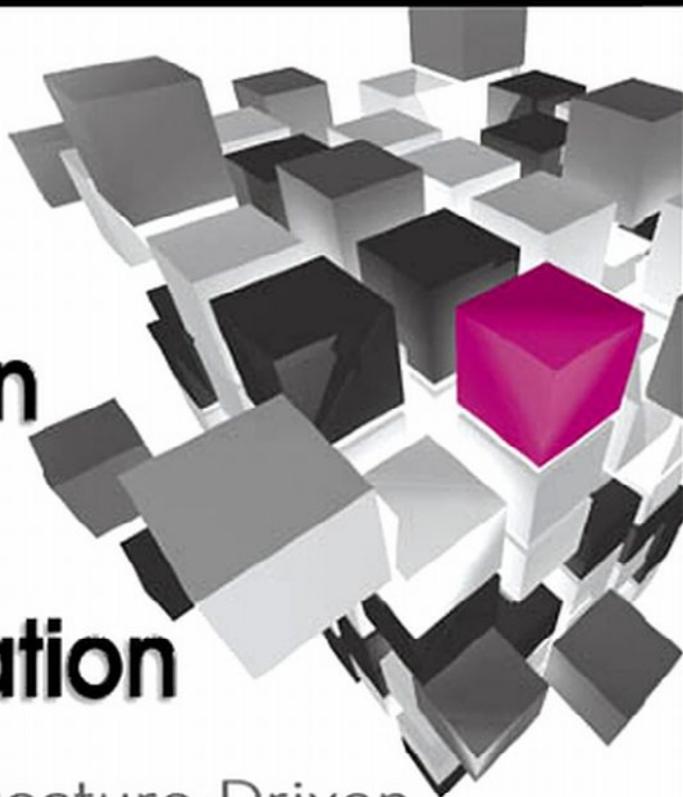


Information Systems Transformation

Architecture-Driven
Modernization Case Studies

William M. Ulrich
Philip Newcomb



The MK/OMG PRESS

Information Systems Transformation

Architecture-Driven
Modernization Case Studies



Morgan Kaufmann OMG Press

Morgan Kaufmann Publishers and the Object Management Group™ (OMG) have joined forces to publish a line of books addressing business and technical topics related to OMG's large suite of software standards.

OMG is an international, open membership, not-for-profit computer industry consortium that was founded in 1989. The OMG creates standards for software used in government and corporate environments to enable interoperability and to forge common development environments that encourage the adoption and evolution of new technology. OMG members and its board of directors consist of representatives from a majority of the organizations that shape enterprise and Internet computing today.

OMG's modeling standards, including the Unified Modeling Language™ (UML®), Model Driven Architecture® (MDA), and Systems Modeling Language (SysML) enable powerful visual design, execution and maintenance of software, and other processes for example, IT Systems Modeling and Business Process Management. The middleware standards and profiles of the Object Management Group are based on the Common Object Request Broker Architecture® (CORBA) and support a wide variety of industries.

More information about OMG can be found at <http://www.omg.org/>.

Morgan Kaufmann OMG Press Titles

Distributed Systems Architecture: A Middleware Approach

Arno Puder, Kay Romer, and Frank Pilhofer

UML 2 Certification Guide: Fundamental and Intermediate Exams

Tim Weilkens and Bernd Oestereich

Real-Life MDA: Solving Business Problems with Model Driven Architecture

Michael Guttman and John Parodi

Business Process Change: A Guide for Business Managers and BPM and Six Sigma Professionals

Paul Harmon

A Practical Guide to SysML: The Systems Modeling Language

Sanford Friedenthal, Alan Moore, and Rick Steiner

Master Data Management

David Loshin

Database Archiving: How to Keep Lots of Data for a Very Long Time

Jack Olson

SOA and Web Services Interface Design: Principles, Techniques, and Standards

Jim Bean

Information Systems Transformation: Architecture-Driven Modernization Case Studies

William M. Ulrich and Philip H. Newcomb

Information Systems Transformation

Architecture-Driven Modernization Case Studies

William M. Ulrich and Philip H. Newcomb



AMSTERDAM • BOSTON • HEIDELBERG • LONDON
NEW YORK • OXFORD • PARIS • SAN DIEGO
SAN FRANCISCO • SINGAPORE • SYDNEY • TOKYO

Morgan Kaufmann Publishers is an Imprint of Elsevier



Morgan Kaufmann Publishers is an imprint of Elsevier.
30 Corporate Drive, Suite 400, Burlington, MA 01803, USA

This book is printed on acid-free paper.

