

# Contents

## Part I The Business Challenge of Dynamic Complexity

<b>1</b>	<b>The Growing Business Problem of Dynamic Complexity . . . . .</b>	<b>3</b>
	A Simple Analogy of a Hill Walker Explains the Hidden	
	Effects Dynamic Complexity. . . . .	4
	An Example of How Interactions in an IT System	
	Cause Dynamic Complexity . . . . .	5
	Is Dynamic Complexity a Modern Problem? . . . . .	8
	Process, Methods and Mathematics . . . . .	8
	Definition of Terms . . . . .	9
	Dynamic Complexity and Its Effects . . . . .	10
	Dynamic Complexity Analysis: The Foundational Mathematics. . .	10
	Dynamic Complexity Solution: Optimal Business Control . . . . .	11
	Conclusion . . . . .	11
<b>2</b>	<b>The Hidden Time Bomb Known as Dynamic Complexity. . . . .</b>	<b>13</b>
	Introduction. . . . .	13
	Understanding the Ticking Time Bomb	
	(a.k.a. Dynamic Complexity). . . . .	14
	Expected Versus Experienced Efficiency-of-Scale . . . . .	16
	Failing to Identify Hidden Causes of Performance Loss . . . . .	17
	Conclusion . . . . .	18
<b>3</b>	<b>The Challenge of Expecting the Unexpected . . . . .</b>	<b>19</b>
	Introduction. . . . .	19
	Framing the Unexpected Challenge . . . . .	20
	The Challenge of Past-Present-Future. . . . .	21
	A Paradigm Shift: The Future Oriented Enterprise. . . . .	23
	Implementing a Broader Future-Oriented Planning Perspective . . . . .	23
	Managing the Multiplier Effect of Dynamic Complexity . . . . .	25
	Meeting the Challenge . . . . .	27

A Short Exercise . . . . .	27
Conclusion . . . . .	28
<b>4 Dynamic Complexity in Action . . . . .</b>	<b>29</b>
Introduction. . . . .	29
Setting the Scene . . . . .	30
Probability and Uncertainty . . . . .	31
The Speed at Which the Unexpected Happens. . . . .	32
Insight . . . . .	33
Conclusion . . . . .	34
<b>5 Hide and Seek . . . . .</b>	<b>37</b>
Introduction to Hidden Effects. . . . .	37
The Law of Unintended Consequences . . . . .	37
Capt. Ed Murphy's (1918–1990) Pronouncement. . . . .	39
Adam Smith Told us Something Relevant a Long Time Ago . . . . .	39
Not Every Law is a Physical Law: Good or Bad? . . . . .	40
Conclusion . . . . .	40
<b>6 Predicting the Unexpected . . . . .</b>	<b>43</b>
Introduction. . . . .	43
Examining the Pitfalls of Probability . . . . .	43
Moving Towards Better Predictability . . . . .	45
How Can We Predict What Has Never Been Seen? . . . . .	45
Conclusion . . . . .	46
<b>7 Gaining Perspective on Complexity . . . . .</b>	<b>49</b>
Setting the Scene About Complexity . . . . .	49
How Can We Define Complexity? . . . . .	49
Who Sees Complexity? . . . . .	50
How to Assess Perceived Complexity? . . . . .	52
The Perceived Static View is not Enough . . . . .	52
Changing Complexity . . . . .	53
Conclusion . . . . .	54
<b>8 The Wool, the Eyes and the Pulling-Over . . . . .</b>	<b>55</b>
The Business Relationship of Complexity and Technology . . . . .	55
The Status Quo . . . . .	56
Consider a Plane Solution. . . . .	57
Consider a Retail Outlet Solution. . . . .	57
Back to Financial Markets: Consider a Parrot . . . . .	59
What About the Future? . . . . .	60
Conclusion . . . . .	61

