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COGNITIVE STYLE AS A BASIS FOR MIS AND DSS DESIGNS: MUCH ADO ABOUT NOTHING?*

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It is commonly believed that the user's cognitive style should be considered in the design of Management Information Systems and Decision Support Systems. In contrast, an examination of the literature and a consideration of some of the broader issues involved in MIS and DSS design lead to the conclusions that: (1) the currently available literature on cognitive style is an unsatisfactory basis for deriving operational design guidelines, and (2) further cognitive style research is unlikely to provide a satisfactory body of knowledge from which to derive such guidelines. The article presents six specific bases for these two conclusions.

From a manager's pespective, the outcome of the study is a suggestion: maintain a healthy skepticism if it is suggested that paper and pencil assessments of the user's cognitive style should be used as a basis for MIS or DSS designs. From a researcher's viewpoint, the study raises two questions: (1) If our research interest is MIS and DSS design, does it seem that further research in cognitive style is a wise allocation of our research resources? (2) If our research interest is cognitive style, does it seem that the use of cognitive style as a basis for MIS and DSS designs will become an important application area?

(MANAGEMENT INFORMATION SYSTEMS; DECISION SUPPORT SYSTEMS; COGNITIVE STYLE)

1. Introduction

During the past half dozen years, there has been a surge of studies concerning the effect of cognitive style on decision making behavior or performance.[1] Many of these studies were motivated by or linked to the belief that the user's cognitive style should be considered in the designs of Management Information Systems (MIS) and Decision Support Systems (DSS) ([1], [4], [12], [14], [25], [38], and [51]).[2]

What conclusions can we draw, at this time, concerning the usefulness of cognitive style as a basis for DSS designs? An examination of the literature and a consideration of some of the larger issues involved in DSS design lead to two discomforting conclusions.

CONCLUSION NO. 1. *The currently available literature on cognitive styles is an unsatisfactory basis for deriving operational guidelines for MIS and DSS designs.*

CONCLUSION NO. 2. *Further cognitive style research is unlikely to lead to operational guidelines for MIS and DSS designs.*

Taken together, these conclusions are at variance with some widely held beliefs. It is especially important, therefore, that the conclusions be correctly interpreted. In particular, they do not state that all cognitive style research is without merit. It may be that cognitive style research has been or will be useful for career counseling, selection and

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[1] "Cognitive style refers to the process behavior that individuals exhibit in the formulation or acquisition, analysis, and interpretation of information or data of presumed value for decision making" [51]. "The cognitive style paradigm emphasizes the problem-solving process rather than the cognitive structure and capacity. It categorizes individual habits and strategies at a fairly broad level and essentially views problem-solving behavior as a personality variable" [25, p. 74]. In particular, it should be noted that cognitive style emphasizes an approach rather than an ability.

[2] For the sake of parsimony, the acronym DSS will hereafter be used to refer to both Management Information Systems and Decision Support Systems.

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placement, coaching and training, choosing procedures for designing DSS, or for other related purposes. The two conclusions simply do no speak to the issue of whether the output of cognitive style research will be useful for such purposes. They do speak to the issue of whether it will be useful as a basis for DSS designs, as is widely believed, and state that in all likelihood it will not.

§§2 and 3 of the article present six bases for the first of the above conclusions. Two of these bases apply only to the first conclusion. The remaining four bases apply to both the first and second conclusions. In a more positive vein, §4 suggests some new directions for cognitive style research that could lead to important contributions to the fields of management in general and DSS in particular. §5 contains a brief summary.

2. Bases for the First Conclusion

One basis for the first conclusion is that the cognitive style literature is, in aggregate, both weak and inconclusive. "Among the weaknesses are: (1) inadequately developed theory of cognitive styles, (2) multitude of measuring instruments with inadequately established psychometric properties (e.g., reliability and validity), and (3) faulty research designs used in empirical investigations of cognitive styles" [60]. Therefore, "Despite the potential importance of cognitive styles for management decision-making and information use, conceptual and methodological weaknesses have sharply limited the payoffs from this line of research" [61].

