Chapter 9

THE STORY OF MARK IV

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9.0 INTRODUCTION

MARK IV is the most successful software product developed by Informatics, and is the most widely sold and installed software product for IBM medium and large-scale system computers, with over 4,000 installations worldwide of it, its special features, and its descendants. MARK IV was a very important factor in making Informatics a successful software company and a leader in software products development. It was the second standardized ready-to-use software program, complete with supporting documentation, offered by an independent software company for commercial sale to a general market. It was slightly preceded by AUTOFLOW, a product created by Applied Data Research (ADR). AUTOFLOW was a small utility program that initially sold for $2,000. MARK IV was a complex application generator that initially sold for $30,000 and much more later. It made its debut in 1967, representing a major advancement in computer usage and the state-of-the-art in practical software technology at that time, remaining almost unrivaled until the mid-1970's. Only in the past several years, after being continuously improved and upgraded with numerous optional special features added to it, has it become a mature product at the height of its market and is being seriously challenged by products utilizing the more sophisticated hardware and software technology of the 1980's. Originally conceived as a general purpose batch-oriented data file management program, MARK IV has evolved into a full application development system and has served as the foundation upon which Informatics has designed and developed or acquired its current implementation systems products including Answer/2, Answer/DB, TRANS IV, INQUIRY IV, and MARK V--all of which are on-line application development products created for different computers and environments.

MARK IV is a general-purpose development system product for business data processing, which means it enables users to set up easily various data files containing information of their choosing, to update these files, to retrieve specific information, perform computations on it, and to generate various formatted reports. In addition to its file keeping functions, MARK IV can perform mathematical operations on rows and columns of data during processing, provide subtotals and totals, calculate monetary and temperature conversions, and prepare tables and indexes to both data files and individual reports. Although a batch system, meaning that it processes a key-sequenced "batch" of transactions against a correspondingly sequenced file, rather than being single transaction-oriented as with modern on-line systems, MARK IV was revolutionary in that it was designed to be actively used by noncomputer professionals in business to design and develop computerized applications serving their particular needs, as well as by professional programmers to build complete business applications.

Up until its appearance, the design, programming, and installation of a computer application required the skills of a professional programmer. MARK IV was the first system made to be used by noncomputer professionals (the first version was based on the simple completion of four standardized forms to specify file organization and content and to request information and reports). This was

a major advancement which can be viewed, along with remote timesharing languages, as the beginning of the evolution of the "user friendly" software products sold today for personal computers. Additionally, MARK IV greatly reduced systems design and programming by professional programmers required to create new and revise existing computer applications. It became an implementation system or a type of computer language to programmers which enabled them to create and implement a number of common data processing applications simply and quickly.

John Postley, the father of MARK IV, best described its uniqueness and advantages with the following statement on file management systems (with pardonable enthusiasm) during 1965 in the midst of MARK IV development:

> With Informatics present file management systems, reduction in the elapsed time (from when the problem is conceived in the mind of the manager to when the problem is ready to run on the computer) by 50 or 100 to one is considered average. Reduction of 1000 to one or more under certain circumstances would not be surprising. Thus, designing in one day an application that might take a week to program is probably a minimal saving, one hour of filling out forms instead of 1-3 weeks of programming is average, and completing forms in an hour for a problem that might take six months to program is entirely feasible.
>
> The applicability of the generalized file management concept to the preparation of reports and analysis is increasingly evident. Independent of the type of data in any particular application, such systems can provide listings, quantity and dollar totals by category, extensions, and an almost unlimited variety of summaries and analyses for operation and management use. Management can use these systems directly without becomming programmers themselves. Informatics' six years of experience in developing and using generalized file management systems now makes computers a truly effective management tool.(1)

The technical essence of MARK IV is that it supplies a number of preprogrammed commonly used functions (within an assumed standard application cycle--read, update, search, format for output) required to perform separate information processing tasks based upon the user's inputted data and the requirements of their report or information request. MARK IV reads the data, fed in by either magnetic tape or punch card, and inserts the user's specifications into the system's programs which are then used to process the user's data files. Over the years, MARK IV was enhanced, and its popularity was such that special versions of it were designed and made available for other 360-like computers including the RCA Spectra 70, Siemens, and Univac machines. The story below details the evolution of MARK IV and its contribution to Informatics and to the computer industry.

9.1 EARLY BACKGROUND: JOHN POSTLEY AND ADVANCED INFORMATION SYSTEMS

The story of MARK IV begins with John Postley. Postley began his computing career in 1948 when he joined the United States National Bureau of Standards

Institute for Numerical Analysis (INA) located at the University of California, Los Angeles. The institute was actively involved in building one of the early computers, the Standards Western Automatic Computer (SWAC), and Postley himself trained personnel in INA's earlier computing facility, which used IBM card equipment with plug boards. While at the Institute, he became acquainted with a number of members of the budding computing community located in the Los Angeles area including Walter Bauer, Frank Wagner, Werner Frank, and Marvin Howard, all of whom were instrumental in the founding and early years of Informatics. In 1951 Postley joined Northrop Aircraft (another hotbed of early computer activity) for two years and then hired on at Hughes Aircraft where he helped to develop the order code (instructions) and wrote the manual for a computer Hughes was developing to be in competition with IBM. Postley then joined Rand Corporation in 1955 for six years, where he headed the team that developed a pioneering logistics system for Tinker Air Force Base which involved the first large-scale use of disk files, with many RAMAC disk drives attached to an IBM 702/5 computer.

During his years at the Institute for Numerical Analysis, Hughes Aircraft and Rand Corporation, Postley became acquainted and worked closely with Dr. Robert Hayes (later the Dean of the School of Library Service at U.C.L.A.) whose interests were in the use of computers to organize, store and retrieve vast amounts of information, and to aid municipal governments in their information processing needs. In 1960 Hayes and Postley became involved in establishing a small advanced computing research subsidiary for Electrada Corporation. The subsidiary was known as Advanced Information Systems, Inc. (AIS). Hayes served as its president and directed research while Postley served as executive vice president for operations and pursued commercial business. Electrada itself was a business venture personally formed in the late 1950's by the executives of several established aerospace companies who wanted to pursue the sprouting but risky high technology electronics business. Electrada made investments in a number of then existing advanced development efforts with the hope of creating a number of new and successful products. As a corporation, Electrada failed. AIS, although small, did acquire some consulting and research business and soon found itself sold to Hughes Dynamics, Inc., a private company personally owned by the now infamous Howard Hughes, who, like the Electrada founders, was fascinated by the potential of the electronics and information processing business. So he started Hughes Dynamics and immediately acquired or started up about 30 small companies in this field. Advanced Information Systems, Inc. simply became the Advanced Information Systems department of Hughes Dynamics with Postley serving as its "Director," the title used by Hughes Dynamics for a department general manager.(2)

9.1.1 The Need for File Management Systems

Through the changes in ownership, AIS continued to remain a small activity with about ten professionals and focused its efforts on helping its customers develop standard methods to store, retrieve, and process information by a computer. While computers had been designed and commercially sold during the 1950's and early 1960's, their manufacturers did not provide programs with them that enabled users to run their required applications. The users themselves, in this case the companies which bought the computers, had to perform their own systems design and programming for the applications they needed. Just as there was no commonality in machine language and tape formats utilized by the

different makes of computers, there was also no commonality in software systems either. Although COBOL and FORTRAN had been developed as universal or standarized programming languages by 1960, every computer application was a separate custom designed development effort regardless of whether it was programmed in the assembly language of the computer or in a higher level programming language like COBOL. Every application had its own unique program and required a programmer to write the program and modify it when changes were needed before it could actually be performed by a computer. The result was an immensely tedious and expensive process for the creation of new computer applications. In addition, there was virtually no interface capability among the different application programs or their data files which frequently resulted in the reinput of existing data so it could be used by a different program for another application! AIS recognized the need for the integration of different applications, the shared use of data by them and a common method for that data to be stored, updated and accessed. In 1960 AIS obtained a consulting and development contract with Douglas Aircraft which permitted it to develop a solution to the problem.

9.1.2 GIRLS: The Generalized Information Retrieval and Listing System

The engineering department of the Douglas Aircraft Company, which used an IBM 7090 computer for advanced development of aircraft design, like many large organizations of that era, had a number of non-compatible applications with data files stored in different formats. There was also a large volume of requests by engineering personnel for special reports or retrieval of specific information from computerized data files. Each of these special requests required its own individual programming and as a result severely slowed down the work flow and performance of the engineering department which needed the information. Stimulated by reports of efforts to solve this problem at General Electric's Hanford Atomic Energy installation, Jim Morrison of Douglas gave Postley a small consulting and systems analysis contract in 1960 (monitored by Dwight Buettell) for AIS to streamline its information processing needs. The result, two years and several contracts later in 1962, was the Generalized Information Retrieval and Listing System (GIRLS), also known within Douglas as "Program RR10". This was a general purpose software program designed by AIS to enable Douglas to process and generate specialized reports from existing magnetic tape data files (some of them created by the IBM 701) and to update these data files quickly and easily. The benefits of GIRLS are abundantly described by the internal report which announced its availability to Douglas personnel:

> Program RR10 (GIRLS) is available for production use. This program has been developed in response to a large number and wide variety of requests for reports consisting of selected information from a magnetic tape file. These requests usually require the preparation of a new program or modification of an existing program.
>
> Several "information retrieval" programs have been prepared in an effort to reduce the cost and flow time of retrieval reports. . . . These programs achieve various levels of generality. Some of them reduce the programming needed to obtain a specific report to the preparation of a load sheet.

The RR10 (GIRLS) program provides a more general solution to the problem of information retrieval and report generation. Its unique contribution consists of combining four generalized capabilities:

1. It can utilize any of a wide variety of tape formats.

2. It can make selections on the basis of complex criteria.

3. It can produce reports in a wide variety of list-type formats.

4. It can produce several reports on a single pass of a magnetic tape file. This can be done with no appreciable increase in retrieval time.

The program has had extensive checkout. Approximately ten different master files have been successfully used for retrieval. Approximately 65 successful production retrievals have been made since July of this year.

The Generalized Information Retrieval and Listing System is designed to provide a semi-automatic means of executing the elementary function of magnetic tape data retrieval and report generation. It selects from any alphanumeric magnetic tape file and prepares reports whose formats may vary from retrieval to retrieval. . . .

By providing such a system, it is expected that a reduction in programming time and 7090 machine running time will be realized. These savings will, of course, be magnified for those retrieval/report generations of short production life and for those reports requiring frequent alterations in selection criteria or report format. In addition, the system allows the requestor(s) to execute multiple retrievals and report generations on a single 7090 machine run. This feature, through judicious usage, is also expected to be of value in the time/cost reduction area and will help Computing Engineering give prompt service with a minimum total system flow time.

Direct access to the information in the tape files is provided by load sheets in the form of the Information Retrieval Request Memo. The memo permits a layman to specify content and format of his desired report to this system.

The users of GIRLS could simply state their search parameters on request forms which were then punched on input cards and fed into the computer with the appropriate tape file and descriptive dictionary.(3)

9.1.3 MARK I and MARK II

The IBM 709 and its successors, the IBM 7090 and 7094, though widely used (mainly for engineering computing) in major industrial firms, was far

outnumbered by the much less expensive IBM 1400 series used primarily for business data processing. With the successful completion of GIRLS, Postley recognized the need for a similar program written for the IBM 1400 series computers and had obtained a contract during 1961 with the city of Los Angeles which permitted the initial development of such a program. This program was named MARK I and permitted the city to retrieve information and generate special reports from its various data files containing information on public works, land lots, tax assessments, etc., in much the same way that Douglas did with its engineering data. The only real difference was that MARK I was written for the smaller IBM 1401 computer and had slightly less functional capability than GIRLS.

MARK I served as a pilot program or prototype for a more advanced file management software system. In serving the city of Los Angeles, Postley could see that such software programs could have a great deal of applicability vis-a-vis the diverse information processing needs of city and county governments and that the same program or system could be sold repeatedly to different municipal governments. Whether Postley and AIS saw themselves as beginning the development of a proprietary software product at this time is difficult to establish. In any event, AIS acquired an expertise in managing urban data, and sought and obtained a development contract with the United States Department of Housing and Urban Development to design and install a series of five computerized Urban Management Data Systems (UMDS) on a test basis in five different cities: Denver, Colorado; Fort Worth, Texas; Little Rock, Arkansas; Tulsa, Oklahoma; and Wichita, Kansas. Each UMDS was to provide for the creation and implementation of a data file for a specific category or type of information required by the city government to manage its urban area more effectively. Each UMDS was based on a different type of information for a different type of benefit or purpose. For example, the data banks would contain land use information for planning purposes, or crime and arrest information by location for police purposes, or census data for taxation and school building purposes. The UMDS's were to aid city planners and officials in governing and effectively planning their municipality. All five cities, while implementing different types of information data files for their users, utilized the same technology. The five separate systems were nothing more than the same data file management system applied to different kinds of data. This program was dubbed MARK II and was a more refined sophisticated production version of MARK I.(4)

9.1.4 MARK III and the Alexandria UMDS

The successful installation of these UMDS systems in turn led Postley and AIS, by 1963, to further file management system development. By this time, they did see themselves as developing an unique proprietary product, a computer software package devoted to planning needs of municipal governments. Postley realized that the implementation of a comprehensive UMDS or file management system that permitted the creation and integrated use of several separate and distinct types of automated information files required by different government departments could prove an invaluable information resource for managing an urban area. For instance, data files of the police department containing information on reported crimes and arrests by location could be used in conjunction with street lighting files of another department and data files of the building department containing information on the location of residences, warehouses, dance halls, or bars. This information could be used to identify streets and

areas where additional lighting should be installed to prevent night-time crime if there was a correlation between the lack of lighting and the frequency of night crime. Postley believed that a number of such comprehensive UMDS systems could be sold.

