

Big Data Strategies for Agile Business



Bhuvan Unhelkar

Big Data Strategies for Agile Business Framework, Practices, and Transformation Roadmap



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Big Data Strategies for Agile Business Framework, Practices, and Transformation Roadmap

By
Bhuvan Unhelkar, PhD, FACS



CRC Press

Taylor & Francis Group

Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business
AN AUERBACH BOOK

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

© 2018 by Taylor & Francis Group, LLC
CRC Press is an imprint of Taylor & Francis Group, an Informa business

No claim to original U.S. Government works

Printed on acid-free paper

International Standard Book Number-13: 978-1-498-72438-8 (Hardback)

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged, please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access www.copyright.com (<http://www.copyright.com/>) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Visit the Taylor & Francis Web site at
<http://www.taylorandfrancis.com>

and the CRC Press Web site at
<http://www.crcpress.com>

Dedicated to these dear friends who departed (some before their time) in the span of a year as this book was being written.

May You All Rest in Peace!

Padmanaabh Desai

Ed Yourdon

Houman Younessi

Warren Irish

Kamlesh Chaudhary

Barry Gunn

Dilip Thakar

Arvind Swami



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Any sufficiently advanced technology is indistinguishable from magic.

Arthur C. Clarke

Freedom from the desire for an answer is essential to the understanding of a problem.

J. Krishnamurti

So it is incumbent on me to know myself, to know it completely, to know its minutiae, its characteristics, its subtleties, and its very atoms

Kahlil Gibran



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Contents

List of Figures.....xxiii
List of Tablesxxix
Foreword.....xxxi
Prefacexxxv
Acknowledgmentsxl
About the Authorxlvii
Domain Terms and Acronyms.....xlix

**SECTION I INTRODUCTION TO BIG DATA STRATEGIES
AND OUTLINE OF BIG DATA FRAMEWORK
FOR AGILE BUSINESS (BDFAB)**

1 Introduction to BIG Data and Agile Business.....3
Chapter Objectives 3
Big Data and Business Value 3
 Data 4
 Value in Decisions..... 5
 Big Data Differentiator..... 6
 Business Agility as a Big Data Opportunity 7
 Data-Driven Decisions, Information, and Knowledge 8
Strategic Approach to Big Data..... 9
 Setting the Scene for Strategies 9
 Understanding and Transcending Analytics and Technologies 12
Data Science to Business Leadership.....17
 Envisioning a Holistic Big Data Strategy.....18
Big Data as Agile Business Enabler 23
 Agile and Big Data 23
 Types and Sizes of Organizations and Their Big Data Capabilities..... 24
 Business Agility Is Fast and Accurate Decision Making with Finer Levels of
 Granularity 24
Composite Agile Method and Strategy 26
Lean, Agile, and Big Data..... 27
Big Data–Driven Business Strategies 28
 External Growth of the Business 28
 Internal Optimization of Business Processes and Structure 28
 Risk Management and Compliance with Big Data31

Sustainability and Environment	31
Challenges of Adopting Big Data.....	31
Contemporary Challenges of Big Data in Business	31
Minimally Understood Business Context (Business and Processes)	32
Lacking a Holistic View to the Approach (Organization and Agility).....	33
Overwhelming and Fast-Changing Technology (Enterprise Architecture)	34
Variety and Volume of Data: Complexity and Lack of Governance (Quality and GRC)	35
Lack of Standards and Skills (Maturity of People)	35
Advantages of Value-Added Strategies for Big Data	35
Tactical Advantages of Big Data.....	36
Operational Advantages of Big Data	36
Strategic Advantages of Big Data.....	36
Foundations of a Big Data Strategic Framework	37
Impetus and Catalysts for Big Data Strategy Formation	37
Reasons for Big Data Adoption Strategy	38
Embedding Big Data Analytics in Business Processes Resulting in Agile Business Processes	40
Action Points in Practice.....	41
Consolidation Workshop	42
Notes	42
Further Information	44
2 Big Data Framework for Agile Business (BDFAB)	47
Chapter Objectives	47
Big Data Framework for Agile Business	48
Need for a Framework for Big Data Adoption.....	48
Big Data Framework for Agile Business	50
BDFAB: Overview of the Framework, Its Values, and the Iterations.....	51
Key Elements of BDFAB.....	51
Values of an Agile Business Enabled by Big Data	54
Key Roles (Technical and Business) in Adopting and Operationalizing Big Data and Agile.....	58
Building Blocks (Modules)	59
Artifacts (Deliverables).....	60
Business Conditions	60
Agile Practices	61
Compendium (with Roadmap, Strategy Cube, and Manifesto)	61
Applying BDFAB: Iterative and Incremental Process	62
BDFAB Modules (Five Building Blocks)	62
Business Investment Decisions (Module 1 of 5)	66
Exploring the Current Business and Organizational Environment	67
Setting the KPIs for the Success of an Agile Business (with Big Data).....	68
Assessing Organizational Readiness through Levels of Maturity in BDFAB	69
SWOT Analysis of an Organization in the Context of Big Data	70
Risk and SWOT Analysis	70
Strengths of Big Data	72

Weak Points in Big Data Adoption	73
Opportunities with Big Data Adoption.....	74
Threats from Big Data Adoption	75
Brief Introduction of the Remaining Four Modules of BDFAB.....	76
Data Science: Analytics, Context, and Technology (Module 2 of 5)	76
Business Processes (Granularity in Decision Making), Analytics, Visualization, and Optimization (Module 3 of 5).....	76
Enterprise Architecture: SMAC and TESP (Module 4 of 5).....	77
Quality, GRC, and People (Skills) (Module 5 of 5)	77
Artifacts (Deliverables) in BDFAB.....	78
Business Conditions (Parameters)	78
Agile Practices.....	80
Compendium (Roadmap, Strategy Cube, and Manifesto)	80
Big Data Adoption Roadmap	80
Strategy Cube (Three-Dimensional).....	80
Big Data Manifesto	83
BDFAB Advantage: Business Value and Risk Reduction	84
Identifying the Risks in Transforming to Big Data–Driven Agile Business.....	84
Iterative Exploration of Needs by Users.....	84
Customer Experience Is a Value Provided through Context	85
Valuing Agile as a Customer-Centric, Rapidly Changing Business	85
Collaborative Partnerships in Offerings.....	85
Reality Testing with Enterprise Architecture.....	85
Encouraging Formation of Communities.....	86
Incorporating Multiple Layers of Analytics in Business Processes	86
Working toward a Holistic Agile Business	86
Ensuring Governance and Compliance.....	87
Sustainability and Carbon Compliance.....	87
Focus on People and Acceptance of External Skills	87
Action Points in Practice.....	87
Consolidation Workshop	88
Notes	88

SECTION II ANALYTICS, PROCESSES, TECHNOLOGIES, ARCHITECTURE, AND DATABASES WITHIN THE BDFAB

3 Data Science—Analytics, Context, and Strategies.....	93
Chapter Objectives	93
Data Science: Analytics, Context, and Strategies	93
Understanding the Importance of Data Science	93
Data Curiosity by Business.....	95
Data Analytics as a Core Part of Data Science.....	97
Data Strategies for Management and Analytics.....	99
Data Types and Their Characteristics for Analytics	103
3 + 1 + 1 (5) Vs of Big Data	103
Security and Storage Issues for Large Volumes and Velocity of Data.....	104
Data Point and the Context	104

A Data Point	104
Data Point and the Context	106
Machine Learning and Hex Elementization: Further to Context	108
Journey of a Context-Based Data Point	110
Granularity of Data, Analytics, and Processes	111
Granularity of Data and Analytics	111
Fine Granularity and Agile	113
Analytic Categories and Business Agility	114
Analytics: From Information to Exploration	114
Leveraging Analytics for Business Agility	119
Action Points in Practice	121
Consolidation Workshop	121
Notes	122
4 Business Process Modeling (BPM), Agile Practices, and Big Data Adoption Process ...	125
Chapter Objectives	125
Business Process Modeling and Big Data Adoption	126
Importance of Business Process Modeling in Big Data Adoption	126
Range of Processes in an Organization	129
Impact of Agile on Big Data–Enabled Business Processes	130
TESP and Big Data	132
Using the TESP Dimensions in Big Data Adoption	132
Economic (Why Adoption of Big Data? ROI and Business Risks)	133
Technology (What to Use in Big Data Adoption? HDFS and NoSQL)	133
Process (How to Adopt Big Data and How Current Business Processes Will Change—Analytics and Usage)	133
Social (Who Will Get the Value, and Who Will Enact the Change? Users, Customers, Staff)	134
Big Data and the Changing Business Functions	135
Changes to Organizational Information Systems	135
Business Analysis, Business Process Reengineering, and Change Management	136
Lean–Agile and Big Data	138
Modeling Requirements for Big Data Solutions	139
Use Case Diagrams in Modeling Requirements	139
Stakeholders in BDFAB	140
Role of Use Cases in Big Data–Based Requirements	141
Role of Activity Diagrams of the UML as Process Models for Embedding Big Data Analytics	142
Nonfunctional (Operational) Requirements	143
Usability Requirements	144
Embedding Big Data Analytics in Business Processes	145
Analytics and Creative Business Processes	145
Steps in Embedding the Analytics in Processes	145
Role of CAMS in Big Data Adoption	146
Activities and Tasks in Requirements Modeling	149
DevOps and Operationalizing the Solution	149
A Roadmap for Big Data Adoption	156