© 2010 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

Library of Congress Cataloging-in-Publication Data

Application submitted

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

ISBN: 978-0-12-374913-0

For information on all Morgan Kaufmann publications,
visit our Web site at www.mkp.com or www.elsevierdirect.com

Printed in the United States of America

10 11 12 13 14 5 4 3 2 1

Working together to grow
libraries in developing countries

www.elsevier.com | www.bookaid.org | www.sabre.org

ELSEVIER

BOOK AID
International

Sabre Foundation

I dedicate this book to my wife Kathy and children Cat and Max.

William M. Ulrich

*I dedicate this book my wife Christine and children Arielle and
Nicolas, parents Bob and Betty, and the brilliant and
dedicated staff of The Software Revolution, Inc.*

Philip H. Newcomb

This page intentionally left blank

Table of Contents

CONTRIBUTORS.....	ix
PREFACE.....	xi
AUTHORS' BIOGRAPHIES.....	xv
CONTRIBUTING AUTHOR ACKNOWLEDGMENTS	xvii

Part 1 Architecture-Driven Modernization

CHAPTER 1 Introduction to Architecture-Driven Modernization.....	3
CHAPTER 2 Modernization Technologies and Services	35
CHAPTER 3 Modernization Standards Roadmap.....	45
CHAPTER 4 Modernization Scenarios.....	65

Part 2 Modernization Case Studies

CHAPTER 5 Modernization of the Eurocat Air Traffic Management System (EATMS).....	91
CHAPTER 6 PowerBuilder/4GL Generator Modernization Pilot	133
CHAPTER 7 Modernization Case Study: Italian Ministry of Instruction, University, and Research.....	171
CHAPTER 8 Modernization of Reliability and Maintainability Information System (REMIS) into the Global Combat Support System-Air Force (GCSS-AF) Framework.....	193
CHAPTER 9 Federal Agency Case Study: Role of Modernization in a Greenfield Replacement/ COTS Project	223

CHAPTER 10	Legacy System Modernization of the Engineering Operational Sequencing System (EOSS)	249
CHAPTER 11	Model-Driven Reverse Engineering of COBOL-Based Applications	283
CHAPTER 12	Veterans Health Administration's VistA MUMPS Modernization Pilot	301
CHAPTER 13	Delta Lloyd Deutschland Data Migration Case Study ...	347
CHAPTER 14	MoDisco, a Model-Driven Platform to Support Real Legacy Modernization Use Cases	365
Part 3	A Guide to Moving Forward with Modernization	
CHAPTER 15	Launching and Sustaining Modernization Initiatives	403
INDEX	419

