformation, such as not foreseeing the organisational barriers that can be caused by stakeholders affected by the transition.

5.5.2.8 Lack of change management experience

If there were people with Enterprise Agile adoption experience at the beginning of the bank's Agile adoption journey, they would have been able to make the bank aware of the major organisational change in the way of working and of the culture moving from a traditional to an Agile ISD approach. It is necessary to be aware of the characteristics of an innovation, in the context of not only the technical characteristics, but also the social systems of the organisation when implementing the innovation (Fleischer and Roitman 1990).

The switch to Agile is a large program of change with many of its aspects happening concurrently, which requires coordination (Baddoo and Hall 2003). The earlier realisation of the task ahead would have resulted in the engagement of people with change management experience who would have implemented strategies to avoid or minimise the issues in the early stages caused by the bank's lack of change management experience.

5.5.2.9 Role and selection of an iteration managers (IM)

Discussion of the role and selection of IMs in an Agile transition is missing from the academic literature. The two IMs interviewed at the bank did not work full-time in their role on their projects. Cohn (2015) states there are differences of opinion as to whether the IM role should be full-time. The author believes that it should be full-time only if economically justifiable. If it is not economically justifiable, that should not exclude the use of an Agile framework like Scrum. The author also states that over time, an IM attached to a project would probably have removed obstacles to the progress of the project team and the team would also have become used to the new process. The team would therefore require less of the IM's time, which is what the IMs at the bank experienced.

Although the IMs interviewed did not comment on any issues associated with assuming another role in the team, Cohn (2010) believes that it is a risky situation. Firstly, the person may not have enough time for both roles. Secondly, the specific role the person is assuming at any point in time might not be clear to other members in the team. Lastly, the person will have less authority as the 'protector' of the team. Furthermore, although the second IM interviewed did not mention any issues associated with doubling up as a technical lead on the project, Cohn (2010) believes that technical leads should not be IMs because they are accustomed to directing their teammates and teammates are also accustomed to referring to the technical leads when making decisions.

The concern by a coach in this study about having a suitable person for the role of IM aligns with Cohn (2010), who states that putting an unsuitable person in the role of IM is a common problem. The author states that most organisations initially select people with experience in management or leadership as their first IMs. However, as the organisation acquires more Agile experience, it begins to appreciate that there are other important attributes to consider when selecting IMs; for example, they should be responsible, humble, collaborative, committed, influential and knowledgeable.

5.5.2.10 Product owner (PO) selection and commitment

The finding in this study that it was difficult to source the right person with the skills, experience and knowledge to be a PO is understandable. Cohn (2010) states that the role is demanding and critical as a PO needs to provide a vision for a product and to

set the boundaries in achieving the vision. Dikert, Paasivaara, and Lassenius (2016) also found that the PO role was particularly important. The authors found that there was better performance from the Agile team and the product met requirements when the PO role was carried out satisfactorily. Conversely, problems arose when the performance of a PO was unsatisfactory. Cohn (2015) states that the PO has to be available, savvy, communicative, decisive and empowered, while Boehm and Turner (2004, 44) state that POs should be 'Collaborative, Representative, Authorised, Committed, and Knowledgeable (CRACK) performers'. Nerur, Mahapatra, and Mangalaraj (2005) confirm that it is particularly difficult finding POs for complex systems.

The finding in this study that the PO's full commitment was an issue in a project is mentioned often in the literature. The most common grievance that teams have about POs is their unavailability when they are required (Cohn 2010). This can upset the quick rhythm of an Agile team. Hoda, Noble, and Marshall (2010) also found that obtaining sufficient time from a customer to do the job was difficult for Agile teams and this was a reason for insufficient involvement of the customer in the process. Smith and Sidky (2009) believe that the PO does not have to work with the team daily but should be available daily when required.

Cohn (2010) states that when a PO delegates, making an incorrect decision is a common problem. The author argues that this is bound to happen due to the pressure of short time-boxed iterations and the speed at which Agile teams operate. Fortunately, this issue did not happen regularly at the bank and any incorrect decisions made were not major. The author suggests delegating just beyond the point where a PO feels comfortable. Unless it is a really bad decision, the author suggests letting the decision remain until the end of the iteration and then determining if it should be reversed. What a PO should not be doing, if delegating work, is constantly overrule decisions made by the delegated staffer, an issue which did not occur at the bank.

5.5.2.11 Developers working part-time on an Agile project

The issue of team members not working full-time on Agile projects at the bank is missing from the academic literature but appears in the practitioner literature. Poston, Patel, and Tymchenko (2016) found that a lack of dedicated cross-functional team

members was a huge obstacle to the operation of Agile teams. Broza (2012) states that a majority of experts in Agile recommend dedicating project team members full-time to an Agile team, as this reduces context-switching costs and allows the team to concentrate on its work. Cohn (2010) agrees that team members will likely get less work completed if they have to work on tasks unrelated to the project. Management will generally find the argument hard to accept as they want to maximise an employee's time (Broza 2012). For example, if a team member spends about eighty percent of his time working in a project, management would want to utilise the remaining twenty percent. Secondly, a developer's workload usually involves other work activities not related to development that are managed separately. If there is a need to share an Agile team member with another team, the author recommends arguing that it should only be with one other team. To minimise this issue of people working on too many activities at the same time, Cohn (2010) suggests reducing the number of projects running concurrently.

5.5.2.12 Inconsistent teams

The issue of inconsistent teams on Agile projects at the bank is also missing from the academic literature but supported in the practitioner literature. The desire to keep teams consistent at the bank so they could be high-performing teams is a finding in this study aligned with Tuckman (1965), who states that a new team would have to repeat the forming, storming, norming and performing phases of team evolution. Broza (2012) further states that keeping a team consistent allows for the development of trust and collaboration, which helps the team reach the performing phase. It was also a good strategy to keep the team together for long-term success once the team reached the 'performing' stage of team evolution. This strategy avoids the dip in productivity when team members are moved out of the team. Smith and Sidky (2009) state that Agile works best when consistent teams work on continuous projects. To minimise the issue of inconsistent teams, Broza (2012) suggests having longstanding teams pull work from a central, shared, prioritised queue instead of pushing a project to a newly formed team in matrix management style, which the bank was considering. This strategy would require another significant operational change in the organisation.

5.5.2.13 Pressure to deliver versus upskilling team members

The finding in this study that team members did not adopt pair programming as it took too much time at the expense of the project supports Mangalaraj, Mahapatra, and Nerur (2009), who found practices like pairing and refactoring were seen as wasteful because they put extra pressure on man-hours. This finding is also supported in Baddoo and Hall (2003) who found that the pressure to deliver products on schedule upset software process improvement initiatives. The authors found that even though it was official that time could be included for process improvement, time was the first thing that was discarded to meet project deadlines. Roberts and Hughes (1996) state that the learning curve for a new SDM will occur at the expense of initial development projects.

5.5.2.14 Coexistence of two approaches during transition

Similar to the finding in this study, Dikert, Paasivaara, and Lassenius (2016) found that using an Agile and traditional ISD approach together was commonly seen as problematic, as it created stress at all levels of the organisation. Cohn (2010) states that using two approaches while moving to Agile is not uncommon for large organisations such as the bank in this study. Sliger (2006) also states that temporarily using an Agile process together with a sequential process is often required in a large organisation transitioning to Agile. Cohn (2010) believes that moving the whole organisation to Agile all at once is too disruptive. The author states that an organisation will just have to go through a period of difficulty where some projects are using an Agile ISD approach while others are still using the traditional approach.

5.5.3 Summary of implementation strategy and issues

The Agile implementation strategy at the bank in transitioning to Agile involved the use of a combination of a top-down and bottom-up approach, a ‘start small’ transition pattern, and a ‘split and seed’ plus coaching strategy to spread Agility to project teams, and an incremental approach in introducing Agile practices.

There were several implementation issues. The findings suggest that the use of a detailed plan is not suitable in Agile implementation. A key finding at the bank was that the Agile principle of iterating towards agility, learning and adapting, and making small continuous changes along the way, is required.

Other significant implementation issues were a perceived lack of awareness of the need to change, middle management resistance, and inadequate stakeholder management and support. These issues could be better managed if the people steering the transition have Enterprise Agile and change management experience.

Another issue during implementation was not having enough Agile projects in the pipeline to meet the demand from IS staff. A focus on teaching Agile as a culture, and applying the values, principles and appropriate practices to non-related projects as well as BAU, is a way to reduce the impact of this problem.

Other issues are the lack of understanding about an IM’s responsibility and the difficulty in getting an appropriate person to be the PO. Keeping Agile teams consistent and having full-time members was a problem in this study as the requirements for resourcing Agile projects are a very complex issue. Finding the balance between getting a team to acquire the skills required in an Agile project and delivering a project is another issue as the pressure to meet the requirements of a project is usually a higher priority than upskilling the team. Having to manage the use of two different approaches during the transition from a traditional to an Agile ISD approach was also difficult to manage.

The implementation strategy and issues identified in this study overall support the academic and/or practitioner literature (see table below).

Table 21. Findings on implementation issues in relation to the literature

| Implementation issues | Supports academic literature | Supports practitioner literature | Missing from literature |
|---|-------------------------------------|---|--------------------------------|
| 5.5.1 Implementation Strategy | | | |
| 5.5.1.1 Implementation approach | Y | Y | |
| 5.5.1.2 Transition pattern | Y | Y | |
| 5.5.1.3 Spreading agility | | Y | |
| 5.5.1.4 Introduction of Agile practices | Y | Y | |
| 5.5.2 Implementation issues | | | |
| 5.5.2.1 Following a comprehensive implementation plan | Y | Y | |

| | | | |
|--|---|---|---|
| 5.5.2.2 Frustration of developers waiting for Agile projects | | | Y |
| 5.5.2.3 Lack of Agile projects | | | Y |
| 5.5.2.4 Middle management resistance | Y | Y | |
| 5.5.2.5 Perceived lack of awareness of the need for change | Y | Y | |
| 5.5.2.6 Lack of stakeholder management and support | Y | Y | |
| 5.5.2.7 Lack of Enterprise Agile adoption experience | | Y | |
| 5.5.2.8 Lack of change management experience | Y | Y | |
| 5.5.2.9 Role and selection of an iteration managers (IM) | | Y | |
| 5.5.2.10 Product owner (PO) selection and commitment | Y | Y | |
| 5.5.2.11 Developers working part-time on an Agile project | | Y | |
| 5.5.2.12 Inconsistent teams | | Y | |
| 5.5.2.13 Pressure to deliver versus upskilling team members | Y | Y | |
| 5.5.2.14 Coexistence of two approaches during transition | Y | Y | |

5.6 Change process

The CEO of VersionOne Inc., an Agile project management tools vendor, states an Agile transformation should be treated as a change management process (Frye 2012). As implementation should be viewed as a dynamic phenomenon (Larsen and Myers 1999) and the process by which a new technology is adopted and used needs to be considered in explaining its consequences (Orlikowski 1993), a process model specific to this study (Figure 12) and a theoretical process model (Figure 13) were developed in order to better understand a transition to Agile .

In her study on change as a result of the adoption and implementation of computer-aided software engineering (CASE) tools, Orlikowski (1993, 334) stated that ‘the intentions and actions of key players, the process by which CASE tools are adopted and used, and the organisational context within which such events occur’ need to be taken into account to explain the consequences of the adoption. One model created by the author was a process model of organisational change around the adoption and implementation of CASE tools for a radical change. The model showed the process of adopting and implementing CASE tools in terms of an interaction of contextual conditions, actions, and consequences.

The three categories of context identified by Orlikowski (1993) that influenced the change process were the environmental, organisational and information system contexts. This supports DePietro, Wiarda, and Fleischer (1990), who also identified the environmental, organisational and technological contexts as the three elements of context that influence (by constraining or facilitating) the process by which an organisation adopts and implements technological innovations.

The model by Orlikowski (1993) reflects the fact that the change process is influenced by the interaction of human action and context over time (Orlikowski and Robey 1991). DePietro, Wiarda, and Fleischer (1990) also propose that management (who are key players) are not passive actors in their context. Management can sometimes be designers of the context; for example, in their strategic decisions, the structures they change, and the communication processes that they promote.

This study found that the Agile transition process at the bank (as summarised in Table 14. Timeline of the Agile transition process) was similar to the process presented in the model by Orlikowski (1993). An adaption of the process model by Orlikowski (1993) based on the findings in this study is described in Table 22 and illustrated in Figure 12.

Table 22. Description of the change process associated with Agile adoption and use

| Arrow | Description |
|-------|---|
| 1 | Influenced by the context, management identified and expressed problems with the current information system development process. Based on their understanding, management decided to handle the problems by opting to move to an Agile ISD approach, forming intentions in relation to what changes they expected would result from Agile adoption. |
| 2 | Management reinforced the context when drawing from it to express their interpretations and intentions. |
| 3 | The actions by management in clarifying problems and framing a solution (labelled ‘conditions for Agile adoption and Implementation’) directed them in their decision to adopt a particular Agile ISD method in system development. |
| 4 | Besides being guided by their interpretations and intentions, the actions by management were also guided by the context within which the Agile ISD method was adopted and implemented. |
| 5 | Subsequently, management carried out actions (labelled ‘Agile adoption and Implementation’) that involved change (such as changing culture, policies, operations, processes, practices and tools), and strategies to manage the change. The actions taken changed the context. |
| 6 | The actions taken brought about a variety of experiences and outcomes as the main actors, that is, the system developers, business and stakeholders responded to the changes (labelled ‘consequences of Agile adoption and Implementation’). |
| 7 | The response was influenced by the context in which the actions took place. |
| 8 | Reactions by the system developers, business and stakeholders changed the context. |

The arrows show the change process being influenced by the interaction of context and the actions of key players over time: in other words, where the context influenced the actions undertaken and the actions influenced the context by supporting or changing it.

