USER-CONTROLLED
SOFTWARE AND SYSTEMS

MAY 1982

USER-CONTROLLED SOFTWARE AND SYSTEMS

CONTENTS

USER-CONTROLLED SOFTWARE AND SYSTEMS

EXHIBITS

I INTRODUCTION

I INTRODUCTION

- The term, "Decision Support System" (DSS), is increasingly being talked and written about. In many respects, Decision Support Systems are the epitome of user-controlled software and systems.

- As this report shows, the concept and definition of a decision support system are still in a state of flux and are to a certain extent not consistent from one authority to the next.

  - However, there is a definite, real core of meaning that may well have a significant impact on the data processing organization as well as on its end users and, through them both, a great impact on the entire corporation.

- Other user-controlled software and systems that are simply miniature or self-contained applications, which do not differ in any significant conceptual respect from the traditional centralized information system applications, are not addressed in this report.

II WHAT IS A DECISION SUPPORT SYSTEM?

II WHAT IS A DECISION SUPPORT SYSTEM?

A. ACADEMIC DEFINITIONS

- Definitions are important to the extent that they promote understanding. In the case of DSS the very profusion of definitions that has come from commentators and academics has led to contradiction among the definers and puzzlement among the spectators. Examples of DSS definitions include:

  - A computer system to support unstructured or semistructured decision-making.

  - A computer system with the following characteristics:

    - Extensible.

    - Able to support ad hoc data analysis.

    - Future-oriented.

    - Available for irregular and unplanned use.

  - A computer system made up of the following components:

    - A language system.

        - A "repository of problem domain knowledge" (i.e., data).

        - A processing system.

    - A computer system developed by learning and adaptation.

    - Computer-based systems that:

        - Assist managers in their decision processes in semistructured tasks.

        - Support, rather than replace, management judgment.

        - Improve the effectiveness of decision-making rather than its efficiency.

- None of these definitions is entirely satisfactory, nor do all of these characteristics, taken together, comprise a clear picture of what DSS can do.

B. CASE STUDY EXAMPLES

- Before returning to more abstract definitions it will be useful to give an idea of the range and concreteness of what is termed a DSS today by including four representative case studies out of a number of self-described decision support systems which INPUT identified during its research.

I. ELECTRONICS MANUFACTURER: SALARY ADMINISTRATION

- This firm required an objective means of distributing its pool of merit increases. Previously, this function was performed manually by the personnel manager and engineering managers and required long hours of allocation and evaluation.

- The manual method was so slow that only one iteration of the process was usually possible, with little or no refining. Often the initial merit increase budget would be revised and the whole lengthy process would have to be done again.

  - The merit package DSS allowed managers to perform as many iterations of their analysis as they felt necessary. It also allowed them to respond quickly and with little effort to budget modifications.

- This DSS was developed at the request of the personnel manager who approached the head of Information Systems Planning, who then enlisted the head of Operations Research to do the job. An Operations Research (OR) analyst with some free time was assigned to the task.

  - The OR analyst used APL to build the system in two to three months, from first discussion of the system to initial results.

  - It was possible to build this application quickly because it required only part of one person's time, and the OR head was willing to commit him and, equally important, the firm's normal formal review and approval process was not required.

  - The OR analyst was not a professional DP person, but had picked up enough APL to do the whole job himself. Writing the system did not require a great deal of detailed logic. The matrix capabilities of APL were quite helpful.

- The manager-users were active participants in the design and development of the system. The OR analyst performed the actual work of writing the system.

- The final system that was developed also:

    - Used a small amount of data extracted from the corporate personnel system. No external data were used.

    - Ran on an internal timesharing system.

    - Cost between $15,000 and $20,000 to develop, and ran with minimal operational costs.

  - The firm reported no major problems in developing the DSS. The only problem was with finding the time for the user group and the analyst to get together to work on the project.

  - The major benefits of the DSS to the firm are:

    - It improves management morale by keeping managers from having to work day and night during the merit review period.

    - It frees managers to deal with other crucial matters (an opportunity cost situation).

    - It allows managers to more fairly allocate merit increases because they are no longer restricted by a time factor.

    - It improves the managers' performance.

2. MAJOR OIL COMPANY: FIVE-YEAR OPERATING PLAN

- This is a system that projects a five-year operating plan at the subsidiary level and consolidates subsidiary data into a total corporate plan. It gives each user the capability of doing "what if?" analysis at the subsidiary level and seeing the impact on the corporate bottom line.

- This DSS was built specifically for the Corporate Planning manager so that he could respond to queries from senior management.

