Association for Information Systems
AIS Electronic Library (AISeL)

ICIS 1980 Proceedings

International Conference on Information Systems (ICIS)

1980

INFORMATION SYSTEMS SUPPORT FOR ASSESSMENT OF MANAGEMENT PERFORMANCE: AN EXPERIMENTAL EVALUATION

James A. Senn
State University of New York - Binghamton

Jerri L. Frantzve
State University of New York - Binghamton

Follow this and additional works at: http://aisel.aisnet.org/icis1980

INFORMATION SYSTEMS SUPPORT FOR ASSESSMENT OF MANAGEMENT PERFORMANCE: AN EXPERIMENTAL EVALUATION

JAMES A. SENN

JERRI L. FRANTZVE

School of Management
State University of New York, Binghamton

ABSTRACT

This paper reports the results of a study to determine how individual managers assemble information from automated systems when the task is evaluating organization performance. An experiment was conducted in which managers were given varying forms of information over a period of time and required to accumulate the information they would need for a later evaluation decision. As the results show, there are differences in the way individuals select and assemble reported information system design practices.

1. INTRODUCTION

A substantial amount of experimental research has been conducted to evaluate the impact of selected information system attributes on individual decision making and problem solving. In these studies, the emphasis has been primarily on the processing mode of the information system itself together with the form in which information is presented to the user. However, little attention has been paid to the process the individual manager employs in assembling information produced by the system to evaluate a business situation.

This paper reports the results of an experimental study in which individuals were asked to evaluate management performance and business operating success in a simulated environment. As part of the experiment, participants were asked to assemble and record, from regularly distributed reports, the information they felt they needed to evaluate management at the end of a longer operating interval. As the results will show, there are important differences in the way individuals select and assemble reported information for such an evaluation. These results relate directly to current information system design practices.

2. PREVIOUS STUDIES

A substantial amount of research on information system structure has been undertaken during the last 10 years to study the effect of different information processing and individual characteristics on decision making. In these studies, various types of information systems (e.g., on-line versus batch) producing selected types of information in varying forms (e.g., raw versus summary), using differing presentation methods (e.g., hardcopy versus screen display) were investigated. Most of these investigations were carried out in controlled environments, although some were conducted in open field settings. Surveys of these types of studies are found in (7, 9, 17).

In addition to varying information system attributes, a substantial amount of attention has been paid to the role of individual differences in use of information systems. By identifying various individual differences of persons using specific types of information systems, it has been possible to assemble a set of beliefs about the impact of these variables on decision quality. The individual difference research related specifically to information systems is summarized in (4, 20).

Differences in individual cognitive approaches have attracted much of the research attention. Studies of field independence/dependence indicate that individuals capable of pulling specific stimuli from complex situations (field independence) tend to prefer detailed, aggregate information (3). Field dependent individuals, on the other hand, require more information and more time to process information.

117

Zmud (20) notes that while the various cognitive complexity dimensions are recognized as influential, the research concering them is sparse. Individuals high in integrative complexity -- those who prefer to deal with situations which involve interrelationships among the elements -- have been found to have the ability to handle more complex information. Cognitively simple people seek the least complex, most direct solution to a problem or situation, while cognitively complex individuals prefer more intricate problems and can tolerate more ambiguity (15). Research regarding hierarchial complexity reveals that individuals high on this dimension prefer situations with several levels which require the application of specific rules (17). Inconsistent findings regarding heuristics and systematics have confused this area of research (2), indicating the need for clear, controlled studies of these behaviors. The literature related to the information system structure and individual difference variables is summarized in Table 1A and 1B. Results and conclusions are still preliminary in many cases. In general, it appears that both quantity and form of information are related to characteristics of individuals using the information (i.e., there is an effect attributable to individual differences). In addition, the extent to which individuals search for information and the amount of time it takes to process it is also affected by individual differences. For certain types of indiviual differences, however, little evidence has been gathered that directly relates to information systems.

When examined in terms of the relation with dependent variable performance characteristics, it has been shown that certain information system attributes produce noticeable differences in performance. Decision time, decision quality, and confidence in decision performance have all been investigated. These results are summarized in Table 1B.

