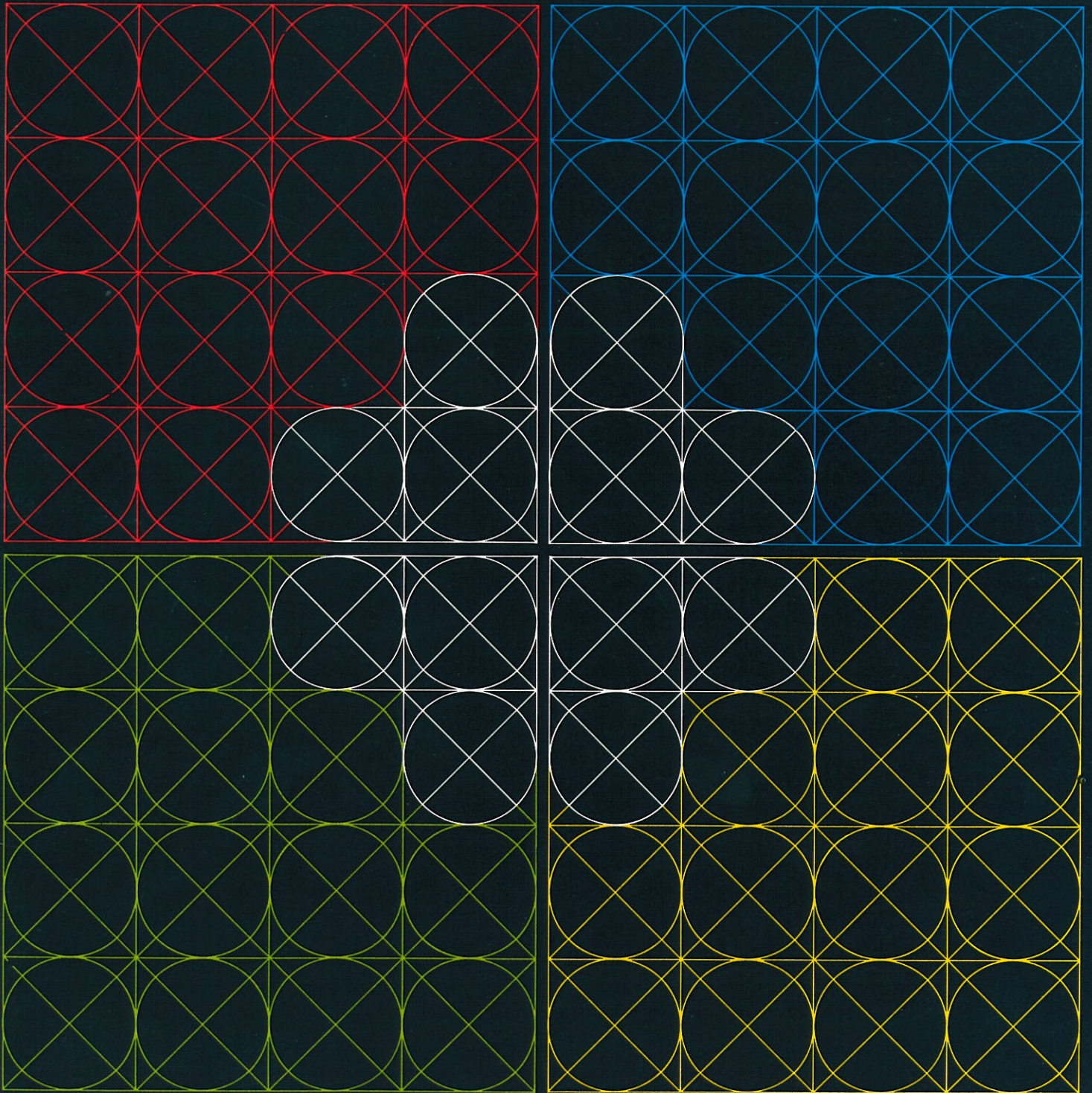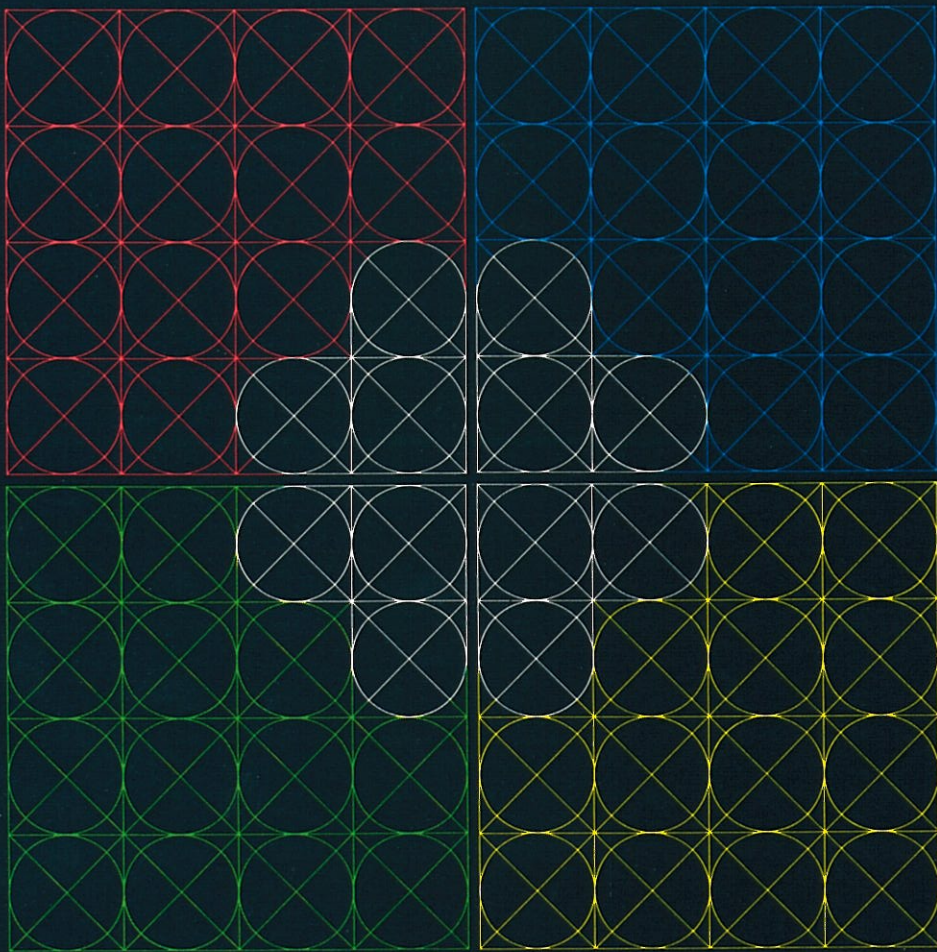**TIS**

Total Information System

The Next Generation of Software

By the early 1980's, just 30 years since its formation, data processing will be the largest industry in the world.

And, by the mid 1980's, it has been estimated that over 70% of the U.S. labor force will be dependent on data processing in their daily work. Why? Because data processing will provide information necessary for these individuals to perform their daily tasks.

Yet, today, just as the industry is about to attain this unique status, more and more decision makers say that their most pressing problem is gaining sufficient information for accurate decision making within the required time frame.

This, despite the fact that data processing departments are working harder and harder to accomplish just this task.

It is no longer a hardware problem. Today, technology is available to access data, construct information, and transmit it back to the user in time for him to take intelligent action.

In reality, data processing professionals face a widening software gap as they confront an explosive need for information.

It is a demand that they are hard pressed to meet!

Clearly, traditional techniques employed by data processing will simply not prevent data processing professionals from more and more frequently hearing complaints that the computer doesn't have the answer a user seeks. This situation is compounded at higher levels of management where key decision makers often find it impossible to obtain the company-wide information needed to conduct business.

