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Volume 300

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Sergey V. Zykov

IT Crisisology Casebook

Smart Digitalization for Sustainable Development

Springer

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To God, my teachers, and my family

Foreword

As a professor, I am always looking for books that offer a new perspective on the content that I teach. Because most of my students are executives, my attention is particularly drawn towards books that present materials in a manner that relates directly to the world as they experience it, sometimes referred to as the "real world". For this reason, I was delighted to be afforded the opportunity to write the Foreword to Sergey Zykov's newest book, "IT Crisisology Casebook: Smart Digitalization for Sustainable Development".

The central theme of this book is "IT Crisisology". The underlying idea is a simple one. As organizations, and the environments with which they interact, grow more digital, they must transform to survive. Unfortunately, such transformations are nearly always precipitated by, or followed by, a crisis. Making it through a crisis is challenging—the process can lead to either value creation or value destruction. How the organization responds will determine which.

To improve our odds of thriving through transformation-wrought crises, it makes sense to learn about them. Unfortunately, general rules for dealing with IT transformation crises are few and far between. To paraphrase the famous opening line of Anna Karenina: "Organizations in the steady state are all alike; every organization in crisis experiences that crisis in its own way". A regrettable truth in a complex world.

So, if we cannot teach general rules for managing the crises of IT transformation, how do we learn about them? One way is by reasoning through examples; by viewing complex situations through the eyes of the managers that confronted them. That is where case studies come in. Rather than providing the reader with rules, these cases offer readers the opportunity to think through a situation and come up with their own situation-specific rules.

The benefits of using case studies do not end with helping readers hone their judgement. Storytelling is the most resonant means of informing—one that works effectively for everyone from the youngest child to the most seasoned executive. Choose the right stories and you not only inform the reader but also inform those to whom the reader retells the stories. And the collection of stories contained in this book should resonate with nearly everyone interested in digitalization and how it is impacting organizations and the environment. No wonder I found it exciting to read.

The book is organized around evolving stages of digitalization and the many challenges the process presents. After setting out a framework and demonstrating how case studies can be applied in the initial chapter, the second chapter begins by looking at early stage transformations, focusing on a series of companies many of which are household names: the consulting company Accenture, the entertainment companies Cirque du Soleil and Disney, the technology companies Dropbox and Foursquare, and the fashion retailer Zara. Understanding how these organizations evolved and transformed will improve both the readers' understanding of the process and their overall IT literacy.

The next chapter begins by focusing on some small businesses that have used digitalization in innovative ways to support their strategies. It then considers some well-known and lesser-known examples of organizations that experienced transformation crises and did not handle them effectively, including Eastman Kodak, ThyssenKrupp, and Blockbuster Video, contrasting these with organizations that managed to pull away from the brink of failure by reinventing themselves for a digital world, such as LEGO.

The fourth chapter, which focuses on multinational organizations and diversity, presents the story of Microsoft, which initially neglected the digitalization process but managed to catch up through new leadership. It also tells the story of Huawei, whose adherence to a core set of principles helped it avoid the declines experienced by so many of its competitors in the mobile device industry, including Deutsche Telecom, Alcatel, Lucent, and Motorola.

In Chap. 5, Zykov turns his focus to an industry case focusing on the Russian forest industry. The case illustrates how issues of technology, resources, the environment, businesses, and government all play an integral part in the transformation process and the crises it produces. The chapter also looks at the CMM(I) model of software process evolution, a transformation-driven model that reflects the degree of control a software development shop exerts over its activities.

The sixth chapter looks at the human side of digitalization, considering the question of how knowledge is transferred and the potential need to accommodate cultural differences. It also looks specifically at the soft skills needed by a software developer.

In the conclusion, the lessons of these chapters are pulled together and some general thoughts about dealing with complex situations are presented.

Upon reading this book, I gained a great appreciation for the many forms in which transformation can manifest itself and in which the accompanying crises can be addressed. I am sure that the reader will feel the same.

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Preface

The focus of this book is real-world case-based crisis management in digital product development. This includes forecasting, responding, and agile engineering/management methods, patterns, and practices for sustainable development.

Over the past decades, production in general and digital product development in particular were understood and practised in different ways. Changeable business constraints, complex technical requirements, and the so-called "human factors" imposed on the digital products caused what was articulated as sustainability "crises". These complex sources of trouble require a practical multifaceted approach to address each of their ingredients. Therefore, this book suggests an approach that contains practical methods, patterns, and techniques to efficiently manage these crises and provide sustainable development.

Software engineering was triggered by what was initially identified as a digital production "crisis"; however, this practically focused discipline even after 50 years of existence cannot be considered a "silver bullet" for digitalization, and wider, sustainable organization development. This means that the digital development/production crisis is still here, and it may immediately occur in case of careless selection or unbalanced application of the rich variety of the principles and practices that the state-of-the-art digital product engineering currently incorporates.