But MARK II was not comprehensive enough. So, acting on this insight, Postley obtained a contract with the City of Alexandria, Virginia to design and install such a comprenensive integrated urban information system--a much more advanced file management system--appropriately called MARK III--which could maintain and keep track of a great many coordinated tape data files on the IBM 1410.

MARK III was truely a comprenensive system. Developed in three phases (study of needs, implementation and utilization), the contract included building and integrating into one interconnected network separate data bases for transportation, public utilities, land usage, schools, hospitals and city planning information. Approximately 75 percent of the information was already computerized, but AIS performed a major project of conducting a physical survey and inventory of parcels of land in Alexandria in order to create and build a land use master file. This was a major undertaking and took almost three years, being fully implemented in July 1965. As one of two central master files created for Alexandria's Mark III, it included information on a total of 78 separate characteristics for each of 20,000 parcels of land in the city. This included data on size, zoning, market value, current use, and ownership of each parcel along with data on related characteristics such as property tax rates, number of children located on the parcel, and types of buildings on each site, etc. There were even subfiles on the individual buildings, their characteristics, and the different business establishments in each building. The second master file contained information on individual street sections in the city. Implemented in March 1965, it contained 120 separate items of information on each street block and intersection in the city--a total of 3,400 separate locations. Of the data contained in this file 8 items held classification information (such as census tract, planning district and neighborhood), another 48 held information on public works (type and specific location of each public work), and the remaining 52 items provided information on city services (fire, police, schools, hospitals, etc.).

With the installation of these two master files (contained on magnetic tape) and the use of MARK III, Alexandria, Virginia was able to process a five year census and forecast of school-age children to aid in school construction and requirements planning, develop land use planning analysis reports, determine suitable locations and requirements for installation of street lights in the city, and evaluate the routes and effectiveness of police patrol assignments. Though implemented for the 1410, the file management system itself was designed with an architecture suitable to operate on IBM 1401, 1410, 7010, 7070, 7074, and with major redesign, System/360 computers. It required a minimum of 12,000 characters of internal storage, four tape drives, a high speed printer, and a card reader and punch. All that was required to define file structures, access information and obtain desired reports from the system was the completion of four separate forms whose information would be input to the computer. Compared to the effort required to make a request, the benefits for users of this system were tremendous.(5)

By this time AIS had grown to 12 people. MARK III acquired public attention when it became operational in March 1965 with all national television networks covering the event and John Postley demonstrating the system for the television audience watching the evening news. In the same month he presented major addresses at the University of California, Los Angeles on "Economic Priorities and Public Morality" and at the annual meeting of the California Association of County Data Processors in San Diego on "Urban Management Data Systems." Raymond J. Mason also delivered an address based on the AIS work to the annual meeting of the Association of Computing Machinery on "File Management." AIS represented the state-of-the-art in computer data management, and it knew it.(6)

9.1.5 Acquisition of Advanced Information Systems

However, Hughes Dynamics as a whole was unprofitable. Most of the companies that it acquired were developing hardware products far in advance of any market demand for them. Ironically, not long after AIS expected to begin working on the Alexandria MARK III project, Howard Hughes suddenly decided, in 1964, to shut down Hughes Dynamics. Hughes moved swiftly and decisively, informing company officials to terminate their activities within a month. For Postley and AIS, one of the profitable departments in the company, the edict came down as a telephone call to find a new corporate home or not receive any paychecks after two weeks.

Interestingly, the national and international attention that was to come to AIS became free advertising for Informatics because of a quick a decisive move by Walter Bauer. Postley, acting on his knowledge developed through professional associations, telephoned Walter Bauer and offered AIS for sale to Informatics. Within a week an acquisition agreement was arranged. So, in April 1964 Informatics purchased AIS from Hughes who paid Informatics $38,000 to assume the liabilities of completing the current AIS contracts (primarily the UMDS for the five cities in the southwest) and adding its staff of 10 people to the Informatics payroll! In one fast acquisition within two years of its founding, Informatics had achieved the capability to enter the proprietary software business as it promised itself in its first business plan. It reaped the benefit of investments in AIS by Electrada and Hughes Dynamics without having to bear the start-up costs itself.(7)

After the successful performance with the City of Alexandria, Informatics Advanced Information Systems department attempted to sell other MARK III UMDS systems to other cities in Southern California and held a Planning Urban Management Data System seminar for 30 representatives from a dozen municipalities in the area. Sales of UMDS, as a proprietary data processing service offered by AIS, were made to the cities of Ananeim and West Covina, California during 1965. In August 1966 a commission salesman named William Wilson was hired in Washington, DC to sell MARK III to the East Coast market. He had sold software called "OPCON" for Datatrol, and probably was the world's first software salesman--but he resigned a year later and never made a sale of MARK III. More significantly, later Postley made a sale to the State of New York in December 1965 for the design of a UMDS that would operate on an IBM 360 computer. This event played a prominent role as it led to the preparation of the first complete external specifications of what became MARK IV. As a whole, however, AIS failed to find many customers for its UMDS services, and only a few for MARK III as a software product.

Nonetheless, during the Alexandria project, Postley did begin to see that standardized generalized file management products could be developed and sold if they were designed for the right IBM computer and marketed to the right set of customers. Stimulated by Hanford where Kendall Wright and Charlie Bachman (the father if IDMS) continued to attack the problem, a number of other leading-edge industrial installations began to grope towards a generalized solution. The key people in AIS, Postley, Arnold P. Anex, and T. Dwight Buettell (who, when at Douglas, had been a prime mover in the development of GIRLS) began formulating concepts and specifications for such products, primarily for the IBM System/360 computer which, announced in 1964, represented the standard of the new third generation computers, and was being acquired by most of the FORTUNE 500 companies.(8)

AIS was so confident that it could rapidly supply such products that its early marketing literature under Informatics ownership, though not incorrect if read carefully, implied that MARK I, II, and III were full fledged software products. Even though MARK IV, the truly first such product, merely existed as a concept paper, a brochcure said:

> What we do
>
> We supply off-the-shelf and tailor-made programs applicable to data processing systems for business.
>
> Our advanced systems and techniques, already developed and implemented, offer a very real saving to you. These proprietay techniques can be used on the most modern electronic computers. Their design is based on AIS-developed and universally applicable rules for information filing, retrieval, data base updating, search, and report generation. Let us tell you specifically how these systems can cut costs in your business.
>
> When you need such computer programs why re-invent the wheel? You can use our know-how to determine how computers can most effectively serve you and develop the necessary systems and programs. You will get the benefit of cost savings and effective operation.(9)

During AIS's unsuccessful efforts to sell MARK III as an urban management data system, Bauer and Postley began to search for other application services for which it could be used. Jules Mersel had some success in selling "Information Systems" studies to the Federal Government, but these never evolved into the use of file management programs.

9.1.6 Media Account Control System (MACS)

Finally, a potential file management application came up in the advertising business. Advertising agencies which placed ads in various media had to plan the advertising campaign for their clients, construct a detailed budget, and finally physically check the media to verify if the ads actually appeared and if there was any unused ad space (that had been planned) in order to calculate the proper billing and to document the services provided to their clients. This was

particularly true for broadcast media (radio and television) where pre-empted spots resulted in rebates. Frank Crane, a advertising consultant, contacted Bauer with the idea of automating this process on a computer. Bauer thought that this might be a good application for a file management system, and turned Crane over to John Postley. Crane claimed to have commitments from several prominent people in the entertainment industry for financial backing. AIS soon began development of such a system based, because of its speed, on MARK I. This system became known as the Media Account Control System (MACS). Ralph Carson, of Carson/Roberts, Informatics own advertising agency, became interested and contributed valuable input to the Requirements Specification. A simple system, for spot broadcast commercials only, was developed.

It soon became apparent that MACS should run on a IBM System/360 so MARK I could not be used. Hence, MACS was custom developed in COBOL to maintain data files on the advertising plan for advertising agency clients and the current status of media orders, to verify actual performance of commercials, record payments from the clients, and prepare the advertising agency's payments to the various media. Crane's backers never came through and no sponsor could be found to fund the development, so prospects for sale as a product seemed dim. Consequently, it was decided to offer MACS as a data processing service to advertising agencies through commercial banks located in major cities. The banks would serve as sales representatives and would be licensed to operate the system on their computers. It was expected that such a service to the advertising industry would lead to more banking business for the banks from the advertising industry.

This was Informatics first (arms-length) entry into the data services business. Informatics proposed the idea to United California Bank which accepted it and signed a contract in July 1965 to market the system as an offering of the bank. A year later the system was ready. The first customer was Carson/Roberts in October 1966 and the system became operational the following month for broadcasting media; its use for print media advertising began in February 1967. The Kenyon & Eckert and Clinton E. Frank agencies of San Francisco became the second and third UCB customers, and an additional MACS franchise was sold to the Harris Trust Bank in Chicago by June 1967. A fourth customer was found in Los Angeles with the firm of Gerth, Brown, Clark & Elkus during August 1967. The fifth customer became the Meyerhoff Agency in Chicago during November 1967. This slow growth in customers gradually permitted some confidence in the eventual success of MACS to arise, and plans were even initiated for the formulation of a more advanced MACS II by the end of the year. Indeed, the expansion of MACS services to the New York area was one of Informatics motivations in opening negotiations with the Interpublic Group, a major marketing organization, for the acquisition of Dataplan Corporation, a New York City data processing service bureau, in January 1968 (see Section 4.2.6).

MACS unfortunately never fulfilled its promise. The highest monthly income for Informatics from the licenses was $2,300 in May 1968. It contributed little to the development of MARK IV. In July 1968 the company decided to discontinue its development activity for the product and sell the existing service to a company headed by Frank Crane for a total of $25,000. The reason for the decision, as reported by Bauer in his monthly report to the Board of Directors, was:

> . . . continued losses on MACS and sizeable research and development necessary to make the product a good one seemed to indicate that it would be quite a while before Informatics could realize any profit or, in fact, break even on operations from MACS. On our very long list of priorities, MACS had to come lower than many other highly desirable areas.

The disposition of MACS was finalized in August. Heading the list of "other highly desirable areas" which had bumped it was the development and marketing of MARK IV which had been taking place over the preceding two years.(10)

9.2 THE INITIAL DEVELOPMENT OF MARK IV

As mentioned, with the successful implementation of MARK III in Alexandria, Virginia, Postley recognized the potential for marketing a standardized file management product that could be sold to multiple customers using the same model computer. He and AIS soon attempted two avenues of approach to explore and test this idea. The first was to offer file management systems specifically designed for particular applications as proprietary services. The first approach resulted in marketing efforts to sell UMDS and MACS as proprietary services; as noted above, these efforts were unsuccessful.

The second approach was to offer the file management system alone by itself, without any specific application developed, leaving it to the purchaser (the user) to implement the selected user application--to offer it as the first "application development system," although that modern term was not used. In this approach the file management system, although it could be used by a data processing service, would simply be sold as a ready-to-use off-the-shelf software product along with sufficient and effective documentation and training for the customers, enabling them to implement computer applications on their own. Indeed Postley, during the performance of the Alexandria project in 1963, prepared a brief concept paper for such a product that would be compatible with the IBM 7040 computer and be known as MARK IV. This second effort resulted in a $652,130 proposal to the Office of Regional Development of the State of New York.(11)

The first phase of the contract, for about $10,000, resulted in the "first complete description of MARK IV" in June 1966. It was a functional specification for a file management system for use by the Regional Development Office and other New York state agencies to provide forecasting models and support for other planning activities. Although the term "MARK IV" was not used in the proposal or any of the product documentation "to avoid paying royalties," the system that was specified was a file management program designed to be a proprietary software product compatible with the IBM System/360 computer (as opposed to the model 7040 as intended by the earlier concept paper). Except for the difference in machines specified, the specification supplied to New York contained virtually the same features as outlined by Postley in the concept paper two years before. The following, taken from an early report, briefly described each of the program functional areas--operating system, file control/maintenance, information retrieval, and report generation.

Operating System

1. The entire system was to exist on punch cards (7040 version only).

2. Programming was eliminated through check marks, circled words and specified numbers on a set of standard input forms.

3. All parameters are checked by the system before being used to compile programs to perform the application; detected errors are rejected and flagged for correction.

4. A master file dictionary to locate all data files would be part of the system deck (punch cards containing the program) while all data master files would reside on magnetic tape in blocked and unblocked formats.

5. There would be exit points in the system to permit the use of special programs to process the data including two options, A and B, provided by the system itself. These were:

   A. Performance of arithmetic functions (addition/subtraction) among data contained in the same column or in different columns;

   B. The use of variable length records and special output formats, simultaneous use of multiple tape files, and folding of fields within columns, and the retrieval of data from files not created by the system.

File Control and Maintenance

1. The combined use of punch card and magnetic tape input.

2. File maintenance transactions or tasks which permit the adding or deletion of individual records, the "blanking" of a field in a specified record, and the resequencing of records in a sequential data file with changes in the index key (change in the order of sort selection).

3. The pre-compiling of field locations of data prior to execution of processing of them and the sequencing of the data from input and the master files.

4. The preparation of a printed record of all input and processing transactions.

Information Retrieval

1. The retrieval of data from different types of files by the insertion of the appropriate data dictionaries in the system deck.

2. User selection permitted through the setting of specified parameters on given criteria.

Report Generation

1. The creation and printing of a large number of different reports from a single pass (one reading) of the data by the computer.

2. Each report may be sorted in any desired sequence, independent of other reports.

3. Sorting by ascending sequence.

4. Provision of column headings, listing of detail entries, and totals for rows and columns as report formatting features.

5. The use of variable spacing.

6. Report format specified by the user through the designation of particular codes on a simple input form.

7. Item counts for each level of data performed and maintained.(12)

New York State never authorized the later phases of the contract--to build and install the system. However, based on these specifications, AIS sought corporate investment funds and formed a project team.