<b>9</b>	<b>An Engineering and Re-engineering View . . . . .</b>	<b>63</b>
	Introduction: Scene Setting About Engineering . . . . .	63
	What's 'Good Engineering'? . . . .	64
	Change, Dynamics and Design . . . . .	64
	Transparency . . . . .	65
	Two Forms of Analysis . . . . .	66
	Benchmarking and Dynamic Complexity . . . . .	67
	Why Technology Still Matters . . . . .	69
	Conclusion . . . . .	69
<b>10</b>	<b>How Dynamic Complexity Drags a Business Down . . . . .</b>	<b>71</b>
	Introduction. . . . .	71
	Example: The Creeping of Dynamic Complexity Drag . . . . .	72
	Contain Risks Using Advanced Modeling to Reveal Unknowns. . . . .	75
	Example: A Telco Prepares for Market Expansion . . . . .	76
	Conclusion . . . . .	79
 <b>Part II Dynamic Complexity Analysis</b>		
<b>the Foundation for the Solution</b>		
<b>11</b>	<b>How Do We Spot the Un-spottable? . . . . .</b>	<b>83</b>
	Introduction to Patterns, Dynamic Patterns	
	and Compound Patterns . . . . .	83
	The Origin of Patterns . . . . .	84
	How Might We Use Patterns? . . . . .	85
	How We Might Understand Patterns? . . . . .	86
	Dynamic Patterns: Emulative Deconstruction . . . . .	87
	How Perturbation Theory Helps Us . . . . .	91
	Computation Uses Dynamic Signature Characteristics . . . . .	92
	Practical Use of Dynamic Patterns in Predicting	
	Future Architecture . . . . .	93
	Insight . . . . .	94
<b>12</b>	<b>Predictive Modeling . . . . .</b>	<b>95</b>
	Introduction. . . . .	95
	Mechanisms to Help Solve the Problem . . . . .	95
	Perturbed Service Process: Analytical Solution . . . . .	97
	Small Divisors and Their Effects Can Cause Chaos . . . . .	98
	System Dynamics Theories . . . . .	99
	Small Divisor Problems in Partial Differential	
	Equations (PDE's): The Perturbed Solution. . . . .	100

<b>13</b>	<b>A Theory of Causal Deconstruction</b> . . . . .	103
	Introduction. . . . .	103
	A Complex System Under Optimal Control . . . . .	103
	Hierarchic Perturbation Model. . . . .	105
	The New Method: Causal Deconstruction Method . . . . .	110
	Stage 1: Establish Base Dynamics . . . . .	111
	Stage 2: Deconstruct Complexity . . . . .	112
	Stage 3: Construct Emulator . . . . .	114
	Stage 4: Predict Singularities . . . . .	116
	Stage 5: Compare to Actual . . . . .	118
	Stage 6: Define Improvement . . . . .	120
	Stage 7: Monitor Execution. . . . .	121
	Example 1: Causal Deconstruction of a Complex IT System. . . . .	122
	Example 2: Causal Deconstruction of a Complex System . . . . .	123
	Example 3: High Technology Production Line Factory. . . . .	125
	Conclusion . . . . .	125
<b>14</b>	<b>Causal Deconstruction: The Beautiful Problem Provides the Smart Solution</b> . . . . .	127
	Introduction. . . . .	127
	The Early Days . . . . .	127
	Deeper into the Solution . . . . .	128
	Examples of Dynamic Complexity (View from the Causal Deconstruction) . . . . .	132
	The Importance of Hierarchic Predictive Emulation within Causal Deconstruction Theory . . . . .	136
	Mathematical Predictive Emulation of Dynamic Complexity. . . . .	139
	Step 1: Define and Collect Information . . . . .	139
	Step 2: Deconstruct and Prepare the Input to the Mathematical Emulation . . . . .	140
	Step 3: Emulate the System and Its Dynamic Complexity. . . . .	140
	Step 4: Use the Mathematical Predictive Analytics to Diagnose, Discover Limit and Identify Remediation. . . . .	141
	Conclusion . . . . .	141
<b>15</b>	<b>A Mathematical Treatise of Dynamic Complexity</b> . . . . .	143
	Introduction. . . . .	143
	The Origin of Perturbation Theory . . . . .	143
	Solving a Problem Using Perturbation Theory . . . . .	145
	Perturbation Orders . . . . .	145
	Why Use Perturbation Theory Versus Numerical or Statistical Methods? . . . . .	146

