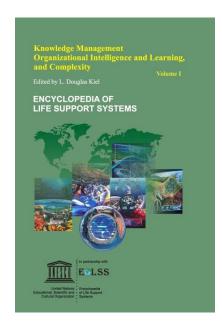
# **CONTENTS**

# KNOWLEDGE MANAGEMENT, ORGANIZATIONAL INTELLIGENCE AND LEARNING, AND COMPLEXITY



Knowledge Management, Organizational Intelligence and Learning, and Complexity - Volume 1

No. of Pages: 354

**ISBN:** 978-1-905839-11-7 (eBook) **ISBN**: 978-1-84826-911-8 (Print Volume)

Knowledge Management, Organizational Intelligence and Learning, and Complexity - Volume 2

No. of Pages: 296

**ISBN:** 978-1-905839-12-4 (eBook) **ISBN**: 978-1-84826-912-5 (Print Volume)

Knowledge Management, Organizational Intelligence and Learning, and Complexity - Volume 3

No. of Pages: 460

**ISBN:** 978-1-905839-13-1 (eBook) **ISBN:** 978-1-84826-913-2 (Print Volume)

For more information of e-book and Print Volume(s) order, please **click here** 

Or contact: eolssunesco@gmail.com

### **CONTENTS**

### **VOLUME I**

Knowledge Management, Organizational Intelligence and Learning, and Complexity	1
Lowell Douglas Kiel, School of Social Sciences, University of Texas at Dallas, USA	
Lowell Bodgias Rici, school of Social Sciences, Chiversity of Texas at Buttas, Con-	

- 1. Introduction
- 2. Defining complexity
- 3. The evolution of complexity in the natural realm
- 4. The self-organizing universe: perpetual novelty in the natural world
- 5. Coping with complexity: the historical, social, and human, implications of complexity
- 6. Exploring complexity: agent-based genetic and emergent models of complex systems
- 7. Knowledge management
- 8. Organizational learning and change
- 9. Organizational learning and ecological economics
- 10. From knowledge to wisdom in human evolution

### **General Features of Complex Systems**

43

Yaneer Bar-Yam, New England Complex Systems Institute, Cambridge, MA, USA

- 1. Overview
  - 1.1. Parts, Wholes and Relationships
  - 1.2. Emergence
  - 1.3. Interdependence
- 2. Self-Organizing Patterns
  - 2.1. What is Pattern Formation?
  - 2.2. Examples of Simple Patterns
  - 2.3. Patterns in Networks
  - 2.4. Subdivision and Creativity
- 3. Complexity, Scale and the Space of Possibilities
  - 3.1. Space of Possibilities
  - 3.2. Complexity and Scale
  - 3.3. Complexity of Social Systems
  - 3.4. Why Complexity?
  - 3.5. Historical Complexity
  - 3.6. Complexity Around Us
- 4. Evolution (Simple to Complex Patterns)
  - 4.1. Selection and Competition
  - 4.2. Evolution and Competition in Sports
  - 4.3. Competition and Cooperation in Sports
  - 4.4. Selfishness and Altruism
  - 4.5. Social and Political Competition and Cooperation
  - 4.6. Groups in Evolution

## **Formal Tools for Exploring Complexity**

96

Bruce J. West, Army Research Center, Research Triangle North Carolina, USA
Paolo Allegrini, National Research Council, Institute of Computational Linguistics, Italy
Paolo Grigolini, Center for Nonlinear Science, University of North Texas, USA

- 1. Introduction
- 2. Complex Systems
- 3. Entropies
- 4. Objectiveness and Reductionism
- 5. Some Measures of Order, Disorder and Complexity

#### 6 Conclusions

о.	Conclusions	
Ma	athematical Structures of Complexity 12	3
	lliam Herbert Sulis, Departments of Computer Science, Psychiatry, Psychology, McMaster Univer	_
	milton, Ontario, Canada	suy,
1.	Introduction	
2.	Structural and Functional Approaches	
3.	Computation and Language	
4.	Computational Complexity	
	4.1. Algorithmic Complexity	
	4.2. Logical Depth	
	4.3. LZ Complexity	

5.1. Simulatability5.2. Crutchfield's E

5. Simulation Approaches

- 5.2. Crutchfield's Epsilon Machines
- 5.3. Dynamical Automata Sulis Machines
- 6. Conclusion

### Hierarchy and Complexity in Physical Systems

145

Bruce J. West, Army Research Office, Research Triangle, North Carolina, USA

- 1. Introduction
- 2. Normal Statistics
- 3. Scaling and Lévy Statistics
- 4. Renormalization and Scaling
- 5. Summary and Conclusions