- The Corporate Planning manager works interactively at the terminal himself to test alternatives and sensitivities.

- The interface to the system is simple and requires no technical ability.

- The system was built by the DSS department which is part of the Information Systems department and is headed by a DSS manager.

  - Presently, the DSS department is thought of as a facilitator organization and, as such, has no technical staff.

  - The DSS department must rely entirely on outside consultants to build its decision support systems. This has led to problems in maintaining existing systems and has caused the DSS manager to request internal staff.

  - All resources for DSS at this firm come out of the functional managers' budgets. Only nominal approval is required from internal DP.

  - The DSS manager, who came to the job a year earlier, picked one application as a showcase and put all his efforts into making that a success.

  - It has been a success and, consequently, he expects little trouble in selling the DSS concept in other areas.

- The planning manager offered strong input in the initial development of the DSS and also made numerous suggestions concerning the prototypes of the system generated about every two months.

- The major tools used in building this system were:

  - RAMIS.

  - EMPIRE.

  - TELEGRAF.

  - Various statistical packages.

- The most important features of these tools, according to the firm, were their:

  - User friendliness.

  - Flexibility and speed in building and evolving new systems.

  - Ability to integrate data base, modeling, graphics, and statistical capabilities.

- This DSS was developed over a six-month period from start to usable version.

  - Development cost was $30,000. Operational cost of the system is minimal, at about $2,500 for the three months during which the plan was created.

- The major benefits of this DSS are:

  - Divisional management is made more effective by allowing it to hypothesize modifications of divisional activity and see the effect on the corporate bottom line.

  - More alternatives can be explored.

  - More timely decisions, with better information, can be made.

3. AIRLINE: STRATEGIC MARKETING ANALYSIS AND RESEARCH

- This is a large DSS which uses an extensive data base of company and industry marketing, pricing, traffic, scheduling, and aircraft data.

- The ultimate end users of this system are the senior officers of the firm who request and receive ad hoc reports about particular decisions.

  - The direct end users of the DSS are first- and second-level managers, analysts and, in some cases, clerical personnel.

  - The data base for this DSS was developed through strong user input as it was created by a joint user/DP staff study.

  - Managers across the organization in a task force developed the data base, down to specification of individual data structures.

- The data base was pulled together by the Computer Services department. The user programs are developed by the end users with support from Computer Services.

- The software tools used in the system are:

  - FOCUS: Useful because it can interface well with data structures that are not well designed. This feature is needed frequently when newly developed or external data are added to the system.

  - SAS: A good advance statistical tool.

  - SIMPLAN: Used for spread sheet analysis.

  - PROJECT II: For large project scheduling.

  - MARK IV: Used to support existing batch oriented processes.

- The most important features of these tools, according to the company, are:

  - The nonprocedural nature of the user interfaces.

  - The ability to access many different data structures in many different operating environments.

  - Product efficiency and vendor service and support.

- This is a large system:

  - It cost $1 million to develop and generates operational costs of about $2 million per year.

    - The concept and design have allowed the system to evolve over time to meet the needs of different users. (There are now about 600 users of the system.)

- The firm feels there have been major benefits from the DSS:

  - Better analysis.

  - More alternative views of decisions.

  - More timely support of users.

  - Broader dissemination of data (both local and global).

4. CONSUMER PRODUCTS COMPANY: MARKETING PROMOTION

- This firm is heavily involved in consumer marketing and spends millions of dollars on marketing promotion and advertising. The company wanted to analyze how it was spending its promotional money to determine if it could be spent more effectively.

- Questions arose such as to whether it was possible to spend less on promotion and still sell as much, or sell less but increase net income.

- The overriding question was "How much promotion should we do and what is the timing?"

- The divisional president of this firm is the ultimate decision-maker. The direct users of the DSS are the marketing managers, brand managers, and the promotional department.

  - This DSS was implemented by an outside consultant, with the system users playing an important role in its conceptual design.

- Within the firm, the DP department is responsible for integrity of internal data and, as such, was consulted for approval for releasing the data to users.

  - DP also monitors computer usage by end users and consults with management when usage appears excessive.

- The consultant for this project reported to INPUT that the addition of new data to the system with NOMAD proved to be quite easy. In-house data were constantly being stripped off existing files and integrated into the DSS.

  - Some users of the system were capable of doing this themselves. In other cases the consultant did it.

    - Many users also added some of their own data at the terminal.

  - This DSS cost less than $20,000 to develop, including consulting fees. The consultant on this project reports that users spend between $50 and $75 per hour to run the system.

- The system is run on an outside timesharing service and fees for this service, as well as for the consultant, are funded through the user departments' outside services budget.