Contributors

- Franck Barbier (Chapter 11).** Consultant, Netfective Technology, Professor, University of Pau, France
- Gabriel Barbier (Chapter 14).** MIA-SOFTWARE, Nantes, France
- Hugo Bruneliere (Chapter 14).** R&D Engineer at INRIA & EMN, Nantes, France
- Eric Cariou (Chapter 11).** Assistant Professor, University of Pau, France
- Robert Couch (Chapter 6 and 12).** Senior Scientist, The Software Revolution, Inc., Kirkland, WA
- Jerome DelaPeyronnie (Chapter 5).** Program Manager, FDP Product Manager, Thales Air Systems, Toulouse, France
- Bernhard Düchting (Chapter 13).** Technical Director of Modernization EMEA, Oracle Corporation
- Sylvain Eveillard (Chapter 11).** Netfective Technology
- Olivier Guitton (Chapter 11).** Netfective Technology
- Dru Henke (Chapter 6).** PowerBuilder Conversion Lead, NVISIA, LLC, Chicago, IL
- Frédéric Jouault (Chapter 14).** AtlanMod Team (INRIA & EMN) Nantes, France
- Mark Kramer (Chapter 10).** Senior Consultant, Target Systems
- Tom Laszewski (Chapter 7 and 13).** Technical Director Modernization, Oracle Corporation - Platform Technology Solutions
- Yves Lennon (Chapter 14).** Sodifrance, Nantes, France
- Jim LoVerde (Chapter 6).** Magna Conversion Lead, NVISIA, LLC, Chicago, IL
- Frédéric Madiot (Chapter 14).** MIA-SOFTWARE, Nantes, France
- Joyce McPeck (Chapter 8).** Northrop Grumman IT, Dayton, OH
- Vincent Morillo (Chapter 5).** FDP Senior Scientist, Thales Air Systems, Toulouse, France
- Luong Nguyen (Chapter 5, 6, and 8).** Operations Manager, The Software Revolution, Inc., Kirkland, WA
- Arnaud Perrier (Chapter 11).** Netfective Technology

Mark Purtil (Chapter 5 and 8). Senior Scientist, The Software Revolution, Inc., Kirkland, WA

Ed Seidewitz (Chapter 9). Vice President, Model Driven Architecture Services, Model Driven Solutions

Michael K. Smith PhD, PE (Chapter 7). Chief Technologist, Apps Modernization, EDS Office of the CTO, Hewlett-Packard

Fakhredine Trimech (Chapter 5). FDP Senior Scientist, Thales Air Systems, Toulouse, France

Kamal Youbi (Chapter 11). Vice President R&D, Netfective Technology

Preface

Much has been written and said about existing software systems over the past few years. Tools and solutions have come and gone as organizations have taken on and discarded numerous “silver bullet” strategies for addressing major business and IT challenges. Yet massive, aging software systems remain at the core of most every industry. Increasingly complex, yet fragile, software systems play a critical role in insurance and healthcare, banking and finance, defense and government, manufacturing and telecommunications, energy and utilities, transportation, retail, and other industries.

Executives have come to the stark realization that these systems can no longer be ignored, are not going to fade away, and must be dealt with proactively and not reactively. We agree, which is why we have written this book. We wrote this book to convey one message: Architecture-driven modernization (or simply “modernization”) can play a strategic role in building a more agile, more competitive enterprise in the face of increasing internal and external pressures and demands. The following Gartner quote states the strategic value of modernization.

IT modernization reinstates IT strategic planning at the heart of the CIO cabinet. Most CIOs will need to develop new skills and competencies in their management teams to deal with the significant challenges of IT modernization.

6 February 2008, ID Number G00154885, Andy Kyte and Dale Vecchio,

Architecture-driven modernization provides an enterprise with a wide variety of options for understanding, evolving, and ultimately transforming critical software systems. Applying modernization options to existing software systems is no longer a tactical luxury or stop-gap measure for organizations. Rather, modernization now plays an essential and strategic role within an enterprise and serves as a vehicle for facilitating the alignment of IT with business strategy

and business architecture. In addition, modernization opens up a variety of new options for executives as they consider the best way to leverage IT funding and avoid cost and project overruns common in many enterprises today.

To best convey the message of how modernization can address these needs, we offer this book as a testament to the fact that modernization provides real and quantifiable value to organizations. We included ten powerful modernization case studies that discuss how modernization solutions have been applied to a number of scenarios, across a wide variety of industries. In addition, we offer insights into why modernization is becoming more of a necessity as executives seek to find new and unique ways to leverage scarce resources yet still mobilize key enterprise initiatives.

Why architecture-driven modernization? We are frequently asked why the term “architecture-driven” is appended to term modernization. The answer is simple. For modernization initiatives and programs to gain long-term executive support so that the program remains successful and sustainable, modernization efforts must look at the broader impacts and benefits on the IT architecture and on the *business architecture*. We provide guidance on how to do this in Part I of this book.