### **Complexity in Chemical Systems**

168

Stephen Keith Scott, Department of Chemistry, University of Leeds, UK

- 1. Introduction: Chemical Kinetics
- 2. Clocks and Oscillations
- 3. Chaos
- 4. Spatial Complexity: Waves and Patterns
- 5. Ignition and Extinction
- 6. Perspectives and Conclusions

# The Science of Self-Organization and Adaptivity

184

Francis Heylighen, Free University of Brussels, Belgium

- 1. Introduction
- 2. The science of self-organization: a historical sketch
  - 2.1. The thermodynamic paradox
  - 2.2. Principles of self-organization
  - 2.3. Various applications
  - 2.4. Complex adaptive systems
- 3. Characteristics of self-organizing systems
  - 3.1. Two examples: magnetization and Bénard rolls
  - 3.2. Global order from local interactions
  - 3.3. Distributed control
  - 3.4. Robustness, resilience
  - 3.5. Non-linearity and feedback
  - 3.6. Organizational closure, hierarchy and emergence

SWEEDOE MINNOEMENT, ONOMINE THE ENTERED EET MIND EET MINO, THE
3.7. Bifurcations, symmetry breaking
3.8. Far-from-equilibrium dynamics
Characteristics of adaptive systems
4.1. Adaptation as fit
4.2. Regulation and the edge of chaos
4.3. Variation and selection
The state-space description of self-organization
5.1 State spaces

- 5.2. Uncertainty and entropy
- 5.3. Attractors

4.

5.

- 5.4. Fitness landscapes
- 5.5. Order from noise
- 6. Conclusions and Future Prospects

### The Self-Organizing Universe

212

R.K. Mishra, All India Institute of Medical Sciences, New Delhi, India

- Introduction 1.
- 2. More on Prigogine and Self-Organization
- 3. Network Thermodynamics
- 4. Photons and Self-Organization in Living Systems

### **Agent-Based Genetic and Emergent Computational Models of Complex Systems**

237

Kevin J. Dooley, Arizona State University, USA Steve Corman, Arizona State University, USA

- Introduction
- General Computational Features of a Complex Adaptive System
- What is Emergence in a Computational System?
- 4. Cellular Automata as an Example of Emergence in a Complex System
- 5. Example of Using a Model to Make Policy Decisions
- Using Computational Models to Develop Theory
- 7. More Advanced Agent-Based Models
- Simulation and Computational Models
- Philosophical Issues

### **Memetic Engineering and Cultural Evolution**

259

David Hales, Manchester Metropolitan University, UK.

- What is Memetics? 1.
- 2. The State and Status of Memetics
- 3. Memetic Engineering in Human Societies
- 4. Memetic Engineering and Artificial Societies
- 5. What are Artificial Societies?
- 6. Memes in Artificial Societies
- 7. Evolutionary Game Theory Models
- 8. Memetic Models of Cultural Change
  - 8.1. The Axelrod Cultural Model
  - 8.2. The Swap Shop Model
  - 8.3. The Open-Mind Model
  - 8.4. The Stereotypes Model
- 9. Conclusions

### **Artificial Life and Human Societies**

270

Domenico Parisi, Institute of Cognitive Science and Technology, National Research Council, Italy

- 1. Artificial Life
- 2. Artificial Life and Human Societies
- 3. Basic Modeling Tools
  - 3.1. Neural Networks
  - 3.2. Learning Procedures
  - 3.3. Genetic Algorithms
  - 3.4. Models of the Environment
  - 3.5. Cellular Automata
- 4. Some Selected Phenomena
  - 4.1. Evolutionary Change
  - 4.2. Transfer of Resources
  - 4.3. Abstract and Historical Simulations

### **Genetic Algorithms**

288

Raffaele Calabretta, Institute of Cognitive Sciences and Technologies, National Research Council, Italy

- 1. Introduction
- 2. Historical Development of Evolutionary Computation
- 3. How to Implement a GA
  - 3.1. What (Hardware and Software) we Need in Order to Implement a GA
  - 3.2. GA Components: Genotype and Phenotype
  - 3.3. GA Selection Methods, Genetic Operators and Mechanisms of Reproduction
- 4. How and Why GAs work
- 5. GAs for Simulating Multi-Level Adaptive Systems
- 6. Conclusion

### **Distributed Artificial Intelligence**

304

Abhijit Deshmukh, University of Massachusetts-Amherst, USA

- 1. Introduction
- 2. Classification of DAI Issues
- 3. Multi-Agent Architectures and Environments
- 4. Distributed Problem Solving
- 5. Distributed Decision Making
- 6. Applications
- 7. Conclusion