Figure 12 illustrates what the change process will probably be like (similar to that experienced by the bank in this study) when management adopts and implements Agile to fundamentally change the culture, and how systems are developed in an organisation. It can be used to anticipate or examine the organisational changes associated with a transition to Agile when the change is radical. As stressed by Orlikowski (1993), it is imperative to remember that although Figure 12 illustrates the content and process of radical organisational change that could be experienced in a transition to Agile, the relationships shown are not deterministic: the changes are

not always what management envisions. For example, management may intend a radical change in culture and process, yet actually experience a radical change only in process but not in culture. In other words, the organisation is ‘doing Agile’, which relates to adopting the process, practices and techniques, but not ‘being Agile’, which relates to embracing the Agile mindset and behaviours (Sahota 2012). This could be due to unforeseen factors, such as inadequate education, training and coaching. There could also be unintended changes; for example, where stakeholders resist changing their work practices to support the Agile teams, resulting in a lack of Enterprise Agility.

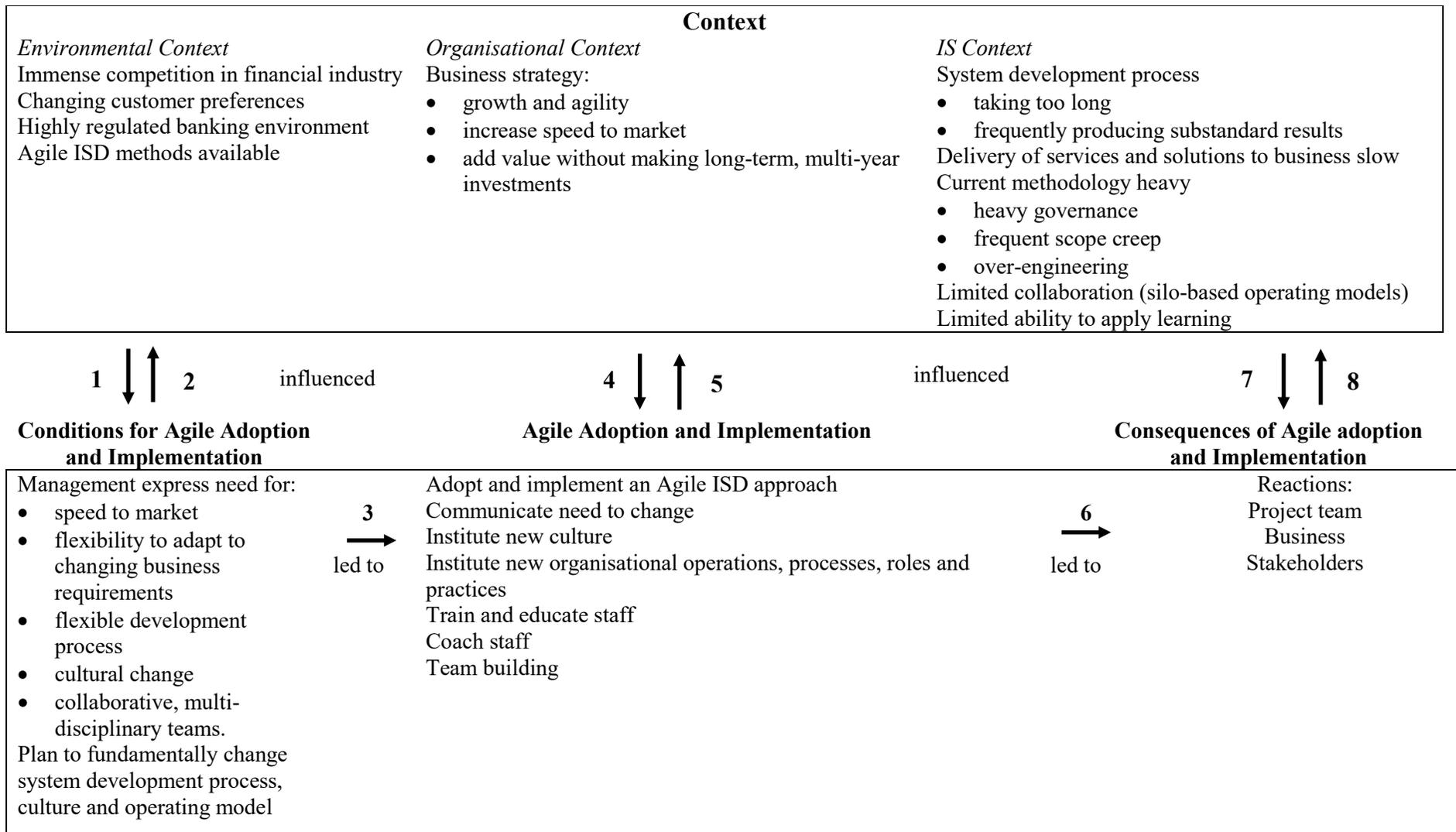


Figure 12. Process of radical organisational change around a transition to Agile

Adapted from ‘CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development’ by W. J. Orlikowski, 1993, *MIS Quarterly*, Vol. 17, No.3, P. 309.

Orlikowski (1993) also developed a conceptual process model, which illustrated a general conceptualisation of the process of organisational change around the adoption and implementation of CASE tools. This author found the model also applicable to this study and therefore adapted it. Based on the findings in this study, a proposed theoretical process model illustrating organisational change around Agile adoption and implementation is illustrated in Figure 13. The figure presents the main themes (that emerged as a result of the data analysis) and their interaction. Such a model is missing from the literature on transitions to Agile. The diagram presents the themes that capture the elements of the process of change: the context, conditions for adoption, change, consequences, and their interaction during the change process.

The conceptual model developed by Orlikowski (1993) was based on the experiences of two organisations adopting and using CASE tools. One organisation experienced radical change while the other saw incremental change. As the change experienced in this single-organisation case study was radical, further organisational change studies around a transition to Agile should examine the proposed model in Figure 13 in circumstances where the organisational change is incremental. ‘This is how we build on each other’s work’, says Orlikowski (1993, 315).

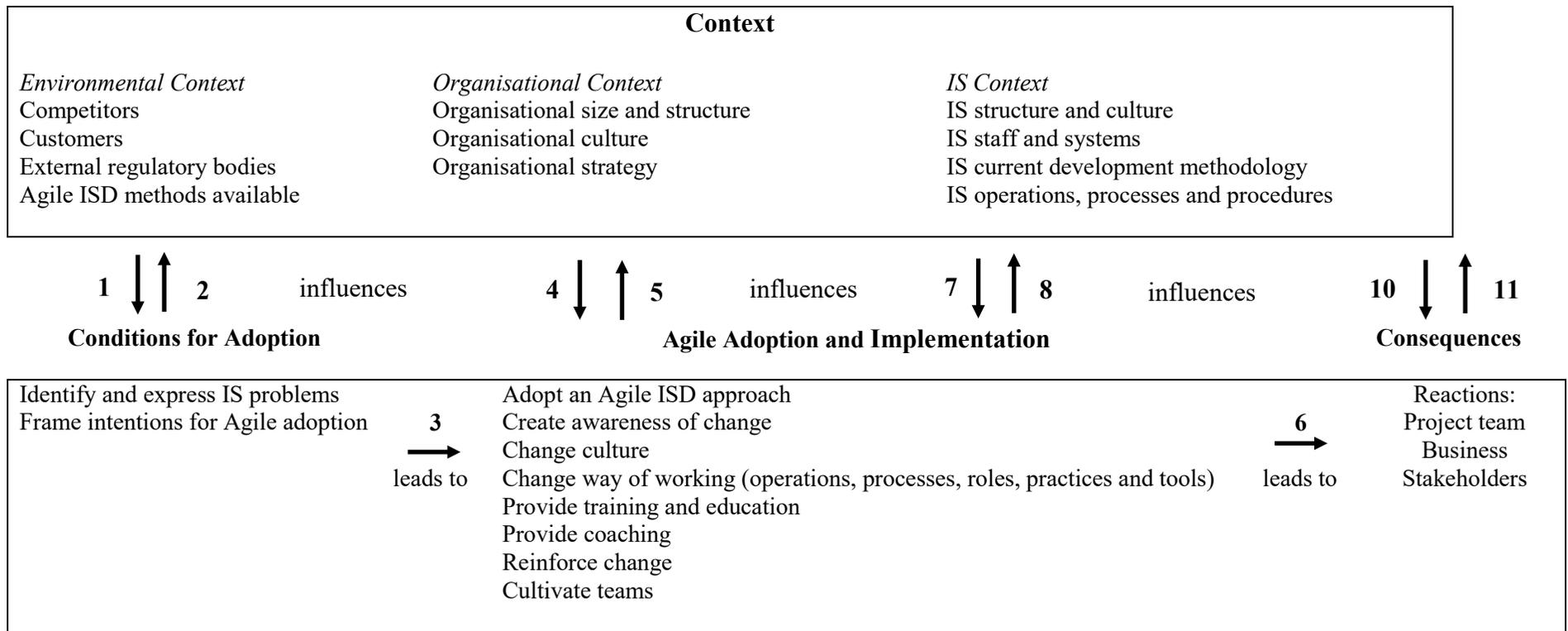


Figure 13. Process of organisational change around Agile adoption and implementation (Key concepts from study)

Adapted from 'CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development' by W. J. Orlikowski, 1993, *MIS Quarterly*, Vol. 17, No.3, p. 309.

6. Conclusion

The first section of this chapter presents the findings in relation to the research questions posed for this study. The next section describes the contribution and significance of the research. This is followed by sections on the quality of this research and its limitations. Finally, the last section suggests some areas for future research.

While the number of large organisations embracing Agile continues to increase each year, there are still obstacles to overcome in its adoption and success (VersionOne 2016). The larger companies tend to struggle more in relation to organisational culture and the transition from Waterfall (ScrumAlliance 2017). It has also been reported (Dikert, Paasivaara, and Lassenius 2016) that empirical studies on Agile transformation and Enterprise Agility are lacking, although these are relevant topics. The need for more case studies on these topics has been suggested by the authors.

This study presents the findings of an exploratory qualitative study using an inductive approach to examine a transition to Agile. It is an in-depth case study involving 24 people from a medium-to-large bank in Australia experiencing issues associated with the transition from a traditional to an Agile ISD approach. This study presents an integrated thematic model (see Figure 3) and a theoretical process model (see Figure 13) to provide a comprehensive explanation of the key elements that shape the outcome of a transition to Agile.

6.1 Research Questions and Empirical Findings

The purpose of this research is to investigate the key elements that shape the transition to an Agile ISD approach by an organisation moving from a traditional to an Agile ISD approach. This study sought to answer the following research questions and set the following objectives:

Research Questions

- What are the key elements that shape the outcome of implementation and use of an Agile ISD approach by an organisation transitioning from a traditional to an Agile ISD approach?

- How and why do the elements shape the outcome of implementation and use of the Agile ISD approach?

Research Objectives

- Identify the key elements that shape the outcome, implementation and use of an Agile SDM by an organisation transitioning from a traditional to an Agile ISD approach.
- Develop an explanatory Type II theory (Gregor 2006) that explains how and why the elements identified shape the outcome of the transition to the Agile ISD approach. A Type II theory is a theory for understanding and explaining but not for precise prediction; for example, explaining how and why things happen in some particular real-world situation.
- Identify the implementation strategy, and the kinds of issues encountered during the process of implementation by an organisation transitioning from a traditional to an Agile ISD approach.

The answers to the research questions and outcomes of the objectives are presented in the following sections.

6.1.1 Answer to research questions (1 and 2) and outcomes of their corresponding objectives

The key elements identified in this study that shaped the outcome of a transition to an Agile approach were the context, causal conditions, the major challenge of change, action/interaction strategies and intervening conditions, as presented in Figure 3.

6.1.1.1 Phenomenon of change

The results in this study revealed that the main challenge when moving from a traditional to an Agile ISD approach in the bank was the radical organisational change: a fundamental change in culture and work practices for the project teams, business, and stakeholders (as described in section 4.2.3 Phenomenon of Change and discussed in section 5.1).

This study found that the transition to Agile at the bank involved an Agile transformation and Enterprise Agility, which represented a radical change for the

organisation. The results demonstrate a significant difference in the way of working and a change in its underlying values and principles for an organisation moving from a traditional Waterfall approach to an Agile ISD approach. Firstly, the transition at the bank entailed a radical change in work procedures, tools and techniques, and in the roles of the people involved. More important was the radical change in culture; that is, a change in behaviour and values to support the new way of working. The change in culture required embracing a new mindset, which in turn involved embracing Agile values and principles; it involved an Agile transformation. Secondly, the organisational change at ABC Bank not only affected the project teams but also areas and stakeholders outside the project teams; it involved Enterprise Agility. The change was an issue as it was a radical change. There was a fundamental change to the way of working and the culture in the bank.

While changes in ISD approaches have been made before - for example, from structured to object-oriented - the change from structured to object-oriented was not found to be radical (Sircar, Nerur, and Mahapatra 2001). The change was far less extensive, particularly in terms of the change to the way people worked and the culture and the fact that it did not extend to areas outside IT. Moreover, pre-existing experience of such change might lead to underestimating the extent and difficulty of an Agile transformation.

6.1.1.2 Action/interaction strategies

This study found that it is very difficult for ABC Bank to adapt to such a radical change (as described in section 4.2.5 Consequences and discussed in section 5.3). It required people to not only learn a new way of working but also unlearn the old way. It also involved overcoming established norms and deeply rooted system development work practices. Achieving Enterprise Agility – getting people and areas outside the teams to embrace the Agile mindset and change the way they worked – made the effort more difficult. It was difficult for areas outside project teams to see the benefit of the change apart from supporting the teams in this new way of working.

This study found that the critical success factors in the transition to Agile at the bank were support (top and middle management, stakeholder), Enterprise Agile adoption experience, change management, and change management experience, and team

building (as described in section 4.2.4 Action/Interaction and discussed in section 5.2).

Obtaining top management support, commitment and involvement was a critical factor in increasing organisational support for the transition at the bank. Sponsorship and financial support from top management were critical. A senior figure, such as the CIO, acting as the 'Agile champion' removed organisation obstacles during the transition. Management support was also needed to motivate and inspire employees to embrace the change.