9.2.1 The Funding and Sponsorship of MARK IV

The team consisted of Postley, Dwight Buettell, Bill Cutler, Wilson Cooper, Fred Braddock, and Herb Jacobsohn. Although AIS had already created working file management systems (MARK I, II, and III) and had preliminary external specifications for MARK IV, the system had to be designed, meticuously reviewed, analyzed, improved, simplified, programmed (in a manner so that the source code could be protected and that the object code could not be improperly altered), tested, and perfected so it could be sold to many different users and used, without failure, for a multiplicity of applications. The importance of this, particularly for the years under discussion, cannot be overestimated. Computer time in the 1960's was extremely expensive. A ready-to-use software program sold to a number of installations should be as free of defects as possible or else result in a massive recall, reprogramming efforts by the seller, and liability to the customers not just for the purchase price of the product but possibly (no matter what the contract said) for any losses resulting from disrupted computer operations as well. Therefore any "bug" which could arise in the operation of the system had to be identified and eliminated.

To support this technical development effort which included preparing appropriate customer documentation and training materials as well as developing marketing and sales efforts, Postley asked for $500,000. This seemed like an enormous risk to both the management of Informatics and to its parent Dataproducts Corporation. Although the **Corporate and Marketing Objectives** for

1966 pinpointed proprietary software programs that could be sold a multiple number of times as a major goal and recognized that "this implies a vigorous marketing and investment program in items such as . . . file management and related services," Bauer and Erwin Tomash (President of Dataproducts and Chairman of the Board of Informatics) both held strong reservations about investing such a large sum of money into the MARK IV program. Tomash had encouraged Informatics since its founding to work towards the goal of creating standardized programs that could be sold in volume, but the idea of software products was totally new, untried and unproven. While common today, software product development in 1966 was truly a financial risk. Postley claimed that the risk was small, since he had knowledge that several large companies were planning internal projects for such a system and would be happy to buy one ready-made. But the corporate management of Dataproducts consisted of hardware engineers, not programmers and systems analysts, who found it difficult to envision a computer program as a standardized product and even more difficult, according to Postley, to understand what a file management system was. Most importantly, neither Informatics nor Dataproducts could comfortably afford the negative cash flow that would result from the project. Tomash suggested a potential solution which was quickly adopted and offered by Bauer in a summary of his reservations in January 1966:

> Our lack of success in selling the 1401 file management system [MARK III] is a sobering fact. It raises the question, certainly, as to how much time and money we should devote to future file management systems. However, we still receive reports of enthusiasm from many sources.
>
> Perhaps the best way to proceed here is to try to develop a coalition approach to the development of a MARK IV system for the 360 computer. With this approach, as I understand it, four or five companies would join us in developing the system and they would be free to use it. The point here is that a $200,000 to $400,000 investment is not necessary for our portion of the investment and it would be more like $50,000 to $100,000. This is my current feeling about file management systems for the 360--that they warrant investment in the $50,000 range, but probably nothing significantly greater.(13)

Postley and his crew took this statement enthusiastically as a mandate to actively search for outside funding and proceed full force with the project rather than a rejection of the estimated size or scope of the the project. Neither Bauer or Tomash objected to this interpretation provided that the project was primarily paid for by others. Indeed, it was felt that by seeking outside investment for MARK IV development the market demand and interest for such a product could be tested. Postley, assisted by Herb Jacobsohn, (who was hired a month later in February 1966) immediately began to pursue prospective sponsors, and, much to everyones delighted surprise, they found them.

After several months of effort, Postley obtained the first MARK IV sponsor. This was Standard Oil of Indiana which on November 6, 1966 agreed to sponsor the system for a total contribution of $100,000. Four more sponsors were found by July 1967. These were National Dairy Industries (now Kraftco) for $90,000, Alan-Bradley Corporation for $100,000, Tidewater Oil Company (a subsidiary of

Getty Oil Corporation--now ARCO) for $110,000, and Prudential Insurance which provided $51,000 and computer machine time and a live environment to test and debug the system. Each sponsor had a different deal concerning how much of their contribution would be returned to them in royalties from future sales. An important feature of their contracts was that, though they would be consulted on the design, the final decision on everything about the product would remain with Informatics. They would have to take whatever was delivered. With $451,000 plus computer time in outside sponsorship funds and a promise of $50,000 from internal funds "if you need it," AIS was able to start the MARK IV development project with a full-time staff of four.

Postley continued to seek prospective sponsors and customers however, and actual orders for MARK IV, prior to its completion, were soon placed for the purchase of a perpetual license to use the system (at a price of $30,000 per installation) by Eastman Kodak Company, General Motors Corporation, the United States Civil Aeronautics Board, Anaconda Corporation, Exxon Corporation, and International Industries. These orders occurred between June 1967 and January 1968 and justified increasing the development staff to six full-time people.(14)

9.2.2 The Design of MARK IV

Project development moved rapidly once funding and staff had been obtained. Meeting daily to discuss all operating and design details of the system, the project team persistently sought to make ease of use, time savings and flexibility the key characteristics of MARK IV:

> Standard application-oriented features will enable users to achieve results with a minimum of involvement in the detailed functions involved. . . .
>
> Simplicity of use by non-computer oriented people is a primary design concept . . . as the system is used increasingly, it will, in effect, "learn" through experience so that repetitive requests will not require detailed restatement and variations of earlier requests will require only a statement of the changes.
>
> MARK IV will accommodate fixed-format files, chained files, hierarchical files, files with trailer records, and any files that can be defined in the COBOL language.(15)

Beginning in early 1966 with the three basic conceptual requirements above, the project team developed detailed preliminary external specifications for all of MARK IV's intended functions by November 21, 1966. These became somewhat finalized in December and formally accepted by January 27, 1967. This dedication to complete specifications before beginning to write code was a key element in the successful development.

Among the features or characteristics which had been added to MARK IV in the passing months was the recognition of different levels of users with varying degrees of sophistication vis-a-vis computers. The MARK IV designers accomodated these differences by building four separate levels or subsets of communication within the system permitting clerical, managerial, systems analyst

and programmer type users to interact with MARK IV at their own level of need and individual knowledge. For clerical type users who simply had to update files and receive standard reports, easy to use forms were provided to submit new data to be inputted and to request reports with or without the additional data. Additional optional forms were created for managerial type users to selectively retrieve different types of information from the data files and to request production of special reports required for their own unique analysis and problem-solving needs. These could be repeated or one-time only reports. For computer systems analysts, responsible for the installation of data files in support of various applications, an assortment of complex capabilities in a number of special programs contained in MARK IV were provided to enable them to create and maintain data files. Finally, for individual programmers there were "exit and entry" points created in MARK IV which permitted the use of specially written programs (in other languages) in conjunction with MARK IV for a given application or the installation of specially written subroutines within MARK IV itself. The latter two levels of communication permitted MARK IV to be flexible enough to be used for an immense diversity of applications and data files and still be simple to use by the computer nonprofessional.(16)

The actual programming and coding of MARK IV took place in 1967. In late 1966 Informatics established a MARK IV Technical Review Committee, composed of senior technical managers not in AIS, to evaluate the design process and to focus attention on perceived weaknesses or needs of the project. The committee consisted of Richard Hill (who served as chairman), G.O. Collins, Robert Heckathorne and R.N. Remund. The group literally adopted Postley's notion of MARK IV as a commercial product and evaluated it from this stance, viewing it from technical, marketing, production and consumer prospectives. While not faulting the technical progress of the project, in February 1967 the committee focused attention on the "packaging" and product support for MARK IV provided to customers along with marketing and production requirements in general. They reported:

> The most apparent lack at this time, which is understandable in the light of the relatively new status of the project and the priorities demanded by other activities, is the degree to which "productization" considerations have been attended. It is understandable that these matters, which relate to design and production control, packaging, delivery, and after-delivery service, will not be studied for some time, but in the committee's opinion there should be more extensive plans to study them.(17)

"Productization" of software posed a completely new set of considerations and problems for Informatics. No one had sold a software product before. How much should the product sell for? In selling systems design and custom programming services, Informatics charged on a time and materials basis or a unique fixed price based on unique estimates of the cost of performance for each customer project. As a standardized product, MARK IV was designed to be "production" software meaning it was to be reproduced a large number of times as long as enough customers for it existed to provide a profitable return on development and production investments and on-going support costs. For hardware, there was an established discipline for estimating such costs. For software, it was much more difficult since computer programs, while often

absorbing unpredictable manpower and funds to design and perfect, are easily reproduced on magnetic tape for a fraction of their development costs. Should the sales price of the software be a percentage of its development cost? How many systems would have to be produced and sold to break even? Should sales price be linked to market demand? How many potential MARK IV customers are there and how much are they willing to pay? What is the market life of the software? Should the software be sold outright allowing purchasers to do whatever they wanted with their purchased copy, except resell it? How can unauthorized duplication of the system and transfer of it to others be prevented?

While such questions have since been answered numerous times by many software companies, in 1967 these were totally new and unanswered questions for the embryonic industry. Informatics was the first software company to confront such issues in its efforts for MARK IV. There were many other as yet unanswered questions. Can a computer program gain patent or copyright protection? What customer support will be provided for installing and maintaining the system and training users how to use it? Will updates and improvements be provided to previous purchasers of the system? If so, should they pay for it and at what price? What documentation should be provided to customers? What if a customer copy of the program fails to work properly; how is the situation resolved? Must the software be warranteed against defects in production and performance? How should the software be marketed; how are customers discovered? Is a professional sales and marketing staff required? How much technical knowledge do they need? How should the product be distributed and delivered to the customer? The Technical Evaluation Committee focused company attention on the need to answers these questions, and as a result corporate management instructed Frank Wagner to retain a consultant to consider a few of them. He hired Brandon Applied Systems, a computer systems consulting firm, in December 1966, for $5,000, to perform a market analysis and pricing study for MARK IV.(18)

Meanwhile, management undertook extensive efforts to answer the questions posed by other "productization" issues and to meet some of the perceived needs. Packaging for the software was studied, and training and instruction manuals were prepared. By May 1967, a preliminary user's manual had been written and, by December, a complete set of customer documentation was published including a general reference manual, a user's training guide, an operations guide for data processing personnel, and a Pracniques Handbook which provided technical know-how on special techniques to use with MARK IV to set up applications. Postley applied for a patent on MARK IV with the United States Patent Office. This effort was unsuccessful although patents were later granted to MARK IV in Great Britan and Canada. Since deliverable documentation existed in written form, it could be copyrighted. However, copyright protection for the code was decided against since it implied making the code public knowledge. Instead Informatics decided to rely for protection on trade secrets law, and took all necessary legal steps to insure that the code was a trade secret, including nondisclosure agreements with employees and customers. This set the precedent for the software products industry. The protection against unauthorized copying and transferring of the software was further enhanced by the decision to deliver no source code and to market the product in the form of a perpetual license to use it, provided it was not transferred to other installations or nonpurchasers and not copied without authorization of Informatics. Minor techniques included using unique and distinctive packaging for the various product items (such as

specially colored punch cards and tape reels with Informatics identification). Eventually, the popularity of MARK IV itself as a large-scale system software product and the job mobility of programmers also provided protection because computer installations which attempted to obtain and use "bootlegged" or unauthorized copies of the software would find it impossible to keep it secret from the data processing industry and thus impossible to prevent Informatics from inevitably finding out and taking legal action.

AIS decided, for the early installations, to provide on-site installation of MARK IV at the customer's site by Informatics technicians to ensure that a properly installed and operating system was provided. Management prepared a marketing plan, and hired a national sales manager, Gordon Utt, reporting to Herb Jacobsohn. A European sales manager, Jeffrey Milton, was also hired, and William Cutler was appointed manager of MARK IV Development "to maintain and increase our [Informatics] lead viz-a-viz the rest of the software industry."(19) Robert White transferred to Advanced Information Systems as manager of technical support responsible for developing a field engineering staff to install MARK IV at customer sites and provide maintenance services when problems occurred.

After several months of investigation, analysis, and internal debate, management decided to base the sales price of MARK IV on market demand for it or rather "perceived value" by the customer. Brandon Applied Systems (which had performed a survey of potential customers) recommended that a price between $25,000 to $40,000 would provide the largest number of customers. So Informatics adopted $30,000 as the initial price of MARK IV model 1, the first commercially available MARK IV system. Lower prices were quoted for subsequent installations by the same customer. An "installation" was defined as one site where all the computers were under one management. In retrospect, it is a matter of conjecture whether MARK IV would have produced more profits if a separate licence had been required for each machine. AIS also initially decided to supply future updates of MARK IV to customers at no charge, believing this would make maintenance easier since all users would uniformly have the same system. Subsequently, this policy was changed to a requirement for an Annual Improvement and Maintenance Service (AIMS) fee. Many years would pass before the size of this fee could be raised to a level now considered respectable.