Many data processing professionals realize that these deficiencies have evolved slowly over the years, inflicting

almost all existing data structures with "implementation inheritance." Implementation inheritance within data processing has produced a perspective on data management that is at the wrong level within an organization when considering information needs. Often, today, the data base reflects an organization's physical structure and emphasizes the lowest, or departmental level information needs of the organization, which were the first requirements the computer satisfied.

Information, however, knows no physical bounds, rather it flows at all levels within an organization and traverses all departmental boundaries. In fact, the higher the level of management seeking information, the more likely this transboundary effect.

If the information needs of decision-making users are to be satisfied, data processing must accept responsibility for building a data management capability that reflects the way in which the organization does business.

Data processing must also move to close the software gap that prevents users from receiving the information in the required time frame. If the flow of information is to be expedited, data processing can no longer afford to expend its most valuable resources in the traditional day-to-day role of "translator." The channeling of information requests through the data processing department to undergo systems analysis, programming and testing has many disadvantages.

First, this translation service is increasingly costly. And, will continue to increase.

Second, it is a lengthy process. In fact, the time taken to gain a response not only increases proportionally with the complexity of the program required, but also depends on the

availability of data processing professionals to perform traditional systems analysis and programming functions.

Third, there is a less obvious problem with "translation." Often, the systems analysis department in interpreting the request modifies it to suit the capabilities of the computer system. The result is a compromise that often fails to meet the needs of the user.

Clearly, it is paradoxical that while the rate at which a request can be processed by the computer has increased many times and continues to increase, the ability of data processing to translate that request into a computer acceptable form has remained essentially unchanged. It is no surprise then that more and more users are demanding direct access to information.

To overcome the software gap and once again satisfy the needs of users, data processing needs a system that:

☒ Organizes data structures so that end-user information needs dictate the data organization rather than vice versa.

☒ Provides rapid response to all information requests by allowing end users direct interaction with the computer whenever possible.

To meet its own need, data processing requires that the system have multiple levels of independence to assure that the software is not only portable today but is positioned to take advantage of future technological developments. Only then can the data processing professional be assured that his investment in software is fully protected.

TIS, the Total Information System, the next generation of software achieves these goals by providing the most responsive systems software available today.

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An information system responsive to the requirements of an organization implies increased data processing responsibilities. Data must be physically structured to reflect the information need; rapid access to the data must be provided through interactive, user-oriented systems; change within the organization and technological evolution must be effectively managed and above all there must be adequate controls.

TIS, enables data processing to accept these responsibilities by employing the concept of Logical Views. A Logical View represents a collection of data items that can be manipulated by a specific user or users.

One of data processing's prime responsibilities is to identify and control all data items that belong to their organizations. And, more importantly, to organize these data items in a manner such that they can be placed in the context the end user desires rapidly and efficiently.

Techniques to achieve this are available with TIS. The concept is known as "Info-Design."

Info-Design allows data processing to identify and quantify all the data items belonging to an organization, how they are used in an end-user information oriented environment and, therefore, how these data items should be managed and stored. The extent to which data processing correctly interprets an organization's information needs will determine the success of TIS.

Info-Design creates a directory of an organization's data items. Statistical analysis determines how the data should be organized within the TIS Data Base.

In practice, a Logical View represents the outer limits of a user view of data items. The user will normally choose to work with some of those data items (selection), under certain conditions (logic) and in a certain format (output). The combination of selection, logic and output criteria represents a Finite Logical View (FLV). The FLV is a specific, logical request for information. The TIS analyses performed prior to establishing the FLV ensure that all activities are permissible. There is no physical location determination of the requested information. A Finite Logical View is, therefore, completely independent of the data base environment. Subsequent translation and extraction of the appropriate data items and alignment in the requested format takes place internally.

A Finite Logical View can be stored in the Directory for subsequent re-execution. Since it is independent of the physical location and structure of the data, data items can be moved within data records, data sets and, in a distributed environment, across data bases with no impact on these logical requests. Indeed, the Logical View concept allows all users of TIS software to be completely independent of change.
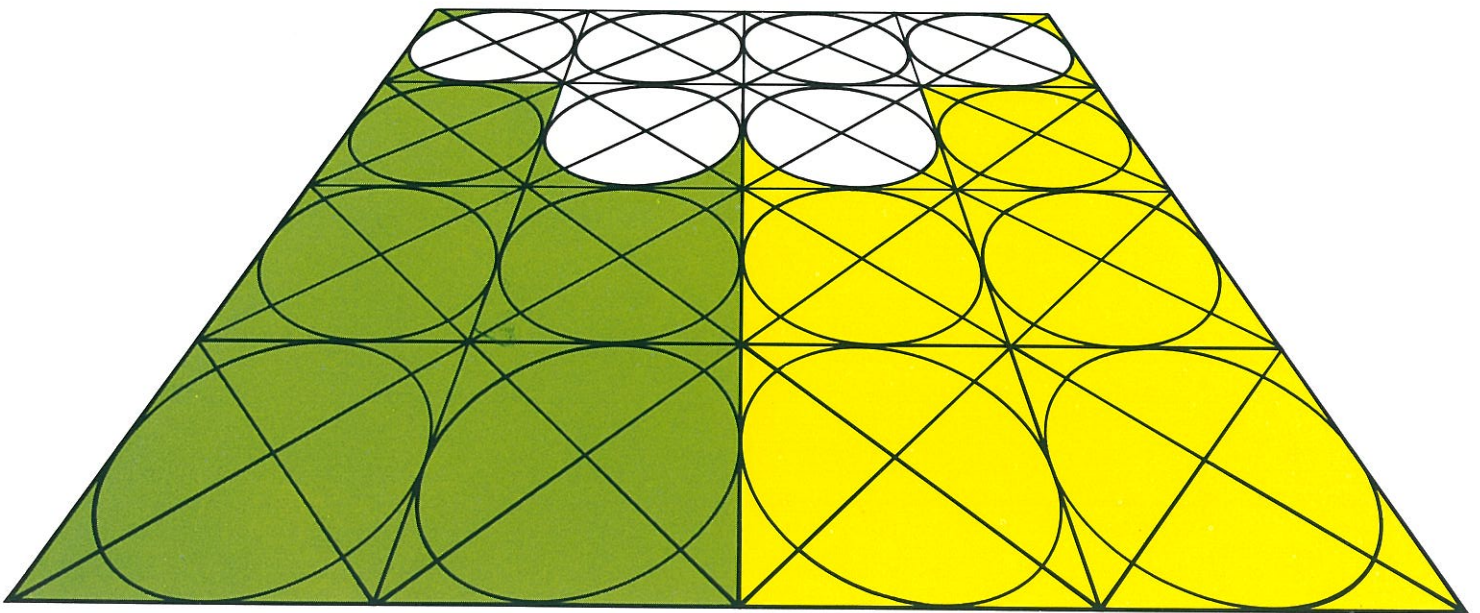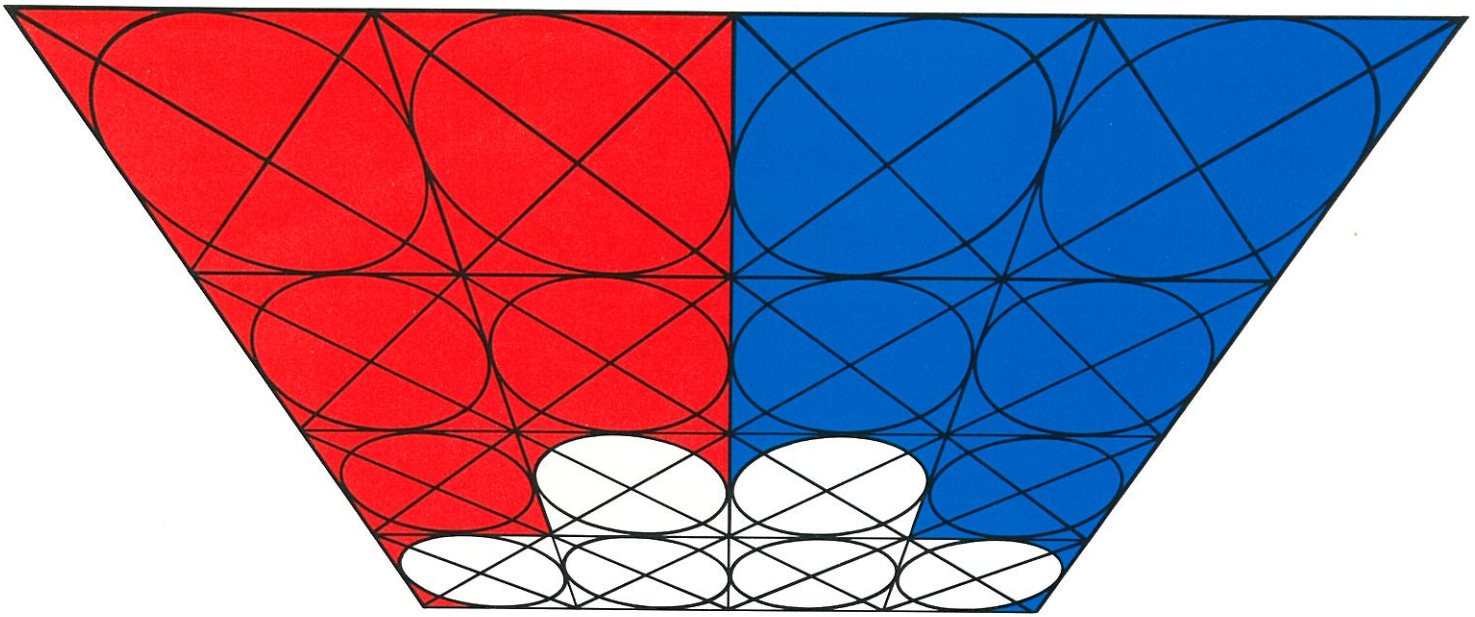
Although it is the Logical View that allows the user to independently interact with the data base, it is the Directory that represents the central point of control for all components of TIS. Whether the facilities are end-user oriented (languages) or more aligned to the needs of data processing (data definition), the Directory acts as the single, integration point. The Directory contains: the inventory of data items; the Logical Views; the Finite Logical Views; the location of all data items; stored messages; security and privacy criteria; the information system descriptors; physical environment descriptors and the attributes of the data items.