Middle management commitment and support was required as this level of management could disrupt a transition to Agile if not involved. The supply of the required resources and promotion of the use of the new Agile ISD method would be non-existent without management support. This study suggests that middle management should be given a basic education in Agile, be assisted in understanding its values and principles, and be convinced of the organisational benefits of Agile.

The transition to Agile at the bank required a change in other areas that worked and interacted with the development teams. Stakeholder management and support in these areas were significant and important for success in achieving Enterprise Agility. This study found that Enterprise Agile adoption and change management experience were also essential, as managing such a radical change was very difficult and demanding.

A significant factor influencing the transition to Agile at the bank was change management. This study found that it is essential as it helps employees understand, commit, accept and embrace the change. The use of a change management framework was vital. Essential change management activities in this study were the communication of the need to change, education and training to provide individuals with the knowledge of how to change, and coaching to develop the ability to change. This study also suggests that recognition of success, such as rewards and celebrations, is required to sustain the change, and the management of change needs to be continuous. Team building activities are crucial to developing team relationships.

6.1.1.3 Intervening conditions

This study suggests that the major intervening conditions that influenced the outcome of the transition at the bank were the characteristics of the Agile ISD method and the characteristics of individuals affected by the change (as described in section 4.2.6 Intervening conditions and discussed in section 5.4).

The perceived usefulness/value and ease-of-use of the Agile ISD method appear to have a significant influence on the outcome. The outcome appears to be more favourable if individuals perceive the method to be useful and of value, and easy to use. This study found that constant messages from management and coaching are required to positively influence the perceived usefulness/value and ease-of-use of the method.

This study found that the outcome of the transition appears to be more favourable if the individuals affected possess certain characteristics that are compatible with Agile values and principles. Some of the more important characteristics are the ability to work in teams, to communicate, and to develop relationships, as well as the qualities of being open and adaptable, and comfortable with ambiguity and uncertainty. These personal attributes can be developed through coaching and training.

6.1.1.4 Change process

The process model depicted in Figure 12 describes what the change process will probably be like when management adopts and implements Agile to fundamentally change the culture and the way systems are developed in an organisation. The proposed process model shown in Figure 13 is a theoretical model illustrating the process of organisational change around a transition from a traditional to an Agile ISD approach. Figure 13 shows the significance of the elements that shape implementation at different stages of the implementation process.

Figure 13 also shows, similar to the study by Orlikowski (1993), that the process of an Agile transition is shaped by the interaction of its contextual conditions, the actions of key players, and the consequences of the transition itself. Therefore, it is essential when trying to understand an Agile transition to consider the intentions and actions of the key players, the context surrounding the transition, and the resulting change process.

6.1.2 Outcome of research objective 3

The results in this study revealed that an Agile implementation strategy (as described in section 4.3.1 Implementation Strategy and discussed in section 5.5.1

Implementation Strategy) involved the use of an approach (top-down, bottom-up, or a combination of both), a transition pattern ('start small' or 'go all-in'), a strategy to spread Agility to teams ('split and seed' or 'grow and split', and/or coaching) and an approach for introducing Agile practices to teams. This study suggests that the context of the transition and the advantages and disadvantages of the components of the proposed strategy need to be considered when developing the strategy.

The findings also revealed a number of implementation issues that organisations in a similar situation to that of the bank would probably encounter. These are described in section 4.3.2 Implementation Issues and discussed in section 5.5.2 Implementation issues.

The findings suggest that the use of a detailed plan is not suitable in Agile implementation (as described in section 4.3.2.1 Following a comprehensive implementation plan). A key finding in this study was that the Agile principle of iterating towards agility, learning and adapting, and making small continuous changes along the way was required. Furthermore, there was a need to empower people at all levels to drive the change; for example, middle management and the various areas in the organisation.

Other significant issues found in this study were a perceived lack of awareness of the need to change, middle management resistance, and inadequate stakeholder management and support. The findings suggest that these issues can be better managed if the people managing the transition have Enterprise Agile and change management experience.

Another issue during implementation at the bank was ensuring that there were enough Agile projects in the pipeline to meet the demand from IS staff. This issue will probably occur if a 'go all-in' implementation pattern is not used. This study suggests that a focus on teaching Agile as a culture, and applying Agile values, principles and appropriate practices to non-related projects and BAU, is one way to reduce the impact of this problem.

Another issue in this study was the lack of understanding of an IM's responsibilities. This study found that the role required a person with certain skills and attributes. This study also found that it was difficult to find an appropriate person with the skills, experience and knowledge in several different areas to be a PO. Some areas of the business, particularly the areas with a small team, could not commit a PO full-time to a project.

Keeping Agile teams consistent in their composition and staffed with full-time members was a problem at the bank as the requirements for resourcing Agile projects were very complex. Finding the balance between ensuring a team acquired the skills required for an Agile project and delivering the project was an issue, as the pressure to meet the requirements of a project is usually a higher priority than upskilling the team. It was found that having to manage the use of two different approaches simultaneously during the transition from a traditional to an Agile ISD approach was difficult.

6.2 Contribution and significance of this research

The contribution of this research to theory and practice is discussed below.

6.2.1 Theory

This study addresses the call for case study research in Agile transformation and Enterprise Agility. It investigates the changes in an organisation transitioning from a traditional to an Agile ISD approach and examines the following key elements which are fundamental to organisational change:

- organisational context and causal conditions within which the transition occurs
- changes required within and outside the project teams, including the nature and magnitude of the change
- strategies used to manage the change
- Agile use and its consequences in terms of the experience and reactions of people in different roles affected by the change
- intervening conditions that influence the outcome
- implementation process, strategy, and issues encountered during the process.

This research synthesises and extends previous research by examining the combined influence of the various challenges, success factors, and intervening conditions influencing an Agile transition from an organisational change perspective. It has developed an integrated thematic model of change (shown in Figure 3) which is lacking in the current discourse on this topic. The integrated thematic model identifies new success factors and intervening conditions (shown in bold in Figure 3) that were absent from the initial literature review on Agile implementation and use (shown in Tables 1 and 2).

To better understand an Agile transition, this study also examines the implementation process, implementation strategy, and the kinds of issues encountered during the process of Agile implementation, a focus that is also absent from the current discourse on this topic. This study has developed a theoretical process model of change in relation to a transition to Agile, as illustrated in Figure 13.

This research, in presenting two complementary theoretical models of change, specifically, an integrated thematic model (Figure 3) and a process model (Figure 13), provides a more comprehensive explanation of the change concomitant with a transition to Agile. The integrated thematic model is a static model that describes and explains the change phenomenon. The process model is a process-oriented model that also describes and explains the change phenomenon. There has been no study to date on a transition to Agile that has developed either type of model. This research has therefore provided a more holistic explanation of a transition to Agile. It has also combined various theories in relation to technology acceptance, innovation, organisational change and resistance in its examination of the transition to an Agile ISD approach.

Comprehending the wide-ranging organisational consequences of a complex organisational change phenomenon, as attempted in this study, is an essential step in planning and managing the change. This study is useful in terms of advancing further understanding of the theoretical foundations of the change that underlies a transition to Agile, and the adoption of Agile scaling frameworks.

Lastly, the findings on a transition to Agile in this study that are missing from the academic literature but found in the practitioner literature, that are missing from the

literature in general, or that are not consistent with the literature, are all listed respectively in the three tables below.

Table 23. Findings missing from the academic literature (but reported in practitioner literature)

| Findings missing from the academic literature (but reported in practitioner literature) |
|--|
| 5.1 Change |
| 5.1.1.1 Teamwork (Collaborate to complete work, whole team responsibility) |
| 5.1.1.5 Response to changes in a project |
| 5.1.1.6 General change in work practices and tools for project team members |
| 5.1.2 Changes in technical practices specific to programmers and testers (Emergent design, automated testing) |
| 5.1.5 New role of an iteration manager (IM) |
| 5.1.6.1 Stakeholders within the IT division affected by the change (Change in personnel responsibility for middle management). |
| 5.3 Consequences of change |
| 5.3.1.1 Teamwork (Collaborate to complete work, whole team responsibility) |
| 5.3.1.2 Documentation (Use of minimal documentation) |
| 5.3.2 Reactions to change in technical practices (TDD, emergent design, automated testing) |
| 5.3.3 Reactions to changed work practices from a business analyst (BA) (way of working for a BA) |
| 5.3.7 Change and project team members |
| 5.4 Intervening conditions |
| 5.4.1.5 Subjective norm. |
| 5.5.1 Implementation Strategy |
| 5.5.1.3 Spreading agility. |
| 5.5.2 Implementation issues |
| 5.5.2.7 Lack of Enterprise Agile adoption experience |

| |
|---|
| 5.5.2.9 Role and selection of an iteration managers (IM) |
| 5.5.2.11 Developers working part-time on an Agile project |
| 5.5.2.12 Inconsistent teams. |

Table 24. Findings missing from the literature

| Findings missing from the literature |
|---|
| Figure 3. Integrated theoretical model of the Change Phenomenon and its related themes |
| 5.1 Change |
| 5.1.6.1 Stakeholders within the IT division affected by the change (The Agile values embraced by middle management, PMO [governance], and Infrastructure and Operations [continuous delivery]). |
| 5.3 Consequences of change |
| 5.3.1.2 Documentation (Deciding what documentation to produce) |
| 5.3.1.4 Delivering value early and frequently (Maximising the number of features as opposed to maximising business value). |
| 5.5.2 Implementation issues |
| 5.5.2.2 Frustration of developers waiting for Agile projects |
| 5.5.2.3 Lack of Agile projects. |
| 5.6 Change process |
| Figure 13. Process of organisational change around Agile adoption and implementation (Key concepts from study). |

Table 25. Findings not consistent with the literature

| Findings not consistent with the literature |
|--|
| Consequences of change |
| 5.3.1.4 Delivering value early and frequently (PO difficulty with prioritisation and user stories) |
| 5.3.5 Reactions to the new role of an iteration manager (IM making decisions for teams). |
| Intervening conditions |
| 5.4.1.6 Career consequences |
| 5.4.1.7 Perceived maturity. |

6.2.2 Practice

Migrating to an Agile ISD approach is very costly for an organisation. Without a proper understanding of the radical nature and magnitude of the change, the attempt to adopt the new approach could result in a costly failure or in the organisation not getting the full benefit from an Agile transition. This research is therefore useful to organisations moving to an Agile ISD approach for the following reasons.

Firstly, organisations that are deciding whether to transition to an Agile ISD approach can make a more informed decision as to whether to make the change. Secondly, this study will help organisations that have made a decision to transition to Agile to better manage their experience, ensuring that they are aware that this transition is not merely the implementation of a new method, but rather the embracement of a new culture that affects the whole organisation, and that the transition involves a process of radical organisational change. Lastly, this research also assists organisations to develop strategies that will manage the organisational changes and implementation issues when transitioning to an Agile ISD approach. The findings in this study have useful implications for organisations, especially for senior management who are implementing an Agile ISD approach. The key findings are listed below:

Clear reasons and goals for Agile adoption. Senior management needs to be clear about the reasons for and goals of Agile adoption and the benefits it hopes to achieve from it. However, the goal should not be simply ‘going Agile’ or adopting a particular Agile ISD method. Agile is a means to an end; for example, faster and earlier delivery of software to customers.

Awareness of the need to change. The message about the goals and benefits of the move to Agile has to be communicated clearly to the organisation before the transition and constantly during the transition. This message should emanate not only from top but also from middle management.

Top management support. This is essential as the transition to Agile will affect the whole organisation over time and management support is required to overcome any resistance from the different areas affected. Secondly, it is a huge change which requires significant support in terms of sponsorship, resources and time, and training.

Middle management support. This is essential to the promotion of agility within areas overseen by middle management. These managers need to help create an awareness of the need to change within their area, and to encourage and help staff in the transition. Resource managers, in conjunction with the PMO, must attempt to allocate team members full-time to an Agile project and keep the Agile team consistent.

Stakeholder support. The transition to Agile needs support from people in different areas within the organisation. All stakeholders affected by the transition must be convinced of the benefits of the change and must be involved as early as possible. Their participation and involvement are essential for a successful transition.

Group to support the transition. A small group, such as the AP at the bank, must be created to support the organisation in implementing the Agile ISD approach. It is essential that there are people with Enterprise Agile adoption expertise in the group as the change will affect most areas of the organisation over time. However, people at all levels and areas in the organisation, not just the group, must be empowered to support the transition and drive the change.

Group to assist in change management. A small group, such as the CMP at the bank, should be created to assist the Agile implementation group in managing the huge fundamental change of moving to an Agile ISD approach.

Education and Training. Education and training are essential. Training helps individuals acquire the required knowledge. Although it will be costly, organisations cannot afford to skim on training. It must be provided early and also needs to be ongoing. It is very important that the focus should be on teaching Agile as a culture (rather than just a ISD method), and applying its values and principles and relevant practices, to all types of work where applicable. Agile practices as well as Agile values and principles must be taught from a more holistic point of view. The use of applicable Agile practices and tools should be encouraged in areas outside IT. It is also essential that education and training be provided not only for the project team members (including the PO) but for stakeholders too, as their support and cooperation are critical to achieving Enterprise Agility. Separate training could also be provided to help staff develop the personal attributes required for an Agile ISD

approach. There must be a strong emphasis on these attributes when recruiting future employees.

Coaching. Coaching, though costly, is the next essential after training, for various reasons. Firstly, it can be used to help change the mindset of individuals. Secondly, coaches can assist the individuals with the new approach and help them discover the usefulness and benefits of the Agile process, practices and tools, an important step in the change process. Coaching can also help to make the Agile ISD method easier to use for individuals. Coaching is very useful in helping the different roles cope with the change in their roles, in particular the challenging new roles of an IM and a PO. Getting team leaders like PMs to move away from a command-and-control management style is especially important. Developing an internal coaching community is central to achieving long-term sustainability.

