

**The effect of context on teachers' ability to
innovate with information and communication
technologies in secondary schools**

by

Mary Elizabeth Reynolds

Submitted in partial fulfilment of the requirements for the degree
of Philosophiae Doctor
(Computer Integrated Education)
in the Faculty of Education
University of Pretoria

Supervisor: Professor Johannes Cronje

August 2009

Acknowledgements

My sincere thanks are due to my supervisor, Professor Johannes Cronje for his challenges, his patience and his belief in me. I gratefully acknowledge my colleagues for their friendship and unfailing encouragement and the leadership of Wilding College for the unique opportunity for lifelong learning and professional growth. In particular, I am indebted to Arthur, Bronwyn, Francois, Hennie, Henry, Ineke, Magriet, Maria, Thabo and Richard for so willingly sharing the stories which are at the heart of this project. I am especially grateful to Dr Irene Lategan for her critical friendship, her mentoring and her encouragement through the really tough times. To Jenny and Irene, thank you for your help in proof-reading under impossible deadline pressures. Last, but by no means least, the encouragement, time, space, love, belief, pride and patience with which my family have withstood the last four years has been unflinching. Katy, Jimmy, Buster and Mom: thank you.

This thesis is dedicated to the memory of my father, Leonard Hensman whose faith in education set me on this path; and to the memory of my aunt and mentor, Professor Bertha Hensman, Chair of the Department of Western Languages and Literature, West China Union University, Chengdu from 1937-1951, whose life of scholarship in the face of extreme adversity has always been an inspiration to me.

Table of Contents

Acknowledgements	ii
List of Figures	xii
List of Tables	xiii
List of Appendices	xiii
Summary	xiv

Chapter 1: Introduction and orientation to the study

	1
1.1. Introduction	1
1.2. Background to the study	1
1.2.1. The educational-cultural perspective	3
1.2.2. The national policy perspective	4
1.2.3. The technology-transformation perspective	5
1.2.4. The school perspective	9
1.2.5. The researcher's perspective	12
1.2.6. Towards a research focus	14
1.3. Statement of purpose	14
1.4. Research problem and objectives	15
1.5. Research question	16
1.6. Scope and context of the study	17
1.7. Research methodology, design and process	17
1.7.1. Research design	17
1.7.2. Research approach	18
1.7.3. Unit of analysis	19
1.7.4. Data collection, transcription and analysis	20
1.7.5. Trustworthiness	20
1.8. Ethical considerations	20
1.9. Limitations	21
1.10. Literature control	21
1.11. Definition of key concepts	23
1.12. Outline of the study	25
1.13. Summary of Chapter 1	

Chapter 2: Review of the literature and conceptual framework

2.1. Introduction	27
2.2. Searching the literature	28
2.2.1. Recently completed literature in the field	31
2.3. The integration of ICTs into the curriculum	33
2.3.1. ICT terminology	33
2.3.2. The 20 th Century: Functional practice	36
2.3.3. The 21 st Century: Towards integrative practice	40
2.3.4. 21 st Century: Integrative practice	43
2.3.5. Integration of ICTs in context	49
2.3.6. Summary of section 2.3	55
2.4. Innovation theory	56
2.4.1. Innovation, change and reform	58
2.4.2. The diffusion of innovations	60
2.4.3. Innovation and schools	64
2.4.4. Innovation and teachers	68
2.4.5. Innovation and ICT integration	70
2.4.6. Sustainability of innovations	74
2.5. Change, reform and transformation	75
2.5.1. Student competencies and transformation	80
2.5.2. Teachers and transformation	81
2.5.3. ICTs and transformation	86
2.6. Complexity theory	88
2.6.1. Complexity theory and organisational behaviour	88
2.6.2. Complexity theory, knowledge and learning	91
2.6.3. Complexity and schools	93
2.6.4. Complexity and ICTs in schools	94
2.7. Summary of the literature review	95
2.8. Towards a conceptual framework	96
2.8.1. Applying the conceptual framework	98
2.9. Summary of Chapter 2	99

Chapter 3: Research methodology, design and process

3.1. Introduction	101
3.2. The research approach	101
3.3. Research methodology	108
3.4. Research design	112
3.4.1. Unit of analysis	114
3.4.2. Data collection	117
3.4.3. Interviews	118
3.4.4. Observation	122
3.4.5. Document verification	122
3.4.6. Data transcription	123
3.4.7. Data analysis	124
3.4.7.1. Illustration of the data	127
3.5. Trustworthiness	129
3.6. Ethical considerations	133
3.7. Limitations	134
3.8. Summary of Chapter 3	136