Info-Design requires that all organizational data is identified, categorized and analyzed. Each of these processes requires the skills of a responsible individual, or team, within the data processing department...the Information Systems Coordinator/s (ISC).

While not difficult or overly complex, the ISC function is important. It is the responsibility of the ISC to ensure that the Directory is correctly created and maintained at the required status level.

Building a TIS Directory

In creating the Directory, the Logical View concept requires establishing the context in which an organization views data. This is accomplished by use of TIS Info-Design.

Identifying Data

Business decisions depend on information; data viewed in context. Data is the most valuable resource of an organization. As such it must be rigorously controlled and managed. In order to achieve the required level of control and management, organizational data must be identified.

Once identified, a specific item is assigned characteristics which establish its unique nature. Such characteristics as allocation of a unique name, length and edit characteristics are required. A description, default value and default columnar headings (for query or report) may optionally be assigned to further qualify the data item in the Directory.

Categorizing Data

Data usage within an organization varies by individual. And, the individual's data usage also varies depending on the needs of the moment.

A responsive information system must be cognizant of the information needs of an organization. Not only what is required, but how it is required, how often, and at what intervals.

In an organizational hierarchy, information needs vary at different levels. At the lowest level (the department) the information needs require only data belonging to that specific department. There is little or no cross-department interaction. At the next higher level in the organization, a management view transcends departmental boundaries.

The higher the level in an organization, the more data that must be made available. Not only must more data be available, but the way in which it is used will often vary. For instance, at the lower levels of management, it is performance on a week-to-week basis that is important. At a higher level, where corporate planning is being undertaken, it is annual performance that is more significant. Same data, but different viewpoint.

TIS Info-Design offers techniques that assist the ISC in identifying the context in which data is viewed by all levels of an organization. This is essential to building a responsive information system.

Analyzing Data

Establishing Logical Views for an organization enables the ISC to identify which data items have the highest and the lowest usage. This is a fundamental step in establishing an information system. However, since information is data viewed in context, the ISC must consider not only the usage of data items across Logical Views, but also their interaction within Logical Views.

It may well be that within an organization, certain data items are always viewed together whatever the level of decision-making. Other items are always viewed discretely and never have more than a one-for-one relationship with other data items.

TIS Info-Design permits the ISC to perform both levels of analysis. The resulting analyses allow the ISC to construct a Logical Model of the data structures required to satisfy the information needs of the organization.

Selection of a Data Base Management System to physically implement the Logical Model is the next step.

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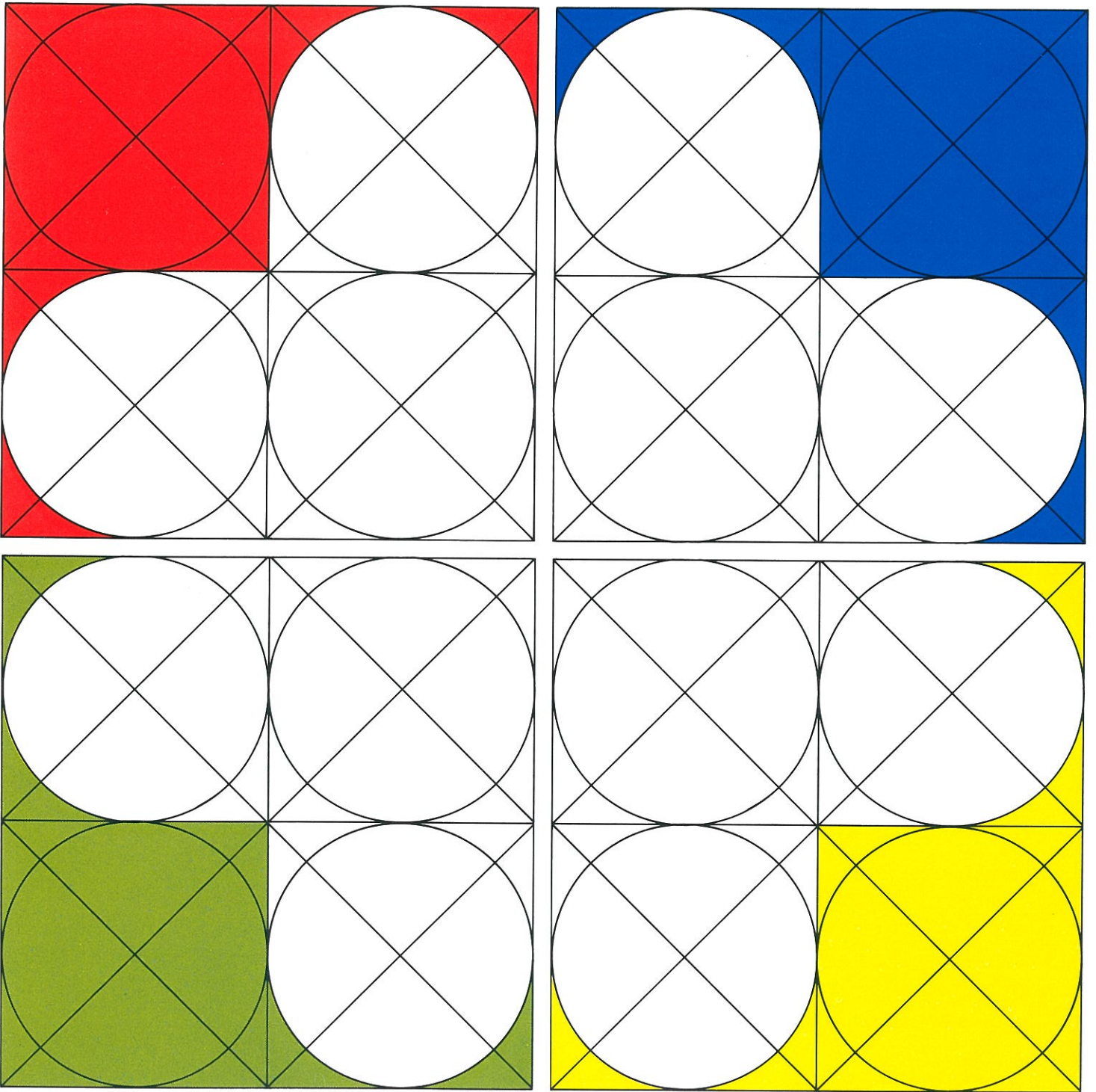
Establishing a physical data base is an essential step in the creation of an interactive information system. With data base, data is stored consistently with a minimum of redundancy, facilitating both control and access.