The above research paradigm is helpful and has produced a substantial amount of information useful in design of automated systems. It is an approach that needs to be continued. However, it is time to move into the central element in the information processing model, namely the process component. The most significant research question lies inside the processing element. That is, we need to identify and understand how individuals process information produced through automated systems. A significant amount of research has been conducted in psychology to understand human information processing in general (1, 2, 10, 15, 16, 18). However, it is important to know more specifically the relation of this processing to computer-based information systems.

We do not yet have answers to such fundamental questions as:

1. How do individuals structure information needed to meet explicit decision making goals and objectives?

2. What factors affect the ability of differing types of individuals to recognize the structure and content of information contained in reports?

3. What processes do individuals use in assembling information from reports to conceptualize a situation so that a decision can be made or action taken?

3. THE EXPERIMENTAL EFFORT

This paper reports the results of the first in a series of experimental programs being conducted by the authors to study the process of individuals using information systems in management settings. The study was aimed at determining how individuals assemble and organize information in evaluation situations and how the various methods they use impact performance.

3.1 RESEARCH ACTIVITIES

An experiment was conducted in which individuals assumed the role of executive managers who in turn have lower level managers reporting to them. In this role, they were told they had to assess the performance of each lower level manager by examining reports containing predetermined assessment information about sales, costs, and profitability. Budget information was contained on the report so the participants could quickly see what performance should have been in comparison to actual performance. The executive managers also had to determine whether overall organization profitability, stated in terms of contributions to cover profits, financing, and operating expenses other than labor and cost of goods sold (i.e., contributions is sales less cost of goods sold and labor cost) was adequate. A minimum contribution level of $39,700 per week was required to consider the week's business a success. Reports were produced for several simulated weeks activities.

Participants in the exercise were told that along with their weekly assessment of performance, they would also be required to look at monthly activities to determine whether management, cost control, and profitability were adequate. It was

118

	INTEGRATIVE COMPLEXITY	CONCEPTUAL SIMPLICITY	HIERARCHIAL COMPLEXITY	FIELD DEPENDENCE/ INDEPENDENCE	HEURISTIC/ ANALYTIC	INTELLIGENCE
QUANTITY OF INFORMATION	Complex can handle more conceptual information	Complex use more complex and less simple information	--	Field Indep. require more information	Heuristic show higher data usage	High intel. seek more information
FORM OF INFORMATION	—	Complex prefer aggregate rather than raw information	—	Field Indep. prefer detailed aggregate information	Heuristic prefer dis-aggregated reports; Analytic prefer disaggregated reports	High intel. prefer quantitative, disaggregated information
EXTENT OF SEARCH FOR INFORMATION	Low are most effective in one-rule situations	Complex search for more information	Low uses few rules	Field Indep. search for more infor-mation	Heuristic search for and select more data	High intel selects information more effec-tively
PROCESSING TIME	—	Complex require more time due to generation of more alternatives and more careful formulation of decisions (but less confidence in their de-cisions)		Field Indep. require more time	Heuristic need more search time	High intel. process selected information more quickly.

_ denotes area where relation is unknown and in need of investigation

Table 1A

Relation of Selected Individual Differences To Information Processing

	DECISION TIME	CONFIDENCE	DECISION QUALITY
FORM OF INFORMATION	Summary form takes less time	No difference due to form of information	Graphic information may produce better quality decisions. No difference in quality attributable to use of summary versus detail information
PROCESSING MODE	On-line is faster. Users of batch/printed reports take more time	No difference due to processing mode	No difference due to processing mode when measured by cost control, profit maximization, etc.

Table 1B
Relation of Selected Performance Measures To Information Processing

pointed out that monthly assessments were important to have a fair and accurate perspective on performance. Presumably someone who just barely missed cost and profit targets one week ("had a bad week") could make them up over the course of a month (or vice-versa).