### **Exploratory Simulation and Modeling of Complex Social Systems**

319

Chang-Hyeon Choi, Department of Public Administration, Kwandong University, Korea

- 1. Introduction
- 2. The Characteristics of a Complex Adaptive System (CAS)
  - 2.1. Nonlinear Dynamic System (NDS)
  - 2.2. Feedback Loops System
  - 2.3. Sensitive Dependency on Initial Conditions
  - 2.4. Non-Equilibrium System
  - 2.5. Emergence
  - 2.6. Bifurcation
  - 2.7. Path dependence
  - 2.8. Coevolution
- 3. Evolutionary System Based on CAS: L-V Model
  - 3.1. Lotka-Volterra Model

4. System Dynamics (SD) as a Research Methodology

5. 6.	Simulation of the Chaotic Behavior of L-V Model Conclusion	
Ind	lex	343
Ab	out EOLSS	349
	VOLUME II	
Jeff	e Implications of Complexity frey Goldstein, Adelphi University, USA Merry, Maagan Michael, Israel	1
<ol> <li>2.</li> <li>3.</li> </ol>	The Increase in Global Complexity 1.1. The Knowledge Era 1.2. Knowledge Workers 1.3. The Global Effects of Knowledge-based Economies 1.4. Sustainability or Future Threat? The Rise of Complexity Theory 2.1. Scientific/Mathematical Roots 2.2. Complexity as a Meta-Principle 2.3. Beyond Reductionism 2.4. Multiple Scales 2.5. Fitness Landscapes Complex Systems in the World Characteristics and Strategies 3.1. Co-evolutionary Adaptation 3.2. Co-evolution 3.3. Adaptation, Innovation, and Learning 3.4. Beyond Hierarchical Control 3.5. Beyond Equilibrium and Continuity 3.6. Combinatorial Strategies 3.7. Increasing Returns and Lock-in	
	mplexity Rising: From Human Beings to Human Civilization, a Complexity Profile neer Bar-Yam, New England Complex Systems Institute, Cambridge, MA, USA	22
1. 2. 3. 4. 5. 6. 7. 8.	Introduction Individual and collective behavior Complexity profile Control in human organizations Environmental demands and complexity Historical progression Human civilization as an organism Conclusions	
	mplexity and Technology et Leydesdorff, University of Amsterdam, The Netherlands	42
1. 2.	Introduction Prevailing Perspectives 2.1. Technology as a Subject of Economics	

- 2.2. History of Technology and the Sociology of Science
- 2.3. Technology Policy Analysis
- 3. Technology as a Complex Phenomenon
- 4. The Endless Transition
- 5. The Coevolution of Technology, Society, and Culture
  - 5.1. Macro-Evolutionary Change
  - 5.2. The Micro-System
- 6. Technological Innovation in Complex Systems
- 7. Normative Implications

### **Complexity and Innovation**

**59** 

Gottfried Mayer-Kress, Department of Kinesiology, Pennsylvania State University, USA

- 1. Introduction
  - 1.1. Generalized Fitness Functions
    - 1.1.1. Innovation and Evolution
    - 1.1.2. Influence of Noise and Chaos
  - 1.2. Example for Physics: Bubble Chamber
- 2. Innovation and Learning
- 3. Fitness Functions and Rugged Landscapes.
- 4. Characteristic Time Scales and Critical Mass
  - 4.1. Time-Scales of Incremental Innovations
  - 4.2. Time-Scales Associated with Bifurcations
  - 4.3. Characteristic Precursors of Bifurcations
  - 4.4. Time Scales and Innovation Strategies
- Cultural Conditions for Innovation
  - 5.1. Written Language
  - 5.2. Money
  - 5.3. Religion
  - 5.4. Music
  - 5.5. Science
  - 5.6. Innovations in China
  - 5.7. Communism
  - 5.8. Global Systems
- 6. Fractal Structures and Self-Similarity
- 7. Forecasting of Innovations
- 8. Extension of State Space Dimensions
- 9. Extrapolation and Emergence of New Frontiers
- 10. Complexity and Innovations in the Information Society
- 11. Computability of Complex Problems
- 12. Innovations and Biological Arms Races

### **Complexity in Climate Phenomena**

**78** 

Isabella Bordi, Department of Mathematics and Physics, University of Camerino, Italy Alfonso Sutera, Department of Physics, University of Roma "La Sapienza", Italy