TIS is designed independent of the data structure and Data Base Management Systems. This independence permits selection of the technique best suited to the specific information needs of an organization, as identified through Info-Design. Traditionally, data base management has been accomplished by using one of three standard structuring techniques. These techniques . . . network, hierarchical and inverted list . . . have forced data processing to select a Data Base Management System that comes closest to satisfying the needs of their specific organizations. The data base decision, therefore, is often a compromise.

Differing information needs dictate variable data structures. No one structure is ideal. Hierarchies are valid in one instance; yet networks are more suited to another.

TIS has been designed to be independent of standard data base structuring techniques. It has also been designed to allow migration to the implementation of new data management concepts.

Sophisticated hardware, offering greatly improved performance to cost ratios, in conjunction with advanced research into data base structuring, offers new opportunities for solving the data base dilemma.

Relational techniques and distributed data base are two manifestations of these opportunities.

TIS allows data processing to accept these flexible, new techniques without impact upon existing applications. TIS is completely independent of the data base environment, allowing imple-

mentation of the technique or techniques that best satisfy the needs of an organization.

To ensure that all levels of users remain independent of the data base environment, it is required that the TIS function managers are used to access the data. The TIS function managers represented by the Pre-processor, the Generalized Data Base Maintenance, Interactive Procedures, and by the Retrievals, utilize the unique Logical View concept. The concept allows data processing to take full advantage of any technological change that improves the responsiveness of the information system . . . distributed data base, realigned data sets or even a new technique for data management. The concept also permits data processing to be responsive to changes in organizational needs.

TIS Data Base Management offers the ultimate in control and access to the data resource.
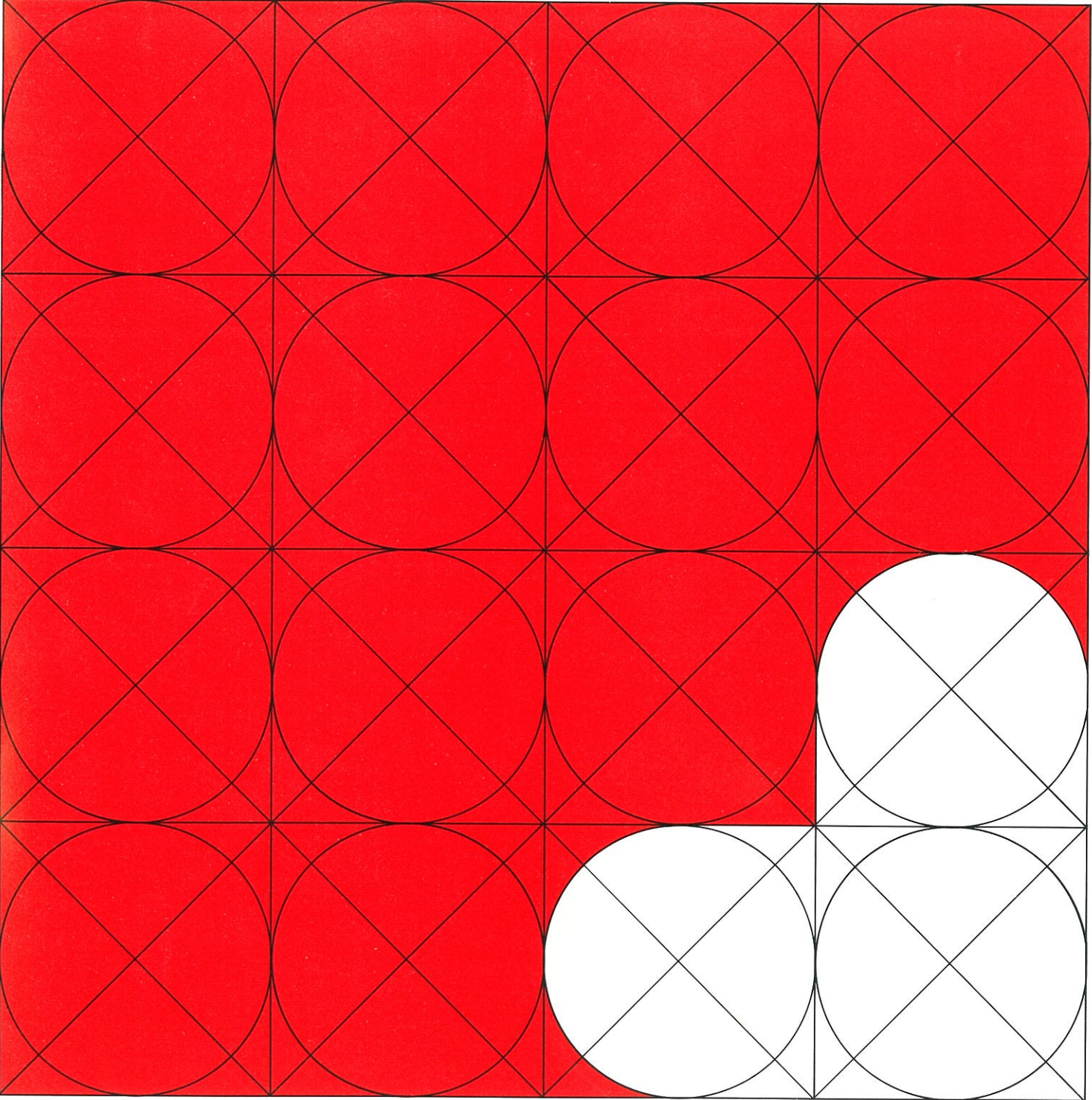
One of the strengths of the TIS concept is that it provides end users direct, yet controlled access to the information the computer contains. End users are not limited to On-Line Query using video displays and/or hard copy terminals, but can also generate simple reports through the Batch Query facility.

No existing system puts as much information at the fingertips of the end users as TIS On-Line Query. By employing a user-friendly language, with familiar words, phrases, syntax and grammar, TIS eliminates the need for end users to understand existing high level programming languages. Most end users have neither the ability nor the desire to understand such complex programming tools as COBOL, PASCAL and FORTRAN.

Showing many of the characteristics of artificial intelligence, TIS On-Line Query allows end users to request information in free-form natural language.

PRINT CUSTOMER, ORDER AND QUANTITY TIMES COST IF ZIPCODE IS BETWEEN 90000 AND 99999 AND WHEN FINSIHED PRINT TOTAL AND AVERAGE OF QUANTITY TIMES COST.