The availability of MARK IV was officially announced to the industry in November 1967. The first deliveries to sponsors were made on January 3, 1968, and first complete installations were accepted at Standard Oil and Prudential Insurance on February 5, 1968. During the previous several months, Informatics continued to seek orders for the system. By February 5, 1968, when the first MARK IV systems were installed at sponsor sites, Informatics had already received 117 orders for the system for a total of $1,805,792 in booked sales excluding the sponsorships! Installation of these sold systems began in March 1968 with the first European installation occurring at the Esso Corporation's European headquarters. The first truly European customer was Ciba Geigy of Manchester, United Kingdom, on August 27, 1968. This was soon followed by installations at BOAC in London and International Computers Ltd. in Manchester. The first Asian Mark IV customer appeared during the year, Yamaniouchi Pharmaceutical in Japan. Twelve months after its formal announcement, MARK IV had surpassed $1 million in total revenues and obtained profitable sales levels in September 1968 (earning a $24,343 net profit on monthly revenues of $809,773

after paying off all internal development costs). These revenues far exceeded those of ADR's AUTOFLOW, MARK IV's rival for the honor of being the first commercially successful software product!(20)

9.3 THE PROMOTION AND MARKETING OF MARK IV

Once MARK IV had been created and released for sale to the marketplace, AIS continued its development activity (to improve and enhance the product) but now the main focus of the department and much of Informatics as well had to be devoted to the marketing and sales of the product. A sales organization had to be recruited, trained and developed. Large numbers of customers and potential customers had to be trained and educated how to use MARK IV. Finally, various separate markets and types of potential users and customers for MARK IV had to be identified to gain sales contacts and to continue to increase product sales. This was a major undertaking, and within 18 months since the announcement of its creation, AIS found itself transformed from a software development/analysis organization of 12 into the Software Products Division of Informatics with approximately 100 employees by 1969 and by 1971 into the Informatics MARK IV Systems Company devoted completely to the enhancement and continued sales and promotion of MARK IV. In the process of selling MARK IV, Informatics found itself establishing and building a professional sales force for the first time in its history.(21)

The promotion and marketing of MARK IV was carried out primarily through five different avenues of activity: 1) the development and growth of both the domestic and the international sales organization; 2) the building of customer loyalty and follow-on sales through the creation and maintenance of a user's group; 3) the franchising of MARK IV to individual service bureaus and computer remote-access services to gain revenues from those who could not afford to buy the product for themselves; 4) the offering of minor product updates and improvements for an annual maintenance fee; and 5) the continued development and sales of new versions of and optional "special features" for MARK IV. The latter item is a very important marketing feature but since it involves subsequent development it is discussed in the appropriate section.

The successful marketing of MARK IV had a significant impact on Informatics as a whole in three ways:

1. Financially, MARK IV began contributing significant levels of revenues and profits to the company during 1969 becoming the single largest revenue producing and profit making business area for Informatics, demanding increased management attention and commanding increased levels of resources. Ultimately, by the early 1970's, the annual performance of MARK IV sales affected the overall financial performance of Informatics and the amount of investment funding available to other areas.

2. The commercial focus created by the marketing of MARK IV completely altered the composition of Informatics customer base within several years. The company primarily became a software supplier to private industry in the 1970's rather than a vendor of high technology software services to the federal government. As Informatics lead as a commercial software products supplier went up, its technical lead as defense and intelligence software systems developer for the government marketplace went down. The company

lost to others its competitive edge in certain government business areas, particularly in programming for defense, intelligence, and administrative systems.

3. Technically, the success of MARK IV caused Informatics to concentrate its attention increasingly on the development or acquisition of other proprietary software products. The company began building business by offering products utilizing specific technologies after these technologies became accepted by the market, letting others assume the financial risks of new technical development. Thus, the marketing focus necessitated by being in the software products business eventually led Informatics to adopt the business strategy a being a marketing leader instead of a technical pioneer.

9.3.1 MARK IV Marketing Organization

As mentioned, Informatics began building a professional marketing and sales force for MARK IV, both in the United States and internationally. In 1968 Gordon Utt was replaced as domestic national sales manager by Stanley Felderman, reporting to Herb Jacobsohn. Later Stanley Felderman became vice president of domestic marketing for MARK IV, reporting to John Postley.

By 1973 the MARK IV Systems Company had 68 people dedicated to the actual selling and installation of MARK IV in North and South America. This group included three domestic regional sales managers, one Latin American sales manager, 24 salesmen, 18 systems engineers (who installed the product), 10 instructors (who provided on-site training to customers), and a headquarters sales support staff. There were sales offices in Canoga Park, California; River Edge, New Jersey; Dallas, Texas; Rockville, Maryland; and Chicago, Illinois. The domestic sales organization also was responsible for Latin America.

Postley's belief in the product also led him, very early, to pursue an international market. He made four separate trips to Europe prior to the release of MARK IV to explore marketing possibilities. This ultimately led to the hiring, in January 1968, of Jeffrey Milton (then a marketing manager for IBM U.K.) as MARK IV manager for Europe, and to the establishment of Informatics S.A., a European subsidiary for marketing MARK IV, with headquarters in Geneva, Switzerland. Beginning with only a few of salesmen in August 1968, Informatics S.A. grew to a staff of 17 people by 1975, and went from $500,000 in revenues in 1970 to over $2 million (about 25 percent of total MARK IV revenues) by 1975. It had additional offices in Copenhagen, Denmark; London, England; Dusseldorf and Mannheim, Germany; Paris, France; and Rome, Italy. The success of Informatics S.A. in winning acceptance of MARK IV in the European market was not confined to Western Europe only; MARK IV has even been sold within the Iron Curtain in Hungary and Bulgaria. (There was some misunderstandings with the U.S. Government which were eventually resolved.) The greatest success was in France, where, according to Frank Wagner, Michel Serfaty became the world's most successful software salesman in the 1970's. The poorest performance was in Germany where Milton was never able to develop even one successful salesman.

Efforts were made to sell the product in other parts of the world through licensees and manufacturers representatives. Initially, Informatics licensed Independent Software Applications (ISA) of Australia during February 1969 to market MARK IV in that country, New Zealand and the Fiji Islands. ISA paid

Informatics $30,000 annually for its marketing rights plus 25 percent of all MARK IV revenues which it produced over $120,000 per year. This arrangement was quickly terminated the following December when Informatics attempted to expand its European business base in general by forming a relationship with P.A. Management Consultants of Great Britain, as discussed in Section 4.4.5. This led to the licensing of P.A. Management for professional service rights using MARK IV within the United Kingdom and Australia in exchange for the annual payment of $42,500 plus royalties to Informatics. While the P.A. Management association never led to increased European custom services contracts for Informatics as intended, it helped a little in the growth of MARK IV sales in the British Commonwealth. The arrangement was soon terminated. In 1971 Informatics tackled the Asian marketplace by retaining Computer Applications Company Ltd. of Japan as a full-service agent, not only selling but providing customer support in Japan.

In spite of the success by 1973, it seemed that the market for MARK IV had hardly been penetrated. Why then were there only 18 commission salesmen in the U.S.? Postley had resisted an accelerated build up for three reasons: 1) The right kind of person to sell MARK IV was exceedingly hard to find--Postley was reluctant to lower his standards; 2) Proper training for a recruit required diversion of resources from making sales that were ripe for the plucking; and 3) It took over a year before a new recruit began to pay his way by making quota, and there were many drop-outs. Thus it cost almost $200,000 to increase the sales force by one person making quota--an enormous investment right off the bottom line.

Bauer was unhappy with the dilemna, and pushed Postley to find a solution, but also feared the losses that an unsuccessful build-up effort could bring. The choice of strategy even was debated by the board of directors. The most convincing argument was forcefully advanced by Lester Kilpatrick, then president of California Computer Products. He pointed out that a great marketing opportunity like this rarely presented itself to a company. This was not the time for faint hearts; he advocated doubling the commissioned sales force, at whatever expense, to exploit this once-in-a-lifetime chance. Bauer and the rest of the board were convinced.

And so, in 1973 Informatics made a commitment to the continued and expanded growth of this sales organization. The marketing effort was seen as allowing Informatics to maintain its lead in supplying file management systems and a means to broaden the MARK IV customer base through sales of other products and services, some of which could be used in conjunction with MARK IV, to preexisting customers. As enunciated in the business plan of 1973, the expanded marketing of MARK IV was to be the major objective of the company:

> Every effort will be made to increase the general business base of MARK IV. We will continue to emphasize the "market development" area of the Software Products Company.
>
> The MARK IV business base can be widened by the development of application packages. Sources of these packages include MARK IV customers, solicited or unsolicited development of a specialized package such as AUDITALL, and Informatics own development. Packages may be sold to MARK IV users, offered

> with MARK IV/ARS [Authorized Remote Service] or be licensed to service bureaus. . . .
>
> We will continue to expand and improve our sales organization for MARK IV as rapidly as we can consistent with continuing to achieve good profit margins. Such development and expansion will allow us to remain in the forefront for file management systems. Similarly, we will continue to expand our technical product base for MARK IV, again being consistent with profit margins and realizing that this is another factor in keeping us in the forefront for file management systems.(22)

The results of MARK IV sales significantly affected Informatics operations and corporate planning in general. MARK IV was a relatively costly product, with its various models (see Section 9.4.2 regarding separate models) selling in price from $15,000 to $50,000, usually plus the price of special features and sometimes additional installations. As a result the average individual sale took from six months to one year to close after initial customer contact. Potential buyers had to be "qualified" as a bona fide prospect who needed and who could afford MARK IV; key people plus all interested parties in the prospect's organization had to be identified and approached as to their needs; data processing personnel and intended users among the customer's staff had to be convinced that MARK IV could meet their requirements and solve their problems; and the purchase of MARK IV had to be financially justified and approved by customer management. This required continual contact and follow-up with prospective buyers on the part of MARK IV salesmen. The company, therefore, paid commissions to salesmen based on an annual quota. However, incentive bonuses were paid for making six month sales quotas which terminated at the end of the second and fourth quarters of the fiscal year. The end result of this practice was a peak and valley, roller coaster-like performance for MARK IV revenues through the year as the first and third quarters would be below average in earnings and third and fourth quarters would usually be very much above average.

This was due to most individual salesmen producing a low level of booked sales during the first month of each quota period (as they filled their pipeline), and then becoming increasingly productive as the sales cycle neared its end, and strongly motivated as the end of the quota period drew near. The problem was exacerbated at year end, when customers spent the last of their annual budget for software products. So the last month saw huge sales, emptying the pipeline again. Such performance was expected and at first did not greatly effect internal operations. But over a period of several years, as MARK IV sales increased and its profits became an ever larger percentage of total company profits, the annual peaks and valleys of MARK IV sales became steeper and more pronounced and eventually made it difficult for management to make accurate financial forecasts and plan operations for the year. The fourth quarter peak also made it difficult for management to even predict, until the fiscal year actually ended, whether financial performance for the company as a whole was going to meet expectations and be sufficiently profitable. By 1976 this practice had become so intolerable that separate and staggered quota periods were considered for the individual regional sales offices in North America and in Europe to provide a more consistent flow of revenue and cash into the company. This was never fully implemented. After several transitional

plans, North America stabilized on a 12-month quota period ending September 30. International never changed. The problem was never solved, although the growth in Informatics profits eventually mitigated the effect somewhat.

Overall, from $2,718,229 in annual revenues ($408,000 of which were from Europe) during fiscal year ending March 1969, the MARK IV sales organization continued to grow and produced approximately $7.4 million in revenues ($2.2 million from Europe) by 1975, accounting for 32 percent of all Informatics revenues ($23.3 million) in that year alone. Total MARK IV revenues from its birth reached $21 million by 1974. Approximately 85 percent (90 percent in Europe) of this business was from the commercial as opposed to the government marketplace. By 1977 MARK IV reached an annual sales rate of $13.5 million with $2 million in annual profits and a projected 18 percent compounded growth rate through 1982. It remained the leading profit producing business activity for Informatics until 1981 when it was surpassed in profitability by Informatics Professional Services operations. Figure 9.4 (see Section 9.5) tabulates financial perfomance of the product on a yearly basis. It can quickly be realized that the product and the marketing of it had a profound effect on Informatics, changing its business emphasis from custom services to software products and from government agencies to commercial customers. Even the Business Systems Division of Informatics Computing Technology Company and Western Systems Company began offering custom services based on MARK IV under the direction of Howard F. Paris and Anthony Lamia, respectively. They offered to perform the design and implementation of sophisticated applications utilizing MARK IV for those who purchased it.(23)

9.3.2 The IV League and MARK IV Education

The large-scale release of the same software system to a number of different customers required that these users be trained in the use of the system. Furthermore since the company intended to create updates and special features for the product, the cultivation of existing customers and users was believed to be the best way to discover what improvements were needed and to make additional sales. Potential customers also had to be discovered and educated as to how MARK IV could benefit them.

Frank Wagner urged the formation of a "user's group." In 1955 he had been a founder of SHARE, the user's group for large IBM scientific computers. In subsequent years, he had acquired inside knowledge of the enormous beneficial impact that SHARE had had on the sales of the IBM 7000 series of computers. Consequently, Informatics decided to create a MARK IV user's group in 1967 or 1968. The first meeting, primarily attended by sponsors, was held in Los Angeles and included a barbeque at John Postley's home in Bel Air. It became evident that the group would build customer loyalty, aid in training customers on how to use MARK IV (resulting in follow-on sales), inform prospective customers about the product and invite them to join the club, announce new versions and special features to a targeted audience for the promotion of sales, and establish firm contacts with seasoned users to determine technical improvements and needs. This first user's group based upon a software product was called the IV League, affectionately nicknamed the Ivy League.

Although responsible for its formation, Informatics, following the example of SHARE (the first, largest, and most successful user's group), fostered the

independence and technical objectivity of the League as a separate nonprofit entity by turning all control and government of the organization over to its membership (MARK IV users). The League's first large meeting was held in New Orleans during February 1969. This meeting was attended by 130 people representing 80 companies which had purchased (many awaiting delivery and installation) MARK IV. There were 121 installations of MARK IV at this time, 16 of which were in Europe. Each installation brought with it a whole new cadre of business users from the corporate customer. The League permitted these growing numbers of users to share notes and discuss each others separate applications of MARK IV. It also provided Informatics with a captive, knowledgeable, and selected audience to announce new versions and features of MARK IV and to "test" the waters and feel out users on potential products and needs under consideration. In fact, during the first IV League meeting, Informatics utilized the opportuntity to announce the availability of an enhanced and more efficient MARK IV model 2 and a smaller model 1 for DOS operating system users. During the second meeting, it announced still more new versions and the availability of special features. Each announcement brought a flurry of orders for these new releases and gave management a clue as to how successful they would be.