This book introduces a set of case studies for sustainability in management as a blend, the components of which have been carefully selected from a few domains adjacent to digital production such as IT-intensive operation, human resource management, and knowledge engineering, to name a few. The key ingredients of this crisis management framework include information management, tradeoff optimization, agile product development, and knowledge transfer.

The case studies this book features, will help the stakeholders in understanding and identifying the key technology, business, and human factors that may likely result in a digital production crisis, i.e., critically affect the organization outcomes in terms of successful digitalization and sustainable development. These factors are particularly important for large-scale applications, typically considered very complex in managerial and technological aspects, and therefore specifically addressed by the discipline of IT Crisisology. Therefore, this book will throw light on the crisis

responsive and resilient methods, techniques, and practices; as such, it will focus on their practical and realistic applications and the resulting benefits for digitalization and sustainable development.

To successfully apply the social and human aspects of IT Crisisology, which often appear subtle, uncertain, and hardly manageable, this book suggests the case study-based approach. An extensive set of comparative case studies for IT-intensive digital businesses of different scales and scopes will be considered. We approach the crisis management solutions from the perspectives of different continents, historical and cultural diversity, which can essentially affect the human factors that often are the root cause of a crisis. The businesses that we examine in these case studies clearly have a number of similarities including their overall structure and ultimate goals. However, certain outcomes and business deliverables due to local varieties and business-specific dynamics might be essentially different. After discussing each of these case studies separately (from the perspectives of business processes, knowledge transfer, and digital products utilized), we will compare them in terms of business, technology, and human-related factors to detect and refine common patterns of digitalization sustainability in crisis environments.

We hope that this book will serve as a reliable compass for the digital product developers and managers of IT-intensive businesses as it will give them the necessary guidelines to navigate confidently through the rough ocean of digitalization in the stormy times of crises.

Moscow, Russia Sergey V. Zykov

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Prof. Dr. Sergey V. Zykov holds a Ph.D. (2000) and Dr. Habil. (2017) in Computer Science. He has a 20-year experience in IT, including Vice-CIO of the ITERA International Oil & Gas Group. He also has over 20 years in teaching computer science and software engineering and holds instructor certificates from Carnegie Mellon University and London School of Economics. Currently, he is a Full Professor at the HSE University, National Nuclear Research University MEPhI, and Russian Technical University MIREA. He served as a Visiting Researcher at the Carnegie Mellon University (USA), the First Moscow State Medical University, and Innopolis University (Russia). He authored over 100 papers and 10 books, including 5 monographs by Springer, among which is IT Crisisology: Smart Crisis Management in Software Engineering (2020). He serves as an Associate Editor at the Intelligent Decision Technologies and International Journal of Knowledge-Based and Intelligent Engineering Systems. His research fields include: crisis responsive software development, enterprise system lifecycles, and data modeling.

Acronyms

6σ	*Six Sigma*
ACDM	Architecture-Centric Development Method
AHP	Analytic Hierarchy Process
API	Application Programming Interface
AR	Augmented Reality
BCG	Boston Consulting Group
BI	Business Intelligence
BiTA	Blockchain in Transport Alliance
CBA	Choosing by Advantages
CIO	Chief information officer
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CRM	Customer Relationship Management
CSF	Critical Success Factor
DEA	Data Envelopment Analysis
DMAIC	Define, Measure, Analyze, Improve, and Control
DMU	Decision-Making Units
EAM	Enterprise Agility Matrix
EBIT	Earnings Before Interest and Taxes
ERA	Evidential Reasoning Approach
ERP	Enterprise Resource Planning
FIIF	Forest Industry Innovation Framework
GDP	Gross domestic product
GUI	Graphical User Interface
ICT	Information and communication technologies
IDC	International Data Corporation
IofAs	Importance of Advantages
IoT	Internet of Things
IQR	Interquartile Range
ISO	International Organization of Standardization
ITC(F)	IT Crisisology (Framework)

KM	Knowledge Management
KPI	Key Performance Indicator
KS	Knowledge Sharing
KT	Knowledge Transfer
KTT	KM Tools and Technology
M2M	Machine-to-Machine
MCDA	Multiple-Criteria Decision Analysis
MCS	Mobile Crowdsensing
MNC	Multinational Corporation
NTI	National Technology Initiative
NYU	New York University
OS	Operating System
PDCA	Plan-Do-Check-Adjust
PDM	Precedence Diagramming Method
PPE	Personal Protective Equipment
PSM	Process Safety Management
PSP	Personal Software Process
PtD	Prevention Through Design
QA	Quality Attribute
RFID	Radio Frequency Identification Technology
ROI	Return On Investment
SCADA	Supervisory Control And Data Acquisition
SD	System Dynamics
SDK	Software Development Kit
SDLC	Software Development Lifecycle
SEI	Software Engineering Institute
SME	Small and Medium Enterprises
STM	Science, Technology, Medicine
TMCS	Top Management Commitment and Support
TNC	Transnational Corporation
TOGAF	The Open Group Architecture Framework
TSP	Team Software Process
UI	User interface
UX	User experience
VR	Virtual Reality
XR	Extended Reality