

# CONTENTS

<i>List of Figures and Tables</i>	<i>ix</i>
<i>Preface</i>	<i>xi</i>
<i>Acknowledgments</i>	<i>xiii</i>
1 Introduction: The Internet in Our Pockets and Handbags; ICT Is More Than Just a Tool	1
1.1 Classrooms of the Future—Learning in CrossActionSpaces	4
1.1.1 Spaces	6
1.1.2 Communication Spaces	6
1.1.3 Co-expanded Communication Spaces	7
1.1.4 Multi-Existing Co-expanded Communication Spaces	7
1.1.5 The Character of Human Action in Such Communication Spaces Is CrossAction	8
1.1.6 A First Summary, CrossActionSpaces	9
1.1.7 What Does This Have to Do With Teaching and Learning?	9
1.2 Teaching Practice Turns Into Digital Didactical Design—Teaching Is Process Design for Learning	12
1.3 The Broader Context—Different Levels	15
1.4 Book Organization	16
1.5 References	19
2 From Sociotechnical Systems to CrossActionSpaces	22
2.1 The Sociotechnical Paradigm—Social and Technical Systems	25
2.2 What Is a System? Differences Between Technical and Social Systems	28

## vi Contents

2.2.1	The General Concept of a System	29
2.2.2	Different Forms of Systems—Structures and Processes	30
2.2.3	Technical Systems	31
2.2.4	Social Systems—Grounded on Communication	34
2.3	Elements of Social Systems: Communication Leads to Expectations and Roles	35
2.3.1	Communication Is Interpretation—The Basic Element of Social Systems: Easy and Complex	35
2.3.2	Communication, Behavior, (Inter)Action, Cross-Actions	38
2.3.3	Characteristics of Social Systems	39
2.3.4	System Theory for Designing Teaching and Learning?	41
2.3.5	Structures of Social Communication Systems: Made of Expectations While Making Connections	43
2.4	Sociotechnical Systems Turn Into CrossActionSpaces	45
2.4.1	What Is a Sociotechnical System? (A Definition)	46
2.4.2	From Sociotechnical Systems to Co-expanding Communication Spaces	47
2.4.3	Educational Institutions: From Systems to CrossActionSpaces	48
2.5	Social Bots as New Forms of Sociotechnical Agents? Antisocial Media	50
2.6	Summary	54
2.7	CrossActionSpaces Linking Systems, Networks and Communities	55
2.8	References	62
3	Dynamics of Roles in CrossActionSpaces: Enabler and Hinderer	68
3.1	Roles—The Interactionism Point of View	72
3.2	Roles—Structural-Functionalism Perspective	74
3.3	Roles in Technology and Software Development (Roles in CSCW)	77
3.4	What Makes Human Behavior Into a Role? Multiple Dimensions	78
3.5	Summary—Roles Enable and Hinder MultiCrossActions in Relations	84
3.6	Teaching, Learning, Roles—Problems in Teachers' Roles and Students' Roles	86
3.7	Role Mechanisms—Assigned and Taken Roles	92
3.8	Different Types of Roles—Informal, Implicit and Formal, Explicit	98
3.9	Summary: Human Interaction Is Evolving Toward Multi-Cross-Action—Roles as Paradox, They Enable and Limit Cross-Action	104
3.10	References	106

4	Learning as Reflective CrossAction: The Example of Learning Expeditions	109
4.1	How Education Has Been Understood for Many Years	110
4.2	Beyond the Concept of the Classroom	114
4.3	Who Learns? We All Do! And Who Has Knowledge? We All Have—It Depends on the Situation	117
4.4	From Course-Based Learning to Learning Expeditions	117
4.4.1	A Candidate for Learning Expeditions: Research-Based Learning Situations (Inquiry-Based Learning)	119
4.4.2	No Learning Expedition Without Creating Conditions for Creativity	121
4.4.3	Beyond Courses—Thinking of Learning Expeditions in Groups and Communities	122
4.4.4	Schools and Universities of the Future—Beyond Courses Toward Learning Expeditions	124
4.5	References	126
5	Teaching Creates Conditions for Learning as Reflective Cross-Action: Digital Didactical Design	130
5.1	Digital Didactics—Three Interwoven Layers	132
5.2	The Middle Layer—Digital Didactical Design (Theory and Process View of Triangle 2)	135
5.2.1	For Empirical Studies—Transforming the DDD Into a Five-Layer Pentagon	139
5.2.2	A Typical Example From Our Classroom Studies—Process Design View	143
5.2.3	Design for Teaching Aims and Learning Intentions	147
5.2.4	Design for Learning Activities (Individual, Collaborative, Community Learning)	149
5.2.5	Process-Based Assessment as Guided Reflections, Feedback and <i>Feedforward</i>	153
5.2.6	Social Relations and Roles—Designing for Social Relationships	155
5.2.7	Interactive Media: ICT Is More Than Just a Tool—Design Thinking in Education	158
5.3	It Is Not Technology or Didactics—Emergence of New Digital Didactical Designs	166
5.4	References	167
6	Projects and Empirical Studies Toward Reflective CrossActionSpaces	172
6.1	#InPUD—Example of an Early Form of Co-expanded Spaces in Higher Education	173
6.1.1	Technology-Embraced Informal- <i>in</i> -Formal Learning Fosters the Conative Level of Learning	174

6.1.2	Anonymity as Duality	175
6.1.3	InPUD Organizes the Jungle of Information for Learners	175
6.1.4	InPUD Is an Example of an Early CrossActionSpace	176
6.2	#PeTEX—Remote Lab Learning in Engineering Education	177
6.2.1	Learning Expeditions Designed as Reflective Cross-Actions	178
6.2.2	Reflective Cross-Actions for Different Learning Levels	179
6.2.3	Intertwining the Technical, the Pedagogical and the Social Dimension	180
6.3	#DaVinci—Creating Conditions for Creativity of Learning Expeditions	182
6.4	#IPM—An Example of Challenges When Designing for Learning Expeditions	185
6.4.1	Why Didn't Students Use the Mobile Devices?	185
6.4.2	The Potential of Mobile Devices—Access to Collaboration at Any Time, Anywhere	187
6.5	#Tablet-Mediated Learning Expeditions in Schools	187
6.5.1	Classroom Studies—Learning Through Reflective Making?	188
6.5.2	Range of Learning Expeditions	195
6.6	References	198
7	Conclusion and Looking Forward . . .	201
7.1	Empowering Teachers as Collaborative Designers— Organizational Change!	202
7.2	Lessons Learned—Designing the Future	203
7.2.1	Our World Is Full of Co-expanded Spaces— CrossActionSpaces	205
7.2.2	Learning Cannot Be Delivered—Traditional Designs Neglecting Designs for Partnerships	205
7.2.3	Learning Is Reflective Multi-Cross-Actions in Relations	205
7.2.4	Designing Conditions for Sociotechnical-Pedagogical Processes—Teaching Is Process Design	206
7.2.5	Schools and HE Need Practices That Design for Learning Walkthroughs and Learning Expeditions	206
7.2.6	Not All Learning Can Be Measured	207
7.2.7	ICT Is More Than Just a Tool	208
7.2.8	Learning Analytics Is a Method and an Instrument to Control Students and Their Behavior—a Provoking Look	208
7.2.9	There Are No Simple Step-by-Step Models for Digital Didactical Designs	209
7.2.10	More Design-Oriented Research and Formative Evaluation Studies	210
7.3	References	211