Chapter 4: Findings: Organisational interactions and their effect on teachers' practice

4.1. Introduction	139
4.2. The relationship between innovation and context	140
4.3. The school: Wilding College	140
4.3.1. The teachers	142
4.4. Main themes identified in the analysis	143
4.4.1. Curriculum change	143
4.4.2. Inclusive education	144
4.4.3. Professional learning	147
4.4.4. The nature of the subject	148
4.4.5. Systemic factors	149
4.4.6. Teacher beliefs	150
4.4.7. Student beliefs and attitudes	151
4.4.8. Societal and parent factors	153

4.5. How organisational interactions affect teachers' practice	153
4.5.1. Organisational interactions: Bronwyn & Ineke	154
4.5.1.1. Curriculum change	154
4.5.1.2. Professional learning	157
4.5.1.3. Nature of the subject	158
4.5.1.4. Constraints	159
4.5.1.5. Summary and preliminary findings	161
4.5.2. Organisational interactions: Magriet <i>et al.</i>	162
4.5.2.1. Curriculum change	163
4.5.2.2. Inclusive practice	167
4.5.2.3. Professional learning	170
4.5.2.4. Summary and preliminary findings	173
4.5.3. Organisational interactions: Henry	176
4.5.3.1. Curriculum change	177
4.5.3.2. Student, societal and parent factors	178
4.5.3.3. Systemic factors	181
4.5.3.4. Summary and preliminary findings	183
4.5.4. Organisational interactions: Richard	185
4.5.4.1. Curriculum change	185
4.5.4.2. Professional learning	187
4.5.4.3. Student factors	190
4.5.4.4. Constraints	192
4.5.4.5. Summary and preliminary findings	193
4.5.5. Organisational interactions: Maria	194
4.5.5.1. Systemic factors	194
4.5.5.2. Inclusive practice	196
4.5.5.3. Professional learning	197
4.5.5.4. Summary and preliminary findings	199
4.5.6. Organisational interactions: Francois	201
4.5.6.1. Systemic factors	201
4.5.6.2. Curriculum change	206
4.5.6.3. Professional learning	203
4.5.6.4. Summary and preliminary findings	205
4.5.7. Preliminary findings: organisational interactions and	

their effect on teachers' practice	206
4.6. Summary of Chapter 4	208
 Chapter 5: Findings: collegial and professional interactions and their effect on teachers' practice	
5.1. Introduction	211
5.2. Schools as professional learning communities	212
5.3. Formal networking structures	213
5.4. Collegial and professional relationships at Wilding College ...	214
5.4.1. Working together: Bronwyn & Ineke	215
5.4.1.1. Intra-departmental relationships	216
5.4.1.2. Relationship with the school leadership	218
5.4.1.3. Inter-departmental relationships	219
5.4.1.4. Relationships beyond the school	220
5.4.1.5. Summary & preliminary findings	221
5.4.2. Working together: Arthur & Hennie, Magriet & Thabo ...	223
5.4.2.1. Intra-departmental relationships	223
5.4.2.2. Inter-departmental relationships	227
5.4.2.3. Relationship with the school leadership	228
5.4.2.4. Relationships beyond the school	230
5.4.2.5. Summary & preliminary findings.....	236
5.4.3. Working together: the case of Henry	240
5.4.3.1. Intra-departmental relationships	240
5.4.3.2. Relationship with the school leadership	244
5.4.3.3. Relationships beyond the school	244
5.4.3.4. Summary & preliminary findings	245
5.4.4. Working together: the case of Richard	247
5.4.4.1. Intra-departmental relationships	247
5.4.4.2. Relationship with the school leadership	248
5.4.4.3. Relationships beyond the school	249
5.4.4.4. Summary & preliminary findings	251
5.4.5. Working together: the case of Maria	252
5.4.5.1. Intra-departmental & leadership relationships	252
5.4.5.2. Relationships beyond the school	255

5.4.5.3. Summary & preliminary findings: Maria	256
5.4.6. Working together: the case of Francois	256
5.4.6.1. Intra-departmental relationships	257
5.4.6.2. Relationship with the school leadership	258
5.4.6.3. Relationships beyond the school	258
5.4.6.4. Summary & preliminary findings: Francois ...	260
5.4.7. Preliminary findings: collegial and professional interactions and their effect on teachers' practice	261
5.5. Summary of Chapter 5	266