During the first several years of the IV League's existence, according to Fred Braddock, who became manager of product development and later vice president/Software Products Technology, the meeting attracted higher level technically sophisticated and interesting users who were quite vocal in identifying application and report generation needs, and thus were helpful to the MARK IV technical staff in determining what special features and improvements were needed. In fact, both Braddock and Robert White fielded challenging questions from the floor during IV League meetings, explaining technical matters and Informatics position to members. White served as the company's representative to the board of directors of the League. As the product was improved and made available to an ever-larger number of people through different versions, less sophisticated and lower level users began attending the IV League meetings primarily for training and basic education. Feedback to Informatics came primarily from professional programmers. In any case, the IV League has always provided Informatics a means of mass contact with its customers but only with users in the data processing organization. Unfortunately, these users overwhelmed the voices of the nonprogramming end users, whom Informatics was never able to reach so it missed the "Information Center" market which developed in the early 1980's for products to be used exclusively by end users..(24)

In conjunction with the IV League efforts, Informatics separately offered MARK IV training seminars in various cities throughout the United States during 1968-1970. These were highly successful in training numbers of new users. By July 1968 approximately 500 people (106 during July 1968) had been trained in the use of MARK IV. Ford Motor Company alone in August 1968 awarded Informatics a $12,000 contract to train "a few hundred Ford employees in MARK IV." By May 1969 a total of 1,443 people had been trained on MARK IV, representing 171 installations in 180 cities in 29 states and the District of Columbia domestically and 32 cities in 17 separate foreign countries. The demand from users and interested parties for information generated enough orders for documentation alone that Informatics Software Products Division shipped three tons of MARK IV manuals in the single months of April 1969! Informatics found

itself planning for the search of a new building equipped with loading docks--something it never envisioned itself ever needing! MARK IV education and publication services alone produced over $900,000 in profitable revenues by 1974. This remained at a constant level through 1982.(25)

9.3.3 The Offering of MARK IV Models and Services

Increased MARK IV sales were also promoted by expanding its potential market by offering enhancements and various versions of the product to different segments of the market. As discussed in more detail in Section 9.4.2, Informatics created several different versions of MARK IV. These included smaller size (less memory and data file size capacity) lower priced systems for the IBM System/360 model 30 and 40 computers. Because of the restricted size of internal storage, this small version was not very successful. At the urging of Herb Jacobsohn, Informatics invested in a version which could be used on the RCA Spectra 70. Univac, convinced that it would help their sales, sponsored versions for their 9400/9700 series, their SS90 computers, and the Siemens computer which was sold in Europe. For this development, Univac paid Informatics $360,000, although it had no right at all to the resultant products which were to be marketed by Informatics. Very few of these non-IBM versions were sold, probably because 1) the economically-minded buyers of these non-IBM computers had restricted budgets, and 2) the MARK IV salesmen didn't feel comfortable in the lairs of anti-IBM users.

Much more successful were special features which enhanced MARK IV's capability by permitting the processing of certain unique tasks. Some of these features permitted very primitive on-line developement (although not real-time processing) of batch applications by specifying required information directly through a remote CRT terminal instead of manually filling out and keypunching forms. By 1975 sales of special features accounted for almost one fourth of MARK IV annual revenues with a total of $5.6 million in sales of the special features offered between July 1968 and May 1974. Different models of MARK IV provided additional potential customers for the product while the special features permitted extra follow-on sales to existing customers.

In addition, following Postley's 1969 five year plan for software products, Informatics went after computer users who either could not afford their own computer or their own separate MARK IV system. This effort to reach every "nook and cranny" of the market would provide suppliers of data services with a "piece of the action." This was done by offering MARK IV on a franchise basis to computer service bureaus beginning November 14, 1968. For timesharing services, there was developed a timesharing version of MARK IV, known as the Authorized Remote Service (ARS). Individual data centers could process applications for their customers utilizing MARK IV through local or remote batch services. As originally conceived by Postley, Informatics would supply the product, maintenance, a standard price structure and nationwide advertising to and on the behalf of service bureaus who would pay Informatics $25,000 for a MARK IV franchise and ten percent of their gross revenues resulting from their sale of MARK IV services. The individual franchises were to be separated both geographically and in technical offerings to their users. Postley foresaw up to 1000 franchises with at least 100 of them earning $500,000 in MARK IV revenues annually which would provide Informatics $2.5 million from the sale of the franchises and $5 million per year from their operations. This grand plan never came to pass.

PRAXA Corporation was one of the prominent local batch service bureaus, and started to develop a full line of accounting program products in MARK IV. In 1973 MARK IV/ARS became available on a nationwide timesharing basis through National CSS, Inc. In accepting MARK IV, National CSS proclaimed MARK IV to be a positive addition to its offerings:

> We are, of course, most interested in having MARK IV become a viable product on the National CSS network, and regard the ability of CSS to participate in both the marketing and the rewards of marketing MARK IV to be significant in establishing a relationship between Informatics and National CSS.(26)

In 1973 the MARK IV was also franchised to Data Logic Ltd. of Canada which provided MARK IV to Canadian customers through remote batch entry basis. Both of these endeavors brought MARK IV to a wide range of users and customers who might never be able to obtain MARK IV solely on their own, and they provided added revenues to Informatics amounting to $214,000 by 1974. Such services also afforded prospects for a MARK IV sale the chance to "try-before-you-buy" at nominal cost.

9.3.4 Other Marketing Issues

MARK IV was further promoted and its annual revenues increased by a change of policy in 1970 which provided routine upgrades and improvements of MARK IV to new customers for a fee rather than "for free" as was done with the original MARK IV customers. The Annual Improvement and Maintenance Service (AIMS) for MARK IV was charged to new customers for an yearly fee of $1,200 for each installation which amounted to $512,000 in additional revenue for the company by 1974. This was a very advantageous move as the previous policy of providing upgrades free was analogous to an auto dealer who supplied new car bodies to his customers every time the manufacturer changed the body style for the particular model which had been previously purchased. The free upgrade policy was costly to Informatics. Postley had opposed it, but gave in to the arguments of Jacobsohn, White, and others, who deemed it a necessary marketing investment until MARK IV reached a position of market dominance.

One of the reasons for MARK IV's great financial success in Europe in the 1970's is that Informatics stated the price of MARK IV in local currency but kept it constant in Swiss francs. Since, until about 1980, the U.S. dollar declined with respect to the Swiss franc, this meant Informatics got more for the product in Europe without actually raising the price. But this happy condition could not last forever, so the subsequent strengthening of the U.S. dollar was a contributing factor to losses in recent years in Software Products International Marketing. MARK IV first exposed Informatics to the complexitites of managing multi-national currencies, but it was not until about 1980 that corporate financial management introduced a hedging procedure.

MARK IV, in all its revenue-producing modes, endowed Informatics with sizeable revenues and profits for 15 years. The success of this long-lasting product, which some skeptics predicted would have a market life of only several years, was due to Postley's marketing imagination and ingenuity in exploiting every possible source of revenues, the building of a superb sales organization,

and finally to the high quality technical development work conducted to continually improve and enhance its performance. This continual development of MARK IV enabled it to remain the leading application development software product throughout the 1970's.(27)

9.4 THE SUBSEQUENT DEVELOPMENT OF MARK IV

Upon the rapid and successful introduction of MARK IV into the marketplace, Postley and his team soon initiated efforts during its first year of sales to improve upon the product they had just created. Continued development was required, so Postley put it, because.

> It is becoming increasingly evident that in order to remain the potent factor that we are now in the software product business, we must begin at the earliest possible instant to expand our product line and to increase our capability to market and maintain these products. This means that very substantial amounts of money must be invested immediately in these endeavors if we are to proceed as rapidly as we must.(28)

The above statement was made in September 1968. By April 1969 Postley had developed a complete five year plan for the development of MARK IV and software products by Informatics. A man of amazing vision, an idealist about the future benefits of computing to society, a high technology marketeer who foresaw that mass marketing of software could only come through standard software products easily used by noncomputing professionals and end users, a dreamer who acted upon his dreams and made them reality, perhaps Postley's only faults were his extreme devotion to MARK IV (which he saw as the ulitmate answer to most computerized business applications) and a poor sense of timing which caused him to initially overestimate and later underestimate the speed of technological and market change. This foresight is evident in his first five year plan in 1969:

> I believe that within the next five years the majority of all data processing work will be carried out by software products and packages.
>
> As a direct result of the emergence of these competitive forces, including both "software" houses and probably hardware manufacturers, Informatics must plan to continue its regular program of product improvement. Although these improved products will probably be provided at extra cost to our then existing users, the necessity to offer them to counter the developments of our competitors seems apparent. . . .
>
> We are selling a capability to use computers. This capability is oriented toward the end user--the man with the problem. While sophisticated applications may require sophisticated approaches, programmer-like in many respects, the community of people who ultimately need the computer services consist of the end users and not the programmers. It is to these end users that our marketing efforts are primarily directed.

Postley rigidly adhered to the concept of the "software product" which he saw as mandatorily standarized without deviation (in terms of price, function, code, and the type of computer it was designed to run on) to permit effective and efficient field support, eliminate customer price negotiations and any "deals." He saw products as having large markets, consisting of thousands of potential users, yielding enough actual customers to offset product development and marketing costs profitably. He saw geometrically increasing demand for software products as they became accepted and used to replace and reduce the size of custom programming staffs of computing organizations. Postley gave serious consideration to competition and appropriate market strategies to defeat it before MARK IV had any true competitors. In 1969 the only possible competing product was IBM's Generalized Information System (GIS) which they derived from the earlier Formatted File System (FFS) developed by IBM for the Department of Defense. IBM initially offered it free with hardware purchases and, after unbundling, for a very low price. Some hard-nosed IBM salesmen, trying to retain complete account control, pushed GIS very hard in strenuous attempts to deter these customers from buying MARK IV. GIS, however, was not as flexible, easy to use, or as capable of implementing the same number of diverse applications as MARK IV. MARK IV easily competed against GIS, and Postley, who utilized industry associations and acquaintenceships with IBM personnel to discover the latest in GIS development, always made sure, through the continuous improvement program, that MARK IV stayed several steps ahead of it and other minor competing file managment products such as ASSIST, developed by Don Sundeen, a former employee of AIS.(29)

The technical competitiveness of MARK IV was maintained by the design and production of new versions of MARK IV for use with smaller IBM machines and computers of other manufacturers, special features or options which extended the capability to perform specific specialized tasks, and the development of application products or packages which relied upon MARK IV for implementation. Between 1968 and 1973, for instance, there were a total of 1400 separate product improvements made on MARK IV. These included the offering of two product model series (MARK IV/I and MARK IV/II) with at least three updates or revisions each, seven distinct individual models or versions of MARK IV, and fourteen special features. In 1968, MARK IV/I release 1, the first MARK IV to be installed, consisted of 72 separate routines with 284 diagnostic messages. By 1974, the coding of MARK IV/II release 4 contained 360 different routines and 730 individual diagnostic messages. MARK IV obviously grew and kept pace with the technical advancements and sophistication of the 1960's and 1970's. The sections below discuss the evolution of special features and different models of MARK IV. It is through these technical advancements that MARK IV became a success and the most widely sold and used software product of the 1970's.(30)

9.4.1 MARK IV Special Features

As an inducement to purchase and a means to fulfill the unique needs of various types of users, Postley recognized the need for the development of special features for MARK IV which could be sold as options to customers. These special features provided MARK IV extra capability to perform specialized data processing tasks such as generating indexes to data files, table look-up capabilities, dollars to pounds conversion or vice versa, extra printing format features, and other items which were in themselves not mandatory needs for the performance of the vast majority of applications but which could be helpful aids

NUMBER	SPECIAL FEATURE	AVAILABILITY DATE
001	Table Lookup	December 1968
002	Indexed Coordinated Files	November 1969
003	Time Processing	September 1971
004	Data Base Interface/IMS	January 1971
005	Extended File Processing	April 1971
006	Extended Transaction Processing	April 1971
007	Text Processing	April 1971
010	Checkpoint Restart	April 1971
011	Resource Optimization	April 1971
013	Batch Freeform Input	December 1971
014	Extended Reporting	January 1972
016	Extended Segment Processing	October 1973
017	Data Base Retrieval/IMS	October 1973
018	Data Base Retrieval/Total	October 1973
019	On-Line Executive	August 1972
020	On-Line Freeform Input	August 1972
021	On-Line Query Language	June 1974
022	Batch Query Language	June 1974
023	Generalized Systems Interface	December 1974
024	Data Base Interface/DL/I/DOS	February 1976
025	Data Base Retrieval Interface/DL/I/DOS	February 1976
026	Query Language/DC	December 1975
027	Advanced Table Lookup	December 1975
030	Query Language/CICS	March 1979
031	Query Language/INTERCOMM	March 1979
032	Document IV	April 1978
034	Graphics	August 1979
035	Array Processing	July 1979
040	Data Base Interface DL/I Entry DOS/VS	February 1980
041	Data Base Retrieval DL/I Entry DOS/VS	February 1980

MARK IV SPECIAL FEATURES

FIGURE 9-1

and tools for a number of different users. The special features were essentially extra individual subroutines not provided with the basic MARK IV program but which were completely compatible with it, easily installed within it, and sold for modest prices ($2,000 to $12,500) compared to the price of the basic MARK IV and other large-scale system software products. The first special features to be offered for sale were the table look-up feature in December 1968 and the indexed coordinated file feature in October 1969. Since 1968, Informatics successfully developed and offered for sale a total of 30 special features (out of a total of 41 development efforts initiated) by 1980. Figure 9-1 below provides a list of these special features and the dates of their first availability.