Persons involved in this exercise were informed that the end of the month evaluations would be done in the same manner as the weekly ones (see Figure 1 for the evaluation questions used). However, they were advised that the weekly reports would not be available and that they therefore would have to record whatever information they felt would be most useful to them in doing the monthly assessment. No suggestions were made by the investigators about how or what to records. Participants were, however, asked to make all notes and recordings on a separate green sheet of blank paper so that all the information they selected from each week would be together. All persons recording information did so only on this green form.

People involved in the experimental activities ranged from 23 to 53 years of age, with the majority between 26 and 35. Approximately 34 percent were in military command and control positions (e.g., commander of training operations, pilot, aircraft commander, etc.). Others were in management positions (store manager, personnel management, etc.) While still others were in staff or operating level positions (auditor, teacher, salesperson, etc.). In additon, 20 percent of the civilians were ex-military personnel. All possessed college degrees, with 25 percent also having Master's degrees. One indiviual had received a Ph.D in a nonbusiness/nontechnical field. The persons participating in this experiment were members of a weekend instructional program offered through the U. S. Air Force at a Strategic Air Command installation. Although some persons were enrolled in the program for master's degree credit, the class was not a typical university course, nor were the persons enrolled typical students.

3.2 HYPOTHESES

Prior to undertaking the experiment and data analysis, the following general hypotheses were developed:

1. The amount and form of information recorded by participants for the monthly evaluation would vary by individual differences.

2. The way individuals structured the information they accumulated for the

monthly evaluation would influence the quality of their assessment as well as how confident they felt in their evaluation.

4. RESULTS

Data collected from the experimental activities described above were analyzed to determine how individuals processed information in a setting where performance could clearly be assessed as adequate or inadequate and to determine whether the reason for performance could be ascertained. An analysis of variance model was used.

4.1 STRUCTURED IMPOSED ON INFORMATION

An important aspect of the process component discussed earlier is how individuals choose to structure information produced in a batch environment for later retrieval and use (i.e., the monthly evaluation). Prior to the experiment, the investigators anticipated that a high percentage of persons would accumulate the monthly decision information for evaluating managers/departments and overall costs by using a structure showing percent above or below budgeted levels. It was also anticipated that the experimental form of information they received (summary or aggregated: 3, 5, 6, 8) would not affect the way in which the individuals chose to structure the information.

Summary informtion included sales, cost, contribution and budget information for each department and for the organization as a whole. Aggregate information included only department contributions and totals for sales, costs, and contributions.

As predicted, there was no significant difference due to condition of the way individuals chose to structure the information they maintained. Likewise, the structure these individuals imposed had greater variability than expected. As shown in Table 2, six different methods for organizing the information were used by participants. The most frequent method of structuring the information was to use budget percentages. Since performance criteria were stated as percent of budgeted amount achieved (e.g., 110 percent to represent being 10 percent over budget and 90 percent meaning 10 percent under budget), this was not surprising. Thirty-seven percent of the decision makers used this method of structuring the information. The second largest group of persons used a structure that combined budget percentages and dollar sales/cost/contribution levels. Although

121

ACTIVITY SUMMARY

MAY 3, 1980
=================

	DEPARTMENT 1	DEPARTMENT 2	DEPARTMENT 3	DEPARTMENT 4	TOTAL
SALES	6,894	8,950	35,598	1,251	52,693
UNITS	574	2,753	890	74	
% Budget	100	102	91	100	94
LABOR	2,827	3,030	4,855	620	11,332
HOURS	707	758	971	103	
% Budget	100	100	100	100	100
COST OF GOODS	2,651	1,741		375	4,767
BEGIN INVENTORY	15,376	6,348		1,188	22,912
PURCHASES	9,897	2,495		255	12,647
END INVENTORY	22,622	7,102		1,068	30,792
% Budget Cost gds	100	99	—	100	100
CONTRIBUTIONS	1,416	4,179	30,743	256	36,594
% Budget	102	105	90	100	92

[ ] Performance   IS   due to management

[ ] Performance   IS NOT due to management

Most successful department:
    Department 1   2   3   4

Least successful department
    Department 1   2   3   4

Best area of cost control:
    labor   goods

Best MANAGED department:
    Department 1   2   3   4
Worst MANAGED department:
    Department 1   2   3   4

