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## INCORPORATING MIS/DSS INTO POLICY COURSES VIA SIMULATION

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### ABSTRACT

There is a trend to emphasize management information systems (MIS) and decision support systems (DSS) for the business curriculum. The development of successful DSS's heavily depends upon effective managerial involvement in the logical design of both managerial decision processes and software systems to support those processes. To achieve this, it is necessary to introduce non-MIS students to DSS concepts so that they can understand their potential role in DSS development. This paper is devoted to a discussion of how simulation can be successfully utilized in policy courses to illustrate DSS design and development.

### INTRODUCTION

The current curriculum standards of the American Assembly of Collegiate Schools of Business require coverage of information systems concepts and applications. In an article in Decision Line [5], Couger summarized computer-oriented curricula in schools of business and concluded by pointing out that a re-orientation of emphasis is underway in courses concerned with MIS to emphasize DSS concepts. Other authors have discussed extended curricula for MIS majors [1;8;15], but most non-MIS majors do not have the time to include several technical MIS courses in their programs. These students still need to obtain the fundamentals and an understanding of the elements of the MIS and DSS systems of a business. The long list of concepts which must be covered in the business curriculum makes it imperative that courses cover multiple goals efficiently where possible. Experience in using a decision support system can enhance this objective. Decision support systems generally include interactive software designed to assist managers in dealing with unstructured decision situations by providing access to integrated data bases and may incorporate software, such as optimization and statistical routines for analyzing data. Keen and Morton [12] provide an example of this.

In a previous paper [6], one of the authors showed how management simulation could be used in MIS courses to illustrate the development of information systems and decision support systems. The emphasis there was on introducing management concepts to the more technically oriented MIS student. Similarly, the managerially oriented business student needs the exposure to the MIS and DSS materials. A successful DSS development requires the effective involvement of management in its planning and design [2;11]. To achieve this, it is necessary to introduce non-MIS concentrants to DSS concepts so that they can understand their potential role in DSS development.

Simulations are already being utilized in many policy courses as a means of providing the students an experiential setting for the learning experience. The design and use of the DSS has many implications for company policy determination and interpretation, and its use in the decision making function relates clearly to the activities of the students in using the management simulation. In this paper we examine some major extensions to one simulation,

Business Management Laboratory [9;10], that make it particularly well-suited to illustrate the development of DSS's and the type of managerial involvement necessary to insure their effectiveness. These extensions consist of a data base created as the simulation progresses and a query language used by students to access and analyze the data. The query language is very easily mastered by non-technical students.

### DECISION SUPPORT SYSTEMS

The notion that management was rapidly entering a new era regarding decision making procedures was cogently argued by Simon [14] a number of years ago. At the time of Simon's writing, computer applications in management were concentrated on dealing with programmed decisions such as processing payroll, accounts receivable and payables. This was perfectly logical as such applications presented the greatest payoffs relative to costs involved. More advanced applications were more risky and often prohibitively expensive.

Since that time, advances in mathematical decision aids and computer technology (both hardware and software) have been rapid. For example, commercially available data base management systems (DBMS) now make it economically feasible to manage data bases consisting of millions of characters. Subsets of data (for example, information about an employee or a group of employees in a personnel data base) can be retrieved and displayed at a terminal in a matter of seconds. Thousands of such systems are already installed and many more are expected in the future. Cardenas [4] and Kroenke [13] contain surveys of commercial DBMS.

Mathematical and statistical packages which can efficiently handle large amounts of data are also widely available. These include software systems for statistical analysis (for example, Statistical Package for the Social Sciences, SPSS) and mathematical programming (e.g. MPSX, APEX III). These packages permit large problems to be solved in a cost effective manner for many users.