- The DSS is considered a major success within the firm since promotional savings of \$6 to \$8 million a year have been generated without any loss in sales. This came about because:

  - There was now the ability to look at many alternative promotional possibilities.

  - The firm can now also look into many other areas that could affect promotional strategy; e.g., the effect that product price changes might have on promotional policy.

- In addition, there was a qualitative benefit in that managers and analysts now have to do far less clerical work and thus can do more analysis. With lower frustration levels, these people do higher quality work, according to the company.

C. A PRAGMATIC DEFINITION

- These are certainly examples of interesting, useful computer systems. But what have they in common? Can we even make some preliminary judgment as to what is not a DSS?

- Those who would set up hard and fast abstract rules as to what a DSS is (or is not) will do so at their own risk.

- At a recent DSS conference, the keynote, overview speaker gave inventory systems as an example of a class of computer systems that would not qualify as DSS (because they were virtually automatic in operation, requiring negligible human intervention and judgment).

  - However, two of the invited speakers proceeded to give as case studies examples of DSS that were inventory systems.

  - All speakers had valid points to make!

- The chief problem with the academic definitions cited earlier is not that they are untrue (since they are usually valid in their own ways) but that they are not oriented to the world of the data processing practitioner.

I. INPUT'S DEFINITION

- In this section INPUT will define the complex of characteristics of a DSS in practical and pragmatic terms. The main identifying features are:

  - Overall importance.

  - User characteristics.

  - Flexibility.

  - Timeliness.

  - Uniqueness.

  - Kind of data needed.

a. High Importance

- The chief thing to keep in mind is that these are important functions - so important that they will be carried out somehow.

  - Acquisitions or five-year plans will go ahead, with or without a DSS or a computer system, if someone high enough wants them. The alternative may be using either the back of an envelope or many clerk-years.

  - It is the perceived importance of the work to be accomplished and the awareness of the inadequacies of manual alternatives which impel the creation of many decision support systems.

b. Senior User Initiated

- The importance is to end user departments - they initiate action on DSS development.

  - It is not any user, but generally a senior executive.

    - The head of payroll, but rarely the finance vice president, cares about the payroll system.

    - The finance vice president will care about "his" DSS.

  - Not only does senior management initiate DSS development, it is also the ultimate user of such systems.

    - This is usually not so in the keyboard or coding sense, but is definitely so when it comes to examining outputs and taking part in reformulating the approach.

c. Flexible Development

- This is directly related to another key characteristic: initial expectations and project requests may assume that a particular system will fulfill expectations.

    - It is in fact very rare that this will happen: initial results will usually be the first in quite a long line of intermediate results. This is what the academics mean by "learning and adaptation."

    - Very often an explicit model is involved, with the key relationships tinkered with even before different assumptions are fed through the model.

        - Models are often implicit; a conventional appearing DP system may be constructed as a prototype to see how it works, then the system may be modified.

    - This key characteristic, of system iteration and evolution, is in fact a good approach to follow in constructing "conventional" systems.

        - It is not done because of perceived time and resource constraints or lack of familiarity with newer software tools (e.g., INQUIRE, FOCUS).

- In addition, there is often a blind faith that "rigorous analysis" will identify all needs and the best way of meeting these needs, once and for all. This is sheer prejudice and is almost always proved wrong by the events that follow.

    - MIS departments should follow with great attention the outcome of these approaches and be prepared to build on successful experiments.

- There is the further possibility, always present, that a DSS once "set," will change from top to bottom in terms of inputs, logic, data, or form of presentation.

- Decision support systems are very sensitive to changes in the external environment, since they are one way that organizations try to better adapt to and control the outside world.

- Changes in markets, competitors' products, internal costs, laws, tax treatments, or company policies and assumptions, can all have pervasive effects on a DSS.

d. <u>Fast Development</u>

- While the requesting department wants lots of opportunity to play around with the system it also wants the whole system ready quickly.

  - Very often the user is working against a timetable that has been imposed on him or, as in the case of an acquisition analysis, yesterday is too late.

  - Bright ideas and targets of opportunity cannot wait for feasibility studies, programmer availability, or COBOL debugging.

    - This is why timesharing services estimate that <u>one-third</u> of their business comes from DSS-type work. They are ready. It helps that in these situations money is literally no object.

e. <u>High Degree of Uniqueness</u>

- DSS systems are virtually always unique.

  - They are highly dependent on the coming together of:

    - A particular person.

    - The organization's needs at a point in time.

        - The particular factors in the external environment currently deemed critical (e.g., interest rates are now a much more critical factor than they were ten years ago).