12-Lanes × 4-Iteration Roadmap	156
Iterative Adoption of Big Data	159
Action Points in Practice	159
Consolidation Workshop	161
Notes	161
5 Enterprise Architecture and the Big Data Technical Ecosystem	163
Chapter Objectives	163
Architecture, Enterprise Architecture, and Big Data	164
Architecture and Big Data	164
Enterprise Architecture in Big Data Technology Adoption	165
Internet of Things, Internet of Everything, and Big Data	169
Agility in Developing and Using EA	170
Mapping Big Data Strategy to EA	171
Big Data and Hadoop Technical Ecosystem	173
Basics of Hadoop	173
Business Opportunities Based on Hadoop and Agile	175
Basics of a Big Data Technical Architecture	176
Analytical, Storage, and Infrastructure Technologies Enabled by the Hadoop Ecosystem	179
Spark Complements Hadoop	179
Synchronization of the Layers of the Big Data Technology Stack	180
Layers of the Enterprise Technology Stack Based on EA	180
Layer 1: Communications (Networks and Infrastructure)	180
Layer 2: Data Storage (SQL and NoSQL)	182
Layer 3: Analytics and Binding	182
Layer 4: Business Processes and Applications	183
Layer 5: Presentations and Visualization (User Interfaces)	184
Security Architecture (All Layers)	184
Disparate, Distributed Elements and Their Synchronization through Services	186
Big Data, EA, and Agile Business Strategies	188
Architectural Change Management and Business Agility	189
Hadoop and Data Agility	190
Embedding Agile Iterations in Analytics and Storage	192
Action Points in Practice	193
Consolidation Workshop	193
Notes	193
6 Social Mobile (SoMo), Presentation, and User Experience in Big Data	195
Chapter Objectives	195
The SMAC Quartet	196
Social, Mobile, Analytics, and Cloud	196
SMAC, Agile, and Big Data	197
SMAC Technologies and Conceptual Mapping with Input/Output, Processing, and Storage	197
Interconnected Nature of SMAC and Importance of the Composite Agile Method and Strategy	199

SMAC and Agile: Approaching with Balance	202
Social Media and CAMS	202
Mobile and CAMS.....	203
Analytics and CAMS	204
Cloud and CAMS	204
Synergizing the Use of the SMAC Stack and Big Data	205
Consumers, Providers, and Value Adders of SMAC	205
Data from Multiple Sources and in Multiple Formats	205
Knowledge Sharing across the Organization	205
Scalability and Agility through Cloud Solutions	206
SoMo, Sustainability, and the Environment	206
SMAC Stack and Business Integration	206
SMAC and the Business Size and Type	206
SMAC Risks and Business Concerns.....	208
Deriving Business Value from SMAC and Big Data	208
Social Media: What, When, and Where of Big Data	208
Social Media and Customer Sentiments	209
Harnessing Variety of Data from SoMo	209
SMAC and Industry Verticals	210
Mobile Apps and Agile Business Processes.....	210
Mobile Apps Development and Deployment.....	210
Mobile Technologies and Personalization of Data and Contents	211
Mobile Technologies and Generation of Big Data	212
Mobile Metadata and Customer Relationship Management	212
Real-Time Interaction with Mobile Apps	212
Spot-Based Analytics	213
Dynamic Business Processes Driven by Mobile Analytics	213
Dynamic Customer Group “Tribe” Formation	214
SoMo and Presentation	214
Presentations (Visualizations)	214
Developing Good Presentation.....	215
User Experience Is the Business Value	215
Beyond User Interfaces and into User Experience	215
User Experience Analysis Subframework.....	215
After User Contact (t_1 to t_{+1})	217
Incorporating User Categories in Analytics.....	217
Action Points in Practice.....	220
Consolidation Workshop	220
Notes	220
7 Cloud-Based Big Data Strategies, Sustainability, Analytics-as-a-Service	223
Chapter Objectives	223
Cloud Computing and Big Data.....	224
Cloud Is the C of the SMAC Stack	224
Basics of Cloud Architecture	224
Cloud Characteristics and Big Data	225
Data Storage and Security on the Cloud	225

Sharing of Data on the Cloud	226
Scalability (Elasticity) of the Cloud	227
Leanness and Agility Facilitated by the Cloud	227
Cloud as a Cost-Effective Mechanism for Storage and Analytics	227
Single-User View Using the Cloud	227
Collaborative Analytics on the Cloud	228
Visualizations and the Cloud	228
Challenges of Big Data Analytics on the Cloud	228
Cloud Analytics Enabling Business Agility	230
Cloud and the Enterprise Architecture	232
Intersection of Cloud and Analytics with SoMo	233
Software as a Service	234
Platform as a Service	235
Infrastructure as a Service	235
Analytics as a Service: Cloud Analytics	235
Architecting Analytical Services	236
Types of Big Data Analytical Services	237
Offering Analytics as a Service	238
Requirements of Data Analytics on the Cloud	238
Developing Services Using the Composite Agile Method and Strategy	239
Services Development Using Agile and Planned Project Management	239
Self-Service versus Managed Service in the Context of Big Data Analytics	240
Positive Experience of the Services to the Users	241
Organic Growth of Services	242
Capacity and Capability Building around Services	242
Market Development	242
Change Management and Self-Serve Analytics	242
Adopting and Positioning Big Data Analytics on the Cloud: Strategic Questions	244
Cloud and Sustainability	245
Cloud and Virtualization Reduce Carbon Footprint	246
Business and Data Integration	248
Cloud and SMEs	248
Action Points in Practice	250
Consolidation Workshop	251
Notes	251
References	253
8 Big Data, Semantic Web, and Collaborative Business Process Engineering (CBPE) ...	255
Chapter Objectives	255
Semantic Web and Big Data	256
What Is the Semantic Web and Its Significance to Big Data?	256
Iteratively Using the Semantic Web for Big Data	257
Business Agility and the Semantic Web	260
Multimedia Data in Developing Semantically Aware Applications	261
Developing Semantically Aware Applications	262
Utilizing Big Data Characteristics in a Semantic Enterprise	262
Deriving Additional Meanings in Big Data Using the Semantic Web	264

Caveats in Using the Semantic Web in Big Data	266
Semantic Web and Organizational Strategies.....	266
Mechanisms for the Using Semantic Web: Ontologies and Taxonomies.....	268
Meaningful Exchange of Information and Knowledge.....	268
Rules and Ontologies for Knowledge Generation in the Semantic Web	268
Input the User Has Provided	270
Information the User Provided in the Past.....	270
Additional Information the User Inadvertently Provided.....	271
Information the User May Not Be Willing to Provide.....	271
Business Value of SAAs	271
Ontologies and Rules	272
Semantic Web Technologies	272
Resource Description Framework and the Basics of Triples in Developing SAAs.....	272
Semi- and Unstructured Data to Analytics	274
Big Data and Collaborations (Using CBPE)	274
Understanding Collaborations	274
Collaborative Business Processes and Agility.....	275
Horizontal Clusters	276
Vertical Clusters	276
Collaborative Environments and Business Value	277
Business Integration with CBPE.....	278
Action Points in Practice.....	280
Consolidation Workshop	281
Notes	281
References.....	282
9 NoSQL Databases and Big Data Strategies.....	283
Chapter Objectives	283
Data Storages and Business Decisions.....	284
Challenges of Big Data Management from a Business Viewpoint	285
The Business of NoSQL	287
Evolution of NoSQL Big Data Stores	287
NoSQL as a Mechanism to Handle Semi- and Unstructured Data	288
NoSQL and Big Data.....	290
Schemalessness of NoSQL and Business Value.....	291
Key-Value NoSQL Database.....	293
Document-Centric NoSQL Database.....	293
Describing Document Databases	293
MongoDB: Example of Document Databases.....	294
Graph NoSQL Databases	294
Describing Graph Databases	294
Columnar NoSQL Database.....	295
Description of Columnar Databases.....	295
HBase and Cassandra: Examples of Columnar Databases.....	297
Fundamental Complexity of NoSQL.....	297
Comparison Factors	297
Using NoSQL Databases in Practice	300

Using in Practice.....	300
NoSQL and Distributed Databases Architecture	301
Clustering, Distribution, and Sharding in NoSQL.....	301
ACID (SQL) and BASE (NoSQL) Database Characteristics	302
ACID: Atomic, Consistent, Isolated, and Durable.....	302
BASE: Basically Available, Soft State, and Eventually Consistent	302
CAP Theorem and NoSQL	303
Effect of Sharding and Replication in Applying the CAP Theorem.....	304
NoSQL and Business Agility	305
Agility and NoSQL.....	305
Use Case: Event Logging and Business Agility	305
Use Case: CMS and Blogging—and Business Agility.....	306
Use Case: Expiring Usage and Business Agility	306
In-Memory NoSQL Databases and Business Agility.....	306
Action Points in Practice.....	307
Consolidation Workshop	307
Notes	308

