

Contents

Acknowledgements	i
Foreword	iii
Abstract	vii
List of Figures	ix
List of Tables	x
List of Worksheets	xiii
List of Acronyms	xiv

The Introduction

Chapter 1 Introduction	1
1.1 Motivation	1
1.2 The Situation of Concerns	3
1.2.1 Themes of Software Engineering	4
1.2.2 Background of Thesis Research	5
1.3 Research Context.....	8
1.3.1 Modeling	9
1.3.2 Problem Solving	10
1.3.3 Knowledge Acquisition	12
1.3.4 Rationale Management	13
1.4 Research Problem.....	14
1.4.1 Root Definition	17
1.4.2 Line of Defensible Logic	19
1.5 Research Concerns	20
1.5.1 Professional Learning Community (PLC)	21
1.5.2 Appreciative Knowledge Environment (AKE)	22
1.5.3 Outcomes-Based Assessment (OBA)	23
1.5.4 Learning-Centered Education (LCE)	24
1.5.5 Virtual Organizing for Learning and Research University	25
1.5.6 Significance in Software Engineering	26
1.6 Research Methods.....	28
1.6.1 Adopting Scenario-Based Design	29
1.6.2 Using Scenarios of Human Activity Systems	31
1.6.3 Sense-Making the Learning Cycle of HAS Modeling	32
1.6.4 Rationalizing the Scenario-Based Learning Approach	33

1.7	Research Goals and Challenges	34
1.7.1	Clarifying the Problem	35
1.7.2	Identifying Design Moves	35
1.7.3	Envisioning the Solution	36
1.7.4	Recognizing Tradeoffs and Dependencies	37
1.7.5	Integrating Diverse Knowledge and Skills	38
1.7.6	Anticipating Impacts on Human Activity	39
1.8	Research Contributions and Synopsis of the Thesis	39
1.9	My Statement of Originality as a Teacher-Researcher	46
1.9.1	International Refereed Journal Articles	48
1.9.2	Case Studies and Handbooks of Research Works	50
1.9.3	Encyclopedia Contributions	51
1.9.4	Research Book Chapters	54
1.9.5	Refereed Conference Papers	57
1.9.6	Qualification of My Publications	64
1.9.7	Acknowledgements for Your Reading and Feedback	81
	References	86

PART I Setting the Stage

Chapter 2	<i>REALSpace</i> : The Story of Student Learning.....	92
2.1	Introduction	92
2.2	The School Learning Environment.....	94
2.2.1	What makes for a good school?	95
2.2.2	What makes for an active learning environment?	96
2.2.3	What makes for an optimized learning environment?	99
2.2.4	What makes for a personalized learning environment?	100
2.3	Transforming Schools into PLC's	104
2.3.1	Focus on Learning	105
2.3.2	Focus on Collaborative Culture.....	105
2.3.3	Focus on Collective Inquiry	106
2.3.4	Focus on Learning by Doing	106
2.3.5	Focus on Continuous Improvement	107
2.3.6	Focus on Measurable Results	107
2.4	The Backdrop for <i>REALSpace</i>	108
2.4.1	Campus Network with Internet Access	109
2.4.2	Online Education with Wireless Access	110
2.5	<i>REALSpace</i> to Define a New Culture of Learning.....	111