- 1. Introduction
- 2. Climate Behavior
- 3. The Governing Equations
- 4. Steady Solutions
- 5. Triadic Interaction in the Two Level Model
- 6. Baroclinic Dynamics
- 7. Baroclinic Adjustment
- 8. Low Frequency Behavior

	mplexity in Socio-Economic Systems er M. Allen, Cranfield University, UK	118
1. 2. 3. 4. 5.	Introduction Socio-Economic Systems and Complexity 2.1. Freedom and Choices 2.2. Knowledge and Uncertainty Complexity and Simplicity 3.1. Four Steps to Reduce Complexity to Simplicity Knowledge Arising from Different Assumptions 4.1. Equilibrium or Studying Attractors 4.2. Non-Linear Dynamics 4.3. Self-Organizing Dynamics 4.4. Evolutionary Complex Systems 4.5. The General Structure of Modeling Complexity in Socio-Economic Systems 5.1. Knowing the Limits to Knowledge 5.2. Survival not Optimality 5.3. Spatial Evolution 5.4. Co-emergence of Structure, Beliefs and Patterns of Behavior	
	mplexity and Organizations phen J. Guastello, Department of Psychology, Marquette University, USA	138
1. 2. 3.	Introduction Individuals and Organizations 2.1. Performance Under Conditions of Stress 2.2. Motivation 2.3. Accidents and Risk Analysis Group Processes 3.1. Creative Problem Solving 3.2. Intersection-Type Coordination 3.3. Bandwagon-Type Coordination 3.4. Leadership Emergence Organizational Processes 4.1. Hierarchical Work Organizations 4.2. General Model of Organizational Change 4.3. Strategic Management Input Recognition 4.4. Strategic Management Response Formulation	
	mplexity, Politics and Public Policy el Elliott, School of Social Sciences, University of Texas at Dallas, USA	160
1. 2. 3. 4. 5. 6.	Introduction New Methods for Looking at Politics Theories of Decision-Making Self-Organization and the "Edge of Chaos" Positive Feedback, Increasing Returns and Path Dependence Conclusion	
	mplexity and Interdiciplinarity lliam H. Newell, School of Interdisciplinary Studies, Miami University, Oxford, Ohio USA	178

©Encyclopedia of Life Support Systems (EOLSS)

Introduction—Holism and Fragmentation, Order and Disorder Interdisciplinarity Defined

3. 4. 5.	The Organization of Interdisciplinarity Complexity Defined Simple, Complicated, and Complex Systems		
6. 7.	Characteristics of Complex Systems Other Forms of Complexity		
8.	Integrating Complexity and Interdisciplinarity		
9.	The Promise of Complexity and Interdisciplinarity.		
	mplexity and Sustainable Development ii-Bin Zhang, Ritsumeikan Asia Pacific University, Japan	194	
1.	Introduction		
2. 3.	Economic Development and Population Growth Economic Development and Knowledge		
<i>4</i> .	Economic Development and Environment		
5. 6.	Economic Development and Government Sustainable Development and Complexity		
0.	Sustamable Development and Complexity		
Co	ping with Complexity and Uncertainty	214	
	phen J. Guastello, Department of Psychology, Marquette University, USA		
1.	Introduction		
1.	Artificial Life and Artificial Intelligence 2.1 Game theory		
	2.2 Expert Systems		
	<ul><li>2.3 Situation Awareness</li><li>2.4 Artificial Life and Related Computations</li></ul>		
3	Control of Chaos		
	<ul><li>3.1 Tracking Nonlinear Dynamics in Systems</li><li>3.2 Control Parameter Manipulation</li></ul>		
	3.3 Periodic Entrainment		
	3.4 Cognitive Strategies for Complexity		
<b>.</b>		220	
Ind	lex	229	
About EOLSS			
110		233	
	VOLUME III		
	V OBCIVE III		
	ganizational Learning and Change: Evolving Systems in a Global Community aise K. Comfort, <i>University of Pittsburgh</i> , <i>USA</i>	1	
1.	Introduction: Change as a Learning Process		
	<ul><li>1.1 Individual Learning</li><li>1.2 Organizational Learning</li></ul>		
	1.3 Collective Learning		
	<ul><li>1.4 Sociotechnical Systems</li><li>1.5 Transitions to Learning Organizations</li></ul>		
2.	Complex Adaptive Systems		
3. 4.	A Preliminary Model of Organizational Adaptation to Changing Environments Types of Organizational Adaptation in Practice		
4. 5.	Obstacles to Organizational Learning		