Many of the packages have been designed to be easier to use than some of the earlier programs, but a problem still exists in making powerful data management and computational tools available for effective use by non-technical managers. This is the question which is attacked by those working in the area known as decision support systems. The key feature of decision support systems is the managerial orientation in terms of the type of decisions which they are designed to support and the manner in which they interface with the user. A DSS is intended to be used by a manager as a support tool in reaching a decision rather than having a programmed decision. The manager uses the DSS interactively in an unstructured, or perhaps quasi-structured, manner from a terminal as an aid to reaching various managerial decisions. This procedure involves a data base and either a data base management system to manage and access the data or

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math/stat packages for data analysis. Alter Li] has defined two basic types of DSS depending upon whether the system is model-oriented or data-oriented.

Model-oriented systems consist of a data base and software for solving a model or models defined on the data. For example, the data base might contain sales data and the model might be a regression system for sales projections.

Data-oriented systems consist of a data base and a data base management system to update and retrieve specific data items. Retrieval may be done through an interactive query language. Query languages are designed for use by non-programmers. Query languages are used to retrieve subsets of data and are unlike programming languages because one command may be totally independent of previous or subsequent commands. For example, in the query language used as an example in this paper, the user might type the command PRINT SALES(P1); and the system would respond by printing the value of SALES for product 1 for the current period. The subscript indicates the product

(1) and SALES is the name of an item in the data base. The query language would have default assumptions, such as providing the information for the current period unless commanded otherwise.

### WHY IN A POLICY COURSE?

In simulations students must establish the organizational structure of their firms, allocate responsibility and authority, and, more importantly for our purposes, establish corporate objectives and policy and develop procedures for making the required decisions to implement such policy. We assume that a major objective of the course is to integrate functional areas and to relate the decision making process to the policy making function. The use of a DSS in conjunction with the simulation program can provide two benefits: (a) the mechanics of the decision making process are simplified so that the student may concentrate more on the policy and/or objectives aspects of the managerial decision process, and (b) the student begins to become accustomed to the concepts and ideas involved in establishing and using a DSS within the operations of a business. Some of the points relating to the MIS/DSS material which may be effectively brought out in the policy course could be:

1. The interaction of corporate goals and objectives with information used in the decision making process may be examined. In planning the MIS/DSS and in using it, the student becomes more acutely aware of the role which information plays in these important aspects of the managerial task. For example, the firm may set as an objective the achievement of some specified sales level by the end of the third period. The DSS may be used to examine the impact of various methods which they might use to achieve this goal, and time may be spent on considering the policy implications of these actions rather than just on the mechanical collection and processing of the data.

2. The firm may use the DSS to aid in selection of appropriate policies for their firm. For example, the DSS can be used to ask "what if" type questions for the purpose of evaluating the potential impact of alternative policy positions. This would be in addition to the usual philosophical questions which must be raised in considering policy questions. Where trade-offs are necessary between desires and possible achievement, this ability to explore alternatives can be of considerable importance to the manager.

3. The DSS may be used as an aid in assembling the data necessary to use some optimization tools, or perhaps in learning where such tools are appropriate in the decision making process. This can have important policy considerations in helping the firm to establish policies on matters such as where and under what conditions they would use satisficing rather than optimizing decision techniques.

4. The use of the simulation-DSS package gives students the opportunity to develop their own MIS/DSS within a corporate-like environment. In this sense it offers many of the same advantages quoted for the business simulation itself in that it provides a non-threatening atmosphere for learning as well as providing the experience of actually using the results of their efforts, providing the feedback which is so necessary in the educational process. This experience highlights the role of management in the development process and provides a good background for development of actual systems in the future.

### USING SLIM

SLIM (System Laboratory for Information Management) [7] is a simulation based DSS designed for use in the educational environment. It provides some major extensions to one management simulation, The Business Management Laboratory [9;10], that make it particularly well suited to illustrating the development of DSS's and the type of managerial involvement necessary to insure their effectiveness. SLIM has been designed expressly for demonstrating MIS and DSS concepts. The SLIM query language can be covered in class in about three hours and is easily mastered by non-technical students. The SLIM data base contains 127 items for each firm for each period simulated (simulation period is a calendar quarter). New data is automatically added to the data base by BML as it processes decisions for the student firms and generates the standard simulation reports. Therefore, as soon as the administrator has obtained the students' input (decisions) and executed the B4L program with this data, the students may access the data base to retrieve the new data via the SLIM query language.