Selection criteria for the roles of IM and PO. The selection of IMs and POs with the required attributes is essential. A set of criteria needs to be created for these roles. A full-time job should be created for the role of IM where economically possible.

Implementation strategy. A combination of a top-down and bottom-up approach in implementation is preferred as most successful changes, particularly moving to an Agile ISD approach, require both. A decision to use a ‘start small’ or ‘go all-in’ transition pattern, and on whether to use a ‘split and seed’ or ‘grow and split’ pattern, combined with coaching for spreading agility to project teams, should be made based on the context and on the advantages and disadvantages of the two patterns. Agile practices should be introduced to teams in an incremental fashion. If the ‘go all-in’ transition pattern is not used, the organisation needs to be prepared to handle the possibility of not having enough Agile projects in the pipeline to meet the demand from development staff.

The change that comes with Agile implementation should be managed in an incremental manner. A big bang approach is not suitable for such a major cultural change. The Agile principle of iterating towards agility and making small continuous changes needs to be applied along the way. An organisation needs to use a ‘learn and adapt’ approach. The use of a detailed implementation plan goes against the nature of Agility and would probably not work in an Agile implementation.

Consistent Agile teams with full-time members. A lack of dedicated cross-functional team members and inconsistency of team composition are huge obstacles to the operation of Agile teams. An option for addressing this issue is to have consistent teams pulling work from a central, shared, prioritised queue instead of pushing a project to newly formed teams. However, this may require a significant operational change in an organisation.

6.3 Research quality

The process used to build theory in this case study research is adapted from Eisenhardt (1989) and is shown in table 11. As this research was a qualitative study, the criterion credibility, transferability, dependability and confirmability (Guba 1981) were used to judge the trustworthiness of this study (see table 12). Other criterion that were also used to judge the qualitative research quality of this study were credibility, rigour and relevance (Kitto, Chesters, and Grbich 2008). A table adapted from the authors shows where these criterion are addressed in this study (see Table 13). Table 13 also includes criteria for evaluating qualitative and case study research quality from Dybå and Dingsøy (2008), Patton (1999), Guba and Lincoln (1989), Höst and Runeson (2007), Saunders, Lewis, and Thornhill (2016), and Sarker and Sarker (2009).

6.4 Limitations of research

This research has some limitations in the generalisability of its findings, and its data collection and analysis.

6.4.1 Generalisability/Transferability

A limitation in interpreting the findings of this qualitative research which used a case study strategy is that the findings cannot be statistically generalised to the entire population. Lee and Baskerville (2003) state 'a theory's pertaining only to the setting where it was developed would not detract from its validity or scientific status.' The findings of this research could be extended to other settings (Lee and Baskerville 2003). The findings of this research could be transferred to other contexts and situations.

The findings in this study (as depicted in Figure 3) could be transferred to medium-to-large organisations where the context is similar and there is a fundamental change

to the culture and way of working for the people touched by the transition. In the opinion of this author, the majority of the issues discovered in this study would still apply even if the context was different and the change was incremental. In other words, the outcome could vary but the strategies used to manage the change and the intervening conditions that influence the outcome of the change, would still be applicable although the strength of the influence could be different.

Similarly, the change process (as depicted in Figure 13), implementation strategy and implementation issues encountered in this study can be transferred to medium-to-large organisations with a similar context and where there is a radical change in the culture and way of working for the people touched by the transition. The change process can probably be transferred in a situation where the change is incremental, but this needs to be tested, as suggested in section 6.5 below.

Lastly, by giving an ample description of the research questions, research design, context, findings and interpretations, this study has allowed other researchers to make a judgment about the transferability of this research to other settings (Saunders, Lewis, and Thornhill 2016).

6.4.2 Potential problems with data collection and analysis

The potential problems in data collection and analysis were in the data collection methods, participant selection, interview bias, cultural differences and the replication of study.

6.4.2.1 Data collection methods

Due to time and access constraints, data were not collected using observation. It was difficult getting permission to observe the teams and stakeholders in action, due to the commercially sensitive information that could possibly be disclosed during the observation process.

However, even if observation was allowed, working full-time and simultaneously being a part-time PhD student made it difficult for this researcher to undertake observation as this would be very time-consuming (Saunders, Lewis, and Thornhill 2016). The authors state that a researcher must be attached to an organisation for a period of time to be able to get a rich and deep understanding of an organisational phenomenon such as change.

Besides the relatively short time allowed for data collection in this study, narrow training will also impinge on the extent of triangulation that is practically possible (Patton 1999). The author argues that the use of observations needs disciplined training and thorough preparation, and states that training to become a competent observer is a meticulous process that is similar to that needed to become a competent statistician. They both involve training, practice, and preparation.

Most importantly, it is difficult to observe the hidden nature of a phenomenon (Speer 2008) such as organisational change and the associated themes discovered in this study. The use of interviews allowed this researcher to obtain authentic accounts that would have been difficult to observe in action.

6.4.2.2 Participant selection

Due to time and access constraints, not all stakeholders are fully represented in the data. The focus in the initial stage of inquiry was on the experiences of Agile project team members in the transition. Enterprise Agility was a theme that emerged later in data collection. Although stakeholders that could contribute to this theme were then interviewed, it would have been good if actual people from the different areas had been interviewed; for example, people in Infrastructure and Operations, Training, Legal and Finance. Information about the issues these areas experienced was obtained from people outside these areas. It is possible that richer and deeper information would have been obtained if the actual stakeholders in those areas had been interviewed.

6.4.2.3 Interview bias

Saunders, Lewis, and Thornhill (2016) identify two types of potential bias in semi-structured interviews that could affect the quality of the data collected. They are interviewer and interviewee or response bias.

To mitigate the effect of any potential interviewer bias, this researcher was mindful not to:

- impose his beliefs and frame of reference on the interview questions
- display bias when interpreting responses from the interviewees.

Saunders, Lewis, and Thornhill (2016) state that a researcher needs to be aware that his or her values and beliefs play a key part in the process of interpreting the data

collected. This researcher was mindful of being sympathetic to and appreciative of the perspective of the participants.

To mitigate the effect of any potential interviewee or response bias, this researcher attempted to improve confidence in his trustworthiness by guaranteeing anonymity (Saunders, Lewis, and Thornhill 2016).

6.4.2.4 Cultural differences

This interviewer was aware that potential problems could arise from cultural differences between an interviewer and interviewees (Court and Abbas 2013). However, no major differences between the cultural backgrounds of this interviewer and interviewees were observed that affected the interaction between them during the interviews. This interviewer found no problem interacting with the interviewees and was able to foster a connection with the interviewees which assisted in facilitating the interviews.

6.4.2.5 Replication of study

This research is a qualitative study that collects qualitative data from a case study using non-standardised interviews. It is neither practical nor possible to replicate the findings from this research without weakening the strength of the qualitative research. Marshall and Rossman (1999) state that findings from this type of research ‘are not necessarily intended to be repeatable since they reflect reality at the time they were collected, in a situation which may be subject to change’.

6.5 Recommendations for future research

As the change experienced in this single organisation case study was radical, further organisational change studies around a transition to Agile could test the theoretical models developed in this study in a scenario where the organisational change was not radical; for example, in an organisation that practiced incremental delivery, used techniques like prototyping, where leaders trusted their teams and practiced servant instead of command-and-control leadership, promoted teamwork, collaboration, face-to-face communication, and was always looking for ways to improve. As a transition to Agile involves both a change in culture and way of working, it would also be interesting to investigate if there are scenarios where the change in culture was radical but the change in way of working was not or vice versa.

Further research could also be carried out in the area of resourcing for Agile projects. The issue of allocating team members full-time to a project and keeping teams consistent is an issue that was not fully resolved at the completion of this study. The idea of moving work to fixed teams instead forming teams for project work was suggested by Broza (2012). Research in how this can be achieved and the issues involved would be beneficial both to academics and practitioners.

Similar to the bank in this study, an organisation that has experienced the benefits of Agile delivery teams might need to scale up this capability in situations where there are a large number of teams working on a big product or different products across its portfolio (Goldstein 2015). More and more organisations are applying Agile practices to large-scale projects due to the success of Agile ISD methods by small and co-located teams (Dingsøy et al. 2018). Scaling Agile was identified as one research question of high priority at the workshop for XP2018 (Dingsøy, Moe, and Ohlsson 2018). Dingsøy, Falessi, and Power (2019) further state that large-scale Agile development is currently of great importance due to the attention on digitisation and an awareness of software's significance in enabling innovation. The authors state that research on this topic is still in a nascent state. The authors state that adopting a scaling framework is a major change for an organisation. They suggest more independent empirical studies on large-scale Agile, such as the selection and practice of scaled Agile frameworks and the challenges associated with the use of such frameworks.

Lastly, Business Agility was also one research question of high priority that was identified at the workshops for XP2017 (Moe and Dingsøy 2017) and XP2018 (Dingsøy, Moe, and Ohlsson 2018). One of the detailed questions identified for Business Agility at XP2017 was the support that the development function required from other functional areas for implementation of large-scale Agile principles and practices. This research raised some issues that the Agile development teams at ABC Bank encountered when working with supporting functional areas. To be able to have a deeper and better understanding of Business Agility, there should be further research in how the other areas need to support the development function, the changes required in these areas to do so, how they apply the Agile values and principles in their work, and the adoption of applicable Agile practices and tools.

In conclusion, the transition from a traditional to an Agile ISD approach should be perceived as a form of organisational change. The transition to Agile involves an Agile transformation and Enterprise Agility; it entails a radical change in the culture and way of working, and the change involves not only Development but also other areas in the organisation. The change is hard as it requires people to not only learn a new way of working but also to unlearn the old way, and it further entails overcoming established norms and deeply rooted work practices. The difficult job of managing and handling the change from the start of the transition requires continuous support from top and middle management, and other stakeholders.

REFERENCES

- Abrahamsson, Pekka, Kieran Conboy, and Xiaofeng Wang. 2009. "Lots done, more to do: the current state of agile systems development research." *European Journal of Information Systems* 18 (4): 281-284. <https://doi.org/10.1057/ejis.2009.27>.
<http://dx.doi.org/10.1057/ejis.2009.27>.
- Adams, Barbara, Eta Berner, and Joni Wyatt. 2004. "Applying Strategies to Overcome User Resistance in a Group of Clinical Managers to a Business Software Application: A Case Study." *Journal of Organizational and End User Computing (JOEUC)* 16 (4): 55-64. <https://doi.org/10.4018/joeuc.2004100104>.
- Ajzen, I. 1991. "The theory of planned behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179-211. [https://doi.org/https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/https://doi.org/10.1016/0749-5978(91)90020-T).
- Ajzen, I., and M. Fishbein. 1980. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Ambler, S. n.d. ""Examining the Agile Manifesto"." Ambysoft. Accessed September 13th, 2011. <http://www.ambysoft.com/essays/agileManifesto.html>.
- Arnold, Steve. 2012. ""Make continuous deployment practical and cost-effective with Rational ALM tools"." IBM. <https://www.ibm.com/developerworks/rational/library/continuous-deployment-rational-alm/continuous-deployment-rational-alm-pdf.pdf>.
- Avery, C. 2005. *Responsible Change*. Cutter Consortium (Cutter Consortium). <https://christopheravery.com/responsible-change-executive-report>.
- Baddoo, N., and T. Hall. 2003. "De-motivators for software process improvement: an analysis of practitioners' views." *The Journal of Systems and Software* 66 (1): 23-33. [https://doi.org/10.1016/S0164-1212\(02\)00060-2](https://doi.org/10.1016/S0164-1212(02)00060-2).
- Balijepally, V., R. Mahapatra, S. Nerur, and K. Price. 2009. "Are Two Heads Better Than One For Software Development? The Productivity Paradox Of Pair Programming." *MIS Quarterly* 33 (1): 91-118. <https://www.jstor.org/stable/20650280>.
- Barnett, Liz. 2008. ""Incremental agile adoption"." Agile Journal. agilejournal.com/articles/columns/from-the-editor-mainmenu-45/755-incremental-agile-adoption.
- Bass, Len, Ross Jeffery, Hiroshi Wada, Ingo Weber, and Liming Zhu. 2013. "Eliciting operations requirements for applications." Proceedings of the 1st International Workshop on Release Engineering, San Francisco, California May 20
- Bazeley, Patricia. 2007. *Qualitative data analysis with NVivo / Pat Bazeley*. Los Angeles: Los Angeles: SAGE.
- Beck, Kent, and Cynthia Andres. 2005. *Extreme programming explained : embrace change / Kent Beck*. Edited by Cynthia Andres. 2nd ed.. ed. Boston, MA: Boston, MA : Addison-Wesley.
- Beck, Kent, Mike Beedle, Arie van Bennekum, Alistair Cockburn, Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith, Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert Martin, Steve Mellor, Ken Schwaber, Jeff Sutherland, and Dave Thomas. 2001a. ""Manifesto for Agile Software Development"." <http://agilemanifesto.org/>.
- . 2001b. ""Principles behind the Agile Manifesto"." <http://agilemanifesto.org/principles.html>.
- Benbasat, I., D.K. Goldstein, and M. Mead. 1987. "The case research strategy in studies of information systems." *MIS Quarterly* 11 (3): 369. https://www.jstor.org/stable/248684?seq=1#metadata_info_tab_contents.