- 6. New Directions for Research and Study
- 7. Conclusions

### **Reciprocity: A Keystone of Organizational Learning**

23

Maureen Porter, *The University of Pittsburgh, U.S.A* Kathia Monard, *The University of Pittsburgh, U.S.A* 

- 1. Introduction
- 2. Applications of Ayni
  - 2.1. The Request for Relationship Springs from a Genuine Need and entails Risks for both Partners
  - 2.2. Growing Networks of Stakeholders share Ownership of the Project
  - 2.3. Service means Lending a Hand, not just Writing a Check
  - 2.4. Physical Labor is an Important Part of the Mix
  - 2.5. Giving must be done joyfully and wholeheartedly
  - 2.6. Preconceptions about Time need to be checked at the Door
  - 2.7. The Exchange needs to be equitable
  - 2.8. The Net "Value" of the Service-learning Relationship is a Complex Equation
  - 2.9. Conclusions
- 3. Reciprocity and its relationship with concepts of Care and Justice
  - 3.1. Relationships of Reciprocity and Caring
  - 3.2. Relationship of Reciprocity and Justice
  - 3.3. Symbiotic Interaction of Reciprocity with Care and Justice
  - 3.4. Contributions of Reciprocity towards a Democratic Society
  - 3.5. Conclusions

# Organizational Learning in the Developing World: The Case of Educational Reform in the State of Aguascalientes, Mexico 44

Leonardo Alvarez Córdova, *Project Manager, Gerencia Pública, Servicios de Consultoria, S.C., Mexico City, Mexico* 

- 1. Introduction
- 2. Berman: the structural nature of implementation, programmed vs. adaptive approaches
- 3. The educational reform in Aguascalientes
- 4. The state of Aguascalientes
- 5. The actors
  - 5.1. The National Union of Educational Workers
  - 5.2. The school inspectors
  - 5.3. Factional and local leaders
- 6. The regionalization and its implementation
  - 6.1. Situational analysis and nature of the implementation
- 7. The external evaluation system
  - 7.1. Situational analysis and nature of the implementation
- 8. The extension of the school calendar
  - 8.1. Situational analysis and the nature of the implementation
- 9. Alvarez' adaptive management style: finding the way and assuming responsibility
- 10. Conclusions

### **Public-Nonprofit Partnership for Social Capital**

63

Naim Kapuco, University of Central Florida, U.S.A

- 1. Introduction
- 2. Public-Nonprofit Partnerships for Social Capital
  - 2.1. Roles of Nonprofits
  - 2.2. The State of the Partnership
  - 2.3. Public-Nonprofit Partnerships

- 2.4. Characteristics of Public-Nonprofit Partnerships
- 3. The Evaluation of Research on Social capital
  - 3.1. Social Benefits of the Partnerships: Towards Generation of Social Capital
  - 3.2. The Role of Nonprofit in Creating Social Capital
- 4. Networks: the Missing Links
- 5. Public Nonprofit Partnerships and Collective Learning
- Conclusion and Future Research

# Toward Sustainable Development of Electronic Teaching in Universities: Challenges and Concerns

**78** 

Breena E. Coates, San Diego State University-Imperial Valley Campus, USA

- 1. Introduction
- 2. Overview of the Literature
- 3. Emerging Themes for Higher Education IT Learning
- 4. New Measures of Instructional Output are Required in Modern Universities
- 5. Re-Learning About Reinforcement and Rewards for Instructional Effort
- 6. Technological Integration and Support Platforms
- 7. Higher Education Organizations and Democratic Ideals
- 8. Intellectual Property
- 9. Critical Thinking and Technology
- 10. Conclusion and Recommendations

### The Nature of Organizational Unlearning

89

Eric W.K. Tsang, School of Business Administration, Wayne State University, USA

- 1. Introduction
- 2. Overview of the Literature
- 3. Definition
- 4. Individual and Organizational Unlearning
- 5. Organizational Forgetting
  - 5.1. Organizational Learning Cycle
  - 5.2. Organizational Memory
    - 5.2.1. Storage
    - 5.2.2. Diffusion
    - 5.2.3. Retrieval
- 6. Inertia
  - 6.1. Size
  - 6.2. Age
  - 6.3. Performance
- 7. Concluding Remarks

#### **Economy as Ecosystems**

103

Daniel Z. Sui, Department of Geography, Texas A&M University, USA

- Introduction
- 2. Mechanistic versus Biological Metaphors in Economics
- 3. Ecology as Nature's Economy
- 4. Economy as Ecosystems
- 5. Putting the Idea into Practice: Ecological Economics and Industrial Ecology
- 6. Perils of Stepping over the Line: Social Darwinism and Socio-biology
- 7. Conclusion: Towards a Green Future by Co-Evolution

### **Mutualism and Cooperation**

119

Michael G. Dalton, California State University, Monterey Bay, USA.