        - Data availability.

        - The resourcefulness of the DSS builder.

    - While the salient features and even most details of a payroll system are identical from firm to firm, this is not so of decision support systems, even those with a superficial resemblance or similar names (e.g., acquisition analysis).

f. Data Dependency

- One of the reasons for this uniqueness is the relationship of a DSS to data.

    - A DSS is very data sensitive: it usually feeds on live data. Without precise data a DSS merely states the possibility of interesting relationships occurring, but users cannot know how these relationships affect them.

    - A DSS rarely requires new data to be generated from company sources. In fact, data are usually extracted or summarized before being used.

        - One service that a DSS may perform is to make clear just how unclean so much of a company's operational data are. The data simply cannot stand up to analysis and, therefore, cannot support analysis.

        - Sometimes a successful DSS will lead to a reevaluation of data capturing, processing, and organization so that, among other things, better company decisions can be made.

- Decision support systems are increasingly using data from a wide variety of external sources. This is driven by two intertwined forces.

  - Decisions and models increasingly have to take into account facts about the outside world.

  - These data are increasingly available in machine readable form, often integrated by the same timesharing firm which supplies and supports the DSS. Exhibit II-I gives an indication of the depth and breadth of these public data bases.

2. CONTRASTS BETWEEN DSS AND TRADITIONAL SYSTEMS

- It is useful to summarize and contrast the differences between a decision support system and a traditional system, as shown in Exhibit II-2.

  - Traditional systems go through a long development process and are used by fairly low-level people. They are often vital to a company's operations, but this is usually recognized only when they do not work.

  - Decision support systems are frequently the focus of bursts of high-level activity (sometimes misinformed and misdirected). It is reminiscent of data processing of the 1960s.

EXHIBIT II-1

EXAMPLES OF FINANCIAL INFORMATION DATA BASES (PARTIAL LISTING)

- Cates Lyons and Company maintains a historical data base of over 800 key financial data items on 250 major bank holding companies.
- Robinson-Humphrey Company maintains a data base of key financial items on 145 top bank holding companies. The data base is offered together with comparative analysis software.
- SBC maintains a financial institutions data base of financial information containing:
    - FDIC data on over 14,000 commercial banks.
    - FHLB data on over 4,500 savings and loans.
    - NCUA data on over 16,500 credit unions.
- Payment Systems, Inc., offers a data base through IDC containing statistics on major aspects of financial transaction systems, including ACH, ATM, credit cards, NOW and share draft accounts, and telephone bill paying systems. The data base also includes key money market indices and market attitudes data on both electronic and paper payment systems.
- Blyth Eastman Dillon & Company maintains a financial data base that contains daily price and yield information on over 800 bonds and other money market instruments including U.S. Treasury notes.

SOURCE: ADAPTED FROM INPUT's REPORT, MARKET OPPORTUNITIES FOR DATA BASE SERVICES

EXHIBIT II-2

SUMMARY OF DIFFERENCES BETWEEN DSS AND NON-DSS

FACTOR	DSS	NON-DSS
Senior personnel initiate?	Yes	Not usually
Senior personnel use?	Yes	No
Timeframe	Short	Medium to long
Changes in software design/ coding assumed?	Yes	No
System reused regularly?	Sometimes	Usually
Model-oriented?	Yes	No
Off-the-shelf packages usable?	Rarely	Usually
New internal data elements created?	Rarely	Often
External data required?	Often	Rarely

III WHAT IS NEEDED TO MAKE A DECISION SUPPORT SYSTEM WORK

III WHAT IS NEEDED TO MAKE A DECISION SUPPORT SYSTEM WORK

- In the previous chapter INPUT showed the key characteristics that distinguish a decision support system from other kinds of data processing systems. Omitted from that discussion were the important areas that actually enable a DSS to work, including:

  - The components of a decision support system.

  - DSS software.

  - Hardware.

  - Organization issues.

- These are all key factors for making a DSS actually work. Obviously, they have much in common with other types of data processing systems. However, as will be seen, there are many uniquely DSS issues involved.

A. DSS COMPONENTS

- In principle, a decision support system is the same as any other computer-based system: there is input-processing-output.

- Even DSS specialists describe the system building steps as very similar to the steps in a traditional computer system, as shown in Exhibit III-1.

- However, on closer inspection a decision support system contains components not usually given prominence in traditional systems, with different types of relationships existing between them (at least conceptually).

- In Exhibit III-2, the major components are broken out into:

  - "Operators," which tell the system what to do.

  - Functions.

  - Data.

1. OPERATORS

- What INPUT has termed "operators" are the heart of the DSS.