SECTION III **QUALITY, GRC, PEOPLE AND THEIR UPSKILLING, AND AGILE BUSINESS WITHIN THE BDFAB**

10 Quality and Service Assurance, Testing, and Governance—Risk—Compliance (GRC) within Big Data.....	313
Chapter Objectives	313
Quality Function and Big Data	314
Quality Considerations in a Big Data Environment.....	314
Detection versus Prevention in Quality of Big Data.....	315
Quality of Data in the Big Data Domain.....	315
Quality of Big Data Analytics.....	315
Model and Architecture Quality for Big Data.....	316
Big Data and Business Process Quality	317
Management of Big Data Quality	317
Quality Environment for Big Data Adoption	317
Approaching the Quality Function for Big Data in a Strategic Manner.....	318
Inherent and Applied Data Quality Characteristics	318
Strategic Considerations in Approaching Big Data Quality.....	319
Quality Activities Corresponding to the Data Transition Phases.....	320
Big Data—Specific Challenges to Quality and Testing.....	323
Syntax, Semantics, Aesthetics, and Value of Quality in Big Data	324
Verification and Validation.....	324
Quality of Models: Syntactical Correctness.....	325
Quality of Models: Semantic Meaning.....	326
Quality of Models: Aesthetics and Ease in Use	326
Data Quality Impacts Business Decision Making.....	326
Quality Practices in Big Data.....	326
Big Data Testing Approach: Functional versus Nonfunctional Quality	328
Quality of Metadata.....	329

Sifting Value from Noise in Big Data	329
Continuous Testing: An Agile Practice	330
Big Data Testing Types	331
Volume Testing	332
Variety Testing	332
Velocity Testing	332
Specific Challenges of Contemporary Testing When Applied to Big Data	333
Mapping Test Cases to Use Cases for Functional Testing	333
Quality of Visualizations	334
Governance–Risk–Compliance in Big Data	334
GRC, Business, and Big Data	335
GRC Technology Benefits	336
GRC Implementation	336
Governance and Risk: A Balancing Act	336
Service Support Using ITIL	337
Service Desk	338
Configuration Management	338
Incident Management	338
Problem Management	339
Change Management	339
Release Management	339
Availability Management	340
Capacity Management	340
Service Continuity Management	340
Service-Level Management	340
Financial Management	341
Security Compliance, Audit, and Risk	341
GRC in Big Data Services Management	342
Request Management	342
Application Management	342
Database Management	342
Environment Management	343
Data Management	343
Customer Management	343
Metrics and Measurement	343
Action Points in Practice	344
Consolidation Workshop	344
References	345
11 Big Data People and Communities	347
Chapter Objectives	347
Soft Aspect of Big Data Adoption	348
Big Data Skills Gap	348
Hard and Soft Skills in Big Data Technologies, Analytics, and Business	348
Capability Enhancement	349
Overlapping Skills of Data Science	353
Skills Framework for Information Age	353

Mapping SFIA to Big Data Skills	353
Developing Team and Organizational Capabilities	355
Training and Upskilling Resources	357
Data Scientist	357
Enhancing Capabilities through Skills, Attitude, Experience, and Influence.....	359
Strategic, Tactical, and Operational Resources	362
Capacity and Capability for Organizational Change with Big Data	366
Changing Business Operations.....	367
Resourcing the Service Model	368
Organizational Capacity and Capabilities to Meet Big Data	369
Managing the Transition at the Operational Level.....	369
Managing the Human Capital for Big Data	374
Performance Metrics	374
Recruiting Process.....	375
Outcomes and Behaviors.....	375
Soft Skills Development	376
Role Transition.....	376
Changing ICT Operations.....	376
Changing Face of Communities with Big Data	377
Cloud-Based Services Platform.....	377
Big Data in Offering Community Services	378
Big Data Application in Developing Agile Communities	380
Action Points in Practice.....	381
Consolidation Workshop	382
Notes	382
12 Functioning Agile Organization with Big Data Adoption.....	385
Chapter Objectives	385
Envisioning an Agile Organization with Big Data	386
Agile as a Business Value from Big Data Adoption.....	386
Advantages of Agility and Big Data.....	388
Envisioning an Agile Organization	390
Functioning Agile Business with Embedded Big Data Analytics	393
Holistic, Fine Granular, and Sensitive Business.....	393
Big Data Enables Agility in Business Dimensions.....	395
External Influencing Factors	396
Customer Relationships.....	396
Business Partners	397
Government Regulatory Factors and Sustainability.....	397
Sociocultural Environment.....	397
Internal Factors and Responses	398
Business Structure	398
Business Innovation.....	398
Business Compliance.....	398
Technology Management	399
People Management	399
Product Management	399

CAMS: Balancing Agility with Formality in Big Data Adoption.....	400
Using CAMS in the Solutions Space	402
Collaborations and Intelligence as Functioning Agile	403
Types of Collaboration	404
Physical Collaboration.....	404
Electronic Collaboration.....	404
Mobile Collaboration	405
Reaching Collaborative Intelligence in Agile Business.....	405
Collaborative Data and Agility.....	406
Collaborative Information and Agility	406
Collaborative Process and Agility	406
Collaborative Knowledge and Agility	407
Collaborative Intelligence and Agility	407
Reaching Collaborative Business Process.....	407
Broadcasting Business Processes	408
Informative Business Processes	408
Transactive Business Processes	408
Operative Business Processes.....	409
Collaborative Business Processes	409
Ongoing Knowledge Synchronization in a Learning Agile Organization	410
Holistic Customer: The Ultimate Goal of Business Agility.....	410
Action Points in Practice.....	411
Consolidation Workshop	412
Notes	412

SECTION IV CASE STUDIES IN BANKING, HEALTH, AND EDUCATION

13 Big Data and Banking: A-Bank Case Study.....	417
Chapter Objectives	417
Description of the A-Bank Case Study.....	417
Outline of the Case Study	417
List of Opportunities for A-Bank with Big Data	418
Stakeholders of A-Bank: Goals and Concerns	419
SWOT Analysis of A-Bank in the Context of Big Data	421
Strengths.....	421
Weaknesses	421
Opportunities.....	422
Threats	424
Mapping of Big Data for Value Creation for A-Bank.....	424
Three Levels of Advantages in Big Data Adoption for A-Bank.....	424
Immediate (Tactical) Advantages for A-Bank with Big Data Adoption	427
Big Data Advantages for Banking Operations (Operational and Business as Usual)..	427
Strategic Advantages and Values to the Many Stakeholders in Banking	428
Applying the TESP Subframework to A-Bank's Advantage	429
SMAC Strategies in Big Data Management	429
Social Media and A-Bank.....	429
Mobility in A-Bank.....	432

Analytics in A-Bank	432
Cloud Computing and A-Bank	432
Big Data Technology Stack and A-Bank	432
Big Data Analytics and Composite Agile Method and Strategy for A-Bank	433
Current State of Banking in Terms of Agility	433
Big Data–Based Options to Make A-Bank Agile	433
Incorporating Big Data–Based Agility in Offering Analytics as a Service of A-Bank	434
AaaS in A-Bank’s Financial Services	434
List of Current A-Bank Services	434
Incorporating Agility in A-Bank’s Services	436
Incorporating Agility in A-Bank’s Branded Services	438
Incorporating Agility in A-Bank’s Operational Services	438
Quality of Shared Services and Big Data	439
Semantic Web and Collaborative Business in A-Bank	440
Quality and Governance Approaches in Big Data Adoption by A-Bank	440
Data Governance Issues in A-Bank	440
Veracity: Quality, Privacy, and Security Issues and the Business Impact on A-Bank ..	441
Special Attention to Privacy of Data in A-Bank’s Initiative	442
Special Focus on Security of Data	442
Summary and Conclusions	442
14 Big Data and Health	445
Chapter Objectives	445
Description of the H-Mead Case Study	445
SWOT Analysis of H-Mead in the Context of Big Data	447
Strengths	447
Weaknesses	447
Opportunities	447
Threats	448
Stakeholders in H-Mead	449
Strategic Advantages and Values to the Stakeholders of H-Mead	449
Mapping the Variety of Big Data to Volume and Velocity for H-Mead	449
Deriving Agile Business Value: New and Changing Business Processes of H-Mead ..	452
Electronic Patient Records and Big Data	453
Current State of Patient Records in H-Mead	453
Patient Record in Use	454
Hospital Staff	454
Support Staff and Agencies	454
Community	455
Collaborators	455
Elements of a Holistic Electronic Patient Record	455
Big Data Processes in Unifying EPR	456
Unified EPR and Big Data Analytics	456
SMAC Stack in H-Mead	457
Incorporating Social Media in the Big Data Framework	457
Incorporating Mobile in the Big Data Framework	457
Big Data Technology Stack in Adopting for H-Mead	458

Big Data Technology Stack	458
Semantic Web and Analytics	458
Quality, Privacy, and Security Issues of Big Data and Business Impact	459
Capturing Quality Data	459
Enhancing People Skills and Capabilities	459
Summary and Conclusions	462
15 Big Data and Education	463
Chapter Objectives	463
Description of the Big Data Adoption Case Study for the Department of Education:	
A Government Scenario	463
Business Case for Big Data	465
Finances and ROI in Education	466
SWOT Analysis of the Education Domain in the Context of Big Data	466
Strengths	466
Weaknesses	467
Opportunities	467
Threats	467
Stakeholders of the DoE	468
Creating BDFAB Iterations	468
Big Data Characteristics: 3V + V Mapping for Education	472
SMAC: Technology Strategies in Big Data Management	473
Incorporating Social Media in the DoE	473
Incorporating Mobile in the Big Data Framework	473
Advantages and Risks in Big Data Adoption	473
Immediate (Tactical) Advantages That Big Data Will Provide to Your Organization	474
Operational Advantages due to Big Data	474
Strategic Advantages and Values to the Many Stakeholders in Your Organization	474
Impact of Big Data Adoption on the Agility of Business Processes in the DoE	476
CAMS Influencing Agility in the DoE	476
Collaborative Business for the DoE Based on Big Data	477
Quality of Big Data in the DoE	477
Veracity: Quality, Privacy, and Security Issues of Big Data and Business Impact	477
Quality of Structured and Semistructured Data	478
Quality of Unstructured Data	478
Summary and Conclusions	478
Appendix A	479
Appendix B	485
Appendix C	487
Appendix D	489
Index	491