2.5.1	Managing Education the Dynamic Way	112
2.5.2	Teaching the Constructivist Mode of Learning	113
2.6	<i>REALSpace</i> to Foster Learning-Centered Experience.....	115
2.6.1	Enabling User Participation and Contribution	116
2.6.2	Providing the Basic Web 2.0 Mechanisms for <i>REALSpace</i>	118
2.6.3	Personalizing <i>REALSpace</i>	121
2.7	<i>REALSpace</i> to Realize the Educational Potential for E-Portfolios	123
2.7.1	Relating to Student E-Learning	123
2.7.2	Positioning E-Portfolio as a Tool for Learning	125
2.8	<i>REALSpace</i> to Support Student Knowledge Work	127
2.8.1	Positioning the Context of Student-Centered CKEs	130
2.8.2	Adopting the CKE Theme of Problem-Based Learning ...	132
2.8.3	Using the PBL Cycle of Collaboration	134
2.8.4	Appreciating the Knowledge Potential of PBL	136
2.8.5	Designing the ICT Support for PBL-Based CKE	137
2.9	<i>REALSpace</i> to Cultivate Virtual Community of Learning	139
2.9.1	Conceiving the Community's Knowledge Processes	141
2.9.2	The Community Scenario of Knowledge Synthesis	145
2.10	<i>REALSpace</i> as a Socio-Technical System	147
2.10.1	Accepting the Architecting Challenge of IS Support	148
2.10.2	Adopting the Scenario-Based Design Method	150
2.10.3	Modeling Purposeful Human Activities	152
2.11	<i>REALSpace</i> to Meet Software Engineering Challenges	153
2.11.1	Eliciting Requirements from Various Sources	154
2.11.2	Analyzing and Documenting Requirements	155
2.11.3	Validating and Verifying Systems Requirements	155
2.11.4	Identifying a Community-Centered Prototyping Process ...	156
2.12	<i>REALSpace</i> to Meet Continuing Education Challenge	157
2.12.1	A New Role of the Teacher	160
2.12.2	A New Role of the Students	161
2.13	Conclusion	162
	References	165
Chapter 3	<i>REALSpace AKE</i> : The Art of Personalized Instruction ...	186
3.1	Introduction	186
3.2	Basic Aspects of Personalized Instruction.....	187
3.3	The Cultural PI Elements in <i>REALSpace AKE</i>	189

3.3.1	Dual Teacher Role	189
3.3.1.1	Teacher-Coach	189
3.3.1.2	Teacher-Adviser	191
3.3.2	Student Learning Characteristics	193
3.3.2.1	Developmental Characteristics	193
3.3.2.2	Student Learning Style	194
3.3.2.3	Student Learning History	194
3.3.3	Culture of Collegiality	195
3.3.3.1	Constructivist Environment	196
3.3.3.2	Collaborative Learning Arrangement	197
3.4	The Contextual PI Elements in <i>REALSpace AKE</i>	198
3.4.1	Interactivity in Student Learning.....	199
3.4.1.1	School or Class Size	199
3.4.1.2	Thoughtful Environments	200
3.4.1.3	Active Learning Experiences	202
3.4.1.4	Authentic Student Achievement	203
3.4.2	Flexible Scheduling and Pacing	206
3.4.2.1	The Block Scheduling Approach	207
3.4.2.2	The Client-Driven Scheduling Approach	211
3.4.3	Authentic Assessment	214
3.4.3.1	Naturalistic Assessment	215
3.4.3.2	Performance Assessment	216
3.4.3.3	Portfolio Assessment	216
3.5	The Design Rationales for <i>REALSpace AKE</i>	217
3.5.1	AKE to Encourage Appreciative Inquiry	218
3.5.2	AKE to Foster Student Engagement beyond the Classroom	219
3.5.3	AKE to Support Community-Based Learning Online	221
3.5.4	AKE to Facilitate Community-Building Online for Student Learning	223
3.5.5	AKE to Engage Faculty in Student Development	226
3.6	Realigning School as Learning Communities	228
3.6.1	Learning as a Community	229
3.6.2	Collaborative Learning in Action	230
3.7	Conclusion	235
	References	237
Chapter 4	<i>REALSpace OBA</i> : The Craft of Learner Assessment.....	255
4.1	Introduction	255