If the user makes a mistake, such as trying to access data outside his or her Logical View or simply misspelling a word, the query will enter into a dialogue with the user attempting to correct the error. When the request satisfies all criteria, the information is displayed:

12:15 P.M. OCTOBER 2, 1978 PAGE 1

CUSTOMER	ORDER	QUANTITY TIMES COST
01403	B4683	1,432.80
09742	AA586	256.00
11036	C9362	982.50
45837	A3982	12,460.00
94382	T4644	5,643.50
TOTAL		20,774.80
AVERAGE		4,154.96

Headings are automatically aligned in columnar format. Lines that exceed the size of the screen or the hard copy page overflow to the next line and are left justified. When a response exceeds the number of available lines, then the query can be scrolled or terminated. Queries can, of course, be saved for subsequent re-examination. Search criteria can readily be modified prior to re-execution.

In addition to On-Line Query, a special subset of the On-Line Query produces reports in a batch environment. This facility is designed to provide the end user with an easy to learn capability while offering features which enable sophisticated reports to be generated. Batch Query is keyword driven from a simple pre-formatted input form. As with On-Line Query, output is columnar with automatic alignment of headings and data items. With On-Line and Batch Query at their fingertips, end users have rapid access to the information they need to make decisions.

To meet the more specialized skills of the data processing professional, TIS also has a Comprehensive Retrieval facility.

Typically, Comprehensive Retrieval is used where data base navigation is complex or where data is accessed from data sets outside the TIS environment.

Yet TIS's ease of use introduces new security demands. To assure that the end user is permitted access to only permissible information, TIS uses Logical View and password protection. Users can access only the Logical Views for which they are authorized. Passwords offer additional security by restricting an individual's access not only to Logical Views but also to the system in its entirety.

All TIS Retrievals utilize the Logical View concept. Repetitively used queries and retrievals can be stored in the Directory as Finite Logical Views (FLV), independent of the data base structure.

Monitoring Progress

As with all TIS components, performance is an important issue. Since a request for information could require the gathering of data items from the entire data base, it is essential that progress of a specific request be monitored and resource usage re-estimated. TIS Retrievals Management performs these functions informing the user that the request may require excessive line or computer resources. The user may then elect to cancel or modify the request. An added safeguard is provided by allowing the Information Systems Coordinator to apply upper resource usage limits that can be either system-wide or assigned to a specific user.
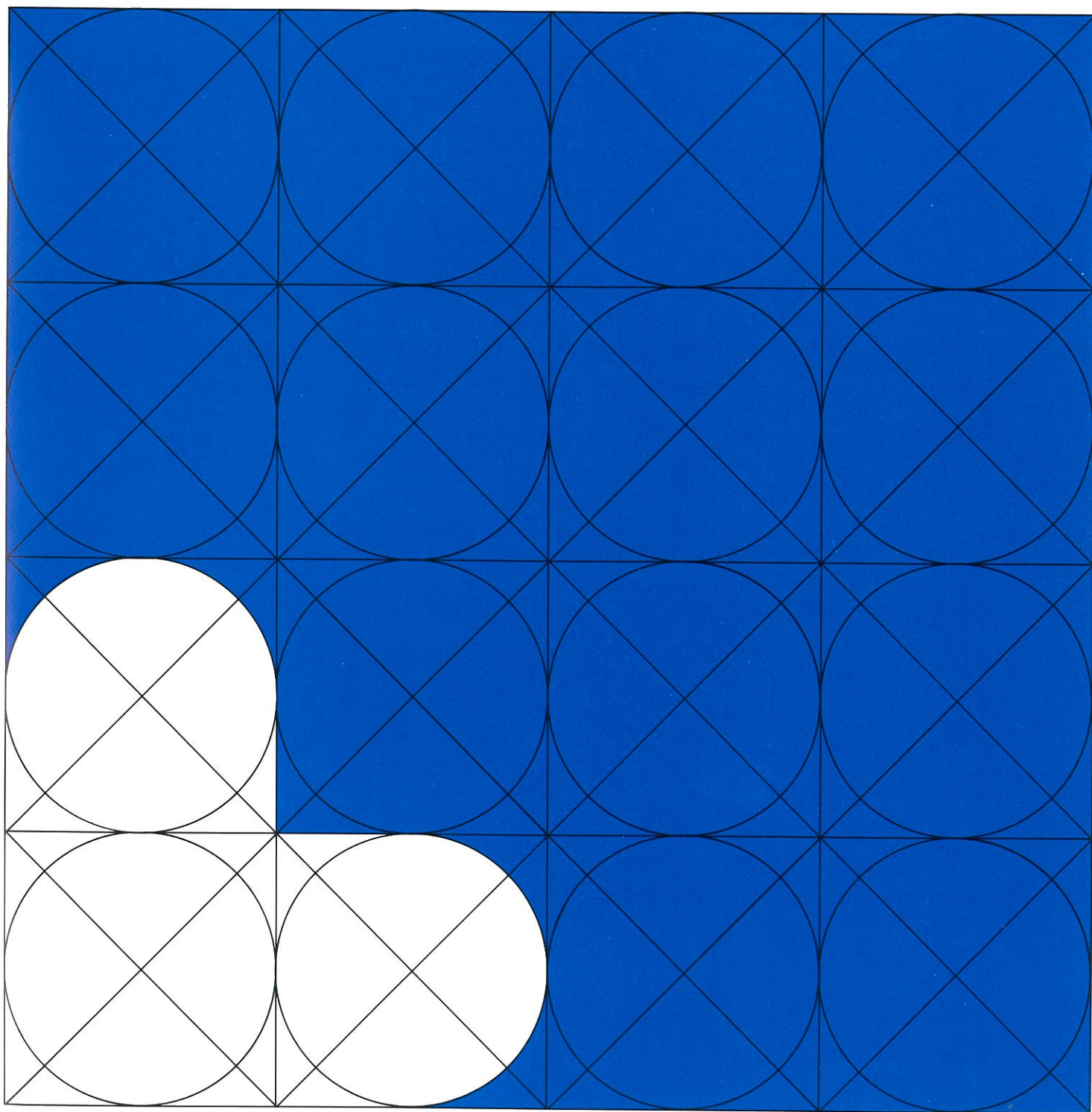
The design of the TIS environment satisfies the need to provide consistent information to the decision makers at all levels and within all departments of an organization. The data comprising the information must be kept current. It must, therefore, be available for modification, addition and deletion.

TIS Update Management offers three facilities to access the data base for maintenance. TIS Pre-processor, is designed for the data processing professional, and Generalized Data Base Maintenance, for the non-data processing individual. The third, Interactive Procedures, combines the power and flexibility of the Pre-processor language with the ease of use inherent with Generalized Data Base Maintenance.

TIS Pre-processor: Allows the data processing professional to take full advantage of all TIS concepts including the Logical View, security, data base independence and use of a user-friendly language. Special verbs permit complex operations against multiple records spread across multiple data sets and, in a distributed environment, across multiple data bases. It is recommended that all applications developed by data processing utilize the Pre-processor. This ensures complete independence from the data base environment.

Generalized Data Base Maintenance: On-line addition, deletion and maintenance of data items is made available to the end user through the TIS Generalized Data Base Maintenance facility. It utilizes the same easy-to-use, natural language developed for the TIS On-Line Query. Repetitive update requests can be saved in the Directory for subsequent re-execution. These requests are independent of the data structures.

Interactive Procedures: The sometimes complex logical relationships between data items demand that updates be strictly controlled. This control can only be established through procedural code developed by an individual cognizant of the complexities. A flexible on-line screen definition in conjunction with a powerful procedural language that interfaces to the data base through the TIS Logical View, allows applications to be developed rapidly, efficiently and independent of the data base and data communications environment.