- Blash, S. 2011. "Champion of Change - The Business Analyst." BA Times. Accessed January 6, 2011. <https://www.batimes.com/articles/champion-of-change-the-business-analyst.html#>.
- Boehm, B., and R. Turner. 2004. *Balancing Agility and Discipline: A Guide for the Perplexed*. Boston, MA: Addison-Wesley.
- Boehm, B., and R. Turner. 2005. "Management challenges to implementing agile processes in traditional development organizations." *IEEE Software* 22 (5): 30-39. <https://doi.org/10.1109/MS.2005.129>
- Brooks, Joanna, and Nigel King. 2014. *Doing template analysis : evaluating an end-of-life care service*. [London] : SAGE.
- Brooks, Joanna, Serena McCluskey, Nigel King, and Kim Burton. 2013. "Illness perceptions in the context of differing work participation outcomes: exploring the influence of significant others in persistent back pain." *BMC Musculoskeletal Disorders* 14: 48-48. <https://doi.org/10.1186/1471-2474-14-48>. <http://dx.doi.org/10.1186/1471-2474-14-48>.
- Brooks, Joanna, Serena McCluskey, Emma Turley, and Nigel King. 2015. "The Utility of Template Analysis in Qualitative Psychology Research." *Qualitative Research in Psychology* 12 (2): 202-222. <https://doi.org/10.1080/14780887.2014.955224>. <http://dx.doi.org/10.1080/14780887.2014.955224>.
- Brownlee, Dana 2008. "The secrets to running project status meetings that work." PMI® Global Congress 2008, North America, Denver, CO. Newtown Square. <https://www.pmi.org/learning/library/secrets-running-project-status-meetings-7009>.
- Broza, G. 2012. *The Human Side of Agile How to Help Your Team Deliver*. Toronto: 3P Vantage Media.
- . 2013. ""So you think you are agile"." ProjectManagement.com. <https://www.projectmanagement.com/articles/280819/So-You-Think-You-re-Agile>.
- . 2017. ""Adopting Agile? Don't Say It's Common Sense"." ProjectManagement.com. <https://www.projectmanagement.com/articles/388341/Adopting-Agile--Dont-Say-Its-Common-Sense>.
- Burkhardt, M.E., and D.J. Brass. 1990. "Changing patterns or patterns of change: the effects of change in technology on social network structure and power." *Administrative Science Quarterly* 35 (1): 104–127. <https://www.jstor.org/stable/2393552>.
- Cao, L., K. Mohan, B. Ramesh, and S. Sarkar. 2013. "Adapting funding processes for agile IT projects: An empirical investigation." *European Journal of Information Systems* 22 (2): 191-205. <https://doi.org/10.1057/ejis.2012.9>.
- Ceschi, M., A. Sillitti, G. Succi, and S.D. Panfilis. 2005. "Project management in plan-based and agile companies." *IEEE Software* 22 (3): 21. <https://ieeexplore.ieee.org/document/1438324>.
- Chan, F. K. Y., and J. Y. L. Thong. 2009. "Acceptance of agile methodologies: A critical review and conceptual framework." *Decision Support Systems* 46 (4): 803-814. [https://doi.org/DOI 10.1016/j.dss.2008.11.009](https://doi.org/DOI%2010.1016/j.dss.2008.11.009). <Go to ISI>://000264701000006.
- Cherniss, Cary, and Mitchel Adler. 2000. *Promoting emotional intelligence in organizations : make training in emotional intelligence effective* Edited by Mitchel Adler. Alexandria, VA: Alexandria, VA : ASTD.
- Cho, I., and Y.G. Kim. 2002. "Critical factors for assimilation of object-oriented programming languages." *Journal of Management Information Systems* 18 (3): 125. <https://www.jstor.org/stable/40398556>.
- Choi, Kyungsub S., Fadi P. Deek, and Il Im. 2008. "Exploring the underlying aspects of pair programming: The impact of personality." *Information and Software Technology* 50 (11): 1114-1126. <https://doi.org/10.1016/j.infsof.2007.11.002>.

- Claps, G. G., R. B. Svensson, and A. Aurum. 2015. "On the journey to continuous deployment: Technical and social challenges along the way." *Information and Software Technology* 57: 21-31. <https://doi.org/10.1016/j.infsof.2014.07.009>. <Go to ISI>://WOS:000345947500002.
- Cockburn, A., and J. Highsmith. 2001. "Agile Software Development: The People Factor." *Computer* 34 (11): 131-133. <https://doi.org/10.1109/2.963450>.
- Cohn, M. 2010. *Succeeding With Agile*. Addison-Wesley Pearson Education.
- . 2015. "ScrumMaster - Full Time or Not? (blog)." *Mountain Goat Software* (blog), *Mountain Goat Software*. April 21. <https://www.mountaingoatsoftware.com/blog/scrummaster-full-time-or-not>.
- Cohn, M. , and D. Ford. 2003. "Introducing an agile process to an organization." *IEEE Computer* 36 (6): 74–78. <https://doi.org/10.1109/MC.2003.1204378>
- Collinson, David. 1994. "Strategies of Resistance: power, knowledge and subjectivity in the workplace." In *Resistance and Power in Organisations*, edited by J. Jermier, D. Knights and W. Nord, 25-68. Routledge.
- Compeau, Deborah R., and Christopher A. Higgins. 1995. "Computer Self-Efficacy: Development of a Measure and Initial Test." *MIS Quarterly* 19 (2): 189-211. <http://www.jstor.org/stable/249688>.
- Conboy, K., S. Coyle, L. Xiaofeng Wang, and M. Pikkarainen. 2011. "People over process: Key challenges in agile development." *IEEE Software* 28 (4): 48-57. <https://doi.org/10.1109/MS.2010.132>.
- Corbin, Juliet M., and Anselm L. Strauss. 2008. *Basics of qualitative research : techniques and procedures for developing grounded theory*. Edited by Anselm L. Strauss. 3rd ed. Los Angeles, California: London : SAGE.
- Court, Deborah , and Randa Abbas. 2013. "Whose Interview Is It, Anyway? Methodological and Ethical Challenges of Insider–Outsider Research, Multiple Languages, and Dual-Researcher Cooperation." *Qualitative Inquiry* 19 (6): 480-488. <https://doi.org/doi:10.1177/1077800413482102>. <http://journals.sagepub.com/doi/abs/10.1177/1077800413482102>.
- Cram, W. A. 2019. "Agile Development in Practice: Lessons from the Trenches." *Information Systems Management* 36 (1): 2-14. <https://doi.org/10.1080/10580530.2018.1553645>. <Go to ISI>://WOS:000463803100002.
- Creasey, Tim. n.d.-a. ""3 Types of Change Resistant Employees and How to Engage them". " Prosci. Accessed December 12, 2017. <http://blog.prosci.com/3-types-of-change-resistant-employees-and-how-to-engage-them>.
- . n.d.-b. ""Understanding Why People Resist Change". " Prosci. Accessed December 11, 2017. <http://blog.prosci.com/understanding-why-people-resist-change>.
- Creswell, J. 2007. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*. 2nd ed. Thousand Oaks, CA: SAGE.
- Crispin, Lisa , and Janet Gregory. 2009. *Agile testing: A practical guide for testers and agile teams*. Addison-Wesley Professional.
- Daft, Richard L., and Selwyn W. Becker. 1978. *Innovation in organizations : innovation adoption in school organizations*. Edited by Selwyn William Becker. New York: New York : Elsevier.
- Davis, F. D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology." *MIS Quarterly* 13 (3): 319. <https://www.jstor.org/stable/249008>.
- DeCuir-Gunby, Jessica T., Patricia L. Marshall, and Allison W. McCulloch. 2011. "Developing and Using a Codebook for the Analysis of Interview Data: An Example from a Professional Development Research Project." *Field Methods* 23 (2): 136-155. <https://doi.org/10.1177/1525822X10388468>.

- Denning, S. 2019. "Lessons learned from mapping successful and unsuccessful Agile transformation journeys." *Strategy and Leadership* 47 (4): 3-11. <https://doi.org/10.1108/SL-04-2019-0052>.
- DePietro, R., E. Wiarda, and M. Fleischer. 1990. "The Context for Change: Organization, Technology, and Environment." In *The processes of technological innovation* edited by Louis G. Tornatzky, Mitchell Fleischer and Alok K. Chakrabarti, 151-175. Lexington, Mass: Lexington Books.
- Dewar, Robert D, and Jane E Dutton. 1986. "The adoption of radical and incremental innovations: An empirical analysis." *Management Science* 32 (11): 1422-1433. <https://www.jstor.org/stable/2631501>.
- Diebold, Philipp, and Udo Mayer. 2017. "On the Usage and Benefits of Agile Methods and Practices." In *Agile Processes in Software Engineering and Extreme Programming: 18th International Conference, XP 2017, Cologne, Germany, May 22-26, 2017, Proceedings*, edited by Hubert Baumeister, Horst Lichter and Matthias Riebisch, 243-250. Cham: Springer International Publishing.
- Dikert, Kim, Maria Paasivaara, and Casper Lassenius. 2016. "Challenges and success factors for large-scale agile transformations: A systematic literature review." *Journal of Systems and Software* 119: 87-108. <https://doi.org/10.1016/j.jss.2016.06.013>.
- Dingsøy, T., T. Dybå, M. Gjertsen, A. O. Jacobsen, T. E. Mathisen, J. O. Nordfjord, K. Roe, and K. Strand. 2019. "Key Lessons From Tailoring Agile Methods for Large-Scale Software Development." *IT Professional* 21 (1): 34-41. <https://doi.org/10.1109/mitp.2018.2876984>. <Go to ISI>://WOS:000460753900006.
- Dingsøy, Torgeir, Davide Falessi, and Ken Power. 2019. Agile Development at Scale: The Next Frontier. *arXiv e-prints*. Accessed January 01, 2019. <https://doi.org/10.1109/MS.2018.2884884>.
- Dingsøy, Torgeir, Nils Brede Moe, and Helena Holmstrom Ohlsson. 2018. Towards an Understanding of Scaling Frameworks and Business Agility: A Summary of the 6th International Workshop at XP2018. *arXiv e-prints*. Accessed December 01, 2018.
- Dingsøy, Torgeir, Nils Brede Moe, Tor Erlend Fægri, and Eva Amdahl Seim. 2018. "Exploring software development at the very large-scale: a revelatory case study and research agenda for agile method adaptation." *Empirical Software Engineering* 23 (1): 490-520. <https://doi.org/10.1007/s10664-017-9524-2>. <https://doi.org/10.1007/s10664-017-9524-2>.
- Dubois, Anna, and Lars-Erik Gadde. 2002. "Systematic combining: an abductive approach to case research." *Journal of Business Research* 55 (7): 553-560. [https://doi.org/10.1016/S0148-2963\(00\)00195-8](https://doi.org/10.1016/S0148-2963(00)00195-8).
- Dybå, T., and T. Dingsøy. 2008. "Empirical studies of agile software development: A systematic review." *Information and Software Technology* 50 (9-10): 833-859. <https://doi.org/10.1016/j.infsof.2008.01.006>.
- Ebert, C., and M. Paasivaara. 2017. "Scaling Agile". *IEEE Software* 34 (6): 98-103. <https://doi.org/10.1109/MS.2017.4121226>
- Eden, Dov, and Arie Aviram. 1993. "Self- Efficacy Training to Speed Reemployment: Helping People to Help Themselves." *Journal of Applied Psychology* 78 (3): 352-360. <https://doi.org/10.1037/0021-9010.78.3.352>.
- Eisenhardt, K. M. 1989. "Building Theories from Case Study Research." *The Academy of Management Review* 14 (4): 532-550. <https://www.jstor.org/stable/258557>.
- Elleithy, Salah. 2013. ""Agile Transformation: The 3 Key Ingredients". PMtimes. <https://www.projecttimes.com/articles/agile-transformation-the-3-key-ingredients.html>.

- Engwall, Mats, and Anna Jerbrant. 2003. "The resource allocation syndrome: the prime challenge of multi-project management?" *International Journal of Project Management* 21 (6): 403-409. [https://doi.org/10.1016/S0263-7863\(02\)00113-8](https://doi.org/10.1016/S0263-7863(02)00113-8).
- Ettlie, John E., William P. Bridges, and Robert D. O'Keefe. 1984. "Organization Strategy and Structural Differences for Radical versus Incremental Innovation." *Management Science* 30 (6): 682-695. <http://www.jstor.org/stable/2631748>.
- Fayol, H. 1949. *General and Industrial Management*. London: Sir Isaac Pitman and Sons Ltd.
- Federoff, Melissa, and Catherine Courage. 2009. "Successful User Experience in an Agile Enterprise Environment." In *Human Interface and the Management of Information. Designing Information Environments. Human Interface 2009*, edited by Michael J. Smith and Gavriel Salvendy, 233-242. Berlin, Heidelberg: Springer, Berlin, Heidelberg.
- Felder, Richard M., and Rebecca Brent. 2005. "Understanding Student Differences." *Journal of Engineering Education* 94 (1): 57-72. <https://doi.org/10.1002/j.2168-9830.2005.tb00829.x>.
- Fells, Michael J. 2000. "Fayol stands the test of time." *Journal of Management History* 6 (8): 345-360. <https://doi.org/10.1108/13552520010359379>.
- Fitz, Timothy. 2009. ""Continuous Deployment at IMVU: Doing the impossible fifty times a day"." <http://timothyfitz.com/2009/02/10/continuous-deployment-at-imvu-doing-the-impossible-fifty-times-a-day/>.
- Fitzgerald, Brian, Gerard Hartnett, and Kieran Conboy. 2006. "Customising agile methods to software practices at Intel Shannon." *European Journal of Information Systems* 15 (2): 200-213. <https://doi.org/10.1057/palgrave.ejis.3000605>.
<https://doi.org/10.1057/palgrave.ejis.3000605>.
- Fleischer, M., and David Roitman. 1990. "Implementation." In *The Processes of Technological Innovation* edited by Louis G. Tornatzky, Mitchell Fleischer and Alok K. Chakrabarti, 197-232. Lexington, Mass: Lexington Books.
- Forbes Technology Council. 2016. ""The Benefits Of Using Agile Software Development"." Forbes CommunityVoice.
<https://www.forbes.com/sites/forbestechcouncil/2016/05/09/the-benefits-of-using-agile-software-development/#47d3197ab0f8>.
- Fruhling, A., P. McDonald, and C. Dunbar. 2008. "A case study: introducing eXtreme Programming in a US government system development project." Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008), Waikoloa, HI, USA January 2008.
- Fry, Chris , and Steve Greene. 2007. "Large Scale Agile Transformation in an On-Demand World." Proceedings of the AGILE 2007.
- Frye, Colleen. 2012. ""Implementing Agile in very large enterprises"." TechTarget.
<http://searchsoftwarequality.techtarget.com/feature/Implementing-Agile-in-very-large-enterprises>.
- Galal, G H. 2001. "From contexts to constructs: the use of grounded theory in operationalising contingent process models." *European Journal of Information Systems* 10 (1): 2-14. <https://doi.org/10.1057/palgrave.ejis.3000381>.
<https://doi.org/10.1057/palgrave.ejis.3000381>.
- Gandomani, T.J. , and Z.M. Nafchi. 2015. "An empirically-developed framework for Agile transition and adoption: A Grounded Theory approach." *The Journal of Systems and Software* 107: 204-219. <https://doi.org/10.1016/j.jss.2015.06.006>.
- Ginzberg, E., and E. Reilly. 1957. *Effecting Change in Large Organizations*. New York: Columbia University Press.
- Glaser, B. 1978. *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory*. Sociology Press.