Most of these features were rapidly purchased by existing customers, but also they frequently induced new customers to purchase MARK IV. The majority of them were conceived and designed by Fred Braddock who succeeded William Cutler as manager of MARK IV development (and eventually vice president/Software Products Technology). Braddock usually picked up ideas for special features from personal conversations with actual users at IV League meetings. Both he and Postley exercised a keen sense as to which of these ideas would be easily marketable and therefore merited (usually very small) investment for development. The marketing of these special features and MARK IV is somewhat analogous to the sales of new cars. The special features were selected optional but "standard" frills which permitted customers to purchase, for an extra cost, a MARK IV system which to a limited degree catered to their individual needs and tastes. Like new cars and their options, MARK IV's special features frequently encompassed two or more specialized capabilities which were sold as one combined unit. A customer who wanted just one of the capabilities provided by a special feature had to pay the price for all the capabilities it included. Special features always produced enormous return on development investment, and had very low marketing costs--often the sale was merely "order taking" by support personnel who were in contact with existing customers.

This entrepreneurial consumer-oriented form of software product marketing, conceived by Postley, coupled with the fact that many special features were items distinctly needed by customers expanded sales and brought extra revenue into the company. While the basic selling price of MARK IV/II was $35,000, the addition of special features selected by customers would boost the sales price of a MARK IV system often to a price of $50,000-$60,000. Eventually, a fully "loaded" MARK IV, containing all the special features, could cost $150,000. By 1972 several of these features represented embryonic efforts for the eventual design of an on-line real-time version of MARK IV although such a system would not crystalize until the late 1970's; these features (such as request preparations, data editing, report viewing and formatting) permitted the user to alter and inspect data and report formats through inquiry on a display. These special features however did not provide for on-line single transaction processing of data.(31)

9.4.2 MARK IV's New Releases and Product Models

During MARK IV's first year of sales in 1968, Informatics had issued up to Release 8 on MARK IV/I by November of that year. Each of these upgrade releases provided minor but convenient improved operating efficiencies to the system. The most significant one during 1968 was release 6 which contained an indexed

sequential access method which improved the computer's ability to search for required data in a master file, resulting in a 20 percent reduction in actual processing time. Release 9, announced in Feburary 1969 and first installed in the following November, effectively became MARK IV/II. It contained numerous improvements and executed twice as fast as MARK IV/I. About this time release numbers were restarted and by 1982 had once again reached Release 9.(32)

Early in 1969, while MARK IV/II was being designed, Postley prepared a visionary five year plan for MARK IV development which he saw as the continuous evolution of new and more sophisticated file management products which kept pace with anticipated technological trends and which were based upon and evolved from the previous MARK IV products. This is shown in Figure 9-2 which is a product planning chart prepared by Postley in 1969.(33) As seen, MARK IV was to evolve from a batch-oriented system to a on-line real-time operating system product and even a dedicated sole purpose MARK IV computing "machine" by 1974. Although the schedule was wildly optimistic (and the nomenclature changed through the years), it is important to note that MARK IV products have roughly evolved according to the continuum that Postley projected. Section 9.5 below describes Informatics activities with respect to on-line successors to MARK IV, notably MARK V, which was initially announced in 1981.

Also in 1981 Informatics released a microcomputer workstation for common business office applications. This system, known as INFORMATICOM (described in Section 11.5.2), could operate as a stand alone computer or as a terminal connected to a larger host computer, and it contained within it a miniature version of a file management system and tools to assist in creating a MARK IV program for execution on the host computer. While not solely dedicated as a MARK IV or file management machine, it does represent a prototype of the "MARK IV machine" conceived by Postley.

The only major flaw in Postley's 1969 forecasts for MARK IV was his sense of timing. Technological trends and market acceptance of these technologies, such as on-line systems and microprocessor machines, took two to three times longer to occur than he had expected. The effect of recessions cut down on discretionary investment. Nonetheless, Informatics largely kept pace with technological and market change, falling slightly behind in the late 1970's with the delay in introducing an application development system for on-line, single transaction-processing.

As seen by Postley in 1969 (see Figure 9-2), MARK IV/I was to serve the need of small DOS operating systems for the IBM System/360 computer. MARK IV/2, which sold for $5000 more at $35,000, would cater to the needs of all System/360 DOS and OS users. Following these, three other MARK IV systems were to be announced by 1970. The first of these was a MARK IV/3 which was to be a smaller size lower priced file management system for smaller System/360 configurations that contained only 32,000 bytes of internal memory. Informatics actually produced four such systems which became available for purchase in 1971. These were the MARK IV models 230 and 234 which sold for $20,000 each and even smaller models 210 and 214 which sold for $10,000 each. With the introduction of these smaller size MARK IV's, Informatics was able to extend its file management market into the lower price small systems area while the higher end of the market was served by MARK IV/2 which was renamed MARK IV/260. Next in the line of early MARK IV products were to be remote job entry and on-line implementation

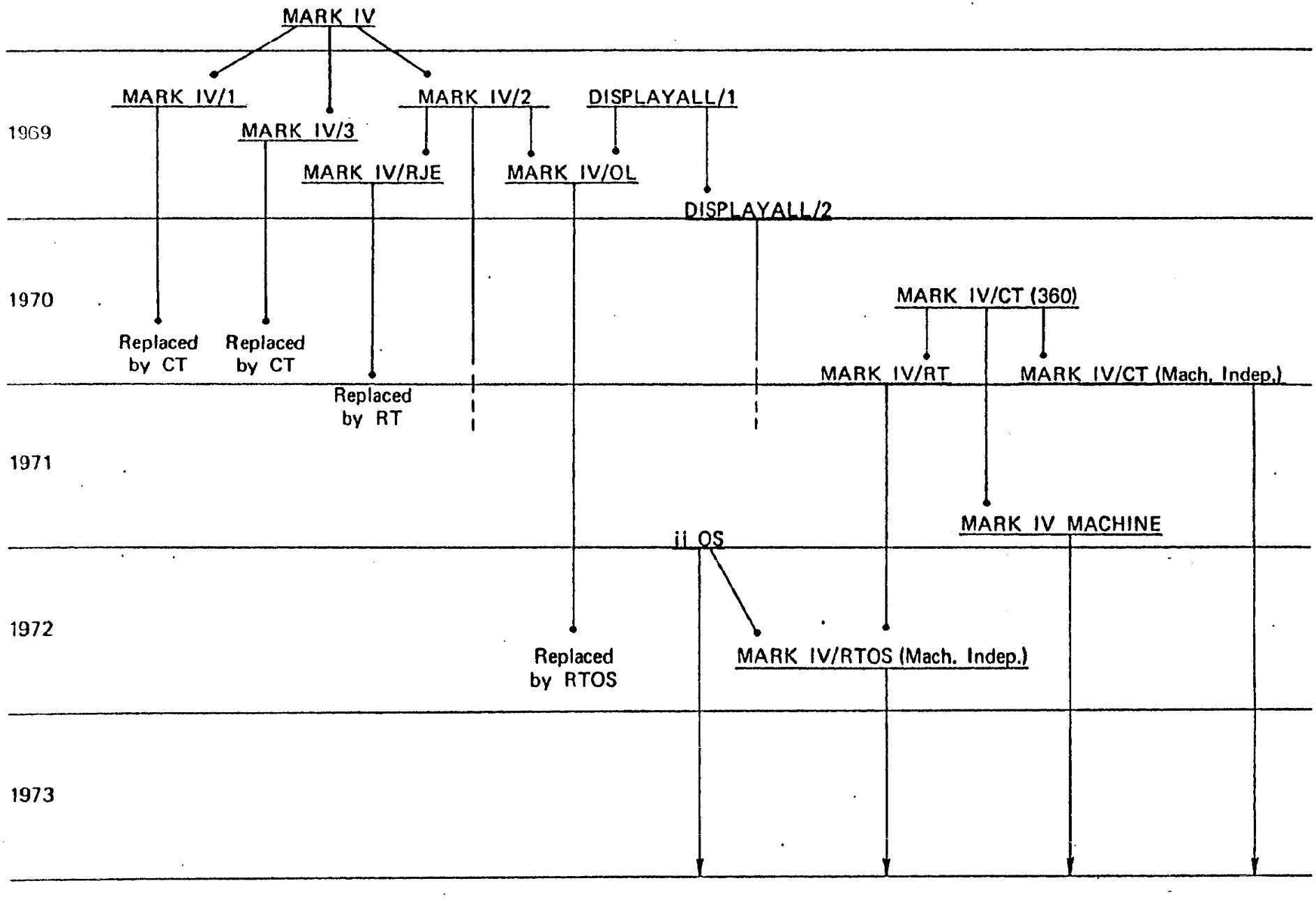
MARK IV
MARK IV/1
MARK IV/3
MARK IV/2
DISPLAYALL/1
1969
MARK IV/RJE
MARK IV/OL
DISPLAYALL/2
1970
MARK IV/CT (360)
Replaced by CT
Replaced by CT
Replaced by RT
MARK IV/RT
MARK IV/CT (Mach. Indep.)
1971
MARK IV MACHINE
OS
1972
Replaced by RTOS
MARK IV/RTOS (Mach. Indep.)
1973

FIGURE 9-2

versions of the system. The remote job entry system, officially dubbed MARK IV/267, was developed and introduced during 1972 when it was installed on the National CSS, Inc. timesharing network under the name of MARK IV ARS (Authorized Remote Service) and later franchised to Data Logic Ltd., a Canadian service bureau. The on-line MARK IV system was once thought to be developed through a combination of MARK IV/II and DISPLAYALL/1, a video display design and implementation product introduced by Informatics in 1969 (described in Section 11.5.1).

As mentioned above, a true comprehensive system to implement on-line, single transaction-oriented application systems in the form of MARK V, was not developed until after 1980. However, Informatics did develop, as early as 1972, several special features that provided some primitive on-line implementation functions, such as the editing and direct input of data through use of a display terminal rather than by the manual completion of paper forms for keypunching. These initial products, as originally foreseen by Postley, were to stay in the market until the end of 1970 or the beginning of 1971 at which time they all were to be replaced by second development phase products.

Figure 9-2 shows that the second phase MARK IV products were planned to consist of what Postley called MARK IV/CT and MARK IV/RT, standing for separate "compiling technique" and "real time" systems, respectively. Both of these were to be introduced by 1971. Of the two, MARK IV/CT had the more immediate importance to Informatics since its development was initiated in March 1969 with a budget of $285,726 and a staff of nine systems analysts and programmers. MARK IV/CT was to bring standard file management systems to COBOL installations of IBM System/360 and to non-IBM third generation computer users. This product was planned to generate COBOL programs to perform file management tasks, and its purposes were to penetrate the market of installations which demanded that all their programs exist in COBOL and to be a first step towards transportability of MARK IV to other machines. Initially the MARK IV/CT was to be developed for use with all System/360 models and configurations, and then further designed to be used by other computers as well. Most significantly, Postley did not see MARK IV/CT as consisting of separate models or versions (for the different computers) but rather, ultimately, as a "machine independent" standard software system. It would be "reentrant and relocatable" in nature, a prerequisite for it to become completely portable and installed on many different makes of computers. Of course, a necessary condition for such a degree of machine independence was that it be implemented in a "machine-independent" language for which processors would exist (or have to be written) on all machines. There is no record that Postley addressed this problem. During its first two years of planned availability, (during 1971 and 1972), Postley forecasted a potential of 105 sales producing $2,625,000 in revenue and $1,101,000 in net profit.(33) However, the project was abandoned as soon as it became evident that it was not feasible in 1969.

The concept of such a software product was extremely future oriented, even visionary. While such hardware independent programs did not arise in the early 1970's as Postley hoped, they began to appear on microcomputers in the late 1970's and early 1980's. The defacto adoption of Digital Research Corporation's CP/M operating system software by several hundred microcomputer manufacturers permitted application software programs designed to run under this operating system to be transferable between different makes of microcomputers utilizing CP/M. Postley was about eight to ten years early in his prediction of the

appearance of hardware independent software. Although Informatics never designed a completely machine-independent product, it did design and develop separate MARK IV models for the RCA Spectra 70; Univac 90, 9400 and 9700 series, and Siemens 4004 computers and all plug-compatible derivatives of them by 1974. These were not machine independent and did not produce COBOL programs. These were not as financially successful as originally hoped, primarily because of the much smaller number (and frequently limited budgets) of non-IBM computer installations. Nevertheless, MARK IV was brought to a part of the non-IBM computer world.

MARK IV/RT was to produce real-time, single transaction processing applications based upon MARK IV/CT and introduced by 1971 to replace the remote job entry MARK IV product and pave the way for the development of the ultimate on-line real-time file management and implementation system, named by Postley as MARK IV/RTOS. This product, representing phase III of MARK IV evolution, was to be available in 1973 and to include machine independence and its own separate operating system. As stated above, Informatics never had such a product until the MARK V generator for on-line applications was announced in 1981; but MARK V is not hardware independent nor does it contain its own unique operating system to provide portability between different makes of computers.

Phase III also included a "MARK IV machine" which Postley envisioned as a microcoded representation of MARK IV/CT with MARK IV as the basic language and operating system on separate hardware which Informatics would have designed and manufactured to its specifications. Possibly it was to be a minicomputer--in 1969 no microcomputers existed so it is difficult to know whether Postley saw this as a small "appliance-type" computer, a large-scale system, or something in between. He further described it with the following:

> . . . this machine may or may not have the capability of employing other basic languages at the same time as MARK IV or as alternatives to MARK IV.
>
> The MARK IV machine will provide the highest achievable efficiency and will enable Informatics to offer a complete package to the user including both the hardware and software which represents the processing capability he needs.

A variation of this concept has recently been attempted (not too successfully) by suppliers of data base management systems. They offer "back end" machines, which are special purpose computers, attached to large mainframes, which are called upon by the mainframe to perform the data management task. It seems, however, that Postley did not contemplate a "back end" machine.