  - Processing logic is typically supplied by the user for each new DSS.

    - This may be within the context of a software modeling package, with or without menus or "fill-in-the-blanks" which make use easier for many people.

  - A query language/report writer (which may be one or more software tools) is a critical element in a DSS and an important part of its user-friendliness (or lack thereof).

  - Much effort is devoted to making this part of some DSS software tools as easy to use as possible, since the target user is assumed to have sketchy DP background and will, in any event, usually not be working full time with the DSS software.

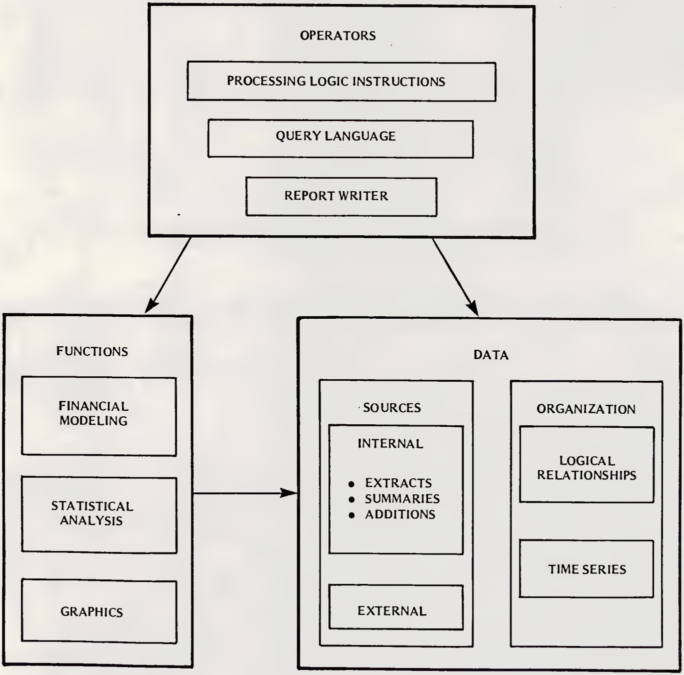
EXHIBIT III-1

FIFTEEN STEPS TO ACHIEVE AN INTEGRATED DSS

1. Establish management's needs
2. Identify system tasks
3. Prioritize tasks
4. Identify system resources
5. Write functional specification
6. Define data element dictionary
7. Write external specification
8. Write internal specification
9. Develop test data
10. Code system
11. Write user's guide
12. Catalog system modules
13. Write system maintenance manual
14. Test system
15. Write application guide

EXHIBIT III-2

DECISION SUPPORT SYSTEM COMPONENTS



2. FUNCTIONS

- Some engineering and scientific systems have similar libraries of functions to draw on, but such accessible functions have until recently been fairly uncommon in business-oriented systems. Exhibit III-3 gives a sense of the range of functions available.

  - Not all functions will be required in all applications. In fact most departments using a DSS will tend to use a limited subset of these functions.

    - However, as new analytic tasks are taken up, new functions will be necessary.

    - Staff transfers, seminars, etc. can also affect which kinds of functions are used, even on existing applications.

3. DATA

- Data issues can become quite complex for two reasons.

  - There is a multiplicity of data sources.

  - Data organization is more complex than most operations-oriented data bases.

- Exhibit III-4 shows the possibilities for different types of data to be used for a decision support system. Many large companies build just this kind of corporate DSS data base.

  - Simply keeping all the updates synchronized is a problem.