Each firm has full access to information about their own firm and limited access to information about the other firms in the simulation. This is essentially the "public" information which would be available in the real world. For example, they would always have access to the quoted prices of the competitive firms, but such information as the amount of receivables factored would be strictly private and available only to the "owning firm. Access to some data is delayed to simulate information that is released in annual reports, or which would simply require an extended period to collect in the real world. Also, when certain data is retrieved which concerns another firm, an error term is included to simulate data collection error.

Since a complete discussion of the SLIM query language and data base is beyond the objective of this paper, we will simply use a few examples to illustrate how it can interact with the decision making and planning process for the simulation firms. As part of the decision making process, each firm must make policy decisions as to such matters as compensation for sales representatives (salary, commission, or some combination). Assume that one firm is reviewing its current sales compensation policy with the Objective of establishing a more aggressive marketing strategy to support their policy of attempting to be a "market

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leader." They wish to examine the current status of such competition for the first six firms in the industry, so they enter the command:

```
LIST COMM (F1-6), SALA (F1-6);
```

LIST is a verb in the SLIM query language to permit the retrieval of a set of data and report it in tabular fashion. COMM is the data item name for COMMISSIONS and SALA is the data item name for base SALARY. (SLIM actually requires only the first four characters of the item name, and only those four are included in the resultant printing.) The subscripts in the command indicate that information for firms 1 through 6 is to be retrieved and reported. Because no subscript was indicated for the relevant period etc., SLIM uses default assumptions (for this example the assumption would be for the current period). The report produced by this command would appear:

COMM	SALA
2.10	2000.00
.75	3500.00
1.90	2500.00
2.75	2000.00
1.50	3000.00
2.50	2000.00

Suppose they now wished to consider the average commission and salary for this group of firms, they could then type the command:

```
PRINT AVERAGE (COMM (F1-6)), AVERAGE (SALA (F1-6));
```

and the Output would be:

AVE	1.92
AVE r	2500.00

where the first AVE is for COMMISSION and the second AVE is for SALARY. They could also issue a command such as:

```
COMPUTE A=COMM/PRICE; PRINT A;
```

This would give them some insight into the relative size of the commission being considered relative to the price of the product on which the commission would be paid. This would be important in consideration of the possibility of passing the COMMISSION along in the price of the product, which brings them back to some of the policy issues involved in adjusting their compensation schedule. Suppose that the value A were printed as 0.0234. This could have been reported in the more usual percentage form by changing the command

```
COMPUTE A=(COMM/PRICE)*100; PRINT A;
```

In this case, the number would be printed as 2.3400 to indicate a value of 2.34 percent. Commands are also available to permit them to compare their CQ4MISSION amount to the MAXIMUM and/or the MINIMUM and/or the AVERAGE values of these data items for the industry.

The students could then use this information to evaluate the compensation schedule they feel is necessary to achieve the desired sales goal considering their policies on pricing in addition to their policies on appropriate compensation levels for sales personnel. Notice how this example illustrates the interaction of policy and strategies, the decision support system, and the information necessary to make the decision. Since the students themselves

formulate policies and strategies and then have hands-on access to data via SLIM, the importance of such interactions is driven home more effectively than a mere description of the process.

As another example, suppose the firm has established certain policies concerning their liquidity goals vis-à-vis various financial ratios. The Ca4pute and PRInt commands may be used to assess their present status and, with some limitation, they may compare their firm with others in the industry. For instance,

the "quick ratio" for the firm can be computed by the command:

```
COMPUTE Q=(AR+CASH)/(AP+STL+SPL); PRINT Q;
```

where AR represents accounts receivable, CASH is self explanatory, AP represents accounts payable and STL+SPL represent the sum of two other current payables in the BML simulation. The value printed for Q is the quick ratio for the firm, and this value is retained in Q for further use in other calculations or reports if desired (until it is replaced by some other COMPUTE Q command). By similar means the firm may examine a variety of Other financial ratios for their firm as a means of implementing a control function for their financial policies. Within the limits of delays for obtaining the relevant information, the student may also examine the similar information from other firms in the simulation as a means of comparing their firm with their competition. This is a non-trivial facet of the evaluation of the practicalities of their own policies.