4.2	What is Assessment for Student Learning?	257
4.2.1	Establish Intended Learning Outcomes	258
4.2.2	Provide Learning Opportunities Leading to ILOs	258
4.2.3	Develop Assessment Measures for Student Learning	259
4.2.4	Use Assessment Results to Improve Learning	260
4.3	Building Faculty Learning Communities for OBA	261
4.3.1	Define the Context of Faculty Learning Community	262
4.3.2	Foster a Culture of Collective Inquiry	263
4.3.3	Navigate from Privacy to Collaboration	265
4.4	Developing Institutional Commitment in Student Assessment	267
4.4.1	Establish Dialogue across the Institution	270
4.4.2	Anchor Institutional Principles of Commitment	270
4.4.3	Emphasize Scholarship of Teaching and Learning	271
4.4.4	Take Ownership of Student Assessment	273
4.5	The Design Rationales for <i>REALSpace OBA</i>	275
4.6	<i>REALSpace OBA</i> to Articulate Learning Expectations	281
4.6.1	Start with Learning Goals	281
4.6.2	Develop Outcome Statements	282
4.6.3	Use Learning Outcomes as a Centerpiece	285
4.7	<i>REALSpace OBA</i> to Design Student Evidence	288
4.7.1	Authentic Assessment Practice	288
4.7.2	Portfolios to Engage Learners in Assessment	289
4.7.2.1	Portfolios provide evidence of learning	290
4.7.2.2	Portfolios enhance learning-centered assessment	291
4.7.3	Criteria and Standards to Assess Student Evidence	293
4.8	<i>REALSpace OBA</i> to Support Faculty Development	294
4.8.1	Deepen Faculty's Own Learning	295
4.8.2	Stimulate an Inquiry-Based Process	295
4.8.3	Encourage Shared Understanding of Learning Outcomes	296
4.8.4	Align Teaching Decisions with Learning Outcomes	297
4.8.5	Collaborate in Analysis of Student Work	298
4.8.6	Participate in Peer Review of Teaching	300
4.9	Remarks for Continuing Challenge	302
4.10	Conclusion	311
	References	313
Chapter 5	<i>REALSpace LCE</i> : The Key to Student Achievement	322
5.1	Introduction	322

5.2	What is entailed in an LCE-Based Course Enactment?	324
5.3	The LCE Approach to Course and Curriculum Development	326
5.4	Designing Equitable and Quality Learning Experience	331
5.5	Adopting a New Frame of Excellence for <i>REALSpace</i>	336
5.6	<i>REALSpace LCE</i> to Support Leadership and Action	349
5.7	<i>REALSpace LCE</i> to Support Effective Educational Practices	351
5.8	<i>REALSpace LCE</i> to Support PDP and Portfolio Building	355
5.9	The Changing Role of Faculty in the Learning Process	358
5.10	Remarks of Continuing Challenges in Teaching and Learning	365
5.11	Conclusion	371
	References	375

PART II Putting the Pieces Together

Chapter 6	Systems Architecting of IS Support for <i>REALSpace</i>	382
6.1	Introduction	382
6.2	The Context of Systems Architecting	384
6.2.1	Definitions of Architecting Terms	385
6.2.2	The Distinction between Architecting and Engineering	388
6.2.3	The Art and Science of Systems Architecting	390
6.2.4	The Foundations of Systems Architecting	391
6.3	The Application of Soft Systems Methodology	395
6.3.1	SSM as a Soft Systems Approach	397
6.3.2	The Classic Seven Stages of SSM Modeling	398
6.3.3	Case Application of SSM in Teaching and Learning	407
6.3.3.1	Define the problem situation	407
6.3.3.2	Express the situation of concerns	408
6.3.3.3	Select the relevant RD's as systems of interest ...	409
6.3.3.4	Assemble concepts into intellectual CM structures	411
6.3.3.5	Use the HAS models to explore the problem situation	416
6.3.3.6	Define changes to the problem situation	422
6.3.3.7	Implement the change processes	423
6.3.4	The Contemporary Development of SSM	424
6.3.4.1	Finding out about a problem situation	429
6.3.4.2	Formulating purposeful activity models	433
6.3.4.3	Exploring the problem situation and taking	

