History of Database Management Systems

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Database management systems (DBMSs) have played an outsized role in the history of software development and in the creation and growth of the software products industry. Recognizing the major role played by these products, the *Annals* is publishing two special issues on the subject. These two issues will be the fourth and fifth sponsored by the Software Industry Special Interest Group of the Computer History Museum (formerly the Software History Center). This issue (the first) is focused on the products, companies, and people who designed, programmed, and sold mainframe DBMS software products beginning in the 1960s and 1970s. The second issue will be devoted to the relational DBMS products, which were developed during the 1970s and came to prominence (and some say dominance) during the 1980s and 1990s.

What was so important about these DBMS products? Why did they have such a major impact on the growth of the software products industry and, more importantly, on the way that almost all major commercial applications were built from the 1970s on? It is a complex story, part of which is told in this issue. Thomas Haigh begins this issue by describing the world prior to DBMSs and some of the early DBMS products. Tim Bergin and Thomas Haigh then examine the database management products that dominated the IBM environment and other major computer platforms in the 1970s and 1980s.

This issue tells the rest of the story through a series of pioneer recollections, principally from people who founded the major DBMS companies or were heavily involved in the growth and development of these products and companies. These eight recollections cover the principal DBMS software products for IBM mainframe computers.[1] IBM itself was a significant player in this marketplace with its IMS product, but all the other products were produced and marketed by independent software companies. Many historians and industry analysts believe that these products and these companies formed the foundation on which the mainframe software products industry was built.

The significance of DBMSs

In some sense, these DBMSs, with their accompanying data communications (or online transaction processing) systems, enabled users in all industries to construct both online and batch applications in a far more timely and cost effective manner. These database and data communications systems became the foundation for building many (some say most) of the core applications in every industry and government agency, and they became the engines that drove the sale of mainframe computers during the 1970s and afterward.

The following list supplies just some of the reasons why industry analysts and historians consider DBMS software products so important from both a technological and business standpoint:

- They provided an efficient way to program complex applications without the cost of rewriting the data access and retrieval functions for each application.
- They provided a relatively simple, standard way to share data among multiple applications and multiple users.
- They created specialized user-oriented languages.
- They provided standard interfaces for the data communications programs so that the online transaction processing applications could be efficiently built, tested, and maintained (both in time and cost).
- They managed the databases on various random- and sequential-access devices

without the application programmer having to think about the differences.

- They provided portability; in many cases, they enabled customers to move their applications from one manufacturer's platform to another or from one operating system to another with relative ease.
- The companies marketing these products became the largest independent software products companies and were the first to go public in the late 1970s and early 1980s.
- They effectively sold a tremendous amount of hardware for IBM, IBM's mainframe competitors, many minicomputer manufacturers, and the independent storage device and terminal companies.

This issue only minimally refers to other related areas that some feel should be considered a vital part of the DBMS story. These DBMS products were preceded by a number of report writers, which used stored information to produce reports in the layout and form desired by the user. These report writers pioneered the definition-based applications approach versus a procedural programming approach. This category included IBM's Fargo and Report Program Generator (RPG), Informatics' Mark IV, Pansophic's Easytrieve, Cullinane's Culprit, Bill Newcomer's Dylakor, and many others. As the Bergin and Haigh article notes, almost every DBMS had its own report writer or could interface to one of the available products.

A second area that was of at least equal significance to report writers were the fourth generation languages (4GLs), which had a user-specified layout mapping the inputs and transformations to the outputs, but each of these products had its own proprietary database within the program. These software products were successful over many years and are still in use today. Ramis, Focus, and Nomad were among the early leaders, and they were followed by many more such application development software products that were introduced in the 1980s. These gave run-of-the-mill users the ability to specify and "program" their own applications without having to wait for the professional programmers.

Pioneer recollections

As a part of this *Annals* special issue, Luanne Johnson and Burton Grad, the cochairs of the Software Industry SIG, contacted pioneers who had developed and marketed the principal mainframe DBMSs to get their recollections on how these products were developed and marketed. These articles show the variety of ways that the market opportunities were recognized, the different technologies that were created to solve the problems, and the competitive marketplace that became the frontline of the software battles during those years. Each company had a somewhat different marketing strategy and appealed to different markets.

The one constant was that they all had to run on the IBM System/360 and its successors (and had to operate under the IBM OS and DOS and their various follow-on names, as well as under IBM's VM system). Many of the products also supported other manufacturers' computers, but the heart of the battle was for the IBM market. IBM's IMS was a major contender, but each of the other software products carved out a significant niche and IBM was certainly not the dominant player in this marketplace as it was in hardware. In the online transaction processing (OLTP) or data communications area, however, IBM's CICS became a de facto standard by the late 1970s. Each of the DBMSs then had to interface to CICS to compete effectively in the IBM marketplace, even though they almost all had their own proprietary data communication system.

We hope that you will enjoy these wonderful stories from the DBMS pioneers:

- Charles Bachman on IDS (GE, Codasyl DBTG, and B.F. Goodrich),
- Thomas Nies on Total (Cincom),
- Robert Patrick and William McGee on IMS (IBM),
- Robert Brueck on System 2000 (MRI, Intel, and SAS),
- Orrin Stevens Jr. on Datacom/DB (CIM, Insyte, ADR, and Computer Associates [now CA, Inc.]),
- John Maguire on Adabas (Software AG), and
- Judith Kruntorad on IDMS (B.F. Goodrich, Cullinet, and Computer Associates [now CA, Inc.]).

These DBMSs were frequently called hierarchical- or network-based systems because of their structure and retrieval capability. An interesting part of some of these DBMS stories is how these companies responded (or didn't respond) to the development of relational DBMSs. Rather than adopt or adapt to this new model and expand their market, many of the companies continued to focus

solely on their own DBMS products. As a result, a whole new set of software vendors dominated the RDBMS marketplace and some grew far larger than the DBMS companies identified in this issue. The RDBMS products eventually supplanted the DBMS products in virtually all query-oriented usages and even in many transaction-processing applications. The story of the relational DBMS companies will be told in a subsequent *Annals* issue.

Reference and note

1. Although many of the packaged software products identified in this issue also operated on non-IBM mainframe hardware, the focus of this article is on IBM mainframe and compatible installations. While many of these packages were also available on minicomputers, that discussion is outside this special issue's scope.

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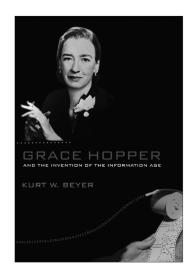
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