These few examples should be sufficient to convey how the SLJM query language can be used by students to obtain information about their firm. In doing this, students are getting hands-on experience with a system that is similar to those that may be subsequently encountered in the business world. This experience should be useful in relieving students of the initial apprehensiveness and frustrations often associated with computer use and should make them more productive managers.

Although SLIM is primarily query oriented rather than model oriented, it can still facilitate modeling and statistical analysis. In addition to the COMPUTE command, a SUBSET command permits the user to transfer data to a file in tabular form. This data can then be used as input for external statistical or other analysis programs. It is also possible for the student to prepare "canned" sets of SLIM commands. These prepared routines may be stored as files and used to replace the terminal input to SLIM. Such canned sets may be repeated as desired to generate reports in a standard format, as in a cash flow report or sales analysis.

### SUMMARY

There are several good reasons for integrating MIS/DSS material into policy courses through the use of simulation. Both policy and MIS/DSS, at least at the upper levels of management, are interdisciplinary and integrative in nature. The experiential role served by simulation is widely accepted in policy courses and is widely used. This same experiential effect may also be extended to include the concepts of decision support systems within the broader scope of management information systems.

Simulation requires that student managers formulate company policies, organizational strategy, and decision-making procedures. This provides the opportunity for illustrating the interrelationships among policy/strategy, decision procedures and

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decision support systems. When a system such as SLIM is available, the query language can be used to reinforce these notions in a highly realistic manner. There is a vast difference in simply talking about data base management, query languages, etc. , and actually providing hands-on access to a dynamic data base that the student understands in a realistic environment. This approach allows the efficient integration of diverse topics into a single course in a coherent manner and thus permits the achievement of multiple educational objectives. The experience of using the query language within a managerial context should prove very useful to students in their future role as managers.

### APPENDIX

#### Data Dictionary

The following items are available in the BML-SLIM data base. They are replicated, where necessary, for each firm for each period, with access controlled by individual firm passwords.

#### Environmental

BBI	Bull-Bear Index (stock market)
EI	Current Economic Indicator
EINQ	Economic Indicator Forecast, next period
EINY	Economic Indicator Forecast, next year
FUT	Current Period Futures Quotation (material)
PRAW	Current Period Spot Quotation (material)
STBR	Current Period Bill Rate (e.g. T-bills)

#### Finance and Administration

AC	Administrative Costs
AP	Accounts Payable
AR	Accounts Receivable
ARF	Accounts Receivable to be Factored
BL	Net Earnings (Bottom Line) after taxes
BOUT	Outstanding Bonds
CASH	Cash Assets
COGS	Cost of Goods Sold
CR	Credit Rating
DIVD	Dividends Declared, current period
FC	Fixed Costs
FE	Factoring Expense
FVBO	Change in Face Value of Bonds (sale or call)
IE	Interest Expense
IT	Type of Short-Term Investment
ME	Miscellaneous Expenses
OE	Owners Equity
PIC	Paid-in Capital
SALES	Sales Revenue
SOFF	Number of Shares Stock Offered
SOUT	Number of Shares Stock Outstanding
SP	Stock Price, last closing
SPL	Outstanding Special Loans
SSP	Stock Sales Price, new issue
SSR	Stock Sales Receipts, new issue
STI	Short Term (90 day) Investment, amount
STII	Short Term Investment Income
STIR	Short Term Investment, rate
STL	Short Term Loan
STLO	Short Term Loans Outstanding
TAX	Tax Liability
TL	Term Loan Balance
TLIR	Term Loan Interest Rate
UBD	Unamortized Bond Discount