              IS
Problem   due to management
         IS NOT

Figure 1
SAMPLE REPORT WITH EVALUATION QUESTIONS

STRUCTURE OF INFORMATION	n	%	SUMMARY CONDITION	AGGREGATE CONDITION
1. Percent of Budgeted Amount *	18	37	11	7
2. Dollar Totals and Percent of Budgeted Amount	16	33	6	10
3. Narrative Description	9	18	4	5
4. Ranking by Performance	3	6	3	0
5. Nothing Recorded	3	6	2	1
	49			

* Includes two (4 %) who also used symbols to highlight information they selected for recording. Both were in summary condition.

Table 2

Information Structuring Process Used For Extended Evaluation Decision

	contributions	92	106	66	88	102
		5/3	5/10	5/17	5/24	5/31
Most Successful		2	2	3	3	3
Least Successful		3	1	1	2	4
Best Cost Control	labor	same	2	4	same	(blank)
	goods	2	2	2	same	(blank)
Best Managed Department		2	2	3	3	1
Worst Managed		4	1	1	2	2

Table 3

Sample Actual Participant Response Using Ranking Structure

participants had been told that (other than for total organization-wide contribution) performance levels, but not dollar cost/performance data would be used for monthly assessment, a large percentage (33 percent) chose to incorporate this data into their information just the same. Apparently persons in this group chose to carry the actual dollar amounts along "just in case" the data would be needed.

The third most frequent group was a surprise. Members of this group, eighteen percent of the total, chose to retain neither budget nor financial data. Instead, they formulated a narrative statement about department performance, sales influence, and cost management for each week. All their evaluations, rankings, expectations, etc. were stated in narrative rather than numerical form. Representative weekly statements by individuals in this group included:

> Performance is unacceptable. Contributions 92% of total. However, all departments meet or almost meet goals. With this in mind a management problem could be key here. The management problem could be especially notable with regard to the handling of goods sold.

> Contributions exceed budget by 6%, even though two of the four departments did not meet budget for the week. It is expected that management has done some effective cost cutting.

A fourth group of individuals used only a ranking structure to retain information about how lower level managers were performing in comparison to expectations. A typical weekly information set is shown in Table 3. Only three of the forty-nine participants used this method.

Three of the individuals (6 percent) kept no written records on which to base their monthly evaluations. However, they participated in the entire simulation, doing all evaluations and responsing to all questions asked of them. Even though they recorded no written information, they were monitoring manager performance. We will examine this group of subjects more in the next section.

The final group is actually a subset of those persons who maintained only performance-against-budget data. Two persons (4 percent) augmented their data through use of symbols. the symbols highlighted high and low performance in a manner where one would quickly be attracted to particular departments and/or cost categories before looking at any other data. A sample report using the symbols to augment other structuring methods is shown in Figure 2.

4.2 DECISION QUALITY

The quality of the decisions people made in evaluating performance levels was measured in the following ways:

1. Whether managers were able to determine if overall organization performance met the specific performance criteria established to indicate minimum acceptance levels.

2. Whether managers were able to determine if the reason for performance being acceptable or not acceptable was due to management (meaning control of costs) or due to sales levels (which were not controllable).

3. Whether managers were able to identify the high and low performance departments accurately. Several criteria were used to measure this variable, including cost control, overall department success, and quality of department managers.

4.2.1 Assessment of Overall Performance Levels

All participants were asked to evaluate whether the organization was achieving its performance goals, stated in terms of contribution to profit. As indicated previously, the necessary contribution level was fixed at $39,700 per week, independent of sales levels, cost incurrences, or labor expenses. Therefore, for a four week month, the minimum contribution level would be $158,800. For a five week month, it would be $198,500. We asked managers participating in the study to evaluate the organization on this criteria at the end of a five week month. For the preceding weeks they maintained data to respond to this evaluation on their "green sheets."

The most accurate evaluation of overall organization performance (in terms of contribution to profits) was the group of two persons who chose to use symbols to highlight their budgetary data. Both individuals monitored total performance levels accurately.