List of Figures

Figure 1.1	Examples of technical, analytical, and strategic decisions related to Big Data.	9
Figure 1.2	Big Data strategies—transcending analytics and technologies. ROI, return on investment.	15
Figure 1.3	Data science supported by EA (Big Data based) is the key to leadership in business.	19
Figure 1.4	Approaching Big Data in a strategic manner for Agile business.	20
Figure 1.5	Foundation of Big Data strategies: short- and long-term decision making based on observations, data, information, knowledge, and insights.	22
Figure 1.6	Business (enterprise) agility is the rapidity and accuracy of an enterprise's response to a rapidly changing external and internal situation.	25
Figure 1.7	Big Data–driven business strategies make use of external business opportunities and internal optimization of business processes, enhancing sustainability and environmental considerations, managing risks, and ensuring compliance	30
Figure 1.8	Contemporary challenges of Big Data in business.	32
Figure 1.9	Embedding Big Data analytics in business processes, resulting in Agile business processes.	40
Figure 2.1	Big Data Framework for Agile Business.	52
Figure 2.2	Key elements of BDFAB.	54
Figure 2.3	The business parameters and maturity assessment of an organization provide an understanding of its capabilities in analytics and technologies to create Big Data strategies that will handle risks and provide Agile value.	70
Figure 2.4	SWOT analysis (example) of a business organization in the context of Big Data—and resultant projects (activities) with the backdrop of business architecture, EA, and business analysis. SSA, self-serve analytics.	72
Figure 2.5	Strategy cube: a three-dimensional Big Data opportunity matrix based on Big Data technology and analytics and business agility.	82
Figure 3.1	Data analytics, data categories (pools), and a subprocess for data transformation.	96

Figure 3.2	Data science: management, analytics, and strategies.	101
Figure 3.3	Further detailed characteristics of Big Data's 3 + 1 + 1 Vs.	104
Figure 3.4	A “data point” and associated considerations	105
Figure 3.5	Data point and the context.	107
Figure 3.6	Hex elementization as a mechanism for context of a data point	109
Figure 3.7	Journey of a data point via context engine followed by analytical engine and the granularity-driven feedback loop.	110
Figure 3.8	Concept of granularity in analytics and the factors in ascertaining the OGL.	112
Figure 3.9	Further details of data analytical processes based on finer granularity requirements.	113
Figure 3.10	Identifying associations and mapping clusters	115
Figure 3.11	Various analytics categories provide Agile business values	116
Figure 3.12	Leveraging analytics for business agility.	120
Figure 4.1	Processes as basics of Big Data adoption for Agile business.	126
Figure 4.2	Strategic adoption of Big Data has positive impacts on both internal and external business processes.	131
Figure 4.3	TESP subframework and business processes	132
Figure 4.4	Impact of Big Data strategies on business functions and organizational information systems.	136
Figure 4.5	Use cases at multiple levels of the organization provide inputs and value in decision making: A medium-sized bank—deciding on credit interest rate rise. .	140
Figure 4.6	Model of a use case diagram representing requirements for deciding on interest rate rise. Use case diagrams provide an overview of actors and use cases. Use cases themselves document interactions between the actor and the system.	142
Figure 4.7	Activity diagram representing the process within a use case updating interest rates for a period in a bank.	143
Figure 4.8	Steps in embedding Big Data analytics within business processes.	145
Figure 4.9	Job aids for Agile practices.	147
Figure 4.10	Requirements modeling process map in CAMS.	150
Figure 4.11	An Agile approach to embedding Big Data solutions in business processes needs to keep DevOps in mind—ensuring that operationalizing Big Data solutions is a holistic business activity.	156
Figure 4.12	Transforming to Big Data—driven Agile business: The BDFAB adoption roadmap with 12 lanes and 4 iterations.	157

Figure 4.13	Aligning the Big Data adoption process (expected to iterate at least four times depending on the intensity required) with the TESP subframework in order to ensure smooth changes to organizational structures and dynamics, and smooth transition to Agile business processes.....	160
Figure 5.1	Mapping Big Data strategy to EA (initial, high-level iteration)	172
Figure 5.2	Basics of a technical architecture incorporating Big Data	177
Figure 5.3	Analytical, storage, and infrastructure technologies enabled by the Hadoop ecosystem. ML, machine learning.....	178
Figure 5.4	Enterprise technology stack and its mapping to the (improvised) Big Data technology stack.....	181
Figure 5.5	Positioning operational services in the context of other services of the enterprise	185
Figure 5.6	Big Data disparate elements and their synchronization.	187
Figure 5.7	Exploring agility in Big Data processing.	191
Figure 5.8	Embedding Agile iterations in analytics (statistics) and storage (technologies). ...	192
Figure 6.1	SMAC: technologies and domains	196
Figure 6.2	The SMAC ecosystem: conceptual mapping.	198
Figure 6.3	Interconnected SMAC and Agile value.	200
Figure 6.4	CAMS brings balance in utilizing SMAC.	202
Figure 6.5	SMAC stack integrated with Hadoop ecosystem: business impact and integration process.	207
Figure 6.6	Social media starts with engagement—leading to opportunities for data collection.	208
Figure 6.7	SMAC: Absorbing, storing, and presenting data from mobile sources.	209
Figure 6.8	Social media in practice (travel example).....	210
Figure 6.9	Mobility focuses on personalization; together with social, mobile enables presentation of an “avatar” of a person to various communities.	212
Figure 6.10	Extending the features of mobile apps incorporating Big Data inputs.....	213
Figure 6.11	User experience, usability, and BA for Big Data strategies—going beyond the time period of customer contact with the business in order to capture customer sentiments before and after the contact period.....	216
Figure 6.12	Strategies for analytics (at the macro- and microlevels) need to consider the pre- and postuser in addition to the user.	219
Figure 7.1	Typical characteristics of Cloud computing and their relationship to Big Data. .	226
Figure 7.2	Sources and types of data on the Cloud influencing and supporting Agile business strategies.....	231

Figure 7.3	Further exploring the intersection of the SMAC stack with particular emphasis on the value provided by the Cloud.	233
Figure 7.4	Architecting SSA and service intelligence.....	237
Figure 7.5	The user ecosystem around the Cloud: user, avatar, crowd, and community	243
Figure 7.6	BDFAB strategy question: Where should the analytics be positioned?	244
Figure 7.7	Desktop virtualization by a user with the help of the Cloud	247
Figure 7.8	Data integration and analytic workflow (Lean–Agile for sustainability).	248
Figure 7.9	Strategies for use of the Cloud—analytics by individuals.....	250
Figure 8.1	Iteratively increasing factors coming into play in enabling the strategic use of the Semantic Web in the world of Big Data.	258
Figure 8.2	The Semantic Web creates opportunities to bring together otherwise siloed contents, patterns, and applications through varied communications channels, resulting in collaborative business processes that form the backbone of a semantic enterprise—resulting in enhanced user experience.	261
Figure 8.3	Semantic applications use characteristics of the Semantic Web to provide value to a semantic enterprise.....	264
Figure 8.4	Semantic enterprise and various organizational strategies.	267
Figure 8.5	Increasingly meaningful exchange of data and information leading to collaborative processes and knowledge.....	269
Figure 8.6	Ontology–taxonomy–rules creating meaningful relationships (as against direct information exchange)	270
Figure 8.7	Example of deriving meaning from relationships (writing triples).	273
Figure 8.8	In collaborative arrangements, a business is no longer at the center of events. Instead, many businesses start dealing with each other, leading to an A2A market. This arrangement is ably supported by the Cloud servers.....	275
Figure 8.9	Collaborative business processes form clusters of businesses that provide greater meaning (semantics) to users (customers, employees, and partners) than stand-alone business processes	276
Figure 8.10	Example of a suite of collaborative business processes in the medical domain—made relatively easily possible through Cloud technologies.	278
Figure 8.11	Business integration with CBPE.....	279
Figure 9.1	The very basics—data storage has various sources, types, and formats	284
Figure 9.2	Six different types of data stores—relational is structured and OO is a semistructured type	289

Figure 9.3	Multiple types of data (e.g., structured, transactional, and unstructured) need to be converted to a large, static data warehouse before they can be “Big Data” analyzed.	291
Figure 9.4	Handling data that is big requires a fundamentally different architecture—that of distribution.	299
Figure 9.5	Additional complexities of myriad users who wanted analytics in real time—and at their location.	300
Figure 9.6	The fundamentals of a distributed data storage architecture start with clustering, followed by distribution: dividing and spreading the large volume of data over many nodes.	301
Figure 9.7	CAP theorem: a database (NoSQL) can satisfy only two out of three characteristics (consistency, availability, and partition tolerance).	303
Figure 10.1	Inherent and applied quality characteristics specific to data and analytics embedded in business processes starting with the source of data and going up to analytics and users.	318
Figure 10.2	Data quality activities corresponding to key phases of Big Data	321
Figure 10.3	Verification and validation of analytical models (for their syntax, semantics, and aesthetics) that operate on data that has been tested for its own inherent (intrinsic) quality.	325
Figure 10.4	Impact of bad quality of Big Data on business processes.	328
Figure 10.5	Quality initiative is an effort to sift value from the chatter and noise of data and make it available to business.	329
Figure 10.6	Sifting noise from data, processes, and technologies to ensure quality	330
Figure 10.7	High-level overview of the what and how of the testing of Big Data.	331
Figure 10.8	Applying ITIL governance framework for analytics as a service.	338
Figure 11.1	Agile in projects	351
Figure 11.2	Mapping the organizational-level Big Data and Agile capabilities with the seven levels of SFIA.	355
Figure 11.3	Developing team-level capabilities for driving business agility with Big Data.	356
Figure 11.4	Business skills required in the adoption of Big Data and agility at the organizational level based on the SFIA.	358
Figure 11.5	Technical (data management Hadoop and NoSQL) skills required in the adoption of Big Data and agility at the organizational level based on the SFIA.	360
Figure 11.6	Governance, quality, and testing skills required in the adoption of Big Data and agility at the organizational level based on the SFIA.	361