#### Marketing Sales

ADV	Advertising Budget (prod, area)
BO	Backorders (prod, area)
COMM	Sales Commission (prod)
LS	Lost Sales to Stock Out (prod, area)
MK	Market Share (prod, area)
PRICE	Price (prod, area)
QC	Quality Control Budget
QC2%	S of QC Budget which goes to product 2
RD	Product R and D (prod)
SAL	Salary for Sales Representatives
SC	Total Sales Compensation, current
SHIP	Flag to indicate shipping policy
SREPS	Number of Sales Representatives (by area)
SV	Sales Volume, units (prod, area)
TRAIN	Sales Trainees, current
UTX	Units Transshipped (prod, area)

#### Plant and Production

CE	Capital Expenditures, current
CPC	Change in Production Capacity (stage, area)
DEPR	Depreciation Charge
FGI	Finished Goods Inventory (prod, area)
FGUC	Finished Goods Unit Cost (prod, area)
ICC	Inventory Carrying Charges
MAIN	Plant Maintenance Expenditures (stage, area)
PC	Plant Capacity in labor-hours (stage, area)
PLAN	Book Value of Plant
PSB	Process Study Budget
PVFS	Production Volume, first shift (prod, area)
PVSS	production Volume, second shift (prod, area)
RMI	Raw Material Inventory (mat, area)
RMO	Raw Material Orders (mat, area)
RMUC	Raw Material Unit Cost (mat, area)
SS%	Second Shift Production Available, r. e. first shift (area)
TPC	Total Production Costs (prod, area)

### REFERENCES

- [1] Alter, Steven, "A Taxonomy of Decision Support Systems, Management Review, April, 1977, pp 39-56.
- [2] Asenhurst, A.L. (ed), "Curriculum Recommendations for Graduate Professional Programs in Information Systems," Report of the ACM Curriculum Committee on Computer Education for Management, Vol. 15, No. 5 (May 1972), pp. 363-398.
- [3] Burch, J. G., and F. H. Sträter. Information Systems: Theory Practice, Santa Barbara, Calif., Hamilton Publishing Company, 1974.
- [4] Cardenas, Alfonso F., Management Systems, Allyn and Bacon, Inc., Boston, Mass., 1979.
- [5] Couger, J. Daniel, "Computers and the Schools of Business," Decision Line, Vol. 9, No. 5, September, 1978, pp. 496-506.

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- [6] Courtney, J. F., J. M. Bierer, T. G. Luckew, J. Kabbes, "Using Management Games as an Aid in Teaching MIS Design," Decision Sciences, Vol. 9, No. 3, July, 1978, pp. 6-7.
- [7] Courtney, J. F. and R. L. Jensen, System Laboratory for Information Management, Atlanta, Ga., developed under a grant from Exxon Education Foundation, 1978.
- [8] Dickson, G. W., and Thomas Dock, "Graduate Professional Programs in Information Systems: A Survey," Interfaces, Vol. 6, No. 1 (November 1975), pp. 38-43.
- [9] Jensen, R. L. Administrators Manual for Business Management Laboratory, Dallas, Texas, Business Publications, Inc., 1977.
- [10] Jensen, R. L. and D. Cherrington, Participants Manual for The Business Management Laboratory, Dallas, Texas, Business Publications, inc., 1977.
- [11] Kanter, Jerome, Management-Oriented Management Information System, Englewood Cliffs, N. J., Prentice-Hall, 1972.
- [12] Keen, Peter G., and Morton, Michael S. S., Decision Support Systems: An Organizational Perspective, Heading Mass. , Addison-Wesley Publishing, 1978.
- [13] Kroenke, David, Database Processing: Fundamentals. Modeling. Applications, Palo Alto, CA, Science Research Associates, 1977.
- [14] Simon, Herbert A., Shape of Automation for Men & Management, New York, Harper and Row, 1965 (See especially Part III, "The New Science of Management Decision").
- [15] Vaszonyi, Andrew, "The Information Systems Option in Master of Business Administration Degree Programs," Interfaces, Vol. 4, No. 4 (August 1974), pp. 12-17.