- 1. Introduction
- 2. Mutualism and Ecosystem Models
  - 2.1. Community Dynamics
  - 2.2. Predator-Prey Dynamics and Community Stability
  - 2.3. Mutualism and Community Stability
- 3. Cooperation and Game Theory
  - 3.1. Nash Equilibrium
    - 3.1.1. The Prisoner's Dilemma
    - 3.1.2. Coordination Games
  - 3.2. Evolutionary Stability
    - 3.2.1. Mixed Strategies
    - 3.2.2. Replicator Dynamics
  - 3.3. Repeated Games
    - 3.3.1. Rational Players and Finite Games
    - 3.3.2. The Folk Theorem
    - 3.3.3. Finite Automata and Genetic Algorithms
  - 3.4. Stochastic Games
  - 3.5. Preplay Communication
- 4. Conclusion and Future Directions

### **Economic Growth and Sustainable Development**

138

Friedrich Hinterberger, Sustainable Europe Research Institute, Austria Fred Luks, Hamburg School of Economics and Policy, Germany Marcus Stewen, Deutsche Gesellschaft für Technische Zusammenarbeit, Germany

- 1. Introduction
- 2. The Empirical Debate: Dematerialization, Growth and Structural/Technical Change
- 3. Sustainable Development, Growth Theory, and Ecological Economics
- 4. Limits to Delinking: Technological Optimism, and Skepticism
- 5. The Other Delinking: Growth and Well-Being
- 6. Conclusions: Biasing Economic Development

#### **Ecological Systems and Multi-tier Human Organization**

149

Emilio Federico Moran, Department of Anthropology, and Center for the Study of Institutions, Population, and Environmental Change, Indiana University, USA

Elinor Ostrom, Department of Political Science, and Center for the Study of Institutions, Population, and Environmental Change, Indiana University, USA

J.C. Randolph, School of Public and Environmental Affairs, and Center for the Study of Institutions, Population, and Environmental Change, Indiana University, USA

- 1. Some Definitions and Assumptions
- 2. Human Choice
- 3. The Structure of Action Situations
- 4. Tiers of Decision-Making Units and their Direct and Indirect Impacts
- 5. Processes, Measurement, Aggregation, and Comparisons
- Conclusions

### Knowledge Management: From Idea to a Discipline

163

Robert de Hoog, Faculty of Educational Science and Technology, University of Twente, The Netherlands

- 1. Introduction
- 2. Characteristic properties of knowledge

- 3. Management
- 4. Quality and goals
- 5. From theory to practice: an example
- 6. Conclusion

#### Data, Information, Knowledge, and Wisdom

179

Susan .P. Stafford, Department of Philosophy, Simmons College, USA

- 1. Introduction
- 2. Data
- 3. Information
  - 3.1. The Decision to Launch the Space Shuttle Challenger
  - 3.2. The Framing of Medical Decisions
  - 3.3. So what?
- 4. Knowledge
  - 4.1. Knowledge is Situated
    - 4.1.1. What is context?
    - 4.1.2. The Global Environment
    - 4.1.3. The Culture of the United Nations Department for Economic and Social Information and Policy Analysis
    - 4.1.4. The Physical Setting, or "The Room" in which the Table is Generated
    - 4.1.5. Informal Knowledge Communities
  - 4.2. Knowers are Epistemically Interdependent
  - 4.3. Knowledge Requires Trust
    - 4.3.1. Basic Trust and Mature Trust
  - 4.4. Knowledge and Values are Intimately Connected
    - 4.4.1. Intellectual Virtue
    - 4.4.2. Epistemic Responsibility
    - 4.4.3. Personal Careabouts and Institutional Objectives
  - 4.5. Knowledge Can be Tacit as Well as Explicit
  - 4.6. There are Multiple Ways of Knowing
    - 4.6.1. Type of Intelligence
    - 4.6.2. Historical Location
    - 4.6.3. Location Within Racial, Class, Age, and Ethnic Groups
    - 4.6.4. The Sex of the Knower
    - 4.6.5. Personal Commitments, Careabouts, and Desires
    - 4.6.6. Cognitive Style
    - 4.6.7. Knowledge Holder Differences
    - 4.6.8. So What?
- Wisdom
  - 5.1. Which Parts of the Planet are Morally Considerable, and Why?
  - 5.2. What are Moral Virtues, and Which Moral Virtues are Relevant to Questions of Life Support Systems?
  - 5.3. How Can Knowledge and Moral Virtue be Integrated?
  - 5.4. Practical Wisdom
  - 5.5. Whose Wisdom?