With regard to the matter of the literature's being inconclusive, Zmud [73] recently noted that "In contrasting the decision behavior of heuristics and systematics both consistent and inconsistent findings have been observed. Systematics have been seen to consistently prefer more quantitative information [22], and require more decision time [40], [41], [66] than heuristics. However, systematics have been found to prefer more [18], [40], [66] and less [2], [48] information and to prefer aggregated [2] and raw [3], [48], [57] data when compared with heuristics" [73]. Similarly, in their reviews, Libby and Lewis [33] and Taylor and Benbasat [61] identified a number of inconsistencies in the findings from various studies.

It may be that the literature's problems of methodological weakness and inconsistency should be treated as two separate bases for the first conclusion. On the other hand, it may be that the methodological problems cited earlier are the cause of at least some of the reported inconsistencies, and so I have treated the two problems as one.

Of course another possible explanation for the apparent inconsistencies is that we do not yet have an adequately developed theory of cognitive styles with which to interpret our findings. But if this is so, if we do not have an adequate basis for interpreting our findings, then we must seriously question whether or not we have an adequate basis for deriving DSS designs.

A third possible reason for the apparent inconsistencies is that the multitude of measuring instruments for assessing cognitive style (cf. [24], [49], [61]), in combination with the variety of behaviors and performance measures that have been studied, causes there to be a limited number of precisely comparable studies. This, in turn, may force those who summarize the literature to compare, on occasion, the results of studies that are not as comparable as the summarizer would wish they were. Thus the literature must be labeled as inconclusive, since either (1) the sparseness of comparable studies prohibits precise comparisons, or (2) the aggregation of noncomparable studies leads to the identification of apparent inconsistencies.

Let us turn now to the second basis for the first conclusion. This basis is concerned with the relative magnitude of the effects of cognitive style. Almost all of the studies contained in the literature report statistical significance. Relatively few report, as a measure of the practical significance, the proportion of the variance in the decision-

maker's behavior or performance that is attributable to cognitive style. When they do, typically only 10% of the total variance is so explained, minus or plus a few percent. Of course this measure of practical significance is not available when small sample sizes or scalability problems force the researcher to use nonparametric statistics, but whatever the reason, the problem remains—it is difficult to view the literature as a whole and to conclude that cognitive style is of practical significance. This is especially the case when one considers the facts that (1) the reported studies generally controlled sources of variance that would be largely uncontrolled in actual practice, and (2) studies where little variance was explained tend to go unreported.[3,4]

> Many researchers involved in the analysis of individual characteristics (e.g., cognitive style) as predictors of human behavior have reached a troublesome conclusion. Specifically, they have concluded that the study of individual differences as predictors of human behavior/performance have been basically unsuccessful. Researchers have not been able to predict consistently behavior/performance on the basis of individual personality characteristics. Rather, behavior appears to be (to a very large degree) determined by the characteristics of the task in which the individual is involved [11].

Although Chervany and Dickson [11] do not indicate that their statement follows from a systematic literature review, it does parallel the thinking of authorities in the field of behavioral decision theory (cf. [51], [55, p. 148]). This view, that personality characteristics account for relatively little variance in complex decision tasks, is supported by studies where a number of personality characteristics are examined (cf. [63], [70]) or where a comparison can be made between the variance explained by task characteristics and the variance explained by individual differences (cf. [43], [45], [67], [68]).