The Phase III products, MARK IV/RTOS and the MARK IV machine, were to be inspired by the fourth generation computers that employed easy-to-use programming languages that permitted non-professional users to take complete advantage of them. As Postley foretold in his 1969 plan:

> Fourth generation machines based on micro-logic techniques will make pseudo-special purpose computers (such as the MARK IV machine) highly practical. Thus, while the machine language of

> the future will be more complex, only programmers of the future will be concerned with it: the users of the future will employ a pseudo-language designed to be easy to use and serve their needs. This implies a decreasing distinction from the use standpoint between the functions of hardware and those of software, especially to the extent that the software is implemented in the micro-logic of the machine. The use of the hardware/software will become a truly user oriented job, and consequently users will be in the best position to implement their own applications.
>
> Very substantial resources are required to implement the program outlined in this paper. While the basis of these resources is financial, independent resource limitations may be encountered in the area of technical and management personnel, and hardware and other technological capabilities. That is, even if we can get the money, we may not be able to get the people and the equipment. . . .

To accomplish this far-reaching product strategy, Postley estimated that a 20 percent profit objective (before investment) from MARK IV sales was required to support advanced development for the products described above.(34) Hindsight reveals that it would have required much more money, even if the technological resources had become available. Although Postley correctly predicted the advent of low cost electronics via micro-chips (which he refers to as "micro-logic"), he did not foresee that its use in data processing would result in the personal microcomputer. He quite correctly foresaw the trend towards user friendly computers (which microcomputer software made possible) and he also correctly predicted several of the problems Informatics would encounter along the road in creating such advanced products.

At the peak of euphoria from the computer boom from 1962 to 1969, Postley could not anticipate nor foresee the effects which the economic recession of 1970-1971 would have on the software industry. The recession hit Informatics hard, causing MARK IV profits to be used to offset operating losses (from data services operations, the liquidation of ATARS Computer Systems, Inc., and the decline in custom programming services in the government marketplace). There was no money available to develop new software products according to the pace initially expected by Postley. After the recession, in 1973 all discretionary resources were devoted to marketing, as described in Section 9.3.1. So, advanced development was slowed for a couple of years due to a lack of monetary resources. The recession also slowed down product development in other companies (it even precluded customer sponsorship) and the growth of the software market in general. Consequently, Informatics did not necessarily fall behind its competition in technological advances. Moreover, the types of fourth generation computers which Postley envisioned were made possible only through micro-electronic semi-conductor circuits which were only first announced by Intel Corporation in 1973. It took another two to three years for micro-chips to be perfected, made reliable as computer components and for their cost of production to decrease. This means Postley's "fourth generation" computers, accompanied by high demand for user friendly on-line real-time software products, did not begin to appear until 1976-1980.(35)

During the early years of MARK IV's existence, Walter Bauer and Werner Frank encouraged Postley to develop an on-line implementation MARK IV followed by a file management system for applications operating in real time. Postley, shortly after his visionary plans in 1969, began to recognize that the market was still immature for the successful creation and introduction of such products. He delayed their development during the early 1970's in favor of special MARK IV single purpose batch oriented application products and packages which provided customers with highly sophisticated pre-designed and implemented applications using MARK IV. These are discussed in Sections 9.4.3 and 11.6. Unfortunately, he devoted too much of the MARK IV Systems Company's attention to the development of MARK IV applications so that the design of technologically advanced systems, originially conceived in 1969, was delayed longer than necessary. This resulted in Informatics being without an available product on hand during 1976-1977 when fourth generation computer environments (data base management systems and teleprocessing monitors) were successfully introduced and the market demand mushroomed for on-line, real time, single transaction-oriented software systems and in particular application development systems. Caught off guard, Informatics could not develop such products in time, and to provide itself with appropriate product offerings which could take advantage of the market demand until MARK V was ready, was forced to acquire several on-line implementation systems products (INQUIRY IV and TRANS IV--described in Sectins 11.7.7 and 11.7.8) for use with different operating environments.(36)

Frank Wagner, realizing the seriousness of delaying the introduction of an on-line implemented MARK IV, issued a call to arms for the creation of such a product by Informatics on August 9, 1976. In this memo entitled **The Mark V Manifesto--An Issue for the Strategy Council**, Wagner discussed the technical development of MARK IV and its predecessor file management systems and specifically noted that, although MARK IV was originally conceived and designed to be as nonprocedural as possible for use by non-computing professionals to implement common applications on their own, successive programming staffs within Informatics (prodded by the programming staffs of the users) continually added "procedural elements" to the product which made it much more sophisticated and effectively turned parts of it into a programming language that could be used only by professional programmers to implement highly complex and sophisticated applications. MARK IV's acceptance by data processing professionals is further discussed in Section 9.6.

In his manifesto, Wagner (perhaps echoing Postley's original product plan of 1969 and idealism) advocated that future file management products return to the use of exclusively non-procedural languages which would enable these advanced products to be used easily by nonprogrammers. He proposed the establishment of a small development program consisting of "user-oriented people" and excluding programmers themselves, "unless non-conventional independent ones can be found," to explore all product possibilities and to examine all available languages for their ease of use. Finally, Wagner called for the creation of new highly advanced, user-friendly application development product, which he called MARK V, to be available by January 1, 1979.(37)

Wagner's manifesto could have been a major turning point in the history of application development products at Informatics. The memo drew quite a bit of response from other management members, including an approval from Walter Bauer who characterized the manifesto as "perceptive and incisive":

> I, for one, firmly agree that a probable good course for Informatics is to move away from procedural languages and get closer to simplified user specification of what he wants. Furthurmore, while I would not want (yet) to endorse in chapter and verse Frank's strategy plan, I think it is reasonable and should be debated as a candidate approach.
>
> . . . What I like about the idea is:
>
> 1. It is almost surely the wave of the future.
> 2. It is the area of software probably least vulnerable to the IBM behemoth than any other.
>
> Let's give this some serious thought!!(38)

Differing responses were made by both Werner Frank and John Postley. Frank was more conservative in his position. While agreeing that concentration on appropriate implementation languages was needed to create new systems products, he differed from Wagner in that:

> Frank [Wagner] goes further to suggest the ultimate development of a MARK V, a quantum jump over our present batch-oriented MARK IV.
>
> I seriously doubt that we can legislate or organize toward discovering a new idea; I doubt that we have enough money and possibly even the talent to create the innovation that Frank [Wagner] envisions.

Werner Frank further argued that the normal course of business should have led to the discovery of such product advancements through the routine efforts of the technical staff of the company. Since no such discoveries were made, he suggested the acquisition of new ideas and products by Informatics investing in 1) university research programs and 2) any attractive and feasible projects of outside inventors and small companies. He felt that such an approach would be an inexpensive approach to locate viable product opportunities:

> The essence of [these] suggestions is to see what's going on in the universe of data processing to advance thinking and ideas regarding implementation languages and hope for the possibility of an opportunity which would allow us to nurture a reasonably good idea without the pains of blue sky R & D.(39)

Postley interpreted Wagner's manifesto as further advocacy for the creation of MARK IV application products:

> By using the term "language" he is talking in programmer terms. I think an end user thinks application terms; therefore, what we must have is a means of implementing applications.
>
> In other words, what Wagner has in effect advocated is more emphasis on MARK IV applications. . . . Building the MARK

> IV/Application Product image is precisely my position and has been for some time; therefore, I agree with Frank [Wagner]. I also agree with Walt [Bauer] that "it is almost surely the wave of the future."
>
> I think if we put it as I have put it in this memo, we should proceed with . . . MARK IV/Application Products. We must implement applications using MARK IV/Series anything to do it. . . .(40)

The course advocated in Wagner's manifesto was never followed. Indeed, Informatics has never had a product planning unit, separate from the development and marketing units. However, this series of internal memos and candid debate soon prompted Bauer to take decisive action. Bauer himself took charge of directing all software products development and marketing. Postley was named corporate senior vice president for long-range product planning, and retained responsibility for International Marketing. He, Wilson Cooper as vice president of Software Products Technology and Stanley Felderman as vice president of Software Product Marketing for North America reported directly to Bauer beginning in 1976. This change was implemented concurrently with an overall corporate reorganization brought about by the acquisition of Programming Methods Inc. by Informatics in late 1975. As described in Section 3.1.3, the separate "companies" of Informatics were discontinued and operating groups were established which combined similar products and services together. But, during 1976, the marketing and technical development functions for software products existed as separate autonomous divisions under Bauer.

During this time very little headway was made to identify innovative product opportunities primarily due to a lack of effective input by the marketing function as to what end users wanted and would buy. Development efforts began to reflect the biases of the internal programming and technical design staff. But there was no dedicated, impartial product planning group to collect all the data and analyze alternative plans in an unbiased way. To fill the vacuum, Wilson Cooper, vice president/Software Products Technology, established a small advanced design group under Fred Braddock with David Saykally as project manager. It was known as the "Skunkworks" (after the famous group of the same name under Kelly Johnson at Lockheed which designed so many famous aircraft). It wrote the first specifications for Answer/DB, MARK V and a data dictionary. The data dictionary became an internal tool for use in building future products. The first two became Informatics most successful system products in the early 1980's as described in Section 9.5.

In 1977 Bauer corrected this floundering situation by appointing Paul Wrotenbery, then vice president and general manager of Equimatics, Inc., as group vice president of Informatics Software Products with all software products operations consolidated under and reporting directly to him. For more detail see Sections 2.1.10 and 4.5. Wrotenbery was a rigorous and demanding task master of high standards. He initiated an exhaustive analysis and review of current operations. Recognizing that Informatics most successful products were those generalized ones which permitted users to design and implement applications of their own choice, Wrotenbery focused Software Products efforts on both the internal technical development and acquisition of these products. "Implementation systems products" was a term used by Wrotenbery (and since

fallen into disuse) synonymous with "application development products." Between 1977 and the present time, under the direction of Wrotenbery and his successor Bruce Coleman (who became group vice president/Software Products Group in late 1978), Informatics successfully developed Answer/2 and Answer/DB, and MARK V (as described in Section 9.6), and acquired TRANS IV and INQUIRY/IV IMS (as described in Sections 11.7.7 and 11.7.8). These are all file management and application development products.

As a postscript to the above discussion, John Postley, the "father" of MARK IV, retired from Informatics at the end of 1979. Wrotenbery, whom Bauer had originally hoped would be the leading candidate to succeed him at the helm of Informatics, resigned his position with the company in November 1978 to become the chief financial officer on the staff of the governor of Texas.(41)

9.4.3 MARK IV Application Products and Packages

As referred to briefly above, Informatics offered specific application products or systems based on MARK IV. These were predefined and usually complex applications, such as accounting functions, which were commonly used and needed and which could be sold to a multiple number of customers. These software applications were based on MARK IV in that they were implemented through use of MARK IV and required the use of MARK IV to be run on the computer. The idea for "MARK IV/Application Products" originated in 1969 with John Postley who felt that by creating specific applications for use with MARK IV the general purpose file management program's capability would be demonstrated to prospective customers and convince them to buy MARK IV if not the specific application. Postley saw these MARK IV applications as standard products which existed as separate modules incorporating all or part of MARK IV. Different modules would be sold to customers depending upon whether they had already purchased an entire MARK IV system or if they just wanted the specific application involved. This involved differential pricing whereby non-MARK IV customers paid more for a MARK IV application ($10,000 per module) then did an existing MARK IV customer ($5,000 per module). Postley hoped to develop enough applications or application modules that a pricing structure could be created that encouraged prospective purchasers to buy an entire MARK IV system whereby, for example, the purchase of seven separate MARK IV applications would be the equivalent price of a full file management system. In 1969 Postley specified that a MARK IV application was to be "designed and implemented in such a way that it can be used essentially in the same form by a large number of customers."(42)

In contrast, other areas of the company viewed MARK IV as a means of providing inexpensive and quickly developed and modified computer applications custom designed or tailored to the customer's particular needs, which are continually changing. These custom applications also were based upon and incorporated MARK IV in their actual operation. In fact, Informatics Computing Technology Company and Western Systems Company established MARK IV Applications Departments to provide custom programming services based upon the utilization of MARK IV. The logical conclusion of this school of thought was that an application developed in MARK IV must frequently be modified as the customer's requirements change. MARK IV is ideal for that.

However, these two approaches did bring into focus the need and method by which MARK IV was protected within an application product or custom development

sold by Informatics. If a non-MARK IV customer purchased a $10,000 application package or product which was implemented or operated through use of a full scale (and potentially more capable and general purpose) $35,000 MARK IV system imbedded within it, might not the customer discover this greater, more advanced capability in his application system and make unauthorized use of it without paying the full price of it? Initially a debate emerged on this issue, with Werner Frank (representing the custom development approach) arguing for full use of MARK IV within application software and protecting the general purpose system through security devices such as encrypted code or blocking off sections (not pertaining to the application) of the program from use by the user. Postley opposed this approach and instead advocated modifying MARK IV programs imbedded within application software to remove any general purpose capability to define new files or systems requests, limiting the supplied software only to performance of the required application for which it was sold. This latter approach eventually won favor, but the issue was never settled, and became moot when MARK IV Application Products failed in the marketplace, and MARK IV application development restricted itself to customers who had already acquired MARK IV. The unhappy story of MARK IV Application Products is presented in Section 11.6.1.(43)

9.5 DESCENDANTS OF MARK IV

9.5.1 The "Skunkworks"

In September 1976 a market research project was commissioned to determine the marketplace requirements for a new software product line, then called Series 3, for computer installations operating in an on-line telecommmunications environment. The team, consisting of David Saykally, Jay Sullivan, Richard Sunderland, and Marv Smith, spent three months interviewing major IBM installations first by telephone (21 companies) and then in person (8 companies). The team identified five components of the product line:

1. An application development system, which would be used by programmers to implement applications which are compiled, stacked on a program library, and invoked from an on-line terminal.

2. A user language, which would provide a simple problem-oriented language for end user ad hoc access to data base information from a terminal.

3. A data dictinary, used by the data base administrator for centralizing the control and maintenance of data definitions.

4. A screen generator, which would be used by a systems analyst to design the format of displays which appear on the user terminal whenever a particular application is invoked.