action	440
6.3.5 An Application of the SSM Process of Inquiry in <i>REALSpace</i>	441
6.3.5.1 Activity One: Finding out about a problem situation	442
6.3.5.2 Activity Two: Formulating purposeful activity models	449
6.3.5.3 Activity Three: Exploring the situation of concerns	460
6.3.5.4 Activity Four: Defining action to improve	478
6.3.6 The Whole SSM Learning Cycle Revisited	480
6.3.7 SSM in the Creation of Information Systems	483
6.3.7.1 What is an information system (IS) for?	484
6.3.7.2 The Links from Worldviews to IS Design	485
6.3.7.3 Information Requirements Analysis for <i>REALSpace</i>	487
6.3.7.4 Gathering the Lessons from SSM: Mode 1 and Mode 2	506
6.3.8 A Process Model to Make Sense of IS Development for <i>REALSpace</i>	509
6.3.8.1 Core Concepts of SSM-Based ISD	512
6.3.8.2 Formulating an ISD Methodology for <i>REALSpace</i>	515
6.3.8.3 Making Sense of the ISD Model for <i>REALSpace</i>	522
6.4 Remarks of Continuing Challenge in SSM – The Context ...	533
6.4.1 Action Research	533
6.4.1.1 The Inadequacy in Hypothesis-Testing Mode of Research	534
6.4.1.2 The Action Research Mode of Investigation ...	535
6.4.1.3 The Criteria of Judging Action Research	536
6.4.1.4 The Importance of the Recoverability Criterion	539
6.4.2 Social Reality as Appreciative Processes	540
6.4.2.1 Vicker's Concept of an Appreciative System ...	541
6.4.2.2 The Model of an Appreciative System	544
6.4.2.3 The Appreciative Processes in SSM	549
6.4.3 SSM and Software Process Tailoring	553

6.4.3.1	The Implication in Software Life-cycle	554
6.4.3.2	The Implication in Process Tailoring	555
6.5	Conclusion	557
	References	572
Chapter 7	Scenario-Based Development for <i>REALSpace AKE</i>	581
7.1	Introduction	581
7.2	Scenarios and System Development	582
7.2.1	Scenarios in System Design	586
7.2.1.1	The Role of Scenarios in Strategic Planning	588
7.2.1.2	The Role of Scenarios in Human-Computer Interaction	589
7.2.1.3	The Role of Scenarios in Requirements Engineering	592
7.2.1.4	The Role of Scenarios in Object-Oriented Analysis/Design (OOAD)	594
7.2.1.5	The Role of Scenarios in the Four Selected Communities	597
7.2.2	Scenarios as Enablers of Change through Design	599
7.3	The Scenario-Based Development for <i>REALSpace AKE</i>	603
7.3.1	<i>REALSpace AKE</i> Background for SBD.....	603
7.3.2	Design Philosophy for <i>REALSpace AKE</i>	615
7.3.3	SBD Approach for <i>REALSpace AKE</i>	617
7.3.3.1	Revisiting Soft Systems Methodology	618
7.3.3.2	Reviewing Use Case Modeling	621
7.3.3.3	Positioning SSM for UCM – An Inquiring Example	623
7.3.3.4	Extending SSM to include Interaction Models for SBD	636
7.3.4	Design Scenarios for <i>REALSpace AKE</i>	639
7.3.4.1	The Context of Scenario-Based Design in <i>REALSpace AKE</i>	640
7.3.4.2	Scenario SB01 for Activity B01 under CM02 in HAS-02	641
7.3.4.3	Scenario SB02 for Activity B02 under CM02 in HAS-02	643
7.3.4.4	Scenario SB03 for Activity B03 under CM02 in HAS-02	646