The next most accurate managers in assessing overall performance were those who kept no information. Two out of the three persons in this group were correct in their assessment of having adequate total contributions.
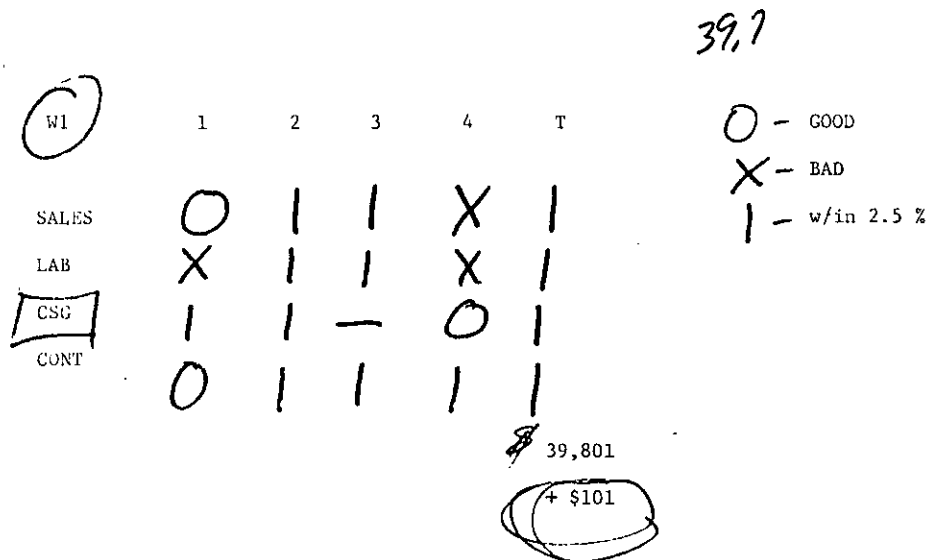
124

Figure 2

Sample Actual Participant Response Using Symbol Structure

Persons who maintained information structured by budget percentages or by a combination of dollar and performance to budget information were somewhat low in accuracy of assessment. As shown in Table 4, 44 and 25 percent of managers in the two respective groups were able to correctly assess monthly contribution to profits when they were required to maintain weekly performance data.

Individuals who organized the performance information in a narrative fashion were even lower in accuracy. Only 11 percent of this group accurately assessed contribution to profits.

The least accurate managers were those who used a ranking structure to organize the performance data. None of the persons in the group who chose to use this method of structuring their data correctly evaluated organization-wide performance when measured in terms of contribution to profits. This result is not entirely surprising since the ranking method would be more appropriate for evaluation of internal departments than for the organization as a whole. Apparently these persons neglected to consider this decision when they adopted their structuring approach.

4.2.2 Assessment of Departmental Performance.

In addition to evaluating the entire organization's performance for the month, we asked participants to evaluate the individual departments as well. In their role as supervisory managers, they were asked to use the same criteria for the monthly decision as they were using on a weekly basis. They were thus familiar with what would be asked of them and could therefore accumulate the data they wanted from each weekly report.

Managers were asked to evaluate which department was most successful and which was least successful for the period. This meant focusing on the combination of cost management and accumulation of contribution to profits. These factors, along with sales levels, were budgeted. The managers were told that budgets were realistic and could be met, so they could assume no problems in unachievable

125

STRUCTURE OF INFORMATION	OVERALL PERFORMANCE	MOST SUCCESSFUL DEPARTMENT	LEAST SUCCESSFUL DEPARTMENT	BEST MANAGED DEPARTMENT	WORST MANAGED DEPARTMENT	TIME (Min)	CONFIDENCE
1. Percent of Budgeted Amount	44 %	51 %	58 %	71 %	59 %	6.25	60 %
2. Dollar Totals and Percent of Budgeted Amount	25	31	50	63	56	6.2	52
3. Narrative Description	11	56	22	56	33	5.1	66
4. Ranking by Performance	0	67	100	67	67	6.0	56
5. Nothing Recorded	67	0	33	55	33	4.3	40
6. Symbols Used	100	0	100	100	100	6.0	42

Table 4
EXPERIMENTAL PERFORMANCE BY STRUCTURE OF INFORMATION

budgets. They were also informed that any performance within +/-2.5 percent of budget should be considered acceptable performance since it is usually impossible to hit a 100 percent budget. Anything outside of the 2.5 percent range would be a disappointing performance. A score of 10 was given to correct evaluations and 0 to incorrect ones.