Figure 11.7	Enhancing organizational capabilities to deploy Agile practices in business processes that make use of Big Data solutions in decision making (skill, attitude, experience, and influence).....	362
Figure 11.8	Overall scope of change management in organizations as they adopt Big Data.	366
Figure 11.9	Change management cycle (service context).....	367
Figure 11.10	Community services platform based on Big Data solutions.....	369
Figure 12.1	Big Data facilitates organizational agility by ensuring a very small gap between the organization and the situation impacting it to enable faster and more accurate decision making.....	386
Figure 12.2	Envisioning an Agile organization.....	390
Figure 12.3	A functioning Agile business (holistic) capitalizing on Big Data strategies: internal and external impacts.	394
Figure 12.4	Business dimensions (external and internal) that are becoming Agile by incorporation of Big Data–driven business strategies.....	396
Figure 12.5	CAMS—keeping the Agile manifesto in balance.....	400
Figure 12.6	In practicing Agile in the solution space, the composite Agile philosophy provides the basis for balance between planned control and the versatility of the Agile approach.....	403
Figure 12.7	Agile businesses make substantial use of business intelligence at all levels. DSS, BPM/BPR, business process modeling/business process reengineering.	404
Figure 12.8	Holistic customer view resulting from the implementation of BDFAB in practice.	408
Figure 12.9	Ongoing agility and knowledge synchronization between users and systems based on Big Data solutions.....	409
Figure 13.1	A-Bank’s AaaS offering.	435
Figure 15.1	Selecting the lanes for configuring Iteration 1 of the BDFAB adoption roadmap for the DoE.....	469
Figure 15.2	Iteration 1 of the BDFAB adoption roadmap.....	470
Figure 15.3	Iteration 2 of the BDFAB adoption roadmap.....	470
Figure 15.4	Iteration 3 of the BDFAB adoption roadmap.....	471
Figure 15.5	Iteration 4 of the BDFAB adoption roadmap.....	471

List of Tables

Table I.1 Mapping of the Chapters in This Book to a One-Semester Course.....xxix

Table 1.1 Key Questions to Be Asked of Big Data from Analytical, Technical, and Strategic Viewpoints10

Table 1.2 Business Factors Impacting Adoption of Big Data13

Table 1.3 Examples of Different Types of Organizations That Stand to Benefit from Strategic Adoption of Big Data25

Table 1.4 Modern Approaches in Decision Making and the Role of Big Data..... 29

Table 1.5 Rationale, Impetus, and Catalyst for the Factors Influencing the Formation of Big Data Strategies..... 39

Table 2.1 Overview of BDFAB55

Table 2.2 Five Major Modules (Building Blocks) of BDFAB 63

Table 2.3 Mini-Iterations across the Building Blocks 64

Table 2.4 Big Data Maturity Model at Individual, Organization, and Industry Levels 71

Table 2.5 Artifacts Associated with the Building Blocks of BDFAB and Their Agile Impact 79

Table 2.6 Business Conditions and Their Impact on Business Agility81

Table 3.1 Data Life Cycle and Its Impact on Management (Admin), Analytics, and Business 102

Table 3.2 Context Parameters of a Data Point (Cash Amount) When Used in Ascertaining Business Outcome 108

Table 3.3 Granularity, Metadata, and Datafication of Processes Based on Different Data Types..... 115

Table 3.4 Data Analytics Types, Strategies, and Examples 117

Table 4.1 Summary of Agile Practices (Techniques) Used in CAMS Grouped in Preiteration, Core Iteration, and Postiteration..... 147

Table 4.2 Formal Requirements Modeling Process Map 151

Table 5.1 Contemporary Technologies and the Way They Relate to the Technologies of Big Data and Agility 167

Table 5.2	Big Data Technologies and Agility.....	188
Table 6.1	SMAC Quartet, Big Data, and CAMS.....	201
Table 6.2	Big Data Usage and SMAC.....	205
Table 6.3	Big Data and SMAC for Different Sizes of Organizations	207
Table 6.4	SMAC and Industry Verticals	211
Table 6.5	Preuser Influencing Factors in UXAF before User Contact (t_{-1} to t_0)	218
Table 6.6	Postuser UXAF Factors after User Contact (t_1 to t_{+1})	219
Table 7.1	Cloud Characteristics and Its Relevance to Big Data Analytics.....	229
Table 8.1	Key Elements of the Semantic Web and Their Use in Big Data Analytics.....	259
Table 8.1	Key Elements of the Semantic Web and Their Use in Big Data Analytics.....	
Table 8.2	SAA Development Considerations in a Solutions Life Cycle	263
Table 8.3	Deriving Semantics from Different Data Types.....	265
Table 9.1	Brief Comparison of the Two Data Storage Domains, SQL and NoSQL.....	290
Table 9.2	Sample Data Structure for Customers	297
Table 9.3	Brief Comparison of the Four NoSQL Databases Based on Their Key Characteristics	298
Table 10.1	Various Aspects of Quality and Their Relevance in the Big Data Domain.....	316
Table 11.1	Description of RACI Corresponding to BDFAB Roles.....	363
Table 11.2	RACI Corresponding to the Five BDFAB Modules for the Roles.....	365
Table 11.3	Activities and Corresponding Organizational Capacity and Capabilities to Meet Big Data	370
Table 11.4	Changes within ICT Operations to Meet Big Data	374
Table 13.1	Mapping Big Data Variety (Structured, Semistructured, Unstructured, Machine Generated, and External) to Its Volume, Velocity, and Veracity in the Context of Banking	425
Table 13.2	TESP Subframework of A-Bank and the Corresponding Tactical, Operational, and Strategic Advantages	430
Table 13.3	Mapping A-Bank's Elements with the Six Enterprise Architecture Factors.....	431
Table 14.1	Strategic Value to E-Health from Big Data Initiative (a Mapping to the Six Columns of the Zachman Framework discussed in Chapter 5)	450
Table 14.2	Mapping the Variety of Big Data to Volume and Velocity in Electronic Patient Records and Health Management in H-Mead.....	451
Table 14.3	Business Capabilities Based on SFIA to Be Used in Profiling and Upskilling Data Scientists.....	460

Table 14.4	Technical Capabilities Based on SFIA to Be Used in Profiling and Upskilling Data Scientists.....	461
Table 15.1	Example Mapping of Big Data Variety (Structured, Semistructured, Unstructured, Machine Generated, and External) to Its Volume, Velocity, and Veracity in the Context of Education.....	472



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Foreword

An International Data Corporation (IDC) study notes that, by 2020, the digital universe will have grown 50 times what it was a decade ago—reaching 40 zettabytes or, effectively, more than 5000 gigabytes per person! This structured, semi-structured, and unstructured data is constantly increasing in volume and velocity. This relentless explosion of data is not merely due to the advent of social media and mobile technologies, but also due to the “streaming” nature of Internet of Things (IoT), sensor devices, and machines. A key challenge for most businesses is to find ways to efficiently exploit the data now available to them and create new advantages in increasingly competitive markets.

To meet this challenge, businesses, agencies, educational institutions, health providers, and many other organizations must develop detailed strategies to organize, understand, and utilize available data to gain valuable insights and enhance operational effectiveness. Big Data can be helpful to the firm in such areas as understanding and meeting consumer needs and wants, optimizing business processes, and handling risk and compliance requirements. While the benefits of Big Data analytics can be substantial, effective use of Big Data may require cross-industry investments, upgrades to infrastructures (storages, communications), applications and devices, and most importantly people skills and capabilities.

This book makes a unique contribution to the discussions around Big Data because it takes a highly business-oriented view of the technologies and analytics of Big Data. Technology is both an enabler of business and the business itself. Large service providers such as Google and Amazon are technology-based businesses, but they also utilize the technologies and analytics to provide value to their customers. This requires not just a detailed understanding of technologies and analytics, but a holistic view of the business organization that is essentially seeking *value* from its investments. This is another unique proposition of this book—it presents agility as a key business value. Therefore, this book is a comprehensive primer for businesses that are not just looking at the Big Data analytics domain, but are eager to capitalize on Big Data in a strategic manner to achieve business agility.

Dr. Unhelkar has taken an approach in this book that promises to be of immense value to the industry—large businesses in particular. Right from the outset, his focus is on *value*. Dr. Unhelkar argues in this book that agility is the goal of business and Big Data is a suitable enabler.

In dealing with new technologies, most business challenges arise not in the concepts but, rather, in their implementation. The Big Data framework presented in this book can help reduce implementation risks significantly. This framework is your insurance against pitfalls and failures as it will help you tread the Big Data path rather carefully.