Why a case study book? When we discussed writing a book with customers, clients, colleagues, and our publisher, one message came through loud and clear: Organizations want to learn how other organizations have applied modernization in practice, including hearing about the successes and the pitfalls of these projects. In seeking out these case studies, we felt that offering a diversified view of modernization was important. We believe that we achieved this diversification from a regional, industry, platform, and project approach perspective.

We also felt that any book on modernization case studies should present those case studies in a broader context. As a result, we have provided readers with a complete context and set of approaches for justifying, launching, and implementing modernization initiatives. In other words, this book not only serves as a basis for convincing your colleagues and management that modernization offers strategic value, but can also serve as an ongoing handbook that you will come back to again and again to continue to expand your understanding of modernization concepts and approaches.

In developing a book that included a number of contributions from additional authors for various case studies, we had an opportunity to see how modernization projects were evolving across international borders and industries. We hope you get as much value out of this book as we gained in writing and editing it.

CONTENT OVERVIEW

Part I of this book provides a comprehensive overview of architecture-driven modernization. Chapter 1, Introduction to Architecture-Driven Modernization, is recommended for anyone who wants to understand why modernization is an essential element of one's IT and business strategy. It discusses how to avoid past project failures and build a sustainable modernization program; modernization benefits and cost justification; modernization as an alternative versus modernization as an augmentation option; how modernization supports business architecture/IT architecture alignment; assessment, refactoring, and transformation disciplines; and useful modernization principles. We hope you can draw from the various studies contained in this chapter to justify your modernization efforts.

Chapter 2, Modernization Technologies and Services, provides a comprehensive view of available tool, technology, service, and deployment options and when these options should be exercised. Chapter 3, Modernization Standards Roadmap, provides insights into the key role of standards in the evolution of tools, technologies, and the practice of modernization. Chapter 4, Modernization Scenarios, overviews how modernization fits into various project scenarios, many of which are incorporated into the case study section of the book in Part II.

Part II of this book provides ten case studies, each packaged into its own chapter. Modernization case studies cover a variety of industry sectors including insurance, banking, and finance; defense; private and public sector healthcare; education; tourism and travel; energy and geophysical services; federal government; air traffic control; and retail. Existing and target platforms varied but ranged from mainframe to specialty environments. In addition, we included stories from four different countries.

Case study projects addressed technology and platform migrations and transformations; hybrid solutions that incorporated commercial-off-the-shelf (COTS) packages with existing software architectures; migration to services oriented architecture (SOA); application and data architecture transformations, including database migrations; and transformation to model-driven architecture (MDA), which included the migration to UML-based environments. In addition, real-world examples of how to procure and maintain funding for modernization efforts provide excellent insights into how to launch these efforts and, just as important, how to sustain them.

Part III of this book contains a chapter entitled, Launching and Sustaining Modernization Initiatives. This chapter provides a list of modernization

pitfalls — what to avoid; an expanded set of guiding principles; how to set up a center of excellence; a modernization tool/technology strategy; a modernization service provider strategy; and a guide for how to get started with a modernization initiative, including procurement strategies; and what to expect from modernization as time unfolds. Many times, books do not always offer the pitfalls associated with a given topic that authors may feel passionate about. However, we feel that it is important to understand when and how you can stumble in a modernization effort and how to avoid these situations.

ACKNOWLEDGMENTS

The authors want to acknowledge a number of individuals and organizations as contributors to this book. First, we want to thank those executives and managers who have committed themselves and their organizations to the work involved in selling the concept of modernization to executives and finance teams that do not understand basic system concepts and the role of these systems within an enterprise. We also want to thank our contributing authors. Each chapter case study identifies the authors that contributed to that particular case study. We could not have written this book without their help.

We additionally wish to thank all of the in-house personnel, service providers, and vendors who worked on these projects. While there are too many to name on an individual basis, these hardworking individuals provided the management and technical skills necessary to deploy and deliver these projects. We would also like to make special mention of the tool vendors that continue to provide automation solutions to the modernization industry.