7.3.4.5	Scenario SB04 for Activity B04 under CM02 in HAS-02	648
7.3.4.6	Scenario SB05 for Activity B05 under CM02 in HAS-02	649
7.3.4.7	Scenario SB06 for Activity B06 under CM02 in HAS-02	651
7.3.4.8	Scenario SB07 for Activity B07 under CM02 in HAS-02	653
7.3.4.9	Scenario SB08 for Activity B08 under CM02 in HAS-02	655
7.3.4.10	Scenario SB09 for Activity B09 under CM02 in HAS-02	657
7.3.4.11	Scenario SB10 for Activity B10 under CM02 in HAS-02	659
7.3.4.12	Scenario SB11 for Activity B11 under CM02 in HAS-02	661
7.3.4.13	Scenario SB12 for Activity B12 under CM02 in HAS-02	663
7.3.4.14	Scenario SB13 for Activity B13 under CM02 in HAS-02	664
7.3.5	Use Case Modeling of REALSpace AKE Scenarios	666
7.3.5.1	Use Case Model UCM01 for Scenario SB01	667
7.3.5.2	Use Case Model UCM02 for Scenario SB02	668
7.3.5.3	Use Case Model UCM03 for Scenario SB03	670
7.3.5.4	Use Case Model UCM04 for Scenario SB04	671
7.3.5.5	Use Case Model UCM05 for Scenario SB05	672
7.3.5.6	Use Case Model UCM06 for Scenario SB06	673
7.3.5.7	Use Case Model UCM07 for Scenario SB07	674
7.3.5.8	Use Case Model UCM08 for Scenario SB08	676
7.3.5.9	Use Case Model UCM09 for Scenario SB09	677
7.3.5.10	Use Case Model UCM10 for Scenario SB10	679
7.3.5.11	Use Case Model UCM11 for Scenario SB11	680
7.3.5.12	Use Case Model UCM12 for Scenario SB12	681
7.3.5.13	Use Case Model UCM13 for Scenario SB13	682
7.3.6	Use Case Descriptions of <i>REALSpace AKE: A Case Example</i>	683
7.3.6.1	Fundamentals of Use Case Modeling	685
7.3.6.2	Writing Use Cases for UCM10.UCS01.01	688

7.3.6.3	Writing Use Cases for UCM10.UCS01.02	689
7.3.6.4	Writing Use Cases for UCM10.UCS01.03	689
7.3.6.5	Writing Use Cases for UCM10.UCS02.01	690
7.3.6.6	Writing Use Cases for UCM10.UCS02.02	691
7.3.6.7	Writing Use Cases for UCM10.UCS02.03	692
7.3.6.8	Writing Use Cases for UCM10.USC03.01	693
7.3.6.9	Writing Use Cases for UCM10.UCS03.02	694
7.3.6.10	Writing Use Cases for UCM10.UCS03.03	695
7.3.7	Reflections on Requirements Discovery for <i>REALSpace AKE</i>	696
7.3.7.1	Expand perspective to discover requirements ...	697
7.3.7.2	Integrate SSM into the discovery process	700
7.3.7.3	Link to mature SE development method	702
7.4	Remarks for Continuing Challenge in Designing AKE	
Scenarios		703
7.4.1	Scenario Planning for <i>REALSpace AKE_{GPW}</i>	704
7.4.2	Scenario Planning for <i>REALSpace AKE_{PLC}</i>	705
7.4.3	Scenario Planning for <i>REALSpace AKE_{LTA}</i>	706
7.4.4	Perceived Challenge in Scenario Planning	707
7.4.5	Perceived Challenge in Combining SSM with Scenario Planning	709
7.5	Conclusion	710
References		712
Chapter 8	Software Prototyping for <i>REALSpace AKE</i>	721
8.1	Introduction	721
8.2	Scenario Thinking for Software Prototyping	723
8.2.1	Scenario Planning for A-Type Software Prototyping	725
8.2.2	Scenario Planning for B-Type Software Prototyping	726
8.2.3	Scenario Planning for C-Type Software Prototyping	728
8.2.4	Scenario Planning for D-Type Software Prototyping	728
8.3	An Example <i>REALSpace AKE</i> Context for Software Prototyping	730
8.3.1	The Essence of Instructional Design Model	731
8.3.2	The Dimensions of Instructional Design Model	732
8.3.2.1	The Collaborative and Social Dimension	732
8.3.2.2	The Learner-Generated Design Dimension	733
8.3.2.3	The Knowledge Management Dimension	734