- Goldstein, J.S. 2015. "What Does 'Scaling Agile' Really Mean?." <https://www.linkedin.com/pulse/what-does-scaling-agile-really-mean-jay-stanton-goldstein>.
- Gratton, Linda, Andreas Voigt, and Tamara Erickson. 2011. "Bridging faultlines in diverse teams." *Engineering Management Review, IEEE* 39 (1): 80-90. <https://doi.org/10.1109/EMR.2011.5729976>.
- Gregor, S. 2006. "The nature of theory in information systems." *MIS Quarterly* 30 (3): 611-642.
- Gregory, Peggy, Leonor Barroca, Helen Sharp, Advait Deshpande, and Katie Taylor. 2016. "The challenges that challenge: Engaging with agile practitioners' concerns." *Information and Software Technology* 77: 92-104. <https://doi.org/http://dx.doi.org/10.1016/j.infsof.2016.04.006>. <http://www.sciencedirect.com/science/article/pii/S0950584916300623>.
- Guba, Egon. 1981. "Criteria for assessing the trustworthiness of naturalistic inquiries." *Educational Communication and Technology* 29 (2): 75-91. <https://doi.org/10.1007/BF02766777>.
- Guba, Egon G., and Yvonna S. Lincoln. 1989. *Fourth generation evaluation / Egon G. Guba, Yvonna S. Lincoln*. Edited by Yvonna S. Lincoln. Newbury Park, Calif.: Newbury Park, Calif. : Sage Publications.
- Guest, G., A. Bunce, and L. Johnson. 2006. "How many interviews are enough? An Experiment with Data Saturation and Variability." *Field methods* 18 (1): 23. <https://doi.org/https://doi.org/10.1177/1525822X05279903>.
- Hage, J. 1980. *Theories of Organization: Form, Process, and Transformation*. New York: Wiley.
- Hardgrave, B. C., F. D. Davis, and C. K. Riemenschneider. 2003. "Investigating determinants of software developers' intentions to follow methodologies." *Journal of Management Information Systems* 20 (1): 123-151. <https://www.jstor.org/stable/40398619>.
- Hastie, S. 2008. "The Role of the Analyst in Agile Projects." InfoQ. <https://www.infoq.com/articles/agile-business-analyst-role>.
- Hastie, S., and S. Robson. 2013. "Scaling agile IT'S ALL ABOUT THE CONTEXT". Software Education. <http://www.softed.com/assets/Uploads/Resources/Agile/Scaling-Agile-Its-All-About-the-Context-Shane-Hastie-and-Sharon-Robson.pdf>.
- Hastie, Shane. 2015. "Agile is not a noun". Software Education. <http://www.softed.com/news/agile-is-not-a-noun/>.
- Hemon, Aymeric, Barbara Lyonnet, Frantz Rowe, and Brian Fitzgerald. 2019. "From Agile to DevOps: Smart Skills and Collaborations." *Information Systems Frontiers*. <https://doi.org/10.1007/s10796-019-09905-1>. <https://doi.org/10.1007/s10796-019-09905-1>.
- Hiatt, J. 2006. *ADKAR: A Model for Change in Business, Government, and our Community*. 1st ed. Loveland, Colorado: Prosci Research.
- Higgins, S. H., and P.T. Hogan. 1999. "Internal diffusion of high technology industrial innovations: an empirical study." *The Journal of Business and Industrial Marketing* 14 (1): 61-75. <https://doi.org/https://doi.org/10.1108/08858629910254157>.
- Highsmith, J. 2002. *Agile Software Development Ecosystems*. Addison Wesley.
- Highsmith, J., and A. Cockburn. 2001. "Agile Software Development: The Business of Innovation." *Computer* 34 (9): 120-127. <https://doi.org/10.1109/2.947100>.
- Hill, T., N.D. Smith, and M.F. Mann. 1987. "Role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers." *Journal of Applied Psychology* 72 (2): 307-313. <http://dx.doi.org/10.1037/0021-9010.72.2.307>.
- Hoda, Rashina, James Noble, and Stuart Marshall. 2010. "Agile Undercover: When Customers Don't Collaborate." In *Agile Processes in Software Engineering and*

- Extreme Programming: 11th International Conference, XP 2010, Trondheim, Norway, June 1-4, 2010. Proceedings*, edited by Alberto Sillitti, Angela Martin, Xiaofeng Wang and Elizabeth Whitworth, 73-87. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Hofstede, Geert. 1980. "Motivation, leadership, and organization: Do American theories apply abroad?" *Organizational Dynamics* 9 (1): 42-63. [https://doi.org/10.1016/0090-2616\(80\)90013-3](https://doi.org/10.1016/0090-2616(80)90013-3).
- Höst, Martin, and Per Runeson. 2007. Checklists for software engineering case study research.
- Humble, Jez, and David Farley. 2010. *Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation*. Pearson Education.
- Humphrey, Watts S. 1998. "Why don't they practice what we preach?" *Annals of Software Engineering* 6 (1): 201-222. <https://doi.org/10.1023/a:1018997029222>. <https://doi.org/10.1023/A:1018997029222>.
- Hutchison, Andrew John, Lynne Halley Johnston, and Jeff David Breckon. 2010. "Using QSR-NVivo to facilitate the development of a grounded theory project: an account of a worked example." *International Journal of Social Research Methodology* 13 (4): 283-302. <https://doi.org/10.1080/13645570902996301>.
- Hüttermann, Michael. 2012. *DevOps for Developers*. Edited by SpringerLink. Berkeley, CA: Apress.
- Jacobs, Peter, and Bart Schlatmann. 2017. ING's agile transformation. edited by Deepak Mahadevan. McKinsey Quarterly: McKinsey & Company.
- Jiang, James J., Waleed A. Muhanna, and Gary Klein. 2000. "User resistance and strategies for promoting acceptance across system types." *Information and Management* 37 (1): 25-36. [https://doi.org/10.1016/S0378-7206\(99\)00032-4](https://doi.org/10.1016/S0378-7206(99)00032-4).
- Johnson, S., and H. Coombs. n.d. ""Beyond budgeting"." ACCA. Accessed November 2, 2017. <http://www.accaglobal.com/an/en/student/exam-support-resources/professional-exams-study-resources/p5/technical-articles/beyond-budgeting.html>.
- Kalenda, M., P. Hyna, and B. Rossi. 2018. "Scaling agile in large organizations: Practices, challenges, and success factors." *Journal of Software: Evolution and Process* 30 (10): 1-24. <https://doi.org/10.1002/smr.1954>. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85047486348&doi=10.1002%2fsmr.1954&partnerID=40&md5=36d52067f77f75d879760849f19ca508>.
- Kim, H. W., and A. Kankanhalli. 2009. "Investigating user resistance to change in IS implementation." *MIS Quarterly* 33 (3): 567-582. <https://www.jstor.org/stable/20650309>.
- King, N. 2004. "Using Templates in the Thematic Analysis of Text." In *Essential Guide to Qualitative Methods in Organizational Research*, edited by Cathy Cassell and Gillian Symon, 256-270. London: SAGE Publications.
- . 2012. "Doing Template Analysis." In *Qualitative Organizational Research: Core Methods and Current Challenges*, edited by G. Symon and C. Cassell. London: Sage.
- King, Nigel, Carmen Carroll, Peggy Newton, and Tim Dornan. 2002. ""You can't cure it so you have to endure it": The experience of adaption to diabetic renal disease." *Qualitative Health Research* 12 (3): 329-346. <https://doi.org/10.1177/104973202129119928>.
- Kirwan, Cyril. 2013. *Making Sense of Organizational Learning: Putting Theory Into Practice*. Gower Publishing Ltd.
- Kitto, Simon C; , Janice; Chesters, and Carol Grbich. 2008. "Quality in qualitative research: Criteria for authors and assessors in the submission and assessment of qualitative

- research articles for the Medical Journal of Australia." *Medical Journal of Australia*; 188 (4). <https://doi.org/10.5694/j.1326-5377.2008.tb01595.x>.
- Korson, Tim, and John McGregor. 1990. "Understanding object-oriented: a unifying paradigm." *Communications of the ACM* 33 (9): 40-60. <https://doi.org/10.1145/83880.84459>.
- Kwon, T.H., and R.W. Zmud. 1987. "Unifying the fragmented models of information systems implementation." In *Critical Issues in Information Systems Research*, edited by R.J. Boland and Hirschheim R.A., 227–251. New York: John Wiley and Sons Ltd.
- Laanti, Maarit, Outi Salo, and Pekka Abrahamsson. 2011. "Agile methods rapidly replacing traditional methods at Nokia: A survey of opinions on agile transformation." *Information and Software Technology* 53 (3): 276-290. <https://doi.org/10.1016/j.infsof.2010.11.010>.
- Larsen, M. A., and M. D. Myers. 1999. "When success turns into failure: a package-driven business process re-engineering project in the financial services industry." *Journal of Strategic Information Systems* 8 (4): 395-417. [https://doi.org/10.1016/S0963-8687\(00\)00025-1](https://doi.org/10.1016/S0963-8687(00)00025-1).
- Lauer, Thomas W., Kailash Joshi, and Thomas Browdy. 2000. "Use of the Equity Implementation Model to Review Clinical System Implementation Efforts." *Journal of the American Medical Informatics Association* 7 (1): 91-102. <https://doi.org/10.1136/jamia.2000.0070091>.
- Lawson, Emily, and Colin Price. 2003. The psychology of change management. *McKinsey Quarterly*.
- Lee, A. S., and R. L. Baskerville. 2003. "Generalizing generalizability in information systems research." *Information Systems Research* 14 (3): 221-243. <https://doi.org/10.1287/isre.14.3.221.16560>.
- Leonard-Barton, Dorothy. 1990. "A dual methodology for case studies: Synergistic use of a longitudinal single site with replicated multiple sites." *Organization Science* 1 (3): 248-266. <https://www.jstor.org/stable/2635005>.
- Leppänen, M., S. Mäkinen, M. Pagels, V. P. Eloranta, J. Itkonen, M. V. Mäntylä, and T. Männistö. 2015. "The highways and country roads to continuous deployment." *IEEE Software* 32 (2): 64-72. <https://doi.org/10.1109/MS.2015.50>.
- Linders, B. 2015. "'Scaling Without Blueprints and the Agile Scaling Cycle'." InfoQ. https://www.infoq.com/news/2015/12/scaling-agile-no-blueprints?utm_source=infoq&utm_medium=related_content_link&utm_campaign=relatedContent_news_clk.
- Lindstrom, L., and R. Jeffries. 2004. "Extreme programming and agile software development methodologies." *Information Systems Management* 21 (3): 41-52. <https://doi.org/10.1201/1078/44432.21.3.20040601/82476.7>.
- Lindvall, M., D. Muthig, A. Dagnino, C. Wallin, M. Stupperich, D. Kiefer, J. May, and T. Kahkonen. 2004. "Agile software development in large organizations." *Computer* 37 (12): 26-34. <https://doi.org/10.1109/MC.2004.231>.
- Livermore, J. A. 2007. "Factors that impact implementing an agile software development methodology." Proceedings 2007 IEEE SoutheastCon, Richmond, VA, USA, 22-25 March 2007.
- Lorenzi, N., R. Riley, A. Blyth, G. Southon, and B. Dixon. 1997. "Antecedents of the people and organizational aspects of medical informatics: Review of the literature." *Journal of the American Medical Informatics Association* 4 (2): 79-93.
- Lynch, Jennifer. 2015. "'Standish Group 2015 Chaos Report - Q&A with Jennifer Lynch'." InfoQ. <https://www.infoq.com/articles/standish-chaos-2015>.
- Mahnič, Viljan, and Tomaž Hovelja. 2012. "On using planning poker for estimating user stories." *The Journal of Systems and Software* 85 (9): 2086-2095. <https://doi.org/10.1016/j.jss.2012.04.005>.

