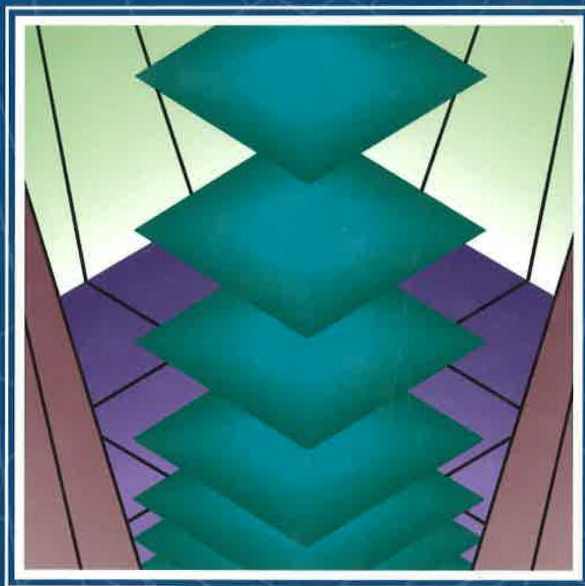


MODERN DATABASE MANAGEMENT

FOURTH EDITION



FRED R. McFADDEN ♦ JEFFREY A. HOFFER

To our families and students, for their guidance and inspiration

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Library of Congress Cataloging-in-Publication Data

McFadden, Fred R.
Modern database management/Fred R. McFadden, Jeffrey A. Hoffer.
--4th ed.
p. cm.
Rev. ed. of: Database management. 3rd ed. © 1991.
Includes index.
ISBN 0-8053-6047-6
1. Data base management. I. Hoffer, Jeffrey A. II. McFadden,
Fred R., Database management. III. Title.
QA76.9.D3M395 1993
005.74--dc20
93-31795
CIP

ISBN 0-8053-6047-6
4 5 6 7 8 9 10—CRW—98 97

The Benjamin/Cummings Publishing Company, Inc.
390 Bridge Parkway
Redwood City, CA 94065

MODELING TIME-DEPENDENT DATA

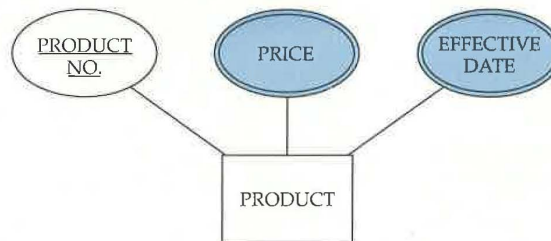
Database contents vary over time. For example, in a database that contains product information, the unit price for each product may change as material and labor costs and market conditions change. If only the current price is required, then only that value needs to be represented. For accounting, billing, and other purposes, however, we are likely to need a history of the prices and the time period over which each was in effect. As Figure 4-10a shows, we can conceptualize this requirement as a series of prices and the effective date for each price. This results in a repeating group that includes the attributes PRICE and EFFECTIVE DATE. In Figure 4-10b, this repeating group has been replaced by a new (weak) entity named PRICE HISTORY. The relationship between PRODUCT and PRICE HISTORY is named Has.

In Figure 4-10, each value of the attribute PRICE is time stamped with its effective date. A **time stamp** is simply a time value (such as date and time) that is associated with a data value. A time stamp may be associated with any data value that changes over time when we need to maintain a history of those data values. Time stamps may be recorded to indicate the time the value was entered (transaction time), the time the value becomes valid or stops being valid, or the time when critical actions were performed (such as updates, corrections, or audits).

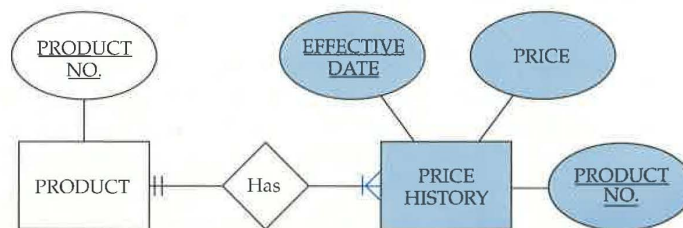
Time stamp: A time value (such as date and time) that is associated with any data value.

The use of simple time stamping (as in the above example) is often adequate for modeling time-dependent data. However, time often introduces more subtle complexities in data modeling. For example, Figure 4-11a represents a portion of an E-R diagram for Pine Valley Furniture Company. Each product is assigned to a product line (or related group of products). Customer orders are processed throughout the year, and monthly summaries are reported by product line and by product within product line.

Suppose that in the middle of the year, due to a reorganization of the sales function, some products are reassigned to different product lines. The model



(a) PRODUCT entity with repeating group



(b) PRODUCT entity with PRICE HISTORY

Figure 4-10
Example of time stamping