These three facilities can only be used after the most searching password and security checks. It's essential that the data resource be protected from unauthorized access and subsequent modification. The TIS Logical View concept is used as the first level of security. The ISC is provided with specialized exit routines to introduce additional security and privacy checks to meet specific requirements.

When using the update facilities, data integrity must be preserved. The TIS Task Level Recovery (TLR) facility monitors the activity to ensure that the data base is logically and physically protected.

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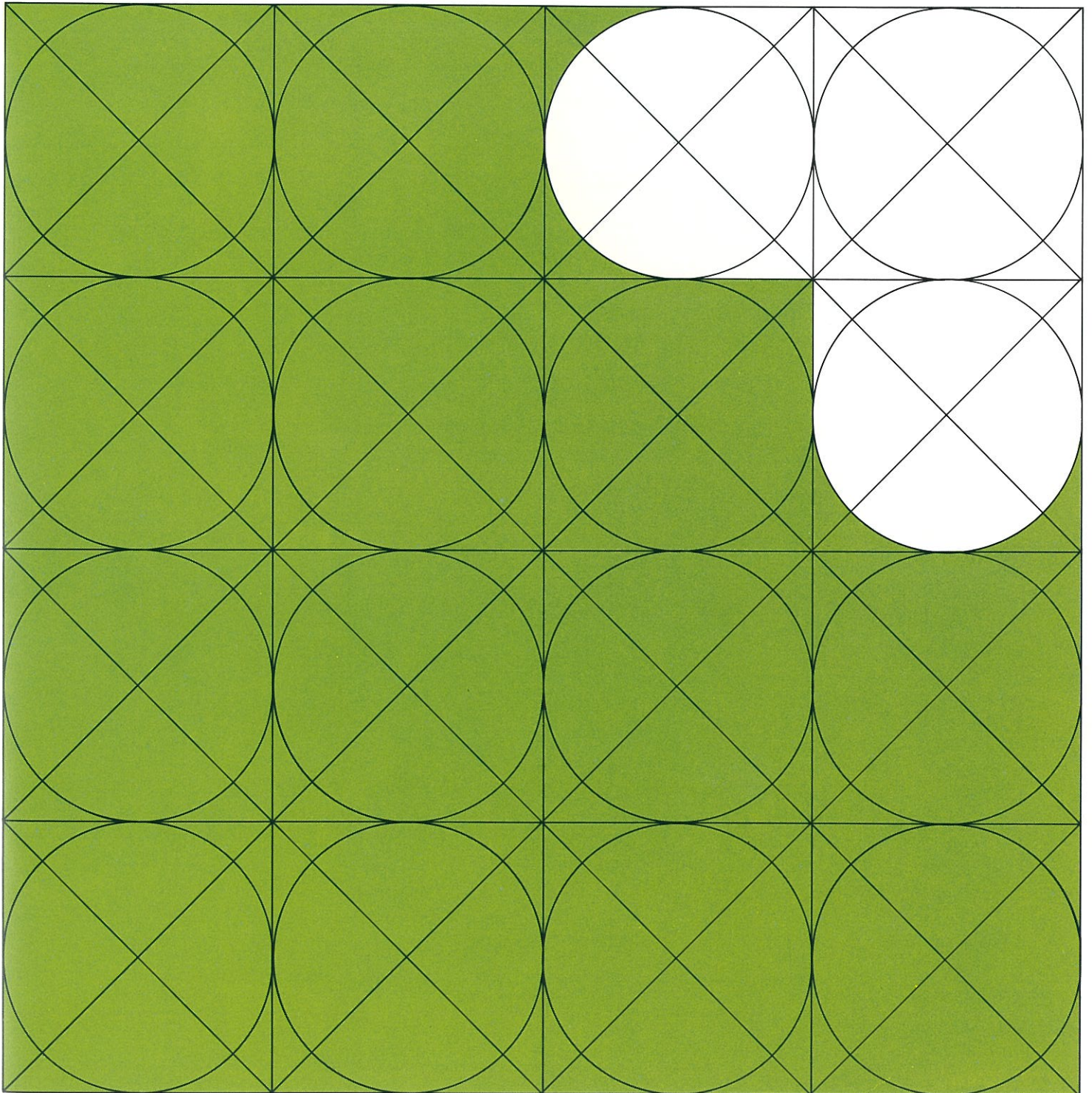
TIS, as a truly interactive, on-line information system requires two levels of communication, external and internal.

External: With TIS, the selection of the appropriate vehicle to handle external communications can be made independently. Both ENVIRON/1 and CICS are fully supported and interfaces are available to all other commercially or self-designed offerings.

In the TIS environment, requests to the software facilities can be generated in a variety of ways. For example, a request can be from a 3270-type terminal, from a card reader or from a remote computer. Transfer of the request to the TIS software requires Communications Management. To ensure independence in TIS Communications Management, a protocol has been developed. Interface routines accept requests from whatever device is being used and manipulate the data into the required format. The interface routines can be associated with the data communications monitor (ENVIRON/1, CICS, et cetera), with a batch interface program or, in a distributed environment, a remote computer, or programmable device. The TIS protocol requires a specific format known as a Logic Control Block (LCB). The LCB is the highest level of request within TIS. It is independent of the communications medium and also independent of the data base environment. Additionally, a user's request can be stored as a series of LCBs, a Finite Logical View, in the TIS Directory for subsequent re-execution by name.

Internal: The Logic Control Block, as stated earlier, is also independent of the data base. The TIS software contains re-entrant modules that determine what the Data Base Management System is and where the data is physically located. This is achieved by reference to the Directory. Once the location is resolved, data extraction commences as specified by the user requested selection criteria and output formats. To avoid constant reference to the Directory, repeatedly used requests (queries), may be saved in the form of Physical Translation Blocks (PTB). Provided that no physical change has been made to the data items (a modified Logical View), the PTBs are accessed directly circumventing the need to translate the LCBs. If a change is made to the data items, even a change as extreme as a different data base technique (relational, set theoretic, et cetera), the existing LCBs can be reprocessed, with no impact on the end user, by use of Cincom supplied translation and extraction modules.