- Mangalaraj, G., R. Mahapatra, and S. Nerur. 2009. "Acceptance of software process innovations - the case of extreme programming." *European Journal of Information Systems* 18 (4): 344-354. <https://doi.org/10.1057/ejis.2009.23>.
- Markus, M. Lynne, and Daniel Robey. 1983. "The Organizational Validity of Management Information Systems." *Human Relations* 36 (3): 203-225. <https://doi.org/10.1177/001872678303600301>.
- Marshall, C., and G.B. Rossman. 1999. *Designing qualitative research*. 3rd ed. Thousand Oaks, CA: Sage.
- McHugh, O., K. Conboy, and M. Lang. 2011a. "Using agile practices to influence motivation within IT project teams." *Scandinavian Journal of Information Systems* 23 (2): 59-84. <http://hdl.handle.net/10379/3415>
- McHugh, Orla, Kieran Conboy, and Michael Lang. 2011b. "Using Agile Practices to Build Trust in an Agile Team: A Case Study." In *Information Systems Development*, edited by Jaroslav Pokorny, Vaclav Repa, Karel Richta, Wita Wojtkowski, Henry Linger, Chris Barry and Michael Lang, 503-516. Springer New York.
- McManus, J. 2003. "Team agility." *Computer Bulletin* 45 (5): 26-27. <https://doi.org/10.1093/combul/45.5.26>.
- Meaney, M., and C. Pung. 2008. *McKinsey Global Survey Results: Creating organizational transformations*. (McKinsey & Company). <http://static1.1.sqspcdn.com/static/f/151916/1862632/1219958417603/Organizational+transformation+>.
- Miles, M., and A. Huberman. 1994. *Qualitative data analysis*. 2nd ed.
- Misra, S. C., V. Kumar, and U. Kumar. 2010. "Identifying some critical changes required in adopting agile practices in traditional software development projects." *The International Journal of Quality and Reliability Management* 27 (4): 451-474. <https://doi.org/10.1108/02656711011035147>.
- Misra, Subhas Chandra, Vinod Kumar, and Uma Kumar. 2009. "Identifying some important success factors in adopting agile software development practices." *Journal of Systems and Software* 82 (11): 1869-1890. <https://doi.org/10.1016/j.jss.2009.05.052>. <http://www.sciencedirect.com/science/>.
- Moe, N. B., T. Dingsøy, and T. Dyba. 2008. "Understanding Self-Organizing Teams in Agile Software Development." 19th Australian Conference on Software Engineering (aswec 2008), Perth, WA, Australia, 26-28 March 2008.
- Moe, N. B., Torgeir Dingsøy, and Tore Dybå. 2009. "Overcoming barriers to self-management in software teams." *IEEE Software* 26 (6): 20-26. <https://doi.org/10.1109/MS.2009.182>.
- Moe, Nils Brede, and Torgeir Dingsøy. 2017. "Emerging research themes and updated research agenda for large-scale agile development: a summary of the 5th international workshop at XP2017." Proceedings of the XP2017 Scientific Workshops, Cologne, Germany.
- Moitra, D. 1998. "Managing change for software process improvement initiatives: a practical experience-based approach." *Software Process Improvement and Practice* 4 (4): 199-207. [https://doi.org/https://doi.org/10.1002/\(SICI\)1099-1670\(199812\)4:4<199::AID-SPIP107>3.0.CO;2-D](https://doi.org/https://doi.org/10.1002/(SICI)1099-1670(199812)4:4<199::AID-SPIP107>3.0.CO;2-D).
- Moløkken-Østfold, Kjetil, Nils Christian Haugen, and Hans Christian Benestad. 2008. "Using planning poker for combining expert estimates in software projects." *The Journal of Systems and Software* 81 (12): 2106-2117. <https://doi.org/10.1016/j.jss.2008.03.058>.
- Moore, G. C., and I. Benbasat. 1991. "Development of an instrument to measure the perceptions of adopting an information technology innovation." *Information Systems Research* 2 (3): 192-222. <https://doi.org/10.1287/isre.2.3.192>.

- Morris, T., and S. Wood. 1991. "Testing the survey method: Continuity and change in british industrial relations." *Work Employment and Society* 5 (2): 259-282.
<https://doi.org/10.1177/0950017091005002007>.
- Mountain Goat Software. n.d. ""Planning Poker"." Mountain Goat Software. Accessed January 30, 2018. <https://www.mountaingoatsoftware.com/agile/planning-poker>.
- Myers, M. 2009. *Qualitative Research in Business and Management*. Sage Publications.
- Myers, M. D. n.d. ""Qualitative Research in Information Systems"." AISWorld. Last Modified October 28, 2016 Accessed May 22, 2017. <http://www.qual.auckland.ac.nz/>.
- Myers, M. D., and M. Newman. 2007. "The qualitative interview in IS research: Examining the craft." *Information and organization* 17 (1): 2. <http://sfx.lis.curtin.edu.au/>.
- Nerur, S., R. Mahapatra, and G. Mangalaraj. 2005. "Challenges of migrating to agile methodologies." *Communications of the ACM* 48 (5): 72-78.
<https://doi.org/10.1145/1060710.1060712>.
- Neuman, W. Lawrence. 2006. *Social research methods : qualitative and quantitative approaches*. 6th ed.. ed. Boston, Mass.: Boston, Mass. : Pearson/Allyn and Bacon.
- Niazi, M., D. Wilson, and D. Zowghi. 2006. "Critical success factors for software process improvement implementation: an empirical study." *Software Process Improvement and Practice* 11 (2): 193-211. <https://doi.org/10.1002/spip.261>.
- Olson, E., and G. Eoyang. 2001. *Facilitating Organization Change: Lessons from Complexity Science*. USA: Jossey-Bass/Pfeiffer.
- Olsson, H. H., H. Alahyari, and J. Bosch. 2012. "Climbing the Stairway to Heaven: A Multiple-Case Study Exploring Barriers in the Transition from Agile Development towards Continuous Deployment of Software." 38th Euromicro Conference on Software Engineering and Advanced Applications.
- Opong, Paul. 2019. "Business Agility: How can Project Management Practice and the PMO Adapt to Uncertain Times ". PMtimes.
https://www.projecttimes.com/articles/business-agility-how-can-project-management-practice-and-the-pmo-adapt-to-uncertain-times.html?utm_campaign=NL_PROJECTTIMES_04_17_2019&utm_source=NL_PROJECTTIMES_04_17_2019&utm_medium=email.
- Orlikowski, W. J. 1993. "CASE tools as organizational change: Investigating incremental and radical changes in systems development." *MIS Quarterly* 17 (3): 309-340.
<https://www.jstor.org/stable/249774>.
- Orlikowski, W.J., and D Robey. 1991. "Information Technology and the Structuring of Organizations." *Information Systems Research* 2 (2): 143-169.
<https://doi.org/10.1287/isre.2.2.143>.
- Overhage, S., S. Schlauderer, and D. Birkmeier. 2011. "What Makes IT personnel adopt scrum? A framework of drivers and inhibitors to developer acceptance " 44th Hawaii International Conference on System Sciences, Kauai, HI, USA, 4-7 Jan.
- Paasivaara, M., and C. Lassenius. 2016. "Scaling Scrum in a Large Globally Distributed Organization: A Case Study." 2016 IEEE 11th International Conference on Global Software Engineering (ICGSE), 2-5 Aug. 2016.
- Patton, M. Q. 1990. *Qualitative evaluation and research methods*. 2nd ed. Beverly Hills, CA: Sage.
- . 1999. "Enhancing the quality and credibility of qualitative analysis." *Health services research* 34 (5 Pt 2): 1189-1208.
- Poston, Robin, Jignya Patel, and Yelyzaveta Tymchenko. 2016. "Making Sense of Resistance to Agile Adoption in Waterfall Organizations: Social Intelligence and Leadership." Twenty-second Americas Conference on Information Systems, San Diego, 2016.
<https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1445&context=amcis2016>.
- Pries-Heje, Jan, and Malene M. Krohn. 2017. "The SAFE way to the agile organization." Proceedings of the XP2017 Scientific Workshops, Cologne, Germany.

- Prosci. n.d.-a. ""ADKAR". " Prosci. Accessed January 9, 2018. <https://www.prosci.com/adkar>.
- . n.d.-b. ""Prosci ADKAR Model: Ability". " Prosci. Accessed December 20, 2017. <https://www.prosci.com/change-management/thought-leadership-library/adkar-model-ability>.
- . n.d.-c. ""Prosci ADKAR Model: Knowledge". " Prosci. Accessed December 20, 2017. <https://www.prosci.com/change-management/thought-leadership-library/adkar-model-knowledge>.
- . n.d.-d. ""Prosci ADKAR Model: Reinforcement". " Prosci. Accessed January 9, 2018. <https://www.prosci.com/change-management/thought-leadership-library/adkar-model-reinforcement>.
- Quinn, James Brian. 1980. *Strategies for change : logical incrementalism*. Homewood, Ill.: R.D. Irwin.
- Rautiainen, K., J. von Schantz, and J Vähäniitty. 2011. "Supporting Scaling Agile with Portfolio Management: Case Paf.com." 44th Hawaii International Conference on System Sciences, 4-7 Jan. 2011.
- Rayhan, S. H., and N. Haque. 2008. "Incremental Adoption of Scrum for Successful Delivery of an IT Project in a Remote Setup." Agile 2008 Conference.
- Ridder, Hans-Gerd, Christina Hoon, and Alina McCandless Baluch. 2014. "Entering a Dialogue: Positioning Case Study Findings towards Theory." *British Journal of Management* 25 (2): 373-387. <https://doi.org/10.1111/1467-8551.12000>.
- Riemenschneider, C. K., B. C. Hardgrave, and F. D. Davis. 2002. "Explaining software developer acceptance of methodologies: A comparison of five theoretical models." *IEEE Transactions on Software Engineering* 28 (12): 1135-1145. <https://doi.org/10.1109/TSE.2002.1158287>.
- Rigby, Darrell K., Jeff Sutherland, and Hirotaka Takeuchi. 2016. "embracing agile." *Harvard Business Review* 94 (5): 40-50. <https://hbr.org/2016/05/embracing-agile>.
- Roberts, T.L., M.L. Gibson, K.T. Fields, and R.K. Rainer. 1998. "Factors that Impact Implementing a System Development Methodology." *IEEE Transactions on Software Engineering* 24 (8): 640-649. <https://doi.org/10.1109/32.707699>.
- Roberts, T.L., and C.T. Hughes. 1996. "Obstacles to implementing a system development methodology." *Journal of Systems Management* 47 (2): 36-40. <https://search.proquest.com/docview/199822460?accountid=10382>
- Rogers, E. M. 1995. *Diffusion of innovations*. 4th ed.: New York: Free Press.
- Rubin, K. 2015. "Agile Misalignment Through the Enterprise Value Chain." *Innolution (blog)* (blog), *Innolution*. September 15,. <https://innolution.com/blog/agile-misalignment-through-the-enterprise-value-chain>.
- Sahota, M. 2012 *An Agile Adoption and Transformation Survival Guide: Working with Organisational Culture*. London: InfoQ.
- Saldana, J. 2009. *The Coding Manual for Qualitative Researchers*. SAGE Publications.
- Samuelson, William, and Richard Zeckhauser. 1988. "Status quo bias in decision making." *Journal of Risk and Uncertainty* 1 (1): 7-59. <https://doi.org/10.1007/BF00055564>.
- Sanders, D. 1974. *Computers and Management*. 2nd ed. New York McGraw-Hill.
- Sarker, Saonee, and Suprateek Sarker. 2009. "Exploring Agility in Distributed Information Systems Development Teams: An Interpretive Study in an Offshoring Context." *Information Systems Research* 20 (3): 440-461. <https://doi.org/10.1287/isre.1090.0241>.
- Sauer, Chris, and Blaize Horner Reich. 2009. "Rethinking IT project management: Evidence of a new mindset and its implications." *International Journal of Project Management* 27 (2): 182-193. <https://doi.org/https://doi.org/10.1016/j.ijproman.2008.08.003>. <http://www.sciencedirect.com/science/article/pii/S0263786308001166>.

- Saunders, Mark. 2012. "Choosing research participants." In *Practice of Qualitative Organizational Research: Core Methods and Current Challenges*, edited by Symons G. and C. Cassell, 37-55. London: SAGE.
- Saunders, Mark., Philip Lewis, and Adrian Thornhill. 2009. *Research methods for business students*. 5th ed. Harlow, U.K.: Harlow, U.K. : Financial Times- Prentice Hall.
- . 2016. *Research methods for business students*. 7th ed.: Harlow Pearson Education.
- Scaled Agile. n.d. ""What is SAFe?"". Scaled Agile Inc. Accessed April 2, 2019. <https://www.scaledagile.com/enterprise-solutions/what-is-safe/>.
- Schatz, B., and I. Abdelshafi. 2005. "Primavera gets agile: a successful transition to agile development." *IEEE Software* 22 (3): 36-42. <https://doi.org/10.1109/MS.2005.74>.
- Schneider, William E. 1994. *The reengineering alternative: A plan for making your current culture work*. Homewood, IL, US: Richard D Irwin.
- ScrumAlliance. 2017. *The State of Scrum Report 2017 Edition*. (ScrumAlliance). <https://www.scrumalliance.org/why-scrum/state-of-scrum-report/2017-state-of-scrum>.
- Senapathi, M., and M. L. Drury-Grogan. 2017. "Refining a model for sustained usage of agile methodologies." *Journal of Systems and Software* 132: 298-316. <https://doi.org/10.1016/j.jss.2017.07.010>. <Go to ISI>://WOS:000411531900017.
- Shenton, A.K. 2004. "Strategies for ensuring trustworthiness in qualitative research projects." *Education for Information* 22 (2): 63–75. <https://doi.org/10.3233/EFI-2004-22201>.
- Sircar, Sumit, Sridhar P. Nerur, and Radhakanta Mahapatra. 2001. "Revolution or Evolution? A Comparison of Object-Oriented and Structured Systems Development Methods." *MIS Quarterly* 25 (4): 457-471. <https://doi.org/10.2307/3250991>.
- Sliger, Michele. 2006. "Bridging the gap: Agile projects in the waterfall enterprise." *Better Software*, July/August, 26-31.
- . 2011. "Agile project management with Scrum." PMI® Global Congress 2011—North America, Dallas, TX. Newtown Square. <https://www.pmi.org/learning/library/agile-project-management-scrum-6269>.
- Sliger, Michele 2012. "Agile estimation techniques." PMI® Global Congress 2012—North America, Vancouver, British Columbia, Canada. Newtown Square. <https://www.pmi.org/learning/library/agile-project-estimation-techniques-6110>.
- Smith, C. 1989. "The case study: A vital yet misunderstood method for management." In *Frontiers of Management*. London.
- Smith, G., and A. Sidky. 2009. *Becoming Agile in an imperfect world*. Manning Publications Co.
- Sony, Michael, and Nandakumar Mekoth. 2016. "The relationship between emotional intelligence, frontline employee adaptability, job satisfaction and job performance." *Journal of Retailing and Consumer Services* 30: 20-32. <https://doi.org/https://doi.org/10.1016/j.jretconser.2015.12.003>. <http://www.sciencedirect.com/science/article/pii/S0969698915301909>.
- Speer, S.A. 2008. "Natural and contrived data." In *The SAGE handbook of social research methods*, edited by Pertti Alasuutari, Leonard Bickman and Julia Brannen, 290-312. London: SAGE.
- Speziale, Helen Streubert. 2011. *Qualitative research in nursing : advancing the humanistic imperative / Helen J. Streubert, Dona Rinaldi Carpenter*. Edited by Dona Rinaldi Carpenter. 5th ed. Philadelphia: Philadelphia : Wolters Kluwer Health/Lippincott Williams and Wilkins.
- Stettina, Christoph Johann, and Jeannette Hörz. 2015. "Agile portfolio management: An empirical perspective on the practice in use." *International Journal of Project Management* 33 (1): 140-152.