8.3.3	The Episodes of Instructional Design	734
8.3.3.1	The Analysis Episode	735
8.3.3.2	The Design Episode	737
8.3.3.3	The Evaluation Episode	741
8.4	An Essential Prototyping Perspective for <i>REALSpace AKE</i> ...	742
8.5	An Effective Prototyping Process for <i>REALSpace AKE</i>	744
8.5.1	Verify Requirements	745
8.5.2	Develop Task and Interaction Flows	745
8.5.3	Determine Necessary Scenarios	746
8.5.4	Define Prototype Components and Content	746
8.5.5	Gather Necessary Content	747
8.5.6	Define the Design Criteria	747
8.5.7	Design and Construct the Prototype	748
8.5.8	Review Prototype	748
8.5.9	Validate Prototype Usability	748
8.5.10	Transition from Prototyping to Implementation	749
8.6	An Example of Prototyping for <i>REALSpace AKE</i>	749
8.6.1	Verify Requirements	750
8.6.1.1	Gather Requirements	751
8.6.1.2	Inventory the Requirements	752
8.6.1.3	Prioritize Requirements and Assumptions	753
8.6.2	Develop Task and Interaction Flows	753
8.6.2.1	Task Flow	754
8.6.2.2	Interaction Flows	759
8.6.3	Determine Necessary Scenarios	759
8.6.3.1	Sketch the Plot	760
8.6.3.2	Choose Cast	761
8.6.3.3	Outline Plot	761
8.6.3.4	Mark Points in Outline	762
8.6.4	Define Prototype Components and Content	763
8.6.4.1	Define Objective and Focus	763
8.6.4.2	Determine Emphasis and De-emphasis	764
8.6.4.3	Select Appropriate Fidelity	764
8.6.5	Gather Necessary Content	765
8.6.5.1	Specify Basic Requirements	766
8.6.5.2	Analyze Expression	768
8.6.5.3	Determine Style and Medium	768
8.6.6	Define the Design Criteria	769

8.6.6.1	Visual Design Guidelines	770
8.6.6.2	User Interface Guidelines	773
8.6.6.3	Apply Guidelines to Prototype	776
8.6.7	Design and Construct the Prototype	778
8.6.7.1	Determine Highest Priority Screens	778
8.6.7.2	Mark Most Important Screen Regions	779
8.6.7.3	Layout Highest Priority Screen	779
8.6.7.4	Layout Remaining Priority Screens	780
8.6.7.5	Specify Design Rationale	780
8.6.8	Review Prototype	781
8.6.8.1	Review the Defined Audience	781
8.6.8.2	Set Goals for Each Version	781
8.6.8.3	Set Expectations for Reviewers	782
8.6.8.4	Prepare for Presentation	782
8.6.8.5	Plan the Next Steps	784
8.6.9	Validate Prototype Usability	784
8.6.10	Transition from Prototyping to Implementation	786
8.6.10.1	Open versus Closed Handoff	786
8.6.10.2	Expected Issues after Handoff	787
8.7	An Example of User Experience Design for <i>REALSpaceAKE</i> 788	
8.7.1	The Context of User-Centered Design (UCD)	790
8.7.2	The UCD Practice for AKE Prototyping	791
8.7.3	The Ideal of User Experience (UX) Design	793
8.7.4	The UX 2.0 Design Challenge for AKE Applications	794
8.7.4.1	Define the primary user groups	795
8.7.4.2	Choose user research techniques	798
8.7.4.3	Conduct user research with the selected technique	804
8.7.4.4	Validate user group definition	814
8.7.4.5	Generate user requirements	815
8.8	Learning from the Prototyping of AKE Episodes	816
8.8.1	The Persona Challenge	817
8.8.2	The Narrative Challenge	818
8.8.3	The Scenario Challenge	819
8.8.4	The Persona-Based Scenario Challenge	821
8.8.5	The Scenarios versus Use Cases Challenge	822
8.9	Remarks of Continuing Challenge in AKE Prototyping	823
8.10	Conclusion	825