# Theories of Human Cognition: To Better Understand the Co-Adaptation of People and Technology

204

Guy Boy, European Institute of Cognitive Sciences and Engineering (EURISCO), Toulouse, France

- 1. Introduction
  - 1.1. Modeling Human Cognition to Rationalize Co-Adaptation of People and Technology
  - 1.2. Outline of the Chapters
- 2. Automation History and Evolution of Practices
  - 2.1. From Energy-Based to Information-Based Interaction

- 2.2. An Interpretation of Automation Evolution
- 3. Artefacts Embed Human Cognition
  - 3.1. Affordances
  - 3.2. Expertise and Artificial Intelligence
  - 3.3. The Cognitive Function Paradigm
  - 3.4. Embedding Cognition into Tools: Looking for the Right Balance
- 4. From Individual Intelligent Assistance to Multi-Agent Communication
  - 4.1. Intelligent Assistant Systems
  - 4.2. From Individual User Assistance Systems to Distributed Cognition
  - 4.3. Evolution of Human-Machine Communication Models
- 5. Human Memory Models as Analogs for External Memory Systems
  - 5.1. Explicit versus Implicit Memory
  - 5.2. Short-Term versus Long-Term Memory
  - 5.3. Space-Time Windows Memory Systems
- 6. An Organizational Memory Application within the IMAT Project
- 7. Co-development of Human and Artificial Cognitive Functions
  - 7.1. From Piaget's Action Schemes to Cognitive Functions
  - 7.2. Co-reliability of Humans and Artificial Agents
  - 7.3. Emerging Behavior of Distributed Cognitive Activities
- 8. Rehabilitating the Art of Memory
  - 8.1. The Art of Memory
  - 8.2. Influence of Descartes' Heritage
  - 8.3. Human Experience
- 9. Conclusion and Perspectives
  - 9.1 Towards an Epistemology of Organizational Cognition
  - 9.2 Towards an Concurrent Approach of Human and Organizational Learning, and Human-Centered Design

### **Information Ecology and Knowledge Management**

239

Yogesh Malhotra, School of Management, Syracuse University, USA

- 1. Introduction
- 2. From Information Ecology to Knowledge Ecology
  - 2.1. Information Ecology Revisited
  - 2.2. New Organizational Environments and Information Ecology
  - 2.3. Knowledge Ecology for the Era of Discontinuous Change
  - 2.4. Beyond Information Ecology to Knowledge Ecology
- 3. Philosophical Basis of Organizational Knowledge Ecology
  - 3.1. Philosophical Bases of Knowledge Ecology
  - 3.2. Myths Underlying Current Knowledge Management Systems
- 4. Accounting for Human Action and Performance
  - 4.1. Sense-Making Bases of Human Action and Performance
  - 4.2. Individual Construction of Meaning in Information-Seeking
  - 4.3. Dewey's Individual Construction of Meaning in Reflective Thinking and Action
  - 4.4. George Kelly's Personal Construct Theory and Individual Construction of Meaning
  - 4.5. Jerome Bruner's Contemporary Perspective of Individual Interpretive Construction
  - 4.6. Self-Control Bases of Human Action and Performance
- Discussion
  - 5.1. Toward "Loose-Tight" Knowledge Management Systems
  - 5.2. From Information to Actionable Knowledge
  - 5.3. Toward Communities of Knowledge Intrapreneurs
- 6. Conclusions

### The Intelligent Enterprise and Knowledge Management

263

Karl M. Wiig, Knowledge Research Institute, Inc, Arlington, Texas, USA

- 1. Introduction: Successful and Viable Enterprises Require Knowledge Management
- 2. The Intelligent Enterprise Perspective
  - 2.1. Four Areas of Emphasis for Intelligent Enterprises
  - 2.2. Success Factors for Intelligent Behavior
  - 2.3. It Is Important for the Enterprise to Be Intelligent!
  - 2.4. Enterprise Success Requires that Everyone Acts Intelligently
  - 2.5. Dimensions of Intelligent Behavior
  - 2.6. How Knowledge Vigilant Is the Enterprise?
  - 2.7. Conditions that Prevent the Enterprise from Acting Intelligently
- 3. Knowledge Management Supports the Intelligent Enterprise
  - 3.1. Enterprise Success Rests upon Effective and Knowledgeable Behavior
  - 3.2. Knowledge Required to Act Intelligently
  - 3.3. The Changing Workplace
  - 3.4. Knowledge Management Implementation Issues
  - 3.5. A Taxonomy of Potential Knowledge Management Building Blocks
  - 3.6. Job Descriptions and Service Paradigms
  - 3.7. Charting Knowledge Management-Related Activities in the Enterprise
  - 3.8. Mapping Knowledge Required for Desired Work
- 4. Concluding Perspectives