- <https://doi.org/https://doi.org/10.1016/j.ijproman.2014.03.008>.
<http://www.sciencedirect.com/science/article/pii/S0263786314000489>.
- Stocks, G. 2015. ""Enterprise-scale Agile: requires moving from 'Us versus Them' to 'We'". PMtimes. <https://www.projecttimes.com/articles/enterprise-scale-agile-requires-moving-from-us-versus-them-to-we.html>.
- Strauss, Anselm L., and Juliet M. Corbin. 1990. *Basics of qualitative research : grounded theory procedures and techniques / Anselm Strauss, Juliet Corbin*. Newbury Park, Calif.: Newbury Park, Calif. : Sage Publications.
- Stray, Viktoria, Dag I. K. Sjøberg, and Tore Dybå. 2016. "The daily stand-up meeting: A grounded theory study." *The Journal of Systems and Software* 114: 101-124. <https://doi.org/10.1016/j.jss.2016.01.004>.
- Sultan, F., and C. Chan. 2000. "The adoption of new technology: the case of object-oriented computing in software companies." *IEEE Transactions on Engineering Management* 47 (1): 106-126. <https://doi.org/10.1109/17.820730>.
- The Oxford Group. 2018. *Dealing with Ambiguity*. <https://www.oxford-group.com/pdf/DealingwithAmbiguity.pdf>.
- Thomas, J. C., and S. W. Baker. 2008. "Establishing an Agile Portfolio to Align IT Investments with Business Needs." Agile 2008 Conference, Toronto, ON, Canada, 4-8 Aug. 2008
- Thompson, R. L., C.A. Higgins, and J.M. Howell. 1991. "Personal computing: toward a conceptual model of utilization." *MIS Quarterly* 15 (1): 125-143. <https://www.jstor.org/stable/249443>.
- Toffler, Alvin. 1970. *Future shock*. London: London : Bodley Head.
- Tuckman, B. W. 1965. "Developmental sequence in small groups." *Psychological Bulletin* 63: 384-99. <http://dx.doi.org/10.1037/h0022100>
- Urquhart, Cathy. 2013. *Grounded theory for qualitative research : a practical guide*. Los Angeles, Calif.: London : SAGE.
- Van Der Vyver, G., M. Lane, and A. Koronios. 2011. "Facilitators and Inhibitors for the Adoption of Agile Methods." In *Systems Analysis and Design: People, Processes, and Projects* edited by Keng Siau, R.H.L. Chiang and B. C. Hardgrave, 31-50. Armonk, N.Y.: M.E.Sharpe.
- van Waardenburg, Guus, and Hans van Vliet. 2013. "When agile meets the enterprise." *Information and Software Technology* 55 (12): 2154-2171. <https://doi.org/http://dx.doi.org/10.1016/j.infsof.2013.07.012>.
<http://www.sciencedirect.com/science/article/pii/S0950584913001584>.
- Venkatesh, V., and F. D. Davis. 2000. "A theoretical extension of the technology acceptance model: Four longitudinal field studies." *Management Science* 46 (2): 186-204. <https://doi.org/10.1287/mnsc.46.2.186.11926>.
- Venkatesh, Viswanath, Michael G. Morris, B. Davis Gordon, and Fred D. Davis. 2003. "User Acceptance of Information Technology: Toward a Unified View." *MIS Quarterly* 27 (3): 425-478. <http://www.jstor.org/stable/30036540>.
- VersionOne. 2016. *10th annual state of agile report*. (VersionOne). <https://versionone.com/pdf/VersionOne-10th-Annual-State-of-Agile-Report.pdf>.
- Wolfe, Susan M., M. Fleischer, Jonathan A. Morell, and J.D. Eveland. 1990. "Decision Processes in Technological Innovation." In *The Processes of Technological Innovation*, edited by Louis G. Tornatzky, Mitchell Fleischer and Alok K. Chakrabarti, 177-196. Lexington, Mass: Lexington Books.
- Worthley, J.A. 2000. *Managing information in healthcare: Concepts and cases*. Chicago, IL: Health Administration Press.
- Yin, Robert K. 2014. *Case study research : design and methods*. 5th ed. Thousand Oaks, California SAGE.

Every reasonable effort has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

Appendices

| Appendix | Title |
|-----------------|---|
| Appendix A | Letter to the gatekeeper |
| Appendix B | Consent form for the gatekeeper |
| Appendix C | Letter to the participants |
| Appendix D | Information sheet for the participants |
| Appendix E | Consent form for the interviewees |
| Appendix F | Permission statement from copyright owner |

Appendix A – Letter to the gatekeeper

[Date]

[Gatekeeper's name]

[Gatekeeper's title]

[Company name]

Dear [Participant's name],

PhD research into the adoption and use of an agile systems development method

Thank you for indicating that [Company name] would be happy to participate in this research. This research project contributes towards the requirements for a PhD degree at Curtin University. The purpose of this document is to confirm and formalise the research project with [Company name]. The planned research will investigate the adoption and use of the agile systems development method (SDM) used in [Company name]. In order to achieve this purpose, this document covers the objectives and approach of this research project.

Research objectives

- To understand the issues that influence the adoption and use of an agile SDM
- To identify the kinds of problems encountered during the process of adopting the agile SDM
- To understand how and why the issues identified influence the adoption and use of the agile SDM.
- To recommend strategies that will positively influence the adoption and use of the agile SDM by project team members.

Research approach

A mixture of semi-structured one-on-one interviews, observation and review of project artifacts will be used to understand the project team's experience with the adoption and use of the agile method.

The interviews will focus on the experience, opinions and thoughts of appropriate people about the adoption and use of the agile SDM. The people interviewed will be developers, testers, business analysts, architects, project managers, iteration managers, business product owners and business subject manager experts. Other individuals from whom data will be gathered are the Head of Solution Delivery, the Agile Practice Manager, agile coaches, external consultants, customers, stakeholders and any other appropriate people who are able to provide relevant comments with regard to the adoption and use of the agile SDM at a project and organisational level.

It is proposed that the interviews occur in a meeting room at your premises. The on-site location will minimise the disturbance to the interviewee's day-to-day activities. With the interviewee's permission, all interviews will be recorded and later transcribed.

The artifact review will focus on the key related artifacts including user stories, plans and project walls, minutes of meetings, internal reports and briefings. This review will allow the researcher to understand the adherence and useful variations to the agile principles and practices adopted.

The costs to your company are expected to be minimal and time based only. The total time required of each participant (maximum of 30) is expected to be about 1.5 hours. The research data collection should be completed within 12 months. All interactions will be arranged around the participant's existing commitments so disruption should remain minimal.

All raw data obtained during this project will remain confidential to me, my direct supervisors and possibly a transcriber. The research report (or any conference papers or journal articles that may result from the study) will not identify participants or their employer unless [Company name] desires that its identity be known. Participants will remain anonymous.

This study has been approved by the Curtin University HREC (Approval Number IS_11_28). If needed, verification of approval can be obtained either by writing to the Curtin University HREC, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or emailing Curtin University HREC at hrec@curtin.edu.au.

If you agree to participate in this research, please sign the consent form on the next page of this document and return it to me through email. Even if you agree, [Company name] is free to withdraw from this research at any time.

If you require any further information, please feel free to email me at jules.desouza@cbs.curtin.edu.au or call me on 92667139. Alternatively you may contact my supervisor John Venable (j.venable@curtin.edu.au or 92667054).

Yours sincerely,

Jules de Souza

(PhD Student)

Phone: 92667139

E-mail: jules.desouza@cbs.curtin.edu.au

Appendix B - Consent form for the gatekeeper

Jules de Souza
School of Information Systems
Curtin Business School
Curtin University
Kent Street,
Bentley, WA 6102.

Dear Jules,

PhD research into the adoption and use of an agile systems development method

Consent to Participate in Research

[Company name] has been informed of and understands the purpose of this study.
[Company name] understands that it can withdraw from this research at any time.
[Company name] agrees to participate in the study for the purpose of this research for your PhD degree and any thesis and other publications.

Name: _____

Title: _____

Company: _____

Signed: _____

Date: _____

Appendix C - Letter to the participants

Participant's name]
[Company name]
[Employment address]

Dear [Participant's name],

PhD research into the adoption and use of an agile systems development method

Thank you for indicating that you would be interested in being interviewed for this research.

This study has been approved by [Company name]. Prior to conducting the interview, Curtin University requires that I obtain your written informed consent. This consent is a normal part of any research project and forms one criterion of the Curtin's Human Research Ethics Committee guidelines that I must meet.

Attached for your information is:

- An information sheet that covers your rights throughout this process.
- A consent form that you can sign and return to me at the beginning of the interview if you decide to participate in this research.

Yours sincerely

Jules de Souza
(PhD Student)
School of Information Systems
Curtin University
Phone: 92667139
E-mail: jules.desouza@cbs.curtin.edu.au

Appendix D - Information sheet for the participants

INFORMATION SHEET

Project Title: An investigation into the adoption and use of an agile system development methodology

This research project contributes towards the requirements for a PhD degree.

Aim of project

The aim of this research is to investigate the issues associated with the adoption and use of an agile systems development method by project team members.

What will be required of participants

The research will be carried out by interviewing you about your experience, opinions and thoughts about the adoption and use of the agile method. Each interview will take between one to two hours. However follow-up interviews may be requested if needed. The possibility of a follow-up interview will be discussed at the end of the first interview.

The cost to you is expected to be minimal and time based only. All interactions will be arranged your existing commitments, so disruption should remain minimal.

Confidentiality and security of information

Material collected from the interviews will be used in this research project as evidence of the adoption and use of an agile software development method and the issues associated with its adoption and use. The final research report will be published as a PhD thesis held at the Curtin University Library. Conference and journal publications may be written based on this research. Written interview notes will be stored at the researcher's home and/or at the researcher's office at the University, and destroyed five years after the completion of the project.

All raw data obtained during this project will remain confidential to the researcher, the researcher's supervisors and possibly a transcriber. The research report (or any conference papers or journal articles that may result from the study) will not identify you or [Company name] unless [Company name] desires that its identity be known. You will remain anonymous. Your permission to be quoted anonymously will be sought.

Participation

Participation in this research is voluntary and you are free to withdraw from this research at any time.

Risks and benefits to participants

The risk to you in this research will be negligible; you will suffer no harm.

This research will be of benefit to organisations adopting an agile method as it will assist organisations in developing strategies that will encourage the use of agile

methods by project team members, and in developing strategies to improve the process of introducing an agile method.

Contact details for researcher, supervisor and Curtin University Human Research Ethics Committee (HREC)

Researcher

Email: jules.desouza@cbs.curtin.edu.au

Contact number: 92667139

Supervisor

Email: j.venable@curtin.edu.au

Contact number: 92667054

Curtin University Human Research Ethics Committee (Secretary)

Email: hrec@curtin.edu.au

Contact number: 92662784

Approval of research

This study has been approved by the Curtin University HREC (Approval Number IS_11_28). If needed, verification of approval can be obtained either by writing to the Curtin University HREC, c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or emailing Curtin University HREC at hrec@curtin.edu.au.

Appendix E - Consent form for the interviewees

Consent Form

Curtin University Consent to Participation in Research

Project Title: An investigation into the adoption and use of an agile system development methodology

I have been informed of and understand the purpose of this study. I have been given an opportunity to ask questions. I understand that I can withdraw from this research at any time without prejudice. Any information which might potentially identify me will not be used in published material.

I agree to participate in the study as outlined to me. I agree to be interviewed by Jules de Souza for the purpose of this research for his PhD degree and any resultant publications and conference publications.

Do you agree to have interviews audio recorded?

YES NO

Do you agree to be quoted anonymously?

YES NO

Name: _____

Title: _____

Signed: _____

Date: _____

Appendix F – Permission statement from copyright owner

From: Ken Rubin
To: Jules De Souza
Subject: Re: Figure on enterprise value-chain misalignment
Date: Saturday, 23 February 2019 12:29:44 PM

Hi Jules,
I appreciate you asking. Yes, you may use the image. I would love to see your thesis when it is done!

Regards,
Ken

Stay connected to my latest content by subscribing to my newsletter

Managing Principal, Innolution, LLC
Author of [Essential Scrum](#)
Creator of the [Visual AGILExicon®](#)
Phone: (303) 827-3333
[book](#) | [website](#) | [email](#) | [linkedin](#) | [twitter](#) | [Facebook](#)

On Feb 21, 2019, at 7:38 PM, Jules De Souza
<Jules.DeSouza@cbs.curtin.edu.au> wrote:

Dear Ken,

I am a lecturer at Curtin University in Perth Western Australia. I am doing my thesis on Agile implementation. It would be greatly appreciated if you could grant me permission to use the figure on enterprise value-chain misalignment in your blog "Agile Misalignment Through the Enterprise Value Chain" published in <https://innolution.com/blog/agile-misalignment-through-the-enterprise-valuechain>. Your figure will be acknowledged in the thesis.

Regards,

Jules

Jules de Souza
Lecturer
School of Management

Curtin University
Tel | +61 8 9266 7139
Fax | +61 8 9266 3076

CRICOS Provider Code 00301J

“Curtin Business School, through industry-connected innovative teaching and research, develops internationally focused graduates committed to excellence.”