Exposing the Unknown Using Mathematics . . . . .	146
Mathematical Hierarchy . . . . .	148
8-Level Hierarchy . . . . .	148
N Level Hierarchy: Postal Services . . . . .	149
Perturbation Theory Mathematical Solution. . . . .	152
The Envelop or the Exact Solution. . . . .	152
The Mathematical Solution (Patents in Reference). . . . .	152
Lower-Level Mathematical Emulation Examples . . . . .	155
Example 1 Space-Time: The Case of Relational Data Model (Direct and Indirect Perturbation). . . . .	155
Example 2: Human Service (Direct and Indirect Perturbation). . . . .	160
Example 3 Space-Time: Postal Sorting Machine or Robot in Automotive Production Workshop . . . . .	161
Example 4: Economic Instruments . . . . .	161
The Mathematical Method . . . . .	163
Validation and Calibration (As the World is not Perfect) . . . . .	163
<b>16 Emulative Deconstruction for Mathematical Prediction . . . . .</b>	<b>165</b>
Introduction. . . . .	165
Definition of Emulative Deconstruction Theory. . . . .	166
Why Is Emulative Deconstruction Necessary? . . . . .	167
Understanding Corporate Performance: Influencers and Impacting Factors . . . . .	167
Examples of Corporate Performance Influencers and Impacting Factors . . . . .	168
Extended Predictive Space . . . . .	168
Common Predictive Platform for Existing and Future Enterprise . . . . .	168
Dynamic Maneuverability Metric. . . . .	170
<b>17 Singularity and Chaos Theory. . . . .</b>	<b>175</b>
Introduction. . . . .	175
Why Singularity and Chaos Point Is Important to Discover and Predict . . . . .	175
The Chaos Theory . . . . .	176
The Singularity Theory. . . . .	178
Single Singularity . . . . .	178
Multiple Singularities: Singularity Resurgence. . . . .	180
Areas Covered by Mathematical Predictive Analytics. . . . .	180
Conclusion . . . . .	182

### **Part III The Application of Optimal Business Control**

<b>18 Improving Business Outcomes with Optimal Business Control. . . . .</b>	<b>185</b>
Introduction. . . . .	185
The Applicability of OBC. . . . .	185
Examples of Business Processes . . . . .	186
Examples of National Processes. . . . .	186
Examples of International/Global Processes. . . . .	186
The Definition of OBC. . . . .	187
Translation of Performance Goals into Computerized Formats. . . . .	187
Consolidation of Historic Patterns and Predicted Metric Information. . . . .	188
Operational Performance Analysis and Identification of Correctional Actions. . . . .	189
Interventions Made by Management in Light of the Predictive Information Reported. . . . .	190
The Theory of Optimal Business Control (OBC):	
Process Control, Optimal Control. . . . .	190
Risk Daunting Managers. . . . .	191
The Vital Solution . . . . .	193
Optimal Business Control Theory . . . . .	194
How It Works . . . . .	195
Optimal Business Control Is a Global Framework . . . . .	197
Example of Corporate Revival. . . . .	197
Conclusion . . . . .	201
<b>19 The Role of Business Architecture: A Case Study . . . . .</b>	<b>203</b>
Introduction. . . . .	203
Architecture Determination . . . . .	203
A Case Study: Using Model-Based Architecture Methodology and X-Act Predictive Tooling to Transform Architecture . . . . .	204
Target Architecture Development and Modeling Approach . . . . .	204
Summary of Approach . . . . .	205
Target Architecture: Guideline Principles . . . . .	206
To Gain Fluidity, Scalability and Predictability . . . . .	206
The Target Architecture Characteristics . . . . .	207
Conclusion . . . . .	208
<b>20 Strategic Transformation of Industries: Predictive Management of Postal Services Case Study . . . . .</b>	<b>209</b>
Introduction. . . . .	209
A Case Study . . . . .	209
Static Versus Dynamic Complexity in Postal Services . . . . .	210