The two groups most accurate in evaluating departments were those who had chosen to use symbols and ranking structures, although the symbol group was not consistent. The least accurate group consisted of those persons who retained no weekly data. Persons who used budget or combined dollar/budget data ranked in the middle of the condition groups.

We also asked the managers to evaluate the department managers by determining which department was the best managed and which was the worst, using previously stated performance criteria. The persons who chose to use symbols to structure their data were most accurate. In fact, they were 100 percent accurate in identifying both the best and worst managed departments. The group with no weekly information again was lowest in accurate assessment.

The two groups who chose to use budget and combined dollar/budget structures were again ranked in the middle. However, they were slightly more accurate in evaluating management success than department success. Both groups were better able to evaluate this type of performance than the mangers who used narrative data. These results are summarized in Table 4.

4.2.3 Other Performance Factors

In many situations where information systems are used, the time required to formulate a decision strategy or to assess events is important. The amount of confidence individuals have in there decision or evaluation also needs to be known. If certain information systems characteristics affect these performance variables, we want to know about it. The study examined these factors in relation to how individuals chose to structure the information they needed for the monthly assessment.

Decision time in this experiment is the elapsed time between the start of the monthly assessment period and completion of the assessment questionnaire. In other words, it does not include the time used each week to assemble the data being saved from the weekly reports. In the monthly evaluation (see Table 4) the most time (over 6 minutes) was required by the persons using budget or combined dollar/budget data. The time needed by

persons using either of these structures was almost identical. Persons using symbol or ranking structures needed only slightly less time. The individuals who assembled narrative structures used still less time, and persons who maintained no information as might be expected, used the least amount of time (just over 4 minutes). Those who chose to maintain no information required about 60 percent of the time needed by the other managers. Thus it appears they did give thought to their responses and did not simply respond haphazardly. This is consistent with the performance levels mentioned earlier for these individuals.

Persons participating in the experimental program were asked to state how confident they were in their assessment decision. To determine confidence, we asked them to compare themselves to how other persons would have done when asked to make the same evaluation. Participants filled in the blank in the following statement:

If 100 managers had to make the same determination/evaluation using this information my decision would be better than _____ of the other persons.

The most confidence was demonstrated by the group who had chosen a narrative structure. Persons using budget data were the next most confident followed by the group that used a ranking method. There was a substantial difference in confidence between persons using budget and combined dollar/budget (see Table 4). Persons using a symbol structure showed low confidence. However, the lowest level of confidence was demonstrated by the group who chose to retain no data from the weekly reports (recall however, that this same group ranked high in accuracy of overall evaluation). Due to the small cell sizes resulting from the diverse structure groupings, it was not possible to conclude significant statistical differences, although the distinctions discussed above are evident.

4.3 INDIVIDUAL DIFFERENCES

Prior to the experimental session, all participants were classified according to two individual difference measures: field dependence/independence and cognitive complexity using standardized measurement instruments (i.e., the Embedded Figures Test and the Cognitive Complexity Questionnaire (11, 12, 13, 19). These instruments were administered to classify persons by the way they impose structure on their information environment and to determine any characteristic styles of dealing with information.

127

While several studies have indicated that such characteristic styles of handling stimuli may interact with information form and format, our results did not support any clear-cut patterns in these individual differences. While there were differences in accuracy, confidence, etc., we must attribute these variations to some complex of factors other than those under investigation. There were no significant differences, for instance, in the accuracy of management assessment between field dependent individuals who kept track of percentages and field independent people who ranked performance.

