*History of Computing:*
*Software Issues*

**Springer-Verlag Berlin Heidelberg GmbH**

Ulf Hashagen
Reinhard Keil-Slawik
Arthur L. Norberg (Eds.)

# History of Computing: Software Issues

International Conference on the History of Computing,
ICHC 2000
April 5-7, 2000
Heinz Nixdorf MuseumsForum
Paderborn, Germany

Springer

*Editors*

Ulf Hashagen
Münchner Zentrum für Wissenschafts- und Technikgeschichte
Deutsches Museum
80306 München, Germany
u.hashagen@deutsches-museum.de

Reinhard Keil-Slawik
Heinz Nixdorf Institut
Universität Paderborn
Fürstenallee 11
33102 Paderborn, Germany
rks@upb.de

Arthur L. Norberg
Charles Babbage Institute
University of Minnesota
Department of Computer Science
200 Union Street, SE
Minneapolis, MN 55455, USA
norberg@cs.umn.edu

Library of Congress Cataloging-in-Publication applied for.

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

History of computing: software issues / International Conference on the History of Computing (ICHC 2000), April 5-7, 2000, Heinz-Nixdorf-MuseumsForum, Paderborn, Germany. Ulf Hashagen (ed.). -
Berlin; Heidelberg; New York; Barcelona; Hongkong; London; Mailand; Paris; Tokio: Springer, 2002

ISBN 978-3-642-07653-4 ISBN 978-3-662-04954-9 (eBook)
DOI 10.1007/978-3-662-04954-9

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilm or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 2002

Originally published by Springer-Verlag Berlin Heidelberg New York in 2002.
Softcover reprint of the hardcover 1st edition 2002

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Typesetting: Camera-ready by editors
Cover-Design: KünkelLopka Werbeagentur

Printed on acid-free paper SPIN: 10851186 45/3142xo - 5 4 3 2 1 0

# Preface

The papers in this volume were presented at a conference that was designed to map out historical study needs in one area of the history of computing, namely, software. The Paderborn conference was sponsored by the Heinz Nixdorf MuseumsForum and co-sponsored by the Charles Babbage Institute and the Heinz Nixdorf Institute of the University of Paderborn. The idea for the conference emerged from the consideration of a larger concept that was to prepare a new handbook on the history of computing. Believing that preparation of the handbook would encounter obstacles in some areas of computing that have not received adequate attention from historians, the originators of the idea of the handbook decided on a series of mapping conferences to try to overcome the obstacles, of which the Paderborn conference is the first. The organizers of the conference invited a group of historians, sociologists, and computer scientists to present papers and comments about a selected set of issues in the history of software. The organizing committee consisted of William Aspray (Computing Research Association, Washington, D.C.), Martin Campbell-Kelly (University of Warwick, U.K.), Ulf Hashagen (Heinz Nixdorf MuseumsForum, Paderborn), Reinhard Keil-Slawik (Heinz Nixdorf Institute, University of Paderborn), Michael S. Mahoney (Princeton University) and Arthur L. Norberg (Charles Babbage Institute, University of Minnesota).

The ambitious overall objective of this conference was to review our present understanding of the history of software and to establish an agenda for further research. The program of the conference was an attempt to explore the topic of the history of software in a new way. We neither intended nor expected the product to be a finished history of any of the topics included in the conference, nor did we want a continuation of previous efforts to describe histories of individual software artifacts. The conference presenters were asked not to attempt to provide finished histories for any of the areas of software history. Instead, speakers and commentators were asked to comment on the fundamental elements that make software what it is, and offer an exploration of our current understanding of software and its history. The organizers decided to address two different perspectives in the conference: the perspective of the computer scientists and the perspective of the historians and sociologists interested in the larger context of a development. Hence, computer scientists, entrepreneurs, historians, and sociologists met to discuss the

selected set of issues. Between speakers and commentators, we hoped to merge the two perspectives into one scheme for investigating the history of software.

