

difficult to maintain the posture that IMS is a purely hierarchical data system. With the inclusion of logical relationships and secondary indexes, IMS supports a complex data structure which in aggregate begins to resemble the networks of the CODASYL system. The status of being a hierarchical system is preserved only in the sense that applications are limited to dealing with hierarchical subsets of that data complex. (And even that position is arguable, since a given application may see several such views simultaneously, with overlap permitted. The application could thus see several different parents for a given segment, one in each view.)

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A. S. Michaels, B. Mittman and C. R. Carlson. "A Comparison of Relational and CODASYL Approaches to Data-Base Management", Computing Surveys 8,1 March 1976, 125-151.

It is a pleasure to read this well written and finely structured paper. Nowhere else can be found as lucid, concise and unbiased a comparison of this complex subject.

Disappointment will most assuredly set in to any reader who expects to read this paper and be told which approach is "best". Although in a number of places the authors cite the strengths and weaknesses of each approach, more often than not a simple, straight forward comparison is presented.

The crux of the problem is determining what is "best" lies in the fact that the user community is so varied, each with its own requirements set, that each approach works "best" against different elements. When the user community is viewed as monolithic, both approaches fall far short of satisfaction. The CODASYL DBTG approach directs itself at the programmer/DBA while the relational approach is directed at the end user or the structurally independent and parametric user (as classified by Senko).

Which system is better depends entirely on the way in which one views the world of computing in the future. If, as in Bachman's terms, the

programmer should navigate the data base or should it be our aim to support the decision maker, who is an unsophisticated user.

While I must admit that I was more often frustrated than not by the lack of specific conclusions, the paper serves admirably as a point by point comparison. It must be left, to highly specialized practitioners to finally resolve various sub-issues. For example, I would like to see a computational linguist like Christine Montgomery or Charles Kellogg address the language level of the DML.

As is mentioned by the authors, the subject of a comparison between the two approaches has been much discussed. The high point of this discussion took place at the ACM SIGMOD Conference in May of 1974, when Charles Bachman and Ted Codd, formally debated the issues. It should also be remembered that the DBTG approach was the subject of extreme scrutiny during the 1970 to 1972 time frame when numerous less formal and gentlemanly "discussions" were held comparing the DBTG specifications and the GUIDE-SHARE requirements. No satisfactory conclusions were ever reached. In the case of DBTG vs. GUIDE-SHARE, the major stumbling block was that of attempting to compare requirements to specifications, an impossible task.

Much is made by the authors of the fact that all of the CODASYL implementations stem from a single source, albeit subsets of the basic specifications. No mention is made of the fact that the requirements base on which the specifications were established have never been made explicit. An understanding of these implied requirements provides insight into just why the various DBTG implementations do things the way they do. At the same time, it never ceases to amaze me how adaptable the DBTG specifications are to corrections of inherent defects and oversights, no small credit due to the original DBTG.

At the same time, the authors cite the latitude afforded and assumed by the various relational implementations. While this has certainly

complicated the task of comparison no mention was made that the relational implementations rest on one of the strongest theoretical foundations in all of computer science. The work of Ted Codd has provided a conceptual foundation for what is, in the words of Tax Metaxidies (chairman of the CODASYL DBTG) "one of the most significant developments in computing".

Few people realize how close we came to having the DBTG specifications accepted by ANSI as a standard. The subsequent revisions would not have worked well in a journal of development context and based on the latest work of the ANSI SPARC ad hoc Data Base Group, who have expanded the concept of the schema, much more basic research is needed before the full CODASYL approach can be successfully implemented.

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NEW BOOKS

The Technology of Data Base Management Systems. College Readings, P.O. Box 11244, Alexandria, VA 22312 (\$9.95). Excellent collection of 36 articles in database management systems over the last 5 years. Major subdivisions are 1) Information Systems 2) Concepts and Requirements 3) Storage and Access 4) Design Perspective 5) Implementation and Management 6) Privacy and Security 7) Evaluation and Selection.

Introduction to Data Management. W.D. Haseman, A.B. Whinston. Order copies from R.D. Irwin Inc., 1818 Ridge Rd., Homewood, Ill. 60430 (price unknown). Student text, comes with teacher's manual and a database management system (GPLAN) written in FORTRAN. Chapter headings are 1) Data Management 2) File Structures 3) Data Structures 4) History of Data Management 5) CODASYL Approach 6) Data Structure and Definition 7) Programmer's Interface 8) DMS as an Extension to FORTRAN 9) Interrogation and Update 10) Data Base Administrator 11) Storage Structure and Environment 12) Systems Design 13) File Conversion 14) Relational Model 15) Designing Optimal Data Structure 16) Future of Database: Planning Systems.