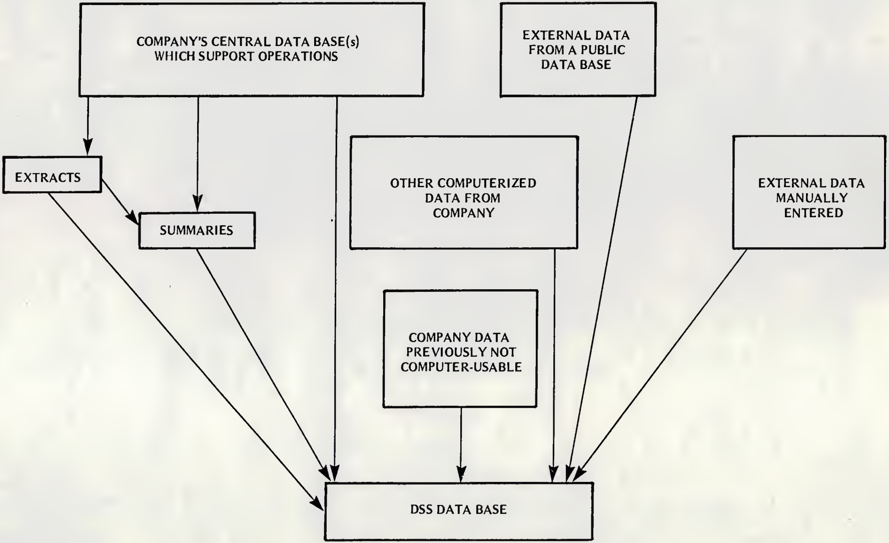
EXHIBIT III-3

EXAMPLES OF DSS FUNCTIONAL CAPABILITIES

- Amortization
- Annualization
- Backward iteration
- Built-in distribution functions
- Compound interest
- Curve fitting
- Depreciation
- Discounted cash flow
- Equation reordering
- Exponential smoothing
- Financial ratio analysis
- Forward referencing
- Impact analysis
- Lease/purchase
- Linear regression
- Monte Carlo simulation
- Multidimensional variables
- Multilevel consolidation
- Multiple regression
- Net present value
- Pro forma capabilities
- Risk analysis
- ROI
- Significance testing
- Simultaneous equations
- Spreading
- Time-series forecasting

EXHIBIT III-4

SOURCES FOR BUILDING THE DSS DATA BASE


COMPANY'S CENTRAL DATA BASE(s) WHICH SUPPORT OPERATIONS
EXTERNAL DATA FROM A PUBLIC DATA BASE
EXTRACTS
SUMMARIES
OTHER COMPUTERIZED DATA FROM COMPANY
EXTERNAL DATA MANUALLY ENTERED
COMPANY DATA PREVIOUSLY NOT COMPUTER-USABLE
DSS DATA BASE

- A more insidious problem is that involved in keeping the logical relationships correct between elements in the DSS data base if data elements change their meaning somewhat from their original source.

- DSS data bases are different from most operations-oriented data bases in that time series are very important. This is understandable since many decision support systems are engaged in trying to foresee future events based upon past data.

    - Many commercial time series oriented data bases have grown up to meet this need.

    - It is often difficult to construct an initial time series of internal data, since such time series data are rarely used for operational purposes.

        - Changing data structures, data definition, and data quality make this a nontrivial task.

- Many DSS constructors would wish, ideally, to have what might be termed a "three-dimensional" data base, the concept of which is shown in Exhibit III-5.

    - Perhaps this will be the next stage in relational data bases (presumably requiring very large processing and storage overheads). This will be some time away.

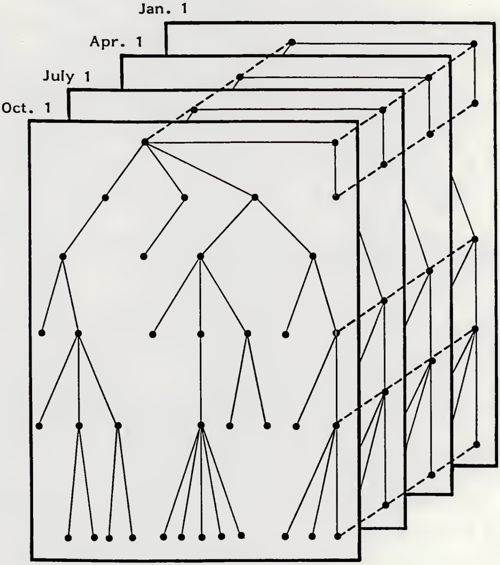
    - Right now, there is usually a choice that must be made between handling either logical relationships or time series well (i.e., easily).

B. DSS SOFTWARE

- Software encompasses both the "operator" and "function" components described earlier.

EXHIBIT III-5

THE THREE-DIMENSIONAL DSS DATA BASE: LOGIC AND TIME



——— Logical relationships at a single point in time

------- Time series

I. SOFTWARE TYPES

- There are approximately 100 languages/packages used for DSS purposes. They fall into five general categories:

  - Traditional programming languages (e.g., FORTRAN, BASIC).

  - Newer, more specialized programming languages (e.g., APL).

  - "Fourth Generation" languages (e.g., FOCUS, INQUIRE).

  - "Home made" DSS packages (e.g., FORTRAN, a statistical package, and an already existing operations-oriented DBMS, such as TOTAL).

  - Vendor-supplied DSS packages (ranging in price from VISICALC to EXPRESS).

- Generally, the performance characteristics of the packages within each group cluster around the same value, as shown in Exhibit III-6.

  - In general there is a tradeoff of price and hardware efficiency against ease of use and features.

  - The low price of VISICALC and its imitators introduces some anomalies into the matrix. This issue will be discussed at greater length below.

