Systems Modeling for Business Process Improvement

David Bustard
Peter Kawalek
Mark Norris
editors

Systems Modeling for Business Process Improvement

David Bustard
Peter Kawalek
Mark Norris

Editors

Artech House
Boston • London
www.artechhouse.com

Library of Congress Cataloging-in-Publication Data
Bustard, David, 1949–
Systems modeling for business process improvement/ David Bustard, Peter Kawalek, Mark Norris.
p. cm. — (Artech House computing library)
Includes bibliographical references and index.
ISBN 1-58053-050-8 (alk. paper)
1. Information resources management. 2. Management information systems.
3. Information technology. I. Kawalek, Peter. II. Norris, Mark. III. Title. IV. Series.

T58.64. B88 2000 00-027445
658.4'032—dc21 CIP

British Library Cataloguing in Publication Data
Bustard, David, 1949–
Systems modeling for business process improvement.—
(Artech House computing library)
1. Industrial engineering—Data processing 2. Reengineering
(Management)—Computer network resources 3. Systems
engineering 4. Software engineering
I. Title II. Kawalek, Peter III. Norris, Mark
658.5'0285'51

ISBN 1-58053-050-8

Cover design by Igor Valdman

685 Canton Street
Norwood, MA 02062

International Standard Book Number: 1-58053-050-8
Library of Congress Catalog Card Number: 00-027445

10 9 8 7 6 5 4 3 2 1

FOREWORD

Hammer and Champy, in their analysis of the impact of information technology (IT) on organizations (*Reengineering the Corporation*, Nicholas Brealey Publishing, 1993), identify innumerable ways in which the rapid evolution of technology can have a massively disruptive effect. They argue that to identify and meet new business objectives, an organization needs inductive thinking, building on the possibilities of the technology and the business opportunities that it provides. Yet, such systems thinking requires skills from two quite distinct cultures: *information systems* and *software engineering*. Traditionally, these two communities have taken quite different views being respectively socioeconomic and technically oriented. Increasingly, the two communities are being pushed together as the rapid evolution of business, driven by the explosion in IT, leads to ever-more complex, interrelated and interworking systems whose development can no longer be achieved without considerations from both sides.

In this book, Dave Bustard and his colleagues have brought together representatives of both communities who present their views in a way that is sympathetic to the idea that recognizing a shared problem is important. The emphasis on modeling is well chosen because it is shared models of systems that will lead to the common understanding on which rapid progress can be made. It is clear that the two communities take a very different approach to modeling.

Information systems models tend to be soft, manifesting themselves as diagrams that on purpose leave some aspects of interpretation open. Software engineering models tend to be hard, ideally being sufficiently accurate and complete that they can actually become part of the system. Bridging this gap in modeling is the core theme of this book.

Lest you think there is less of a gap here than I make out, consider the use of terminology by the two cultures. Many words are shared, but few meanings. A speaker using the words *ontology* or *ethnography* is probably from the information systems community. A speaker using the words *component* or *agent* is probably from the software engineering community. But what of a speaker using the words *process* or *system*? Such a speaker could be from either community, but you would need to know from which to understand what each word meant. You will see the authors of the papers in this book valiantly trying to bridge this gap in understanding.

The difficulty we have in researching topics such as those addressed here arises from the fact that systems-level research is necessarily interdisciplinary and necessarily bridges many cultures. This is a major challenge for research in the United Kingdom and worldwide. It is, however, an area of research in which we might expect the United Kingdom to excel having, as we often claim, a tradition for breaking down the barriers between institutions. This book makes an excellent contribution to the important objective of uniting the systems thinkers (the inductive thinkers) from both information systems and software engineering. Much remains to be done—but this is a good place to start.

Peter Henderson
Professor of Computer Science, University of Southampton
Coordinator, Systems Engineering for Business Process Change
(an EPSRC research program)

September 1999

PREFACE

Organizations need to improve to survive. Information technology (IT) currently plays a significant part in helping to achieve that improvement. This book examines the nature of such organizational change and considers, in particular, the supporting contribution of systems modeling to the change process.

Through IT, modern organizations can improve both their efficiency and their effectiveness. The Internet, for example, offers businesses access to potential customers, in any part of the developed world, 24 hours a day, 365 days a year, with minimal overhead costs.

Unfortunately, the many cited cases of failure make it clear that the potential gains through IT are not easily realized. The essence of the problem is that it can be *very hard* to achieve beneficial organizational change. This is true whether the goal is to introduce imaginative new ways of working, migrate to new technologies, or simply make improvements in areas of known weakness. The resulting upheaval is met with resistance—often with justifiable cause.

Making good use of IT is therefore a challenging design task. If we want to bring about genuine improvement within an organization, if we want outcomes to be managed and not left to chance, then we need appropriate design techniques and processes. This is the subject matter of this book. The particular focus is the development and use of *system models*. These provide a basis for understanding

where change is desirable and describing how it can be achieved. A model can cover any relevant aspect of a business, its IT support, or the change process.