James M. Curran, PhD

*Dean, College of Business
University of South Florida Sarasota–Manatee*



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Preface

This book, *Big Data Strategies for Agile Business: Framework, Practices, and Transformation Roadmap*, outlines a strategic approach to Big Data that renders a business Agile. There are three key motivators for this book:

- a. Extract strategic business value from Big Data, which essentially revolves around business agility,
- b. Reduce business risks in adopting Big Data by basing it on carefully constructed thought process, and
- c. Provide an overview of the Big Data analytics and technologies as enablers of Big Data strategies

In order to achieve the above goals, this book starts with a strategic understanding of the core purpose of data—which is to enhance business decision making. Many businesses struggle with the right set of questions to ask of Big Data rather than the answers to the questions. This book provides a framework to ask those questions and develops a systematic approach to arrive at the answers. The discussions on the capabilities of Big Data technologies (e.g., Hadoop/HDFS and NoSQL) and Big Data analytics (e.g., Descriptive, Predictive, Prescriptive and NPS) provide the basis for Big Data business strategies.

The flexibility and rapidity in decision making is understood and expanded in this book as Agile Business. An Agile Business is described as one in which decisions are made dynamically based on analytics that are themselves changing depending on the circumstances of an individual customer and/or the context in which the business finds itself (e.g., political uncertainty, changing legal structure, global collaborations). This brings in agility for the analytic processes themselves. This book uniquely covers significant ground between Big Data and Agile Business.

What is Big Data and how is it different than regular data? Why should a business bother about it—especially when there is so much investment in regular data? What are the associated risks in adopting Big Data? What are the benefits? Should the business decide to adopt Big Data, what would be a good approach to managing and reducing the risks? These are some of the key strategic questions asked in this book.

The discussions herein are aimed to ameliorate the paucity of literature on the *strategy* aspects of Big Data. In order to help organizations adopt Big Data, this book is written around the following layers: Agile values, data science-related key roles, Big Data building blocks (modules), suggested artifacts and deliverables, business conditions (parameters defining the business, like big, medium, small; product or service), and selected Agile method techniques. This discussion is closely accompanied by a 12-lane × 4-iteration Big Data transformation road map, a strategy cube, and the Big Data manifesto. The end result is a “Big Data Framework for Agile Business” (BDFAB v2.5).

The BDFAB maintains reference to industry standards in quality and process modeling, maturity models, reference enterprise architectures, and standards. The Big Data technology domain is experiencing acute shortages of skills in the Hadoop ecosystem, the NoSQL database suites, and programming based on MapReduce, “R,” and Python. This book specifically addresses the need for resource planning including upskilling, training, recruitment, and coaching people and teams in the Big Data domain through a Skills Framework (SFIA). Furthermore, this book discusses dissipation of capabilities and skills through the formation of Centers of Excellence around Big Data and related disciplines.

Finally, note how collaboration is becoming a norm in most modern businesses. Each business strives to combine its offerings with those from many other businesses. For example, travel (e.g., TripAdvisor) is combining with insurance and taxi (e.g., Uber); logistics (e.g., FedEx) is combining with retail; and the hospital domain is combining with airlines (e.g., medical tourism). Each business has many collaborative components that make Big Data initiatives go beyond a single organization. Whether it is health, education, insurance, banking, agriculture, or transportation, each of these industries and many more are experiencing dramatic changes through widespread opportunities to collaborate, analyze, and execute their strategies, driven by the technologies and analytics of Big Data. In addition to the interfaces and integrations (typically on a cloud architecture), these initiatives are best supported by a suite of guiding principles. Adhering to these principles can provide a common ground for utilization of Big Data in a strategic manner. This book takes the first step towards the common ground by presenting a five-statement Big Data manifesto.

These discussions should help mitigate the risks associated with adoption of Big Data by businesses. This book further demonstrates the application of the BDFAB in practice through case studies.

BDFAB and the associated ideas discussed in this book are based on a combination of literature exploration, conceptual model building, research and experimentation, and the author’s practical consulting experience. BDFAB is well received in a number of forums in the United States, India, and Australia. BDFAB is also the basis for Big Data-related educational courses for higher degrees. The material in this book thus promises to be of value to both businesses and academics. My hope is that this book will provide to be a valuable addition to the repertoire of thought processes around Big Data and Agile strategies, and that it will provide organizations with much-needed insights into how Big Data technologies and analytics can provide strategic business value.

Please note that URLs in endnotes were accessed in 2017.

The Structure of This Book

Section I of the book is made up of Chapters 1 and 2. This section will be of interest to all readers, but data scientists and senior decision makers of an organization responsible for Big Data adoption will find this part of direct value. Chapter 1 focuses on introducing the concepts of Big Data strategies and clearly delineating them from Big Data analytics and technologies. Chapter 2 outlines the Big Data Framework for Agile Business (BDFAB). The framework itself needs to be kept in mind in going through the remaining chapters.

Section II of the book is made up of Chapters 3–9. This section will be of particular interest to data scientists, data analysts, process modelers, architects, and solutions designers.

Chapter 3 focuses the characteristics of Big Data—3V+V+V, optimum granularity level, and context. Chapter 4 outlines the process aspect of Big Data—capturing requirements with use cases and activity graphs of the UML and the TEST sub-framework; 13 Agile techniques in the solutions space; and the 12-lane × 4-iteration Big Data adoption process. Chapter 5 deals with the

Hadoop-based Big Data technologies and places them within the enterprise architecture. Chapter 6 introduces the SMAC stack and deals particularly with its SoMo (social media and mobile) aspect; user experience analysis with its pre- and post-users is also discussed. Chapter 7 is focused on the cloud and how its use can help in developing Analytics-as-a-Service (AaaS). Chapter 8 outlines the place of Semantic Web, RDF, and triples within Big Data adoption. This chapter also discusses the Collaborative Business Process Engineering for Big Data. Chapter 9 introduces the distributed database architectures and compares the NoSQL databases (Key-Value, Columnar, Document, and Graph), keeping the CAP theorem in mind.

Section III is made up of Chapters 10–12. The section deals with the “soft” aspects of Big Data adoption. It will be of particular interest to HR managers, quality analysts and testers, people associated with community formation, and everyone interested in understanding Agile in a business/organizational context. Chapter 10 discusses the nuances of quality assurance and testing in Big Data space. This chapter also explains governance, risk, and compliance (GRC) in Big Data. Chapter 11 is all about the people—approaches to upskilling staff (using SFIA framework), moving the organization from doing and learning to being Agile, and community formation. Chapter 12 is dedicated to the description of a functional Agile organization post–Big Data adoption.

Section IV is made up of Chapters 13–15 and focuses on case studies. These case studies are based on real organizations, but they are discussed in a hypothetical manner. The purpose of these case studies is to demonstrate the application of BDFAB. Therefore, these case studies do *not* contain the nitty-gritty details of analytics and technologies. The case studies simply show where and how the various modules of BDFAB are applied in real life. The case studies need to be read in conjunction with the previous chapters of this book—and, in particular, the BDFAB framework.

Readers

Following are the reader categories (not limited to this list) that I believe will find this book useful:

- a. Data architects, data analysts, and data scientists looking for a strategic, holistic Big Data-adoption framework that will enable them to apply their data expertise to business
- b. Business decision makers, CXOs, and directors who want to understand the relevance of Big Data to their business and how it can provide business agility
- c. Business process modelers (business analysts) responsible for embedding Big Data analytics and analytical services within the business processes of the organization
- d. Solution developers working in an Agile environment with Hadoop and NoSQL, who want to learn the end results of their effort
- e. Quality analysts and testers in the Big Data space who are organizing verification and validation activities for analytical algorithms, business processes, and data
- f. Advanced degree students of management, business, and information technologies—specifically MBA, MSc, and MIT students—who would like to study Big Data in the context of business
- g. Researchers and professors responsible for investigating and teaching skills related to Big Data strategies for Agile business and project management

Each chapter of this book has objectives, abstracts, detailed discussions, figures, tables, and sidebars. References in each chapter contain relevant books, articles, and websites. The action points at the end of each chapter are for the benefit of practitioners, and the consolidation

workshops can come in handy in training seminars and senior classrooms. The workshop questions can be worked out by students (or industrial training participants) to demonstrate their grasp of the chapter. Thus, this book should be of value to courses at graduate levels in business as well as information technologies. Suggested courses, subjects, or units that can use this book in an academic format include: Big Data Strategies and Frameworks; Big Data Analytics in Business; Big Data Technology and Management; and Advanced Topics in Business Management.

Key Takeaways of This Book

These are the key takeaways that the readers will get from this book:

- Find an all-encompassing, holistic approach to Big Data adoption (Big Data Framework for Agile Business—BDFAB) that will result in Agile business value
- Transcend the focus of Big Data adoption from analytics and technologies to business strategies
- Discuss the importance of Big Data technologies (Hadoop/MapReduce), enterprise architecture (EA), and social–mobile–analytics–cloud (the SMAC stack) in Big Data adoption
- Discuss the approach to requirements modeling (with Use cases and Activity graphs of the Unified Modelling Language [UML]) analysis in Big Data related projects
- Provide an understanding of issues surrounding quality and testing in Big Data-related projects
- Share a practitioner’s view on Big Data strategies that would be helpful to consultants as well as in-house decision makers
- Understand the concepts of Big Data strategies and Agile business through examples and case studies
- Outline the details of Big Data from a senior student/academic perspective

Mapping the Book to a University Course

Table I.1 offers a suggested mapping of the chapters in this book to a 13-week university course mainly aimed at the graduate level. The consolidation workshops at the end of each chapter can be used for exercises as well as developing a case study on BDFAB throughout the semester.