We must also thank the Object Management Group (OMG) on several counts. First, we want to thank the OMG Press (Morgan Kaufmann Elsevier) for having the foresight to request and support our work on this book. Specifically, we want to thank our editors, Greg Chalson and Heather Scherer and Production Manager, Paul Gottehrer. In addition, we want to thank Richard Solely, CEO of OMG, for his encouragement on this project. Finally, we want to thank the OMG Architecture-Driven Modernization Task Force for all of the work that it has performed on modernization standards. Again, there are too many ADM Task Force members to thank individually, but without their work on the ADM standards, modernization could have stagnated.

Finally, we want to thank our families and numerous other colleagues who have had to put up with us diverting our attention from other matters for the past year. We hope you enjoy reading this book as much as we enjoyed writing it.

William M. Ulrich and Philip H. Newcomb

Authors' Biographies

William M. Ulrich is President of Tactical Strategy Group, Inc. and a management consultant. Fortune 1000 companies, government agencies, high-tech companies, and consulting firms have sought Mr. Ulrich's advice on business/IT architecture alignment. Mr. Ulrich is Co-Chair of the OMG Architecture-Driven Modernization Task Force, Co-Chair of the OMG Business Architecture Special Interest Group, Editorial Director of the Business Architecture Institute, and author of hundreds of articles and three books. Mr. Ulrich's last book was titled *Legacy Systems: Transformation Strategies* (Prentice Hall). In 2005 Mr. Ulrich was awarded the "Keeping America Strong Award" as seen on the Heartbeat of America for his work in the field of systems modernization.

Philip H. Newcomb is CEO of The Software Revolution, Incorporated (TSRI), and an internationally recognized expert in the application of artificial intelligence and formal methods to software engineering. He has published numerous papers and articles in technical journals and is a frequent presenter to national and international forums in his field. He has his MS degree in computer science from Ball State University in 1988 with graduate work towards this degree from Carnegie Mellon University and the University of Washington, and his BS degree in Cognitive Psychology from Indiana University in 1976. Over the course of 32 years, he has done groundbreaking research in the application of artificial intelligence, software engineering, automatic programming, and formal methods technology to industrial software problems, including 13 years at the Boeing Artificial Intelligence Center as a Principal Computer Scientist before founding TSRI in 1995. Mr. Newcomb formulated the conceptual product framework and led a team of computer scientists to develop the software transformation technology and products offered by TSRI.

This page intentionally left blank

Contributing Author Acknowledgments

The authors of Chapter 5, Modernization of the Eurocat Air Traffic Management System (EATMS), would like to acknowledge Roger Knapp, Robert Couch, Francesca Anderson, Greg Tadlock, and Randy Doblal of The Software Revolution, Inc. for their contributions to the successful execution of the EATMS project.

The authors of Chapter 7, Modernization Case Study: Italian Ministry of Instruction, University, and Research, would like to acknowledge Alfredo Giorgi, SIDI project leader; Saverio Passaro, MIUR Application Development and Maintenance team leader; Massimo Rocchi, Hosting and Data Center team leader; and Francesco Mesto, EDS Applications leader for the SIDI project. This case study was compiled from presentations prepared by Francesco Mesto, Antonio Menghini, Corrado Fontanesi, and Alfredo Giorgi. Valuable suggestions were provided by the above team as well as Larry Acklin, Remo Denato, Fabio Valeri, and Aldo Tosti of HP.

The authors of Chapter 8, Modernization of Reliability and Maintainability Information System (REMIS) into the Global Combat Support System-Air Force (GCSS-AF) Framework would like to acknowledge Mel Meadows, Richard Micek, David McGuire, Karen Chambers, Patty Roll of Northrop Grumman IT, and Matthew Campbell, Francesca Anderson, Greg Tadlock, Roger Knapp, and Bob Couch, and Randy Doblal of The Software Revolution, Inc. for their contributions to the successful execution of the REMIS project.