- The multivendor, home-grown approach is common.

  - It often represents a compromise that manages to get the worst of both worlds:

    - Inefficient use of hardware resources.

    - Difficulty in obtaining support.

EXHIBIT III-6

CHARACTERISTICS OF DSS SOFTWARE APPROACHES

TYPE OF APPROACHES:	TRADITIONAL PROGRAMMING LANGUAGE	NEWER PROGRAMMING LANGUAGE	"FOURTH GENERATION" LANGUAGE	"HOME-MADE" DSS PACKAGE	VENDOR SUPPLIED DSS PACKAGE
Example of approach:	FORTRAN, BASIC	APL	FOCUS, INQUIRE	DBMS + language + statistical package	VISICALC, EXPRESS
Characteristics:					
Price	Low	Low	Medium-High	Medium-High	Low-High
Hardware resource consumption	Low	Low	High	Medium-High	Medium-High
Ease of nonprogrammer use	Low	Low/Medium	Medium	Low-Medium	Medium-High
Features-range	Low	Low	Low/Medium	Medium-High	Medium-High
Features-integration	Low	Low	High	Low-Medium	High
Coding speed	Low	High	High	Low-Medium	Medium-High
Modifications ease	Low	Low-Medium	Medium	Low-Medium	High
Modifications - turnaround speed	Low	Low-Medium	Medium	Low-Medium	High

        - Limited features.

        - Relatively unfriendly.

    - However, it represents a perceived low entry price approach since often all that has to be acquired is a statistical package (e.g., SAS).

- The "fourth generation language" approach makes a lot of sense where a "mini-system" (or perhaps even a large system) has to be put into place (to collect and store data, for example) before the DSS per se can begin to function.

2. VENDOR PACKAGES

- Increasingly, DSS software means one of the integrated packages that have been developed over the past ten years. This is because many of these packages fill an important need at a reasonable cost.

    - To a certain extent, however, the very existence and active marketing of the packages have helped to create a demand for them (and, possibly, for the DSS approach).

        - "Marketing" does not mean just advertising and sales calls; as a top executive at one of the leading firms told INPUT: "We can create primary demand through professional activities; advertising just builds brand preference."

- If a company intends to seriously engage in modeling and other DSS activities, INPUT does not recommend a do-it-yourself approach, either by relying on a programming language, or by trying to construct its own model (in, say, FORTRAN).

- In the early and mid-1970s many companies tried the in-house approach. By now, however, even some of the largest companies are abandoning it.

- They are writing off often formidable past investments because the in-house approach is not friendly enough and cannot be maintained.

- The up-front and ongoing investment in building a DSS package system should not be minimized.

  - One leading firm estimates that the current product took 75 man-years to develop.

  - Another believes that not a single line of code written five years ago remains in the present version of the package.

- A single company, no matter how large, will generally spend less to provide itself with as many copies as are necessary of a proprietary product.

3. SELECTING A VENDOR PACKAGE

- All prospective vendor package buyers want to know: "What's the best package?"

  - The only truthful answer is, "It depends."

- There are two basic reasons for this answer:

  - Package offerings are constantly changing, as products enter and leave the market and, more importantly, as products are modified and enhanced.

  - Even more than most packages, each DSS package tends to have its special strengths (and, perhaps, weaknesses).

    - These should be closely matched against what the purchaser sees to be its key needs.

- Two key objective discriminants are price and product age.
  - Very expensive ($100,000 plus) packages are much more flexible and often have more features than, say, most $3,000-10,000 packages.
    - VISICALC, at $100-200, is in a class by itself.
  - Recently released products tend to have learned from earlier products and offer more.
    - However, they may have start-up problems, and they may not stay the distance.
  - However, in the broad middle range of products (in terms of price and age) the tradeoffs are very complex and each user will have its own special needs to be matched against products.
- An observation made by several vendors is that there are too many vendors already, given the current size of the marketplace.
  - This means that commitment to the market as well as sales growth and profitability should be kept in mind by any purchasers.
- Based upon INPUT's observations, there are several key areas to focus on in defining the company's needs for a DSS software package.
  - What features are <u>really</u> needed?
    - Too often, technicians want "one of everything"; this will add to the cost and complexity.
    - A few features (e.g., consolidations) may be so important that the search will really revolve around them.

- Will there usually be a few or many sources of data?

  - If much external data are needed, then it would make sense to deal with a timesharing firm that could supply both the data and the software package.

- Will logical or time series data be most important?

- How self-sufficient will the organization (both users and the MIS department) be?

  - This will determine the importance of local support and documentation.