Addressing the Problem . . . . .	210
Postal Services Challenges and Proposed Predictive Technology Roadmap. . . . .	215
Towards Robust Service Delivery . . . . .	217
Service Planning, Control and Monitoring Through the Predictive Emulation. . . . .	218
Further Role of Predictive Emulator: Towards Optimal Control. . . . .	220
<b>21 Using Predictive Analytics to Mature IT Production . . . . .</b>	<b>221</b>
Introduction. . . . .	221
Perspective . . . . .	221
What's Wrong with Current IT Production Practices? . . . . .	222
Testing Is a Burden . . . . .	223
Difficult Budget, Time and Quality Trade-Offs . . . . .	223
Unpredictable Results. . . . .	223
How 'Dynamic Complexity' Threatens IT Production Goals. . . . .	224
Too Many Variants . . . . .	224
Risk Exist in Gaps Between Domains . . . . .	224
Common IT Testing Challenges and Solutions . . . . .	225
Reinventing IT Production with Predictive Analytics . . . . .	226
Use Predictive Analytics in All SDLC Stages . . . . .	227
Become Future-Oriented. . . . .	228
Understand NFRs. . . . .	228
Monitor NFRs as They Evolve . . . . .	229
Use OBC to Support Strategic SDLC. . . . .	229
Expand Testing Capabilities . . . . .	229
Adopt a Holistic Approach . . . . .	230
Achieve 100 % Testing Coverage . . . . .	230
Map Business Requirements to Technical Specifications. . . . .	231
Diagnose and Improve . . . . .	232
Getting Started with Predictive Model-Based Testing. . . . .	232
Establishing a Test Factory to Advance System Testing Maturity . . . . .	232
What Problems Does a Test Factory Solve? . . . . .	233
Test Factory Benefits . . . . .	234
Conclusion . . . . .	235
<b>22 Prescriptive Production: A Case Study . . . . .</b>	<b>237</b>
Introduction. . . . .	237
Background. . . . .	237
How 'Dynamic Complexity' Threatens Production Goals . . . . .	238
Dynamic Complexity Causes Performance Loss . . . . .	238
Instinctive Decision-Making Is No Longer Sufficient. . . . .	238
Overcoming Production Management Challenge . . . . .	239

Predictive Analytics Provide Insights into the Future . . . . .	239
Pairing Human + Machine . . . . .	240
Reinventing Production Management . . . . .	240
How Prescriptive Production Works . . . . .	241
Maximize ROI with an Analytics Center of Excellence . . . . .	242
Getting Started with a Phased Approach . . . . .	243
Conclusion . . . . .	244
<b>23 The Economic Environment: A Prospective Case. . . . .</b>	<b>247</b>
Introduction. . . . .	247
The Components and Characteristics of a Broader Solution . . . . .	247
Is the Next Economic Bubble Showing Its Early Shoots? . . . . .	249
Conclusions. . . . .	251
<b>Epilog: Defining the Way Forward . . . . .</b>	<b>253</b>
<b>Appendix: Exploring the Pitfalls of Traditional Risk</b>	
<b>Analysis in Financial Industries . . . . .</b>	<b>261</b>
<b>Key Concepts . . . . .</b>	<b>267</b>
<b>Glossary . . . . .</b>	<b>269</b>
<b>Bibliography . . . . .</b>	<b>273</b>
<b>Index . . . . .</b>	<b>279</b>



Solving the Dynamic Complexity Dilemma

Predictive and Prescriptive Business Management:

Answering the Need for a New Paradigm

Abu el Ata, N.; Perks, M.J.

2014, XXVI, 281 p. 92 illus., 6 illus. in color., Hardcover

ISBN: 978-3-642-54309-8