Table I.1 Mapping of the Chapters in This Book to a One-Semester Course

<i>Week</i>	<i>Discussion Topic</i>	<i>Relevant Chapters</i>	<i>Comments for an Educational Course</i>
1	Introducing Big Data and Agile Business	Chapter 1	Outline the importance of business agility that is enabled by Big Data. Advantages and challenges in use of Big Data. What do we mean by “business agility” anyway? (Speed and accuracy in decision making.) Arguments for a need of a framework are established.
2	Big Data Framework for Agile Business (BDFAB)	Chapter 2	Basic understanding the BDFAB, including its values, roles, building blocks, artifacts, conditions, Agile practices, and the supporting compendium (Big Data manifesto, strategy cube, and 12-lane adoption process)
3	Data Science, Data Analytics (Structured and Un-structured) and (Their Impact on) Business Agility	Chapter 3	Understanding 3V+V+V of Big Data. Relating data and analytics. The role of data science. The importance and relevance of context and granularity of decision making.
4	Business Process Modeling, Use Cases, and Big Data Adoption Process	Chapter 4	Relating Big Data analytics to business processes. Use of UML (use cases and activity diagrams) in modeling Big Data-enabled process. The iterative and incremental Big Data adoption process (12 lanes × 4 quarterly iterations).
5	Enterprise Architecture and Hadoop (HDFS) Ecosystem	Chapter 5	Zachman and TOGAF EA frameworks and positioning adoption of Big Data within those frameworks. A review of the Big Data technologies.
6	Social Mobile (SoMo) and Input/Output Data Strategies	Chapter 6	Discussion around the SMAC stack and how it is positioned with BDFAB. Importance of user experience (UX) and how to source data to analyze UX.

(Continued)

Table I.1 (Continued) Mapping of the Chapters in This Book to a One-Semester Course

<i>Week</i>	<i>Discussion Topic</i>	<i>Relevant Chapters</i>	<i>Comments for an Educational Course</i>
7	Cloud-Based Big Data Strategies	Chapter 7	Further discussion on use of cloud within BDFAB implementation. Creation of Analytics-as-a-Service (AaaS) and Self-Serve Analytics (SSA).
8	Big Semantic Web and Collaborative Business Process Engineering (CBPE)	Chapter 8	Semantic web ontologies, taxonomies, and rules within Big Data; use of RDF and triples and how they relate to Big Data adoption; collaborative business process engineering.
9	Business Value in NoSQL	Chapter 9	Discussing four different types of NoSQL databases (KV, Document, Columnar, and Graph); application of the CAP theorem to NoSQL databases. Relating to business value of Agility.
10	Quality, Testing (Veracity), Metrics, and Governance–Risk–Compliance (GRC) of Big Data	Chapter 10	Use of quality techniques to improve data, analytics, and process quality. Prevention and detection of errors in Big Data. Discussing the GRC aspect of BDFAB.
11	Big Data Resourcing—People in Projects and Organizations—and Communities; Compliance and Risks	Chapter 11	Use of SFIA framework for information-age skills in BDFAB. How to enhance the capabilities using skills–attitude–experience–influence.
12	Functioning Agile Business Post–Big Data Adoption	Chapter 12	Based on the Art of Agile Practice, this is a summary chapter on use of agility in organizations and how Big Data further enables that agility.
13	Consolidation and Review		Case studies worked by the students can be reviewed here.

Mapping the Book to a Three-Day Workshop (Industry Setting)

Table I.2 presents a potential mapping of the book to an industrial three-day workshop

Table I.2 Mapping of the Chapters in this Book to a Three-Day Workshop

<i>Day</i>	<i>Session</i>	<i>Presentation and Discussion Workshop Topic</i>	<i>Relevant Chapters</i>	<i>Comments for a Workshop</i>
1	8:30–10:00	Introducing Big Data and Agile Business	Chapter 1	Start with a case study/real life organization. Discuss the understanding of Big Data—its potential challenges and advantages in the context of the organization. This can be a SWOT/PESTLE analysis. Note down the concerns and risks.
	10:30–12:00	Big Data Framework for Agile Business (BDFAB)	Chapter 2	Basic understanding the BDFAB, including its values, roles, building blocks, artifacts, conditions, Agile practices, and the supporting compendium (Big Data manifesto, strategy cube and 12-lane adoption process). Discuss the Big Data Manifesto from a company/industry viewpoint.
	1:30–3:00	Data Science, Data Analytics (Structured & Unstructured) and (their impact on) Business Agility	Chapter 3	What type of data will be newly sourced? Will it be collected by the organization or ingested from data providers? Discuss in the context of 3V+V+V of Big Data. Focus more on context (hex elementization) and optimum granularity level as compared with actual analytics.
	3:30–5:00	Business Process Modeling, Use Cases, and Big Data Adoption Process	Chapter 4	Focus on the fact that analytics in practice are deeply embedded in business processes, hence the importance of modelling—with UML (use cases and activity diagrams). Also, a separate dedicated focus on the iterative and incremental Big Data adoption process (12 lanes × 4 quarterly iterations).

(Continued)

Table I.2 (Continued) Mapping of the Chapters in this Book to a Three-Day Workshop

<i>Day</i>	<i>Session</i>	<i>Presentation and Discussion Workshop Topic</i>	<i>Relevant Chapters</i>	<i>Comments for a Workshop</i>
2	8:30–10:00	Enterprise Architecture and Hadoop (HDFS) Ecosystem	Chapter 5	Review an existing EA framework if available. Otherwise, discuss Zachman and TOGAF EA frameworks and how they will help reduce the risks in the adoption of Big Data. Study of the enterprise technology stack and the positioning of operational services using the technologies.
	10:30–12:00	Social Mobile (SoMo) and Input/Output Data Strategies	Chapter 6	Discuss the four elements that make up the SMAC stack from a practical viewpoint. Discuss the changes to access, devices and usability, applications, and infrastructure resulting from Big Data adoption. Workshop around the pre- and post-user factors within user experience analysis.
	1:30–3:00	Cloud-Based Big Data Strategies	Chapter 7	Further discussion on the use of the cloud within BDFAB implementation. Positioning the analytics across the network and their integration with processes and presentation is part of this discussion.
	3:30–5:00	Big Semantic Web and Collaborative Business Process Engineering (CBPE)	Chapter 8	Outline of a Big Data-driven semantic enterprise. Use of semantic Web ontologies, taxonomies, and rules within Big Data; use of RDF and triples and how they relate to Big Data adoption; challenges and importance of collaborative business process engineering (CBPE).

(Continued)

Table I.2 (Continued) Mapping of the Chapters in this Book to a Three-Day Workshop

<i>Day</i>	<i>Session</i>	<i>Presentation and Discussion Workshop Topic</i>	<i>Relevant Chapters</i>	<i>Comments for a Workshop</i>
3	8:30–10:00	Business Value in NoSQL	Chapter 9	Discussing four different types of NoSQL databases (KV, Document, Columnar, and Graph); application of the CAP theorem to NoSQL databases. Importance of integration of NoSQL databases with existing enterprise data. Relating NoSQL to business value of agility.
	10:30–12:00	Quality, Testing (Veracity), Metrics, and Governance-Risk-Compliance (GRC) of Big Data	Chapter 10	Review of existing quality activities within an organization. Discussion on which of these quality techniques apply to improve data, analytics, and process quality. Prevention and detection of errors in Big Data. The governance, risk, and compliance (GRC) supported by Big Data and required within Big Data are two important practical aspects of BDFAB.
	1:30–3:00	Big Data Resourcing—People in Projects and Organizations—and Communities; Compliance and Risks	Chapter 11	What are the existing skills in the organization related to Big Data? What is the skill gap (use of SFIA framework)? And how to upskill and enhance the capabilities of the organization? Which communities are important, and how to foster their development based on services?
	3:30–5:00	Functioning Agile Business Post-Big Data Adoption	Chapter 12	Discussion on Agile beyond methods and in the organizational space. Based on the Art of Agile Practice, this is a summary chapter on use of Agility in organizations and how Big Data further enables that agility.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Acknowledgments

Abbass Ghanbary
Abhay Saxena
Aditya Ghose
Alok Sharma
Amit Tiwary
Anand Kuppuswami
Andy Lyman
Anthony Tockar
Anurag Agarwal
Asim Chauhan
Aurilla Aurelie Arntzen
Bhargav Bhatt
Bharti Trivedi
Basant Maheshwari
Channa Achilingam
Cihan Cobanoglu
Colleen Berish
Daniel A. Thuraiappah
Ehsan Sheybani
Ekata Mehul
Faizan Ali
Fawn Ngo
Girish Nair
Giti Javidi
Haydar Jawad
Joe Askren
James Curran
Javed Matin
Karan Karandikar

Keith Sherringham
Larry Bobbitt
Lila Rajabion
M.N. Sharif
Masa K. Maeda
Milind Barve
Mohammed Maharmeh
Motilal Bhatia
Murat Tanik
Norbert Raymond
Nosh Mistry
Radmila Juric
Rajeev Arora
Ram Govindu
San Murugesan
Sanjeev Sharma
S.D. Pradhan
Steve Blais
Sunita Lodwig
Suresh Paryani
Tad Gonsalves
Trivikrama Rao
Tushar Hazra
Vipul Kalamkar
Vivek Eshwarappa
Warren Adkins
Walied Askarzai
Yi-Chen Lan
Zahid Iqbal

Thanks to my family for their support and good wishes: wife, Asha; daughter, Sonki; son, Keshav (son); sister-in-law, Chinar; and our dog, Benji.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

About the Author



Bhuvan Unhelkar (BE, MDBA, MSc, PhD; FACS; CBAP®) has extensive strategic and hands-on professional experience in the information and communication technologies (ICT) industry. He is an associate professor of IT (lead faculty) at the University of South Florida Sarasota–Manatee (USFSM), and is the founder of and consultant at *MethodScience*.