### **Knowledge Management and Cooperation Technology**

295

Giorgio De Michelis, Dept. of Informatics, Systems and Communication, University of Milano – Bicocca, Italy

- 1. Introduction
- 2. Cooperative Processes
- 3. The Complexity of a Cooperative Process
- 4. Knowledge Creation within Cooperative Process
- 5. Knowledge Creation within Organizations
- 6. Computer Based Systems for Supporting Knowledge Creation

### **Organizational Knowledge Creation and Management**

309

Max Boisot, Professor of Strategic Management, ESADE, Barcelona, Spain

- 1. Introduction
  - 1.1. Historical Background
  - 1.2. The Present
  - 1.3. Outstanding Issues
- 2. What is Knowledge?
  - 2.1. Abstraction
  - 2.2. Codification
- 3. Learning and the Generation of New Knowledge
  - 3.1. Learning Opportunities
  - 3.2. Knowledge Generation
- 4. Social Knowing
  - 4.1. Knowledge Sharing
  - 4.2. Knowledge Absorption
- 5. Managerial Implications
  - 5.1. The Paradox of Value
  - 5.2. Governance
  - 5.3. Strategy and Organization
  - 5.4. Operational Level
- 6. Coclusion

### The Role of Culture in Knowledge Management

327

Woo-Soon Park, Department of Public Administration, Dong-A University, Pusan 602-714 Korea

- 1. Introduction
- 2. Knowledge Management at a Glance
- 3. Cultures in Organization and Society
  - 3.1. Management Philosophy
  - 3.2. Organizational Structure
  - 3.3. Reward System
- 4. Why Culture in Knowledge Management?
- 5. Cultures That Enhance or Hinder Knowledge Management
  - 5.1. Eastern versus Western Culture
  - 5.2. Open versus Closed Culture
  - 5.3. Collaborative versus Authoritarian Culture
  - 5.4. Record-Oriented versus Word-of-Mouth Culture
  - 5.5. Empowered versus Power-Distance Culture
  - 5.6. Impersonal versus Personal Culture
  - 5.7. Market-Oriented versus Agrarian Culture
  - 5.8. High-Trust versus Low-Trust Culture
- 6. Conclusion

### Hierarchy, Complexity, and Agent-Based Models

352

David Geoffrey Green, Environmental and Information Science, Charles Sturt University, Australia

- 1. Introduction
  - 1.1. The Need for Complexity Studies
  - The Nature of Complexity
  - 2.1. The Network Model
    - 2.1.1. Graphs
    - 2.1.2. Networks
  - 2.2. Hierarchies
  - 2.3. Agents
  - 2.4. Complex Problems
- 3. The Science of Complexity
  - 3.1. Control Theory
  - 3.2. Emergent Phenomena
  - 3.3. Criticality
  - 3.4. Self-Organization
    - 3.4.1. Global Order and Local Interactions Between Agents
    - 3.4.2. L-Systems and Growth
    - 3.4.3. Agents and Intelligence
  - 3.5. Measures of Complexity
    - 3.5.1. Measuring Complexity
    - 3.5.2. Computational Complexity
  - 3.6. Adaptation and Evolution
- 4. Studies of Complexity
  - 4.1. The Origins of Complexity Research
  - 4.2. Simulation
    - 4.2.1. Development of Simulation Methods
    - 4.2.2. Object-Oriented System Development
  - 4.3. Evolutionary Computing
    - 4.3.1. Neural Networks
    - 4.3.2. Search and Optimization
  - 4.4. Artificial Life
    - 4.4.1. Biological Self-Organization
    - 4.4.2. Self-Replication
    - 4.4.3. Cellular Automata

4.5.	(	Cc	m	ıp	le	xity	ir	ı Biol	ogy

- 4.5.1. Natural Computing
- 4.5.2. Biological Complexity
- 4.6. Complexity in Human Systems
- 4.7. Complexity in Physical Systems
- 4.8. Complexity and Knowledge
  - 4.8.1. The Paradigm of Natural Computation 4.8.2. Organizing Information

  - 4.8.3. The Internet
- 5. The Future

**About EOLSS** 

- 5.1. Managing Complexity in the Real World
- 5.2. Complexity and Technology
- 5.3. Open Questions

Index	391

397