The authors of Chapter 10, Legacy System Modernization of the Engineering Operational Sequencing System (EOSS), would like to acknowledge Matthew Campbell, Francesca Anderson, Greg Tadlock, Roger Knapp, Mark Purtill, Robert Couch, and Randy Doblal of The Software Revolution, Inc. for their contributions to the successful execution of the EOSS project, and Cdr. Rich Voter, NETWARCOM N63, Maryann Rockey, Deputy Chief Naval Operations,

Vice Admiral Richard Mayo, NETWARCOM, Admiral (Ret.) Archie Clemins, Commander in Chief of the U.S. Pacific Fleet for their management, oversight and sponsorship of the EOSS LSM project.

The authors of Chapter 12, Modernization of the Veterans Health Administration's MUMPS Modernization Pilot, would like to acknowledge the following TSRI personnel for their contributions to the MUMPS conversion pilot: Matthew Campbell, Francesca Anderson, Greg Tadlock, Roger Knapp, and Randy Dobar. The authors would also like to thank the following personnel at the VHA for their support for the MUMPS conversion pilot: Robert N. McFarland, Assistant Secretary for Information and Technology; Craig B. Luigart, Associate Deputy Assistant Secretary for Policy, Portfolio Oversight and Execution, Office of Information and Technology; Robert M. Kolodner, M.D., Acting Deputy Chief Information Officer for Health and Acting VHA Chief Health Informatics Officer; Jim Demetriades, Chief Health Information Architect of the Veterans Health Administration's Office of Information; The authors would also like to thank the following SAIC personnel to their contributions to the MUMPS conversion pilot: Larry Peck, President, Enterprise and Infra Solutions Group; Dr. Stephen Rockwood, Special Executive Staff; Robert McCord, Senior Vice President and Health Solutions Business Unit General Manager; Dr. Marv Langston, Senior Vice President and SPAWAR Account Manager; Pamela Graff, Vice President and Director of Business Development; Dennis Eisenstein, Vice President and Operations Manager, George Hou, Assistant Vice President and VA Account Manager; Bruce Custis, Assistant Vice President and Acquisition Manager Conversion Pilot; Alex Bravo, Project Manager.

The authors for Chapter 13, Delta Lloyd Deutschland Data Migration Case Study, would like to acknowledge the following people. First, Bernhard Duchting who is a member of the Oracle Modernization Solutions team in Europe. He was the Oracle Modernization trusted technical advisor for this project. In this function he leads application portfolio and detailed assessment phases of the project and provides technical assistance for the life of the modernization effort. He also provides recommendations for legacy modernization based on database migration and integration, as well as application porting and rehosting.

The Consulting project was led by Ulrich Buck. He is a senior principal consultant based in Hamburg and has a strong background in mainframe modernization. Ulrich was involved in similar projects in Germany, Switzerland, UK, and the United States. Ulrich is authoring a case study about the DLD project and has provided invaluable assistance and input to this chapter.

FreeSoft is a modernization partner based in Budapest. They started to invest in migrating Ingres and Informix environments in 1990. This included database migration, ESQL conversion, and replacing dialog systems (i.e., Informix 4GL)

by Oracle Forms and HTML. Their X2O conversion technology for porting applications is based on a runtime emulation with minimal change to the source programs. Recently, FreeSoft added the same capability for DB2 environments, both on mainframe and distributed platforms.

UC4 is a leading provider of solutions for workflow automation. The UC4 job scheduler was used in the project to map the job scheduling from IBM mainframe to the target platform.

Finally, credits go to Tom Laszewski from the Oracle Modernization Solution Team for his continued support, guidance, contribution to the content, and proofreading during the creation of this chapter. Tom has authored many articles on modernization, and also co-authored the book *Oracle Modernization Solutions* published by PACKT.

The authors of Chapter 14, *MoDisco, a Model-Driven Platform to Support Real Legacy Modernization Use Cases*, would like to acknowledge the European Commission, which funded the EU FP 6 project Modelplex; the work presented in the MoDisco Case study has been carried out in the context of the EU FP 6.