References	830
Chapter 9 Virtual Organizing for <i>REALSpace AKE</i>	841
9.1 Introduction	841
9.2 The Era of Engagement in Higher Education.....	843
9.3 The Potential of Virtual Organizing	845
9.3.1 Understanding the Three Vectors of Virtual Organizing	846
9.3.1.1 Virtual Encounter	847
9.3.1.2 Virtual Sourcing	847
9.3.1.3 Virtual Expertise	848
9.3.2 Adapting the Three Vectors to Virtual Organizing CoI's	848
9.3.2.1 Virtual Encountering the Various CoI's	849
9.3.2.2 Virtual Sourcing the Various CoI's	850
9.3.2.3 Virtual Expertizing the Various CoI's	850
9.3.3 The Virtual Organizing Context to Steer Change	851
9.4 The Potential of Collaborative Inquiry.....	852
9.4.1 What is Collaborative Inquiry?	854
9.4.2 What makes Collaborative Inquiry Valuable?	855
9.4.3 What makes Collaborative Inquiry Possible?	857
9.4.4 What makes Collaborative Inquiry Unique?	858
9.5 The Potential of Blended Learning	860
9.5.1 What is entailed in blended learning?	861
9.5.2 What differs blended learning from conventional technology-supported learning?	862
9.5.3 What makes blended learning unique in supporting collaborative inquiry?	863
9.5.4 What framework of ideas to support CoI with blended learning?	864
9.5.4.1 The Purposeful Inquiry	865
9.5.4.2 The Open Inquiry	866
9.5.4.3 The Disciplined Inquiry	866
9.5.4.4 The CoI Constituent Elements for Blended Learning	867
9.5.5 What blended learning could mean for virtual CoI?	870
9.5.6 How could blended learning be designed to support a CoI?	871

9.6	Virtual Organizing CoI for Blended Learning	872
9.6.1	The Virtual Organizing Hinge for Teaching and Learning	874
9.6.2	The Virtual Organizing Design Context for CoI-based Learning	875
9.6.3	The Virtual Organizing Facilitation Context for CoI-based Learning	877
9.6.4	The Virtual Organizing Instruction Context for CoI-based Learning	879
9.6.5	The Virtual Organizing Assessment Context for CoI-based Learning	881
9.7	Instructional Design for Collaborative CoI's via Virtual Organizing	883
9.7.1	The Context of Collaborative Learning for CoI's Online	884
9.7.2	The Blended Instructional Strategies for CoI-based Learning	889
9.7.3	Before a Synchronous Session	891
9.7.4	During a Synchronous Session	893
9.7.5	Between Synchronous Sessions	897
9.7.6	Next Synchronous Session	901
9.7.7	Exploring Collaborative Learning through Online Discussion	902
9.7.7.1	The Discussion Forum Online	903
9.7.7.2	Example Discussion Activity for Online Forums	904
9.7.7.3	Example Rubric for Assessing Online Forum Discussions	905
9.8	<i>REALSpace AKE</i> Development and Appreciative Inquiry	906
9.8.1	The Context of Appreciative Inquiry	907
9.8.2	The <i>REALSpace</i> Model of Appreciative Sharing of Knowledge	909
9.8.2.1	Discovering “What is”.....	911
9.8.2.2	Creating “What might be”	914
9.8.2.3	Prioritizing “What could be”	917
9.8.2.4	Declaring “What will be”	919
9.9	Future Trends to Meet Knowledge Challenge in Higher Education	919
9.9.1	The Importance of Organizational Story-Telling	922
9.9.2	The Nature of Community-Based Inquiry	922