5. An on-line editor and syntax checker, to be used with any of the above products for source statement entry.

MARK IV SYSTEMS

700 INSTALLATIONS IN 37 COUNTRIES

TOP 10 USER GROUPS

DOMESTIC

INDUSTRY GROUP	NUMBER OF INSTALLATIONS
PETROLEUM	117
GOVERNMENT	70
DATA PROCESSING INDUSTRY	41
INSURANCE	40
COLLEGES/UNIVERSITIES	37
UTILITIES	35
FOOD PROCESSING	32
TRANSPORTATION	29
FINANCIAL/BANKS	28
CHEMICALS	25

FOREIGN

INDUSTRY GROUP	NUMBER OF INSTALLATIONS
PETROLEUM	30
MANUFACTURING	18
CHEMICAL	14
AUTOMOTIVE	12
FOOD PROCESSING	11
BANKING	7
PHARMACEUTICAL	7
SERVICES	6
INSURANCE	5
GOVERNMENT	5

FIGURE 9-3

MARK IV REVENUES AND PROFITS
PLAN VS ACTUAL
($ millions)

(1)	1969	1970	1971	1972	1973
Projections Made in 1968					
Revenues	1.2	1.4	1.6	1.0	0.8
Profit	0.5	0.6	0.8	0.5	0.5
Actual					
Revenues	2.8	2.8	3.4	4.1	7.5
Profit (2)	(0.1)	0.3	0.5	0.7	2.0

(1)	1974	1975	1976	1977	1978
5 Year Plan Made in 1973					
Revenues	7.9	9.3	11.6	14.1	15.5
Profit	1.0	1.0	1.2	2.1	2.6
Actual					
Revenues	8.2	8.4	11.1	13.0	15.5
Profit (2)	1.1(3)	0.3(3)	1.8(3,5)	1.6(3,5)	1.6(3,5)

(1)	1978	1979	1980	1981	1982
5 Year Plan Made in 1977					
Revenues	16.7	19.1	22.1	25.8	30.8
Profit	3.1	3.2	3.6	4.1	4.8
Actual					
Revenues (4)	15.5	18.2	19.0	19.1	18.9
Profit (2)	1.6(3,5)	1.2(3,5)	4.1(4,6)	6.4(6)	6.5(6,7)

(1) All years are calendar years (although prior to 1975 the company reported on a fiscal year ending in March).

(2) All profits are pre-tax after corporate allocation and a pro-rata share of the corporate interest when and as it was charged to the operating unit (after approximately 1974). True profits would be larger if interest income had been computed from the large positive cash flows.

(3) Profits were not reduced for any share of the amortization from 1974 through 1980 of the acquisition costs of Informatics incurred by The Equitable.

(4) Includes all Answer products in later years.

(5) Costs of field sales allocated to other products by revenues.

(6) Costs of field sales charged to other productrs as incurred.

(7) Estimated, based on methodology used from January 1980 through June 1982, after which computations of product profitability were discontinued.

FIGURE 9-4

The user language, including an on-line text editor and syntax checker, was delivered three years later, in late 1979, as Answer/DB. The application development system and screen generator were combined into a single product, MARK V, released for test marketing in late 1980 and to the full market in November 1981. The data dictionary is still under development and is planned to provide, in 1984, a common library facility for MARK IV, MARK V, and Answer/DB.

9.5.2 Answer/DB

Answer/DB was implemented under IMS/DC, generic CICS, and TSO; technically, it operates as a front end (syntax checking) and back end (output display) to a MARK IV "engine," which is executed in the background to perform data retrieval. MARK IV gave Answer/DB some of its best capabilities: resource control and security for the data base administrator, and access to essentially any data base structure for the end user. Answer/DB was planned to become the engine for future products linking the IBM mainframe and the Personal Computer. Its price is in the $40,000 class. There were over 200 Answer/DB installations by the end of 1983.

9.5.3 MARK V

MARK V was designed to be "to the development of on-line programs what MARK IV is to the development of batch programs." The syntax was carefully designed to be compatible with MARK IV--identical where functions overlapped such as in the procedural logic. An efficient new compiler was developed first for the IMS/DC environemnt and then adapted to the CICS environment. MARK V/IMS sells for about $90,000; MARK V/CICS will sell in the $40,000 to $50,000 range. MARK V was expected to become Software Products Group's leading seller in 1983, with installations nearing the 100 mark.

9.5.4 Answer/2

One other product was created during the late 70's: Answer/2, a repackaging of a small MARK IV to compete in the low end batch reporter market, selling for about $20,000. Introduced in mid-1979, approximately 150 installations have been made by 1982.

9.6 THE ACCEPTANCE OF MARK IV

As mentioned earlier, MARK IV achieved rapid success and became Informatics largest selling software product and business area during the 1970's. In 1973 the company reported that the industry groups, listed in Figure 9-3, accounted for the tabulated number of MARK IV installations.(44) Figure 9-4 shows MARK IV actual revenues and profits for 1969 through 1982 compared, for each of three five year periods, to those originally projected in 1968, and to 5 Year Plans made in 1973 and 1977.(45) As is shown, MARK IV has completely outlived and outperformed all the initial expectations of both its designers and Informatics management. (The relatively low actual profits percentage from 1974 through 1979 resulted from the policy of "plow back profits for investment" discussed in Section 3.3.3.) It remained a popular and marketable product into the 1980's and through 1982 was still being very profitably sold. The revenues after 1977 did not come up to the five year plan made in that year which assumed that some evolutionary development system for on-line applications would contribute to

revenues beginning in 1977. But MARK V was not introduced until 1981. Among the reasons for this long-lived extended success is that the potential customer base or market for MARK IV sales continued to grow between 1974 and 1978 as shown in Figure 9-5, which shows forecasts made in 1973. Easily apparent in this latter figure is the fact that Informatics actual penetration into this potential market for MARK IV has always been a minor fraction compared to the overall market which could have bought MARK IV. For these five years, the plan for cumulative MARK IV sales was $58.4 million as contrasted to the estimated cumulative potential market of $974 million--a mere 6 percent penetration! There are many reasons for this relatively small percentage. Possible reasons might include a comparison of expenditures for the product and its marketing as compared to the rest of the vendors, especially IBM, or the fact that the MARK IV market was limited to large IBM mainframes used for business. Nevertheless, it is this large, growing market for application development systems which permitted the annual sales of MARK IV to increase and for it to remain a viable product still in demand in 1982. By 1982 MARK IV and its decendants had over 1,840 installations in more than 40 countries.

From a user perspective, both professional programmers and noncomputer professional users embraced MARK IV warmly. During the product's first year of sales, nonprofessionals, which had exceeded 1,400 trained by Informatics, welcomed MARK IV as giving them the ability to utilize a computer to serve their needs with minimal training and ease of use. They did not have to learn a programming language but merely had to specify the format of their files and reports and the type of information they wanted to search for by filling out a few very simple forms. They did not have to have extended communication with programmers nor worry about the differences in technical language between themselves and data processing personnel. For data processing managers and systems analysts, MARK IV's ease of direct use by nondata processing personnel could permit them to focus their efforts and that of programming staffs towards new systems development and complex applications rather than waste their time implementing and maintaining simple user applications. It would remove the routine and the ordinary from their workload. Indeed, MARK IV may even have slightly contributed to the evolution of computer utilization from daily business transaction processing to the higher level decision support systems required for long-range business planning. Is it any wonder MARK IV became the most popular and widely sold large-scale software product during the 1970's?

Among professional programmers, MARK IV came to be accepted as a legitimate programming language. In France recruiting ads for programmers have listed "MARK IV experience required" as prominently as COBOL! This was due to the influence of programmers on Informatics technical design staff during the 1970's who were responsible for improving and upgrading the product while still maintaining its ease of use for nontechnical users. This evolution of MARK IV into an acceptable computer language is described by Frank Wagner in his **MARK V Manifesto** in which he compares MARK IV and its predecessors as following on the trail of earlier less user oriented "procedural" programming languages such as COBOL:

> I have always had the impression that, in 1960, Postley/Anex and Buettell/Morrison (to the extent that, as the customer, they collaborated in the design of GIRLS) were not really aware that they were inventing a "language." Three of them were

MARK IV SYSTEMS MARKET

($ MILLIONS)

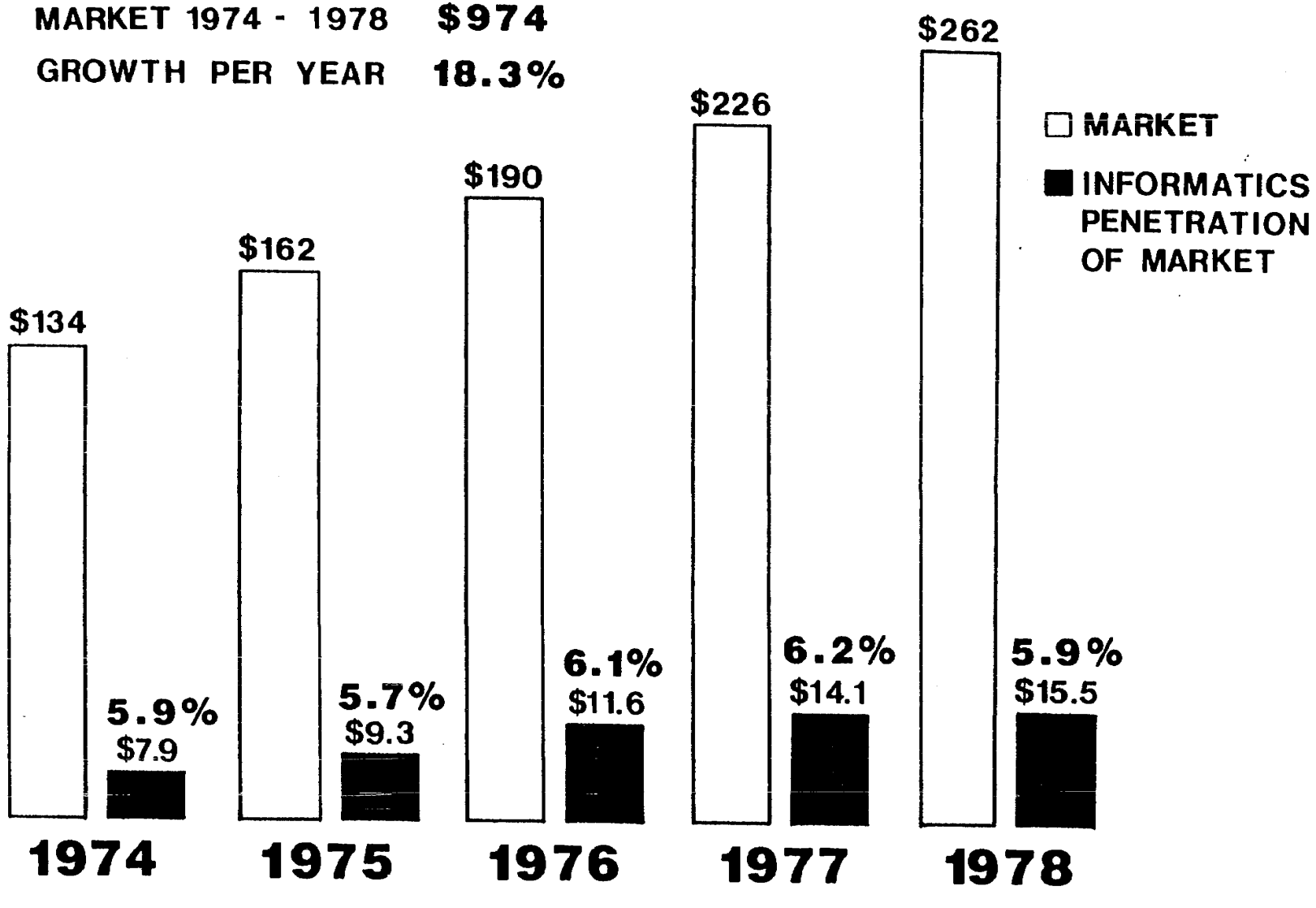

FIGURE 9-5

> business data processing management types, as distinguished from programmers, and thus, they at least had the capability of avoiding assuming that it had to be procedural.
>
> . . . Experience showed (from experience gained from creating the MARK I, II and III systems for the IBM 1400 series family of computers) that a file management system was excellent for relatively straightforward business data processing which didn't get too sophisticated in editing, or too complicated in the type of transaction processing done. Under Informatics, MARK IV evolved. Designers consisted of Postley, Buettell, Jacobsohn, Cooper, Braddock and Cutler--the last four were programmers. Procedural elements crept in from them and from comments of programmers within customer sites.
>
> By 1970 the programmers' influence was dominant, both among the users and within the development organization. Features began to creep into the language which were highly procedural in nature--in fact, most of them could only be invented by, and understood by programmers. So the language now became something that could be used for implementing very sophisticated and very complicated applications--<u>but only by programmers.</u> Whether we were helped or hurt by this trend is hard to tell, but the original (unwritten) design objectives were fulfilled, and in 1976 (16 years after Jim Morrison first started the ball rolling [with the first contract he gave to Postley]) we are offering the world the ability to implement business data processing applications many times quicker and cheaper than by using COBOL.(46)

This statement abundantly explains why MARK IV is a technical success among data processing professionals. The creation of four levels of communication inside the program (discussed above in Section 9.2.2), as originally defined by John Postley in 1967, actually made the product a vastly useful tool for computer professional and non-professional alike.

In 1982 MARK IV was approaching the end of its product cycle. It is a mature product which has passed its peak in sales as the market for batch application development systems begins to shrink. However, it will have several more years of profitable sales before it is finally discontinued by Informatics. It is now being succeeded by application development systems such as MARK V and Answer/DB for on-line applications as described in Section 9.5. These are its natural and direct descendents, and through them MARK IV shall continue to exist.

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