The LCBs are used for both external and internal communication. They represent a standard protocol that allows the TIS software to remain independent of both the data communications and data base environment.
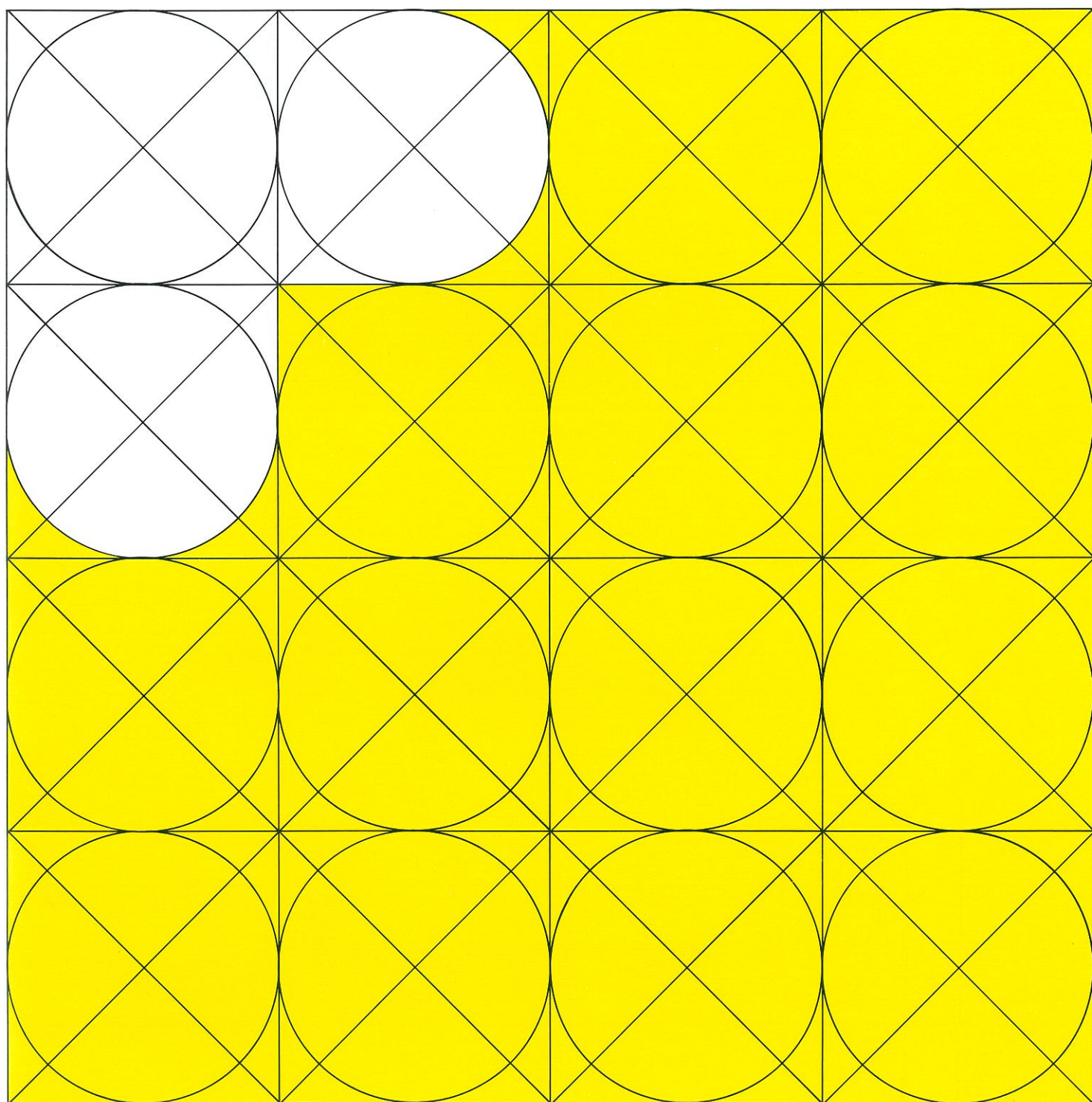
The TIS software is designed to manage the changing needs of business and data processing industries. The software is divided into five components:

Directory: An integrated TIS Data Base containing all data necessary to control and manage the information system. Includes data item definition, data item location, Logical Views, users, security codes, saved logical requests and descriptions of the physical environment.

Data Base Management: TIS Data Base represents a single controlled source of all organizational data. The design concepts of TIS allow this data to be accessed independent of physical structures and data location. This independence permits the ISC to optimize the performance characteristics of the data base as dictated by changing need or improved technological capability.

Retrievals Management: The TIS Logical View concept allows all users of retrievals to interact with the data independent of structures. Retrievals are also designed to offer language capabilities suited to the particular aptitude of the users. Principles of artificial intelligence are used to accomplish this objective. The languages are deemed user-friendly and the security requirements are stringent.

Update Management: Information is often of dubious value if the data from which it is derived is not current. The TIS Pre-processor, Interactive Procedures and Generalized Data Base Maintenance facilities allow both data processors and non-data processors alike to modify, add and delete data items within their Logical Views. This updating is independent of data base structure and data location.

Communications Management: Standard protocols are used to allow internal and external communication to take place independent of the data communication and data base environments. Both ENVIRON/1 and CICS are supported by TIS.

These five components represent the TIS environment. The Directory is central and the remaining four components are fully integrated with it.

Operationally, the TIS software is responsible for all jobs and/or tasks that interface to it. The software must manage and control the TIS activities in all partitions or regions. To achieve this objective a "central mode" of operation is required. This "central mode" enables the software to be viewed as an extension of the operating system.

TIS is designed to manage and control the data resource. Task Level Recovery ensures complete data base integrity.

The TIS concept of environmental independence provides an organization with the necessary software tools to confidently address the changing needs of business and data processing.

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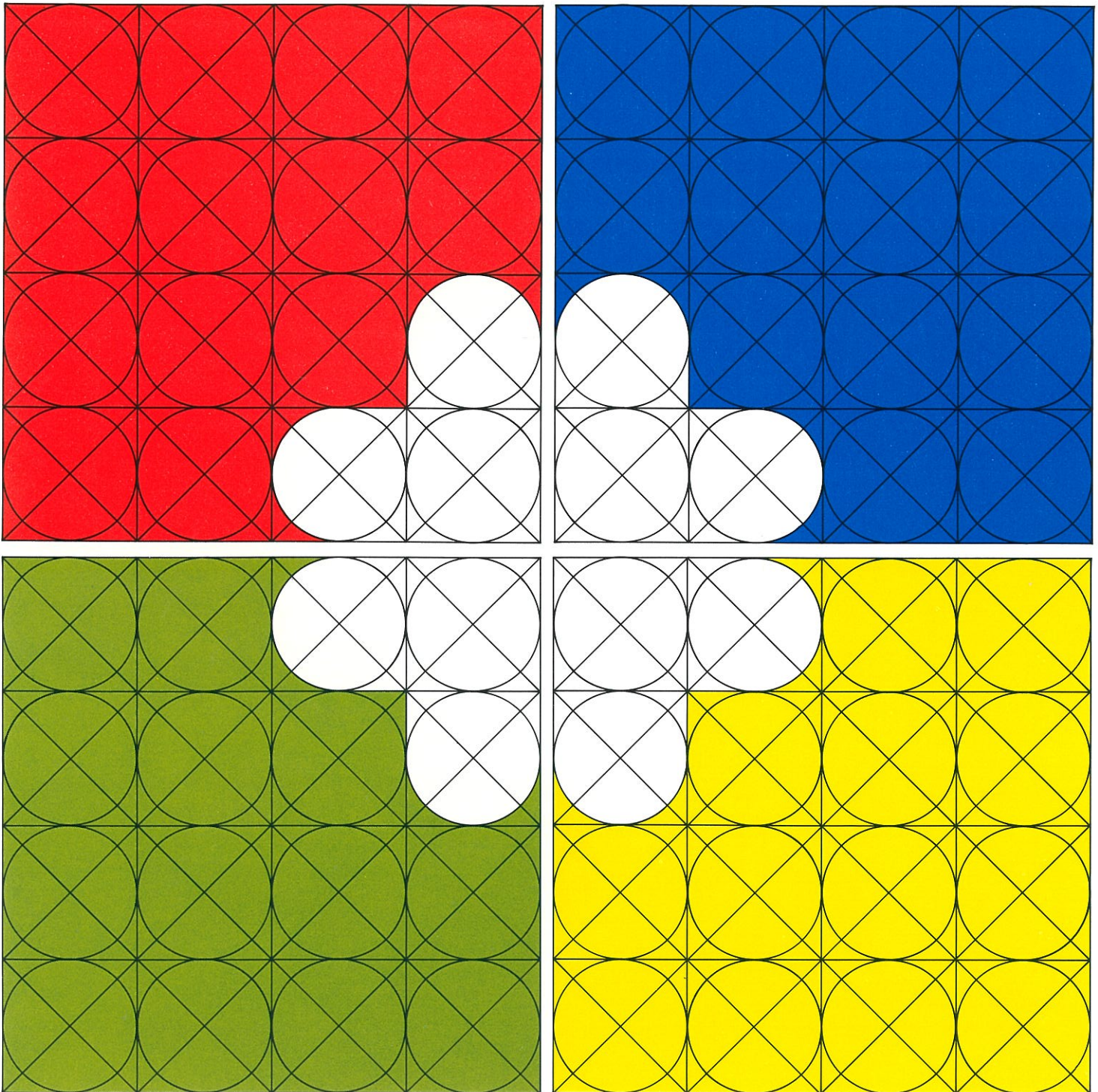
From the successful foundation of data base, TIS allows data processing to begin the transition to the information systems decade. And, as data processing builds information systems that truly reflect the needs of an organization and its top management, data processing's value to the organization will grow. In fact, the advantages TIS brings to the decision maker are more than matched by the new opportunities it offers data processing.