We hope that the volume presented here is only the first step in a larger series of conferences and scholarly studies on the history of software. Many issues had to be left out, and the attempts to structure the field have to be regarded as immature. The dialogue started here, especially between historians and computer scientists, has to be continued. This dialogue will be by no means easy to conduct, because with software the object of historical study comes close to our personal life and experiences. It is, however, our dear hope that this dialogue will create for the reader as much of a challenging learning experience as it was for the historians and computer scientists attending this conference.

## Acknowledgments

The way the book evolved also made great demands on everyone engaged in its production. We are especially indebted to Sandra Sewzyk (Heinz Nixdorf MuseumsForum), Andreas Brennecke (Heinz Nixdorf Institute, University of Paderborn) and Lars Klein (University of Paderborn), who coordinated the production of the book and eventually assumed responsibility for the layout of the text as a whole. Our gratitude also goes to Philip Bacon, who took care of correcting our non-native speakers' English. Finally, we would like to thank Ingeborg Mayer and Dr. Hans Wössner of Springer-Verlag. The extraordinary care and patience they all showed here have contributed to the overall quality of the book.

Ulf Hashagen
Reinhard Keil-Slawik
Arthur L. Norberg

Munich, Paderborn, and Minneapolis, January 2002

# Table of Contents

**Introduction** ..... 1

**Prologue: A Computer Pioneer's Talk** ..... 9

Pioneering Work in Software During the 50s in Central Europe ..... 11
Friedrich L. Bauer

**Part 1: Software as Science** ..... 23

Software as Science—Science as Software ..... 25
Michael S. Mahoney

Commentary on Michael S. Mahoney ..... 49
David Edge

Software as Science? Commentary on Michael S. Mahoney ..... 55
Gerhard Goos

Discussion following "Software as Science" ..... 61
Thomas Haigh

**Part 2: Software as Engineering** ..... 63

Software as Engineering ..... 65
James E. Tomayko

Commentary on James E. Tomayko ..... 77
Albert Endres

Commentary on James E. Tomayko ..... 83
Bruce E. Seely

Discussion following "Software as Engineering" ..... 93
Mary Croarken

**Part 3: Software as Reliable Artefact** ..... 95

A View from the Sonnenbichl:
On the Historical Sociology of Software and System Dependability ..... 97
Donald MacKenzie

Commentary on Donald MacKenzie ..... 123
Bernd Mahr

Dependability Then and Now: Commentary on Donald MacKenzie ..... 127
Victoria Stavridou

Discussion following "Software as Reliable Artefact" ..... 135
Mary Croarken and David Grier

**Part 4: Software as Labor Process** ..... 137

Software as Labor Process ..... 139
Nathan Ensmenger and William Aspray

Are Programmers Oppressed by Monopoly Capital, or Shall the Geeks Inherit the Earth? Commentary on Nathan Ensmenger & William Aspray 167
David A. Hounshell

A Commentary on David A. Hounshell's Commentary on "Software as Labor Process" ..... 177
Nathan Ensmenger and William Aspray

Discussion following "Software as Labor Process" ..... 179
Mary Croarken

**Part 5: Software as Economic Activity** ..... 183

Software as an Economic Activity ..... 185
Martin Campbell-Kelly

Commentary on Martin Campbell-Kelly ..... 203
Pierre-E. Mounier-Kuhn

Commentary on Martin Campbell-Kelly ..... 211
David C. Mowery

A Note on Martin Campbell-Kelly's "Software as an Economic Activity" and David Mowery's "Commentary" ..... 219
David A. Hounshell

Discussion following "Software as an Economic Activity" ..... 223
Thomas Haigh

**Part 6: Museums and Exhibitions** ..... 225

Collecting Software: Preserving Information in an Object-Centred Culture 227
Doron Swade

Commentary on Doron Swade ..... 237
Joachim Fischer

Towards a Software Museum: Challenges and Opportunities ..... 245
Ernst Denert and Klaus-Peter Löhr

Towards a Software Museum: Challenges and Opportunities ..... 261
Friedrich L. Bauer

Preserving Software in History Museums: A Material Culture Approach .. 263
David K. Allison

Commentary on David K. Allison, "Preserving Software in History Museums" ..... 273
Hartmut Petzold

**Epilogue** ..... 275

Probing the Elephant: How Do the Parts Fit Together? ..... 277
Michael S. Mahoney