

INNOVATION '89

TECHNOLOGY TRANSFER IN FLORIDA

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A SEMANTIC DATABASE MANAGEMENT SYSTEM

A proposal for INNOVATION-89 by Naphtali Rishe

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A database model is a convention and method of organization and usage of databases. The predominant database models of the seventies were the Hierarchical and Network models. The predominant model of the late eighties is the Relational Model. It is believed by most experts in the field that the models used in the nineties will be models of the next generation, namely *semantic* database models. The market for database managements systems is currently growing at the annual rate of 20-25%. For 1992 this market is estimated at \$6 billion a year in the U.S.A. alone.

The primary purpose of the semantic models is to provide a simple, natural, computer-independent, flexible, and non-redundant specification of information and of the logical structure of the user's enterprise. The meaning of the user's information is analyzed and stored in the computer. The computer is made to comprehend and treat the information in the way similar to that of the human user. The human-computer gap is narrowed; the interaction is made easier; harder and more complex tasks can be specified by the human user and performed by the computer.

Semantic models offer major advantages versus the Relational and older models with respect to database design, database maintenance, conciseness of languages, reliability and consistency of data, ease of application programming, and friendliness of the end-user services. In addition to the above advantages, it has been recently proved by N. Rishe that the semantic models have potential for much more efficient (faster response) implementation than the conventional data models.

N. Rishe has developed one of the semantic models, namely the Semantic Binary Model (SBM). Its advantage over the other proposed semantic models is that SBM has a small set of sufficient simple tools by which all the semantic aspects of any application can be described. This makes SBM easier to use for the novice, *i.e.* friendlier for the user, and also easier to implement, *i.e.* requires a smaller investment in the development of the database management system proposed herein.

N. Rishe has developed high-level user languages that accompany the model (a data definition language, a fourth-generation data manipulation and programming language, non-procedural languages for queries, updates, specification of constraints, user-views, etc.), which are described in his recent books and papers.

N. Rishe has invented and developed algorithms for implementation of SBM by a database management system which will be more time-efficient and provide much more comprehensive and friendly services to the user than the services provided by the conventional systems.

Prototypes featuring subsets of the system have been successfully implemented.

This proposal is for the rapid and successful completion of development process and for marketing of the above database management system.

During the steps of product development, an indirect marketing approach is proposed as follows (in addition to the principal marketing campaign, which should include advertisements, exhibits, seminars, and other promotions.)

A new textbook entitled *Database Design: The Semantic Modeling Approach*, by Dr. N. Rishe, the proposer, will be published within the year by Prentice-Hall. This book is expected to be used extensively by universities for database courses. This book presents the field of databases from the perspective of the semantic database management system and languages that will be supported by the product proposed herein. Prentice-Hall representatives will push this book to all U.S. (and many foreign) universities. They will leave about 1000 free copies to professors teaching database courses so that the latter would consider adoption of the book for their courses. Dr. Rishe is developing a student software package to accompany the book. This package will have logical features similar to those of the product proposed herein, but the product will work only with small student problems; it will not allow concurrency, backup, recovery, and security. Prentice-Hall representatives will recommend the above package to the universities together with the book.

By the time the full product appears in the market, a generation of recent college graduates will be experienced in it and will recommend it to their employers as a tool for development of future databases.

It should be taken into account that about same time competing semantic database systems will appear in the market. However, the product proposed herein is expected to be successful in a significant share of the market due to:

- a. Its simplicity of use
- b. Its highly-competitive logical properties
- c. Its high efficiency
- d. Its hopeful popularity among recent college graduates

Larger investors might be interested in developing a complete line of products which provide extensive database management services and work on most computers. Extrapolating the 1988 achievements of independent vendors of the current relational database management systems, the annual sales of the proposed line by mid-nineties are likely to be \$100-700 million.

Smaller investors may be interested in developing a less ambitious product running on some types of computers, for example the personal computers. Database management systems for personal computers are expected to have about 35% of the market of all database management systems, for medium computers — 55%, and 20% for large computers. Therefore, a product offering a comprehensive line of services but restricted to the personal computers will compete on at most 35% of the \$20-30 billion annual worldwide database management system market of the mid-nineties. In practice, a part of this market will be dominated by products having a full line for all of the levels of computers (*i.e.* not restricted to the personal computers). The market remaining for free competition will probably be \$4-6 billion annually. If the proposed restricted product is successful in 1% of the latter market, it can expect annual sales of \$40-60 million.

About the Proposer

Professor Naphtali Rishe is an authority on databases and a known expert on semantic modeling, software engineering, systems analysis, information analysis, design of software systems, and education of computer professionals.

Dr. Rishe has been a professor at the University of California and Florida International University since 1984.

From 1976 to 1984 Dr. Rishe headed major software projects for Israeli and U.S. governments.

Since 1984 Dr. Rishe has been a consultant for Hewlett-Packard, Israel Defense Forces, the University of California, State of Florida, and other companies.

Dr. Rishe has authored 65 publications on issues of Computer Science and software development, including his recent book *Database Design Fundamentals: A Structured Introduction to Databases and a Structured Database Design Methodology*. (Prentice-Hall, Englewood Cliffs, NJ, USA, 1988. 436 pp. ISBN 0-13-196791-6.)

Prof. Rishe has a Ph.D. in Computer Science from Tel Aviv University and M.Sc. and B.Sc. Summa Cum Laude in Computer Science from the Technion — Israel Institute of Technology.

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