**Chapter 6: Findings: ICT interactions and their effect on
teachers' ability to innovate**

6.1. Introduction	269
6.2. Innovation and ICTs	269
6.3. ICTs and innovation at Wilding College	271
6.4. ICTs and innovation: introduction to the cases	273
6.4.1. ICTs and innovation: the case of Bronwyn & Ineke	274
6.4.1.1. Process innovation	274
6.4.1.2. Information literacy	278
6.4.1.3. Enablers and constraints	282
6.4.1.4. Summary & preliminary findings	284
6.4.2. ICTs and innovation: the case of Arthur et al.	286
6.4.2.1. Process innovation	286
6.4.2.2. Product innovation	290
6.4.2.3. Information literacy	294
6.4.2.4. Enablers and constraints	295
6.4.2.5. Factors influencing ICT use	300
6.4.2.6. Discontinuation of innovation	305
6.4.2.7. Intra-departmental collaboration in ICT use	306
6.4.2.8. Summary & preliminary findings	307
6.4.3. ICTs and innovation: the case of Henry	310
6.4.3.1. Process innovation	310
6.4.3.2. Product innovation	313
6.4.3.3. Information literacy	313

6.4.3.4. Enablers and constraints	315
6.4.3.5. Summary & preliminary findings	319
6.4.4. ICTs and innovation: the case of Richard	321
6.4.4.1. Process innovation	322
6.4.4.2. Factors influencing ICT use	324
6.4.4.3. Intra-departmental collaboration in ICT use	325
6.4.4.4. Enablers and constraints	326
6.4.4.5. Summary and preliminary findings	327
6.4.5. ICTs and innovation: the case of Maria	330
6.4.5.1. Process innovation and information literacy	330
6.4.5.2. Constraints	331
6.4.5.3. Summary and preliminary findings	332
6.4.6. ICTs and innovation: the case of Francois	333
6.4.6.1. Product innovation	333
6.4.6.2. Constraints	335
6.4.6.3. Summary and preliminary findings	337
6.4.7. Preliminary findings: ICT integration and innovation	339
6.5. Summary of Chapter 6	342

Chapter 7: Findings: School leadership and its effect on teachers' ability to innovate

7.1. Introduction	345
7.2. ICTs, innovation and school leadership	345
7.3. School leadership and ICT management at Wilding College ..	346
7.4. ICTs, innovation and school leadership	347
7.4.1. Leadership perceptions of ICTs	348
7.4.2. Curriculum change	350
7.4.3. Curriculum innovation	354
7.4.4. Working together	356
7.4.5. ICTs and innovation	358
7.4.6. Constraints to ICT integration	361
7.4.7. Encouraging teachers to integrate ICTs	364
7.4.8. Perceptions of the future	366
7.4.9. Preliminary findings: school leadership	368

7.5. Summary of Chapter 7	371
---------------------------------	-----

Chapter 8: Discussion of findings; conclusions and recommendations

8.1. Introduction	373
8.2. Synoptic overview of the study	373
8.2.1. Chapter 1	373
8.2.2. Chapter 2	374
8.2.3. Chapter 3	376
8.2.4. Chapter 4	377
8.2.5. Chapter 5	378
8.2.6. Chapter 6	379
8.2.7. Chapter 7	379
8.3. Discussion of the findings from a theoretical perspective	380
8.3.1. The study of complex contexts	381
8.3.1.1. The context of Wilding College	381
8.3.1.2. Complexity & the context of Wilding College	382
8.3.2. Innovation	384
8.3.3. Professional learning	388
8.4. Discussion of the findings from an empirical point of view	389
8.4.1. The effect of organisational interactions	389
8.4.2. The effect of collegial and professional interactions	394
8.4.3. The effect of ICTs on teachers' ability to innovate	400
8.4.3.1. From an organisational perspective	400
8.4.3.2. From a pedagogic perspective	402
8.4.3.3. From a relationship perspective	404
8.4.4. The effect of leadership interactions	405
8.5. The effect of context on teachers' ability to innovate with ICTs	409
8.6. Conclusions	411
8.7. Reflection	412
8.7.1. Methodological reflection	412
8.7.2. Scientific reflection	414
8.7.3. Substantive reflection	415
8.7.4. Personal reflection	416



8.8. Recommendations	416
8.8.1. Recommendations for policy and practice	417
8.8.2. Recommendations for further research	418
8.9. Limitations of the study	418
8.10. Conclusion	419
List of references	421
Appendices	447