- Is a large volume of data anticipated?

● Benchmarking realistic jobs is appropriate <u>if</u> major activities can be defined in advance.

● Heart to heart talks with current users can substitute for benchmarks and may be more revealing in many cases, given the complexities of setting up equivalent benchmarks.

C. THE POTENTIAL FOR DSS FAILURE

● Like most human enterprises, DSS practitioners and theorists focus to a large degree on decision support systems that are working and used. Many decision support systems are unsuccessful. The reasons for this are varied but fall into two general classes:

- Those caused by technical problems.

- Those caused by a lack of acceptance.

1. TECHNICAL FAILURES

- The technical issues are many and varied, but for the most part will be recognizable by those who have been in data processing for a while; a partial list is given in Exhibit III-7.

  - Many of these problems are caused by the nature of the problem/solution not being sufficiently understood before plunging in.

  - In many ways, this is a strength of a DSS. The theory behind it and much DSS software assume it to be the case.

    - Happily, the insuperable problems are almost always identified before too much in the way of time, resources and, especially, promises have been committed.

    - Contrast this to classical systems where it may be literally years before the truth has sunk in that a much-touted new system simply will not do what was counted on. This can be learned in a matter of days in many DSS implementations.

  - Note that for the most part DSS failures are not the failures of the classic, large DP system; i.e.:

    - Too late.

    - Over budget.

    - Do not meet user needs.

EXHIBIT III-7

EXAMPLES OF DSS FAILURE CAUSED BY TECHNICAL PROBLEMS

- Software unsuited to job
  - Original selection wrong
  - Job evolved beyond original expectation
- Objectives too vague or unstructured to be well quantified
  - Often not known until it is tried
- Inadequate/insufficient technical support
- Data unavailable and/or not understood
- Data come "unstuck" and/or out of synch
  - Especially a problem where data are marshalled from many sources for time series analysis
- Attempt to put system into regular production, that is unsuited technically
  - A special danger for decision support systems
- Run costs too high for benefits
  - Where an outside timesharing service is used
- Takes too many hardware/people resources supplied by others
  - For internally developed systems

2. LACK OF ACCEPTANCE

- Failures caused by a lack of direction or support are almost unique to decision support systems. While the system may work in a technical sense, it really does not accomplish anything: the operation was a success but the patient died.

  - According to a leading DSS software vendor, while ongoing top management involvement is critical for success, "plenty do not stay involved." Planners and analysts too often plan in isolation and are out of touch with changing top management needs.

- One of the biggest weaknesses in decision support systems (one not often talked about much in public) is their lack of credibility in some management circles.

  - Obviously, there are some independent-minded managers who do not care for planning in general, and computerized planning in particular.

  - The more thoughtful managers have doubts much more difficult to deal with: How can we plan and forecast within our company when so much is dependent on ill-understood external financial and economic variables?

    - According to this position, it is not enough to say that a certain project is very sensitive to a high inflation rate if the planners cannot come up with a credible inflation rate scenario.

- Many of the financial planners that INPUT spoke to were frankly defeatist in their ability to really forecast the future. There have been too many financial shocks and turning points which no one had foreseen.

  - A representative of a DSS vendor whom INPUT interviewed said that many users of their package were frankly "frustrated by having good ideas that were not appreciated within the company." In large part this was a direct result of the unsuccessful efforts of "academic economists to forecast general economic movements accurately."

- One of the most surprising problems associated with DSS is that companies often do not validate the results of their forecasts over time. (Most decision support systems, explicitly or implicitly, are making statements concerning what would be happening in the future.)

  - A leading vendor of DSS software said that the fact that "many companies do not perform routine post-mortems on their forecasts affected DSS credibility."

  - This was amply confirmed in a series of interviews which INPUT conducted with financial planners.

    - Many had obviously never even considered reviewing actual against planned performance. Several, in the course of the interview, thanked INPUT for the suggestion.

    - Others said that it had been considered, or conducted in a cursory fashion, but that it had not been done in depth because they "knew" that later events (primarily inflation) had invalidated their forecasts!

    - It should be noted that the planners interviewed were not in companies noted for their planning efforts and achievements. However, they were all firms well up on the list of "Fortune 500" companies and by all evidence are representative of those companies that do try to plan.

- Sometimes there can be a DSS failure caused by its doing its job too well. The result is correct but it goes so strongly against entrenched folklore that it is not accepted.

- This is a failure of presentation and, also, one caused by not involving the real decision-makers early enough.

- This problem is often caused by bright staff people trying to impress their supervisors with what "I" can do, rather than what "we" can do.