Areas of expertise include:

- Business analysis and requirements modeling (use cases, BPMN, BABOK; helping organizations upskill and apply skills in practice)
- Software engineering (UML, object modeling; includes undertaking large-scale software modeling exercises for solutions development)
- Agile processes (*CAMS*—practical application of composite Agile to real life business challenges, not limited to software projects)
- Corporate agile development (upskilling teams and applying Agile techniques in practice)
- Quality assurance and testing (with focus on prevention rather than detection)
- Big Data strategies (*BDFAB*—emphasis on application of Big Data technologies and analytics to generate business value)
- Collaborative Web services (SOA, Cloud; upgrading enterprise architectures based on services including developing Analytics-as-a-Service)
- Mobile business and green IT (with the goal of creating and maintaining sustainable business operations)

His industry experience includes banking, finance, insurance, government, and telecommunications, where he develops and applies industry-specific process maps, business transformation approaches, capability enhancement, and quality strategies.

Dr. Unhelkar has authored numerous executive reports, journal articles, and 20 books with internationally reputed publishers, including *Big Data Strategies for Agile Business* (Taylor and Francis/CRC Press, 2017). Recent *Cutter* executive reports (Boston, MA) include Psychology of Agile (two parts), Agile Business Analysis (two parts), Collaborative Business and Enterprise Agility, Avoiding Method Friction, and Agile in Practice—A Composite Approach. He is also passionate about coaching senior executives, training, re-skilling and mentoring IT professionals, forming centers of excellence, and creating assessment frameworks (SFIA-based) to support corporate change initiatives. Dr. Unhelkar is an engaging presenter, delivering keynotes, training seminars, and workshops that combine real-life examples based on his experience with audience participation and Q&A sessions. As a result, these industrial training courses, seminars, and workshops add significant value to the participants and their sponsoring organizations, as the training

is based on practical experience, with a hands-on approach, and accompanied by ROI metrics. Consistently ranked high by participants, the seminars and workshops have been delivered globally to business executives and IT professionals notably in Australia, the United States, Canada, the United Kingdom, China, India, Sri Lanka, New Zealand, and Singapore. Dr. Unhelkar has won the Computerworld Object Developer Award (1995), Consensus IT Professional Award (2006), and IT Writer Award (2010). He also chaired the business analysis specialism group of the Australian Computer Society.

Dr. Unhelkar earned his PhD in the area of object orientation from the University of Technology, Sydney. His teaching career spans teaching at both undergraduate and master's level, wherein he has designed and delivered courses including Global Information Systems, Agile Method Engineering, Object-Oriented Analysis and Design, Business Process Reengineering, and New Technology Alignment in Australia, the United States, China, and India. Many courses have been designed and delivered online: for the Australian Computer Society's distance education program, the M.S. University of Baroda (India) master's program, and, currently, Program Design with the UML and Mobile App Development at the University of South Florida Sarasota–Manatee. Earlier, at the Western Sydney University, he supervised seven successful PhD candidates and published research papers and case studies. His current industrial research interests include Big Data and business value, and business analysis in the context of Agile. Dr. Unhelkar holds a Certificate-IV in TAA and TAE and is a Certified Business Analysis Professional® (CBAP) of the IIBA.

Professional affiliations include:

- Fellow of the Australian Computer Society (elected to this prestigious membership grade in 2002 for distinguished contribution to the field of information and communications technology), Australia
- Life member of the Computer Society of India (CSI), India
- Life member of Baroda Management Association (BMA), India
- Member of the Society for Design and Process Science (SDPS), USA
- Rotarian (President) at Sarasota Sunrise Club, USA; Past President Rotary Club in St.Ives, Sydney (Paul Harris Fellow; AG), Australia
- Discovery volunteer at NSW parks and wildlife, Australia
- Previous TiE Mentor, Australia

CRC Press Books by Bhuvan Unhelkar

Unhelkar, B. *Big Data Strategies for Agile Business*. Boca Raton, FL: CRC Press/Auerbach/Taylor & Francis Group, 2017.

Unhelkar, B. *The Art of Agile Practice: A Composite Approach for Projects and Organizations*. Boca Raton, FL: CRC Press/Taylor & Francis Group, 2013.

Unhelkar, B. *Green ICT Strategies & Applications: Using Environmental Intelligence*. Boca Raton, FL: CRC Press/Taylor & Francis Group, 2011.

Unhelkar, B. *Mobile Enterprise Transition and Management*. Foreword by Ed Yourdon, USA. Boca Raton, FL: CRC Press/Taylor & Francis, 2009.

Unhelkar, B. *After the Y2K Fireworks: Business and Technology Strategies*. Foreword by Richard T. Due, Canada. Boca Raton, FL: CRC Press, 1999.

Domain Terms and Acronyms

<i>Term/Acronym</i>	<i>Description & Comments</i>
AaaS	Analytics as a Service
BA	business analysis: a discipline of exploring and identifying business needs, prioritizing them based on risks and business goals, and providing potential solutions that fulfill those needs. These areas of work include exploring and identifying business needs, prioritizing them in the context of the capabilities of the business, and risk-based comparisons. Can also mean “business architecture.”
BASE	Basically Available, Soft state, Eventually consistent
BDFAB	Big Data Framework for Agile Business
BPI	business process integration: brings together varied business processes in order to provide unified value to stakeholder. BPI also brings together data, processes, architecture and stakeholders together in an integrated manner. BPI also deals with integration of underlying systems that provide data and its processes for business processes.
BPM	business process modeling – modeling of business processes with a view to understanding and optimizing them – usually undertaken with a recognized suite of notations derived from a framework. A BPM can define both “as is” and “to be” state of a process.
BPMN	business process modeling notation
BPR	business process reengineering: a fundamental re-think of the way an organization operates, typically shifting the mindset for a hierarchical inward facing organization to an process-driven, customer-centric outward facing organization. Making use of technologies, BPR aims to improve the efficiency and effectiveness of organizational processes by many folds (as against a percentage). Consequently, business process reengineering forms the basis to fundamentally reshape the way an enterprise conducts its operations.
CAMS	Composite Agile Method and Strategy
CAP	Consistency – Availability – Partition tolerance

I ■ Domain Terms and Acronyms

<i>Term/Acronym</i>	<i>Description & Comments</i>
CBPE	Collaborative Business Process Engineering – approach to modeling a suite of collaborative business processes that cut across multiple organizational boundaries – still making using of one or more of known process modeling techniques
CBPE	collaborative business process engineering
CEMS	carbon emissions management system
CRM	customer relationship management
DevOps	development and operations
EA	enterprise architecture
ERP	enterprise resource planning
GRC	governance, risk, and compliance
Hadoop	Big Data technology for distributed storage and processing on commodity computing (Hadoop is not a acronym)
HDFS	Hadoop Distributed File System
HR	human resources
KVP	key–value pair (a type of NoSQL database)
MDM	master data management
MPP	massive parallel processing
NFRS	non-functional requirements specification
NoSQL	Not Only Structured Query Language
ODBA	outcome driven business architecture
QA	quality assurance
QC	quality control
RDF	Resource Description Framework
SE	semantic enterprise
SFIA	Skills Framework for the Information Age
SMAC Stack	social, mobile, analytics, and Cloud stack
SoMo	social media and mobile
SSA	self-serve analytics
SWOT Analysis	strengths, weaknesses, opportunities, and threats analysis
SWT	Semantic Web Technologies

<i>Term/Acronym</i>	<i>Description & Comments</i>
TESP	technical, economic, social, and process
UML	Unified Modeling Language
TOGAF	The Open Group Architecture Framework
V & V	verification and validation (quality assurance)



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

INTRODUCTION TO BIG DATA STRATEGIES AND OUTLINE OF BIG DATA FRAMEWORK FOR AGILE BUSINESS (BDFAB)

I



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Chapter 1

Introduction to BIG Data and Agile Business

Chapter Objectives

- Understand data, Big Data, and their importance to business organizations
- Set the business context for Big Data, the analytics, and the relevance of Agile
- Explore the potential *value* of Big Data for business as a decision-making tool
- Appreciate the need for a strategic, holistic approach to Big Data adoption that aligns Big Data to business strategies
- Underscore the importance of Big Data beyond analytics and technologies and in the business space
- Explain the benefit of Big Data as an enabler of business agility
- Provide an understanding of Agile business and separate it from Agile methods
- Explain how Big Data should be harnessed to aid in building business agility
- Outline the business growth, optimization, risk management, and sustainability opportunities for businesses with Big Data
- Discuss the contemporary challenges of Big Data adoption encountered by organizations
- Create the foundation for short- and long-term Big Data strategies by moving from observations to data, information, knowledge, and insights

Big Data and Business Value

Data is one of the most important organizational resources. Like oil, water, and electricity, data can also be considered a utility. Organizations that learn to harness the potential of this data resource have a distinct business advantage. Sourcing, storing, sharing, securing, analyzing, and presenting data insights are integral to being a learning organization. Big Data is essentially data, further characterized by large *volumes*, extreme *velocity*, and myriad *variety* laced with *veracity*. These are the popular Vs of Big Data. A learning organization goes beyond using the inherent characteristics of Big Data by discovering the hidden *value*. This is the fifth V—value—and it can