It may well be that the differences in information structuring preferences are a result of exposure once on the job rather than characteristic styles. Thus they may be trainable. These issues are planned for more in depth examination during future investigations.

5. ANALYSIS OF RESULTS

It is clear from these results that individuals have diverse and unique ways of structuring information they need to formulate for evaluation and assessment decisions. Furthermore, the structures they use are independent of the form of the information they receive from information systems under batch processing. Even when users are provided with reports in one format which contain all relevant data needed to do performance evaluations, most reprocess and restructure the information when they need to accumulate and assemble it for more long term evaluations. This factor may have special significance for design of information systems that monitor both long and short term performance. It may be that managers will be more effective if they receive informtion in a different structure for longer term events than for frequently recurring situations. This is more important for internal unit details than for gross, organization-wide performance information.

Even when individuals are able to accumulate and assemble information into a structure they select themselves, there are differences in both evaluation time and confidence, as well as in performance effectiveness. These results tend to confirm earlier studies which infer that users do not necessarily know what information they need or how it should be presented to them. It appears that when given the opportunity to structure their own information where varying levels of assessment are necessary (e.g., organization wide versus department level), persons will select a structure that fits one level of assessment better than (and possibly while ignoring) the other. This in turn affects which level managers can accurately evaluate.

The effect of symbol and narrative structures are particularly interesting. Even though small cell sizes prevent statistically firm conclusions, it appears that using symbols to highlight certain information can improve individual assessment performance. At the same time, there is no significant increase in decision time. Their use does not lead to greater assessment confidence. Experiments conducted over a longer period of time are needed to expand our knowledge in this area.

Persons using narrative structure for information demonstrated the most confidence, which tends to confirm earlier studies that point out the common reliance on verbal and/or descriptive information in upper level management settings (14). Narrative written information is similar in structure to verbal descriptive information. Persons using this structure also required the least amount of time (other than those who had no written information) when compared to all other participants. Yet their effectiveness in evaluating performance was low for both organization and department performance assessment. Even though users of computer systems often want to substitute quantitative data in favor of descriptive information, it may be that systems designers should resist this tendency when clear performance criteria (such as being above or below budget) have been stated, regardless of the management level.

Research is necessary to study how general purpose data extraction packages and personal report files can better meet individual characteristics of the nature outlined in this study. It is not clear how reports can be customized to meet unique decision maker characteristics.

This entire investigation needs to be carried out with larger groups of individuals and over a longer duration. However, the findings reported here do suggest the need for more research in understanding how people use information produced through automated information systems.

REFERENCES

1. Bariff, M. and Lusk, E. J. Cognitive and personality tests for the design of management information systems. Management Science,23, (1977), 820-829.

2. Barkin, S. R. and Dickson, G. W. An investigation of information system utilization. Information and Management, 23, (1977), 820-829.

3. Benbasat, I. and Dexter, A. S. Value and event approaches to accounting: an experimental evaluation. Accounting Review, 54, (1979), 735-749.

4. Benbasat, I. and Taylor, R. N. The impact of cognitive styles on information system design. MIS Quarterly, 2, (1978), 43-54.

5. Chervany, N. L. Management information system: design questions from a user's perspective. Management Information Systems Research Center, Working Paper Services, MISRC-WP-71-11, University of Minnesota, (1972).

6. Chervany, N. L. and Dickson, G. W. An experimental evaluation of information overload in a production environment. Management Science, 20, (1974), 1335-1344.

7. Cooper, R. B. and Swanson, E. B. Management information requirements assessment: the state of the art. Data Base, 10, (1979), 5-16.

8. Dickson, G. W., Chervany, N. L., and Kozar, K. A. An experimental gaming framework for investigating the influence of management information systems on decision effectiveness, Management Information Systems Research Center, Working Paper Series, MISRC-WP-71-12, University of Minnesota, (1972).

9. Dickson, G. W., Senn, J. A. and Chervany, N. L. Research in management information systems: the Minnesota experiments. Management Science, 23, (1977), 913-923.

10. Doktor, R. H. and Hamilton, W. F. Cognitive style and the acceptance of management science recommendations. Management Science, 19, (1973), 884-894.