⊠ TIS reduces data processing work loads, freeing professional staff to build new application systems. Thanks to TIS's direct user interaction, translation of user requests is reduced, freeing the data processing staff to continue refining the effectiveness of the information system.

⊠ TIS enables data processing to anticipate and absorb change more readily. The design criteria anticipate the need for change. Data processing can react quickly to evolving business needs.

⊠ TIS allows data processing to respond to technological innovation. Conversion can become a way of life as data processing attempts to respond to continued changing technology. With TIS, no conversion is required in assimilating change.

⊠ TIS offers data processing centralized control. The TIS Directory represents a control center for the information system. Access to the data base is strictly controlled through security codes and passwords.

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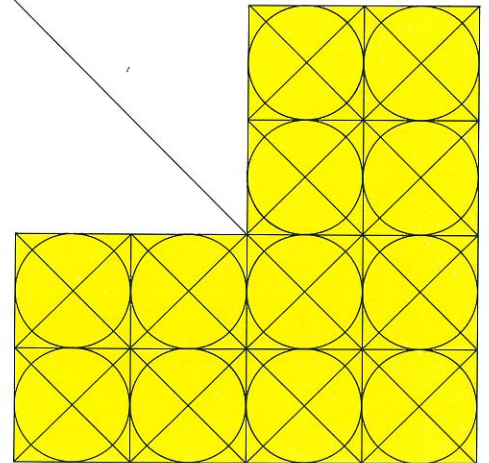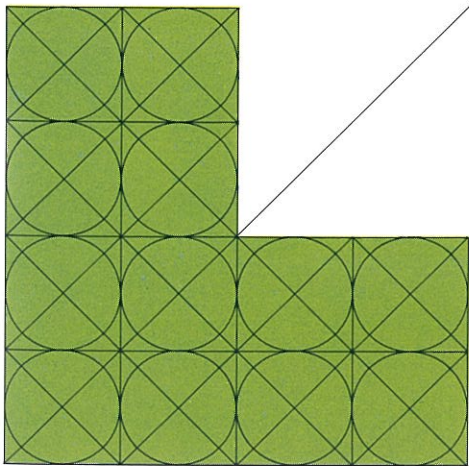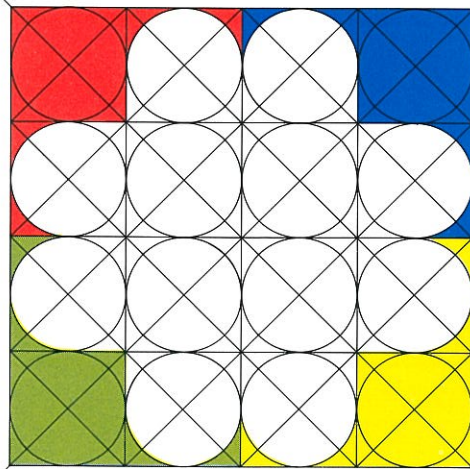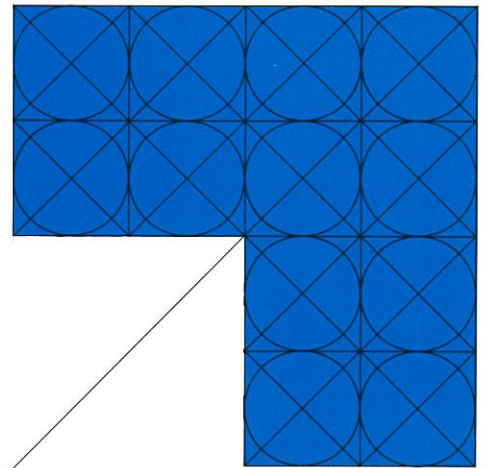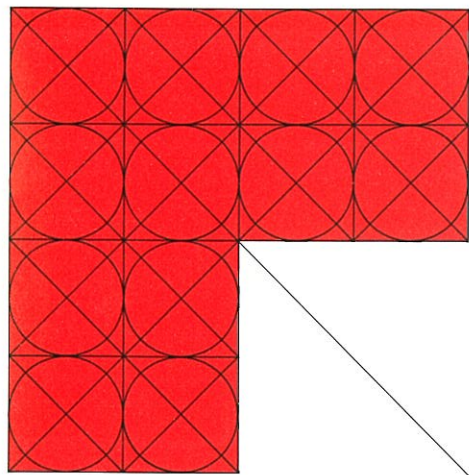
For users, whatever their level in the corporate structure, TIS offers unprecedented capabilities.

☒ Only TIS gives the user rapid and direct access to information. TIS On-Line and Batch Query facilities mean that the user no longer experiences translation delays. Answers are displayed rapidly in the required format on video monitors or reports.

☒ Only TIS offers user-friendly languages for information access and update. Utilizing the principles of artificial intelligence, TIS allows the users to query and update data through a familiar, natural language.

☒ Only TIS offers complete independence from the data base and data communications environment. The unique Logical View concept of TIS allows all levels of users (data processing and non-data processing alike) to access data independent of data structure and location.

☒ And only TIS allows an organization's information need to determine data base design. Through TIS Info-Design, the information needs of an organization can be analyzed and modelled to generate a responsive information system.

☒ TIS represents an invaluable management tool. TIS offers the most significant improvement in the administration of an organization since the introduction of the computer itself. For the first time the information necessary to decision-making is directly available to all levels of management. Vital business decisions can be made without delay.

☒ TIS can mean the difference between the success and failure of the computer in your organization. Indeed, in today's competitive world, your computer provides the information that may mean the difference between success and failure for your organization itself.
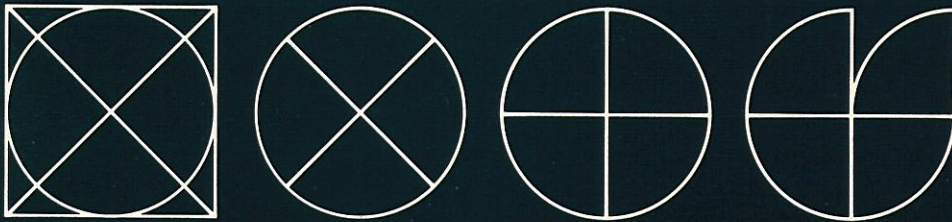
Consider Cincom for a full spectrum of information systems, products and services. Over a decade of experience with 2500 clients worldwide has proven the value of Cincom solutions which include:

Systems software products with the most advanced DB/DC technology available to deliver information rapidly to whoever in an organization requires it.

Application software products architected for a DB/DC environment in such application areas as manufacturing, finance, health care, et cetera.

Applications services specialists who aid customers in the design and management of DB/DC application programs to assure on-time and on-budget implementation.

Education programs and seminars for the data processing industry offered year round throughout the world.

Programmer productivity products designed to increase the efficiency and effectiveness of data processing personnel.

Mini-computer software designed to address the particular needs of these systems including distributed data base and unique data base machine requirements.

Research and development dedicated to pioneering achievements in such areas as artificial intelligence, relational data base and logical modelling.

Consider also Cincom's commitment to a client's success as evidenced by its world-wide support organization in 42 cities in 11 countries.

If you consider this total solution approach to your information systems software needs, shouldn't you consider Cincom?

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The Total Information Systems People.

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