The title of the book brings together two concepts that have become dominant themes in the design of IT systems: one is *systems* and the other *business process improvement*.

WHY SYSTEMS?

Any organizational change program is likely to be *systemically* complex. That is, it will be characterized by a network of interdependent factors. Any tug at this network is likely to have ramifications elsewhere. For example, the task of developing a new database can quickly become associated with issues of work practices, levels of training, reward schemes, and alternative political manifestos for the development of the organization. Within this complex organizational context is the technical task itself, namely the challenge that the IT development team faces in trying to comprehend, define, and support the organizational activities of current and potential IT users.

Systems approaches strive to provide a means for understanding and managing such complex situations. Many techniques have been in use for a long time, such as *sociotechnical systems design* and *soft systems methodology*. It is reassuring that their value is now becoming better recognized in the IT community. By taking a systems approach, the IT practitioner is seeking to find a way of appreciating the complex relationships that affect change, resisting the urge to ignore soft factors that are difficult to control and yet trying to preserve sufficient rigor and thoroughness in the work.

WHY BUSINESS PROCESS IMPROVEMENT?

Any IT intervention will have to account for its value in some terms or other, such as reduced costs, greater opportunities generated, or higher user satisfaction. Therefore, both at the design stage and at an evaluation stage, it is necessary to define the scope of IT in a way that allows a thorough appreciation of its contribution. By considering this impact of IT on business processes, IT designers can take a sufficiently rich vantage point from which to consider a computing system's true implications for the business. The design task becomes still more complex, however, as any business process will be a function of organizational, technological, and human resource factors.

Thus, the design task is enlarged. Far from being a technical intervention, we are likely to find ourselves undertaking a sociotechnical and, perhaps, multidisciplinary project. Such enlargement of scope and perspective carries with

it its own risks but has the potential to enhance our understanding and improve the quality of the IT design.

It follows that at the design stage, the IT system should be described in a way that allows its impact on the business process to be understood. The business can then sensibly debate the merits of the new design and can compare it with existing or previous designs. At the evaluation stage, a rich set of process metrics can be assembled to provide evidence of the value of the new process. These metrics might be quantitative, such as costs, customer contacts, or cycle time, or they might be qualitative, such as accounts of customer experience or descriptions of user satisfaction.

Interpreted in this way, the business process design is used as the fulcrum of a broader systemic intervention. It is not the only concern, but the design of the business process does allow the impact of a wide range of variables to be discussed. It can be used to help build a rich model of the organization—a model that can then be used alongside other models in the quest to bring out the full potential of IT support.

WHY IS THIS BOOK IMPORTANT?

Arguably, IT has been the defining technology of recent years. Advances in IT have shaped and reshaped our lives. This book is concerned with furthering this process. As IT becomes ever-more deeply embedded in our work and social activities, it becomes more important that we are able to manage it, to use it efficiently, and above all to use it effectively.

This book is the work of prominent researchers and practitioners in the application of IT in organizations. The ideas and approaches that are described deal with various aspects of organizational change, taken from business, information systems, and software engineering perspectives. Together they address the major concepts and issues in systems thinking and business process improvement. An emphasis on systems modeling provides a unifying theme across the contributions and gives a practical emphasis in the work. The net effect is a book that is *really* useful—one that can help inform any analysis, design, or evaluation of organizational change involving IT.

WHO SHOULD READ THIS BOOK?

This book is written for all those concerned with deploying IT in organizations. The chapters are written by and for those with software engineering and information systems backgrounds, but the material is also of value to those more concerned with business and management. We anticipate that both academic and

company researchers will find it interesting to consider the value of the thinking and approaches offered. Students, especially those at a Master's level and above, will also benefit from access to the ideas, methods, and techniques described.

ACKNOWLEDGMENT

This book has been developed and refined from material presented at a workshop titled *Systems Modeling for Business Process Improvement,* held in March 1999 at the University of Ulster, Coleraine, Northern Ireland. The workshop was partly funded by the U.K. Engineering and Physical Sciences Research Council (EPSRC) through the Systems Engineering for Business Process Change (SEBPC) program, coordinated by Peter Henderson and Dominic Semple.

We are very grateful to those who reviewed the papers submitted to the workshop from which the material in this book has been selected. The main reviewers were Bruce Campbell, Albert Alderson, Alistair Sutcliffe, Bill Hutchinson, Steve Polyak, Zimin Wu, Hussein Zedan, Pat Lundy, and George Wilkie. The quality of the final papers has also benefited from indirect contributions from the workshop attendees who participated in the many lively debates on the ideas involved.

We thank Pauleen Marshall and Zhonglin He for their help with the camera-ready layout of the contributions, and Viki Williams, Susanna Taggart, Ruth Young, and Jon Workman of Artech House for their guidance and encouragement throughout the production process.

Dave Bustard, University of Ulster
Peter Kawalek, University of Warwick
Mark Norris, Norwest Communications

CONTENTS