List of Figures

Figure 2.1: Relationship between ICTs and innovation	29
Figure 2.2: The flux and change of innovative processes	57
Figure 2.3: The interrelationship of reform, transformation, change and innovation in the school context	85
Figure 2.4: Relationship between perspectives	97
Figure 2.5: Conceptual framework	98
Figure 3.1: Four paradigms of social research	104
Figure 3.2: Research design	113
Figure 3.3: Example of direct interplay of factors	128
Figure 3.4: Example of indirect interplay of factors	128
Figure 4.1 Organisational effects: Bronwyn & Ineke	162
Figure 4.2: Organisational effects: Magriet and Thabo	174
Figure 4.3: Organisational effects: Arthur and Hennie	175
Figure 4.4: Organisational effects: Henry	184
Figure 4.5: Organisational effects: Richard	193
Figure 4.6: Organisational interactions: Maria	199
Figure 4.7: Organisational effects: Francois	205
Figure 5.1: Collegial & professional interactions: Bronwyn & Ineke	222
Figure 5.1: Collegial & professional interactions: Magriet & Thabo	237
Figure 5.3: Collegial & professional interactions: Arthur & Hennie	238
Figure 5.3: Collegial & professional interactions: Henry	245
Figure 5.6: Collegial & professional interactions: Richard	252
Figure 5.7: Collegial & professional interactions: Maria	256
Figure 5.8: Collegial & professional interactions: Francois	260
Figure 6.1: ICT factors: Bronwyn and Ineke	285
Figure 6.2 ICTs and innovation: Arthur and Hennie	300
Figure 6.3: ICTs and innovation: Thabo and Magriet	308
Figure 6.4: ICTs and innovation: Henry	320
Figure 6.5: ICTs and innovation: Richard	328
Figure 6.6: ICTs and innovation: Maria	333
Figure 6.7: ICTs and innovation: Francois	338

List of Tables

Table 1.1: Definition of key concepts	21
Table 2.1: Literature search terms	28
Table 2.2: Aspects of ICT integration	44
Table 2.3: Table of ICT integration into different subject areas	45
Table 2.4: Components of the Classical Diffusion Model	61
Table 2.5: Framework of inter-related competencies	81
Table 2.6: Six principles of Complexity Science	90
Table 2.7: The nested organisation of knowledge	92
Table 3.1: Case study characteristics	110
Table 3.2: Types of case studies and their purposes	112
Table 3.3: Research timeframe	113
Table 3.4: Representativeness of teachers/leaders by department	116
Table 3.5 Complexity characteristics	124
Table 3.6: Sample of coded data	125
Table 3.7: Sample of coding spreadsheet	126
Table 3.8: Criteria for trustworthiness	131
Table 4.1: Table of teachers interviewed	142
Table 6.1: Convergent factors between ICTs and innovative practice	341
Table 6.2: Disconvergent factors between ICTs and innovative practice.....	342
Table 7.1: Convergence between leadership and teacher roles	369
Table 8.1: Interplay of organisational factors	390
Table 8.2: Interplay of relationship factors	398
Table 8.3: Interplay of ICT factors	405
Table 8.4: Interplay of leadership factors	408
Table 8.5: Summary of findings	410

List of Appendices

Appendix 1.1 Teacher-librarian role	447
Appendix 1.2 Ethical clearance certificate	453
Appendix 2.1 Keyword relationships	454
Appendix 3.1 Questions guiding teacher interviews	455
Appendix 3.2 Questions guiding leadership interviews	456
Appendix 4.1 Table of changes	457
Appendix 6.1 Anti-plagiarism policy	460

Summary

This qualitative case study explores how secondary school teachers innovate in the face of complex simultaneous and ongoing mandated changes and in particular, how they innovate with ICTs. The study argues that by understanding the whole-school context, the integration of ICTs can be better understood. The research setting is a complex independent, monastic secondary school in South Africa. Rather than select exemplary projects which are the usual focus of ICT research, the school was chosen for its combination of highly developed ICT infrastructure, but relative lack of exemplary achievement with ICTs.

Using Sherry and Gibson's (2005) terminology – convergence, mutuality and extensiveness – derived from their sustainability research, this study investigates the interplay of contextual factors that affects teachers' ability to innovate in their practice, focussing on process innovation and arguing from a complexity and innovation theory point of view. Contextual factors were identified broadly as organisational factors, collegial and professional relationship factors, and ICT factors. Although all teachers were willing to innovate in practice, particularly in response to radical mandated curricular change and an inclusive philosophy, it was found that contextual factors have differing effects on their individual ability to innovate. The study identifies patterns in which not only positive factors converge, but negative factors (termed disconvergent factors) also converge. Collegial and professional relationship factors affect the diffusion or extension of innovation. These are limited by a lack or under-exploitation of lateral communication means.

The study concludes that the effects of context are unique to each individual teacher and that their professional learning trajectory needs to be scaffolded and personalised. Both ICT-based and collaborative opportunities should be provided in support of a professional learning community to address the need to diffuse innovation laterally and to enable sharing that will reduce current overload and stress levels.