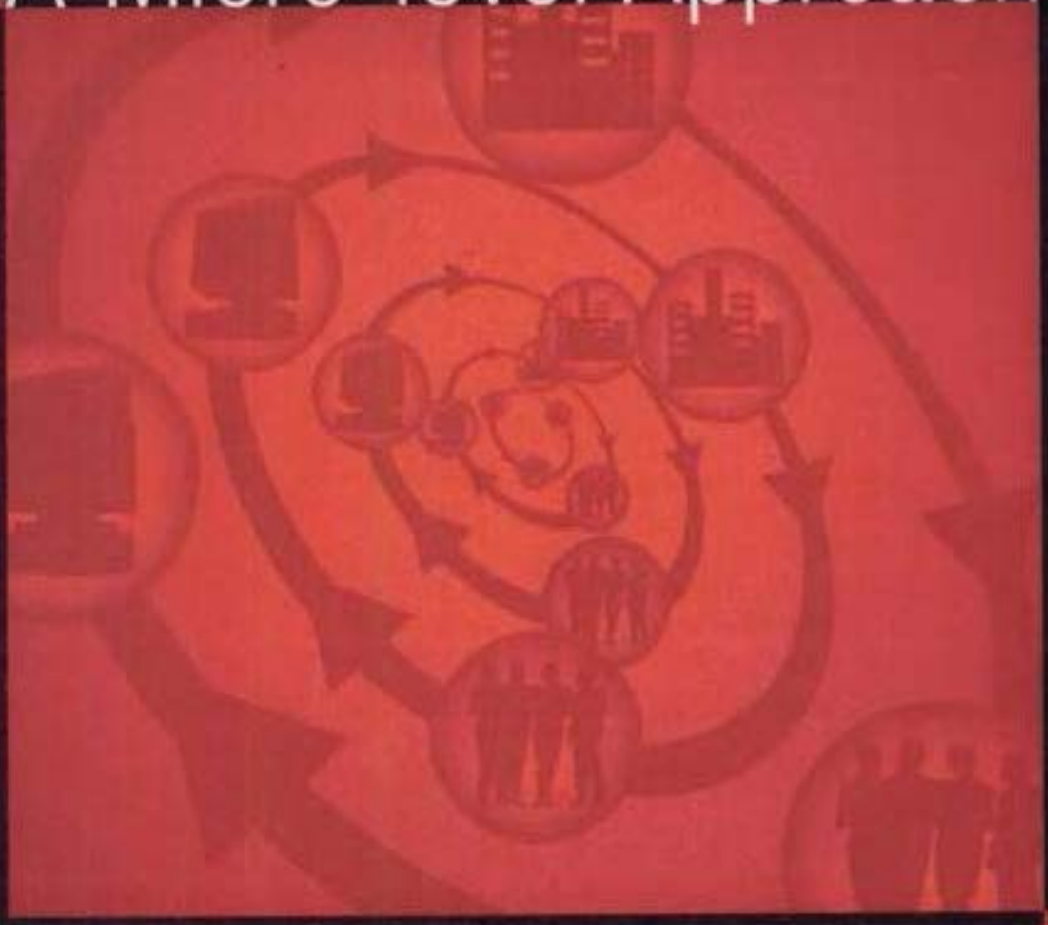
Rajkumar Roy (Ed.)

Industrial Knowledge Management:

A Micro-level Approach



Springer

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ISBN 1-85233-339-1 Springer-Verlag London Berlin Heidelberg

British Library Cataloguing in Publication Data
Industrial knowledge management : a micro-level approach
1.Knowledge management 2.Knowledge management - Computer network resources 3.Knowledge management - Data processing
I.Roy, R. (Rajkumar), 1966-
ISBN 1852333391

Library of Congress Cataloging-in-Publication Data
Industrial knowledge management : a micro-level approach / Rajkumar Roy (ed.).
p. cm.
Includes bibliographical references and index.
ISBN 1-85233-339-1 (alk. paper)
1. Information resources management. 2. Knowledge management. I. Roy, R. (Rajkumar), 1966-
T58.64.I454 2000
658.5--dc21 00-044029

Typesetting: Camera ready by contributors
Printed and bound by Athenæum Press Ltd., Gateshead, Tyne & Wear
69/3830-543210 Printed on acid-free paper SPIN 10746129

Languages for Knowledge Capture and their Use in Creation of Smart Models

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Abstract: Languages are means of capturing the knowledge for the design and development of a product. Smart Models are the results of such knowledge capture. The author, first describes how languages for knowledge capture have evolved over a thirty year time period. Author through literature search finds such languages to fall into three major classes: (a) Geometry-based language (b) Constraint-based language (c) Knowledge-based language. The paper then describes the differences and similarities of these languages that can be employed to capture life-cycle intent. The second part of the paper describes how such languages are being used in creation of smart models. A smart model is a reusable conceptualization of an application domain. The models contain the knowledge (attributes, rules or relations) of the application domains forming the basis for future problem solving. The paper also describes two popular ways of formulating a problem that leads to such smart models: (1) Constraint-based programming (2) Knowledge-based programming. Through analysis of existing practices, new development and trends, the paper then discusses some "new emerging directions in the use of languages for the knowledge capture". Finally, the benefits of knowledge capture and creation of smart models over conventional models are discussed.

1. Introduction

Except in a few rare cases, products are now so complex that it is extremely difficult to correctly "capture" their life-cycle intent right the first time no matter what C4 (CAD/CAM/CAE/CIM) tools, productivity gadgets or automation widgets are used. Traditionally, CAD tools are primarily used for activities that occur at the end of the design process. Such usage of CAD tools, for instance, during detailing geometry of an artifact, is in generating a production drawing, or in documenting geometry in a digitized form (See Figure 1). CAM systems are conventionally used to program machining or cutting instructions on the NC machines for a part whose mock-up design, clay or plaster prototype may already exist. CAE systems are used to check the integrity of the designed artifact (such as structural analysis for stress, thermal, etc.), when most of the critical design decisions have already been made.

This book presents the latest thinking, activities, and future trends in industrial knowledge management at the micro-level. Micro Knowledge Management is concerned with capture and reuse of knowledge at the operational, shopfloor and conceptual level. This book demonstrates how to successfully apply knowledge management at the micro-level. It presents a thorough overview of industrial practice, practical challenges and the future direction of Micro Knowledge Management (MicroKM). The reader will benefit from the book's use of different frameworks, concepts and industrial case studies.

The key topics addressed in the book are:

- Engineering and managing knowledge at the micro-level
- Capture and reuse of micro-level knowledge
- Developing knowledge models, knowledge representations
- Industrial best practice
- Tools
- Prototype system development

Industrial Knowledge Management will be of interest to researchers, practitioners and students involved in realising knowledge management at the micro-level, who wish to bridge the gap between theory and practice.

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