11. Goodenough, D. R. The role of individual differences in field dependence as a factor in learning and memory. Psychological Bulletin, 83, (1976), 675-694.

12. Gruenfeld, L. W. and Weissenberg, P. Relationship between supervisory cognitive style and social orientation, Journal of Applied Psychology, 59, (1974), 386-388.

13. Jackson, D. N., Messick, S. and Myers, C. Evaluation of group and individual forms of embedded figures measures of field independence, Educational Psychological Measurement, 24, (1964), 177-192.

14. Mintzberg, H. The manager's job: Folklore and fact. Harvard Business Review, 53, (1975), 49-61.

15. Schroder, H. M., Driver, M. J., and Streufert, S. Human Information Processing, New York: Holt, Rinehart Winston, Inc., (1967).

16. Tyler, L. E. The Psychology of Human Differences, New York: Appleton-Century-Crofts, (1965)

17. Van Horn, R. L. Empirical studies of management information systems, Data Base, 5, (Winter 1973), 172-180.

18. Witkin, H. H., Dyk, R. B., Paterson, H. F., Goodenough, D. R., and Kays, S. H. Psychological Differentiation: Studies of Development, New York: John Wiley Sons, (1962).

19. Witkin, H. A., Oltman, P. K., Raskin, E., and Karp, S. A. A Manual for the Embedded Figures Test, Palo Alto: Consulting Psychologists Press, (1971).

20. Zmud, R. W. Individual differences and MIS success: a review of the empirical literature. Management Science, 25, (1979), 966-979.

MEASURING USER INVOLVEMENT IN INFORMATION SYSTEM DEVELOPMENT

MARGRETHE H. OLSON

New York University

BLAKE IVES

State University of New York, Binghamton

ABSTRACT

"User involvement" in information system development and management is generally accepted as an important mechanism for improving system quality and ensuring successful system implementation. This paper critically reviews research to date on user involvement and its relationship to system quality, system use, and user attitudes toward information systems. It presents a multi-dimensional framework for defining and measuring user involvement and explains the process undertaken to validate the framework and derive an adequate measure of user involvement in information system development and management.

1. INTRODUCTION

Developing information systems to meet users' requirements has often been claimed to be a major problem of information system design and implementation. A common prescription for solving this problem is "user involvement," participation in the development process by a member or members of the target user group. The concept of user involvement is, however, poorly defined and poorly understood. Practice therefore falls far short of prescription in involving the right users in the right activities at the right times to ensure successful system implementation.

In this paper the concept of user involvement is examined. The prescriptive and empirical literature regarding user involvement is reviewed, and methodological issues regarding its measurement are discussed. A framework for defining and measuring a number of different activities that constitute user involvement is presented.

2. PRESCRIPTIONS FOR USER INVOLVEMENT

Many authors contend that user involvement positively affects the success of information system implementation. It has been suggested that a major contributor to system failure is the user not understanding how the system works, an understanding that can be acquired through participation in the system design effort (36). Others have contended that user involvement reduces the probability of misunderstandings between the systems and user groups (2, p. 173). Another suggestion is that user involvement will "reveal potential resistors and give them their chance to negotiate openly" (15). Lucas (20) suggests that involvement can have direct benefits to the user: it can be ego-enhancing, challenging, and intrinsically satisfying; it provides greater knowledge of and training on the system; and it may allow the user to retain control over system operations.

There are many different ways users can become "involved" in the system development process. One common prescription is for a representative from the user department to be selected as a member of the project team (17, 18, 27, 35). The management level of the user and the degree of involvement may vary widely. Some authors believe that the operating manager is ultimately responsible for the system, rather than a representative of the manager or a staff member, must actively participate in the design process (13, 20, 31). Others have suggested that users take full responsibility for certain aspects of development such as report design and user training (20). It has also been suggested that user management assume the leadership role throughout the entire development process (30).

Steering committees have been recommended as a mechanism for involving executive-level managers in system planning, problem definition, and implementation (18, 20). Charging users directly for development of new systems has also been suggested as a method for