9.9.3	The Nurture of Virtual Communities of Inquiry	924
9.9.4	The Positioning of Technological Support for CoI's	926
9.10	Conclusion	928
	References	930

PART III Conclusions

Chapter 10	<i>REALSpace</i> Epilogue: A Journey to Create the Future	943
10.1	Introduction	943
10.2	Reflecting on Organization Transformation in Higher Education	944
10.3	Reflecting on the Future of Software Engineering	946
10.3.1	Software Engineering as a Discipline	948
10.3.1.1	Confronting the Engineering Dilemma	949
10.3.1.2	Lacking the Scientific Foundation	950
10.3.1.3	Navigating the Road to Maturity	951
10.3.2	Software Development as a Practice	952
10.3.2.1	Understanding the Monumental versus Accidental Spectrum	953
10.3.2.2	Adapting Software Development as a Process of Learning	955
10.3.3	Software Engineering Education as a Respectable Endeavor	957
10.3.3.1	Where does Software Engineering Program Belong?	959
10.3.3.2	What can be alerted in Software Engineering Education?	960
10.3.3.3	What does it mean to do Software Engineering Educational Research?	961
10.4	Reflecting on My Thesis Research	964
10.4.1	The Action Research Issues to Conceive <i>REALSpace</i>	965
10.4.2	The Case Study Methodology	967
10.4.3	The Construction of Case Studies for <i>REALSpace</i>	968
10.4.3.1	Scenario-Based Case Study	969
10.4.3.2	Action Planning for Case Study	970
10.4.4	The Practitioner's Action Research Cycle	976
10.5	Lessons Learned from Applying SSM to <i>REALSpace</i>	978
10.5.1	Learning from SSM's Development in the 1970s	981

10.5.2 Learning from SSM's Development in the 1980s	983
10.5.3 Learning from SSM's Development in the 1990s	985
10.6 Lessons Learned from Applying SBD to <i>REALSpace</i>	986
10.6.1 The Solution-First Strategy	987
10.6.2 The Use of Scenarios in Solution-First Design	989
10.6.3 The Challenges in Scenario-Based Design for <i>REALSpace</i>	990
10.6.3.1 Design Action Competes with Reflection	991
10.6.3.2 Design Situations are Fluid	993
10.6.3.3 Design Moves have Many Consequences	994
10.6.3.4 Design Leads Technical Knowledge	996
10.7 Lessons Learned from Applying UX Design to <i>REALSpace</i>	998
10.7.1 The Engineering of User Experience	1000
10.7.2 The Renewed Focus of User Experience	1001
10.8 Lessons Learned from Virtual Organizing <i>REALSpace</i>	1002
10.8.1 The Challenge for Virtual Organizing	1003
10.8.2 The Promise of Virtual Organizing CoI's	1005
10.9 Rethinking Doctoral Education as the Formation of Scholars	1007
10.9.1 Making the Implicit Explicit	1009
10.9.2 Moving Doctoral Education into the Future	1010
10.9.2.1 Scholarly Integration	1011
10.9.2.2 Intellectual Community	1012
10.9.2.3 Stewardship of Knowledge	1014
10.9.3 Creating Performance Expectations for the Dissertation ...	1017
10.10 Perspectives for Future Work in <i>REALSpace</i>	1018
10.10.1 Deliberating with Core Systems Ideas	1022
10.10.2 Embodying Different Tracks of Systems Thinking	1023
10.10.3 Identifying Hard and Soft Systems Methodologies	1026
10.10.4 Meeting the Challenge of Educating Future Software Practitioners	1030
10.11 Conclusion	1033
References	1035
 Bibliography	1051
 Brief Profile of the Author	1114