To summarize what has been said so far, the facts (1) that the literature on cognitive styles is weak and inconclusive, and (2) that to date the preponderance of evidence indicates that the practical significance of cognitive styles is relatively small, suggest that the currently available literature is not a satisfactory basis from which to derive operational DSS design guidelines.[5]

But, what of the second conclusion? Is it not likely that more and better research would provide a satisfactory basis? One would certainly like to think so, but a number of considerations suggest that the answer to this question is negative. The first and

[3] Of course, a few percent of a large number can be a number of some importance. In such cases, however, i.e., in cases where a decision can have a considerable impact, we expect to observe (a) multiple participants in the decision process and (b) extensive organizational study and review of both the problem and the choice (cf. [53], [39]). Thus, in those cases where the user's cognitive style might be of some importance, the effect of any one decision maker's cognitive style tends to be diluted.

[4] A very few studies report that a large proportion of variance was explained. In this regard we should note that, if the experimental task is very similar to items in the assessment instrument, it is inevitable that a high correlation will be observed. This is especially true when the dependent variable is performance and when the instrument tends to measure perceptual or cognitive *ability* rather than cognitive *style*. An excellent example is the very interesting study by Rouse and Rouse [50], where an instrument that tests the subject's ability to match complex images predicted up to 50% of the variance in performance on a task of finding "faults" in graphically portrayed mechanical systems.

[5] The concept of cognitive style as a predictor of decision-related behavior has high face validity. Many people, including the author, can recall instances where their subjective assessment of another person's cognitive style seemed to be highly explanatory of the person's decision-related behavior. How can we explain this discrepancy between what we "know" from experience and what we must conclude from an assessment of the literature? One answer, I believe, is that our inadvertent employment of the *availability heuristic* [64] causes us to judge the strength of the cognitive style decision-behavior relationship by the frequency of "hits" in the confirming cell of the 2×2 table, while ignoring (or not storing) data in the other three cells. Two recent reviews on overconfidence in judgment offer support for this view [15, p. 7], [42, p. 112]. Other answers may be our use of the *representativeness heuristic* [64] (particularly as this is realized through "the illusion of validity" [64]), or our susceptibility to the *hindsight bias* [51], although I find less support for these explanations than for the previous.

third of these considerations are related principally to scientific matters. The second and fourth are related to the practice of DSS design.

3. Bases for the Second Conclusion

One basis for believing that further cognitive style research will not lead to operational DSS design guidelines is associated with the fact that cognitive style is only one of many individual differences that may be relevant to designing DSS. For example, response to uncertainty [32], [70], cognitive complexity [65], [69], responsiveness to organizational norms of rationality [37], need for achievement, risk-taking propensity [62], [63], academic background, intelligence [62], [63] previous training or familiarity with the particular task or instrumentation [6], [36], [54], dogmatism [34], [62], [63] and a number of other individual differences [59], [70] are related to human information processing and decision-making behavior. Since it is highly unlikely that all individual differences would be positively correlated with one another, either in general or especially in the case of any one decision maker, it is also highly unlikely that DSS design guidelines that might follow from a particular decision-maker's cognitive style would not be in conflict with at least some of the guidelines that might follow from some other of the decision-maker's characteristics. How are such dilemmas to be resolved? Are we to build a master multivariate statistical model that draws upon the intercorrelations among all known-to-be-relevant individual differences in order to generate a set of "best-fitting" design guidelines? Of course not. Not only is simultaneously accounting for all individual differences likely to be infeasible, but the empirically derived correlations would be necessarily based on data from samples of individuals and would therefore not necessarily apply to the particular individual for whom we might be designing a DSS.

To summarize this point, further cognitive style research is unlikely to lead to operational design guidelines because (1) there are many individual differences related to decision making behavior and the task of constructing an empirically-based normative design model that accounts for all of their effects is overwhelming, and (2) even if we could build such a model, it would be inapplicable to any one decision maker because there are individual differences in the nature and extent of association among individual differences.

A second basis for skepticism concerning the usefulness of further cognitive style research for developing DSS guidelines follows from a consideration of what would be admissible and credible DSS design advice in the eyes of a practicing manager. Many would agree that it is the professional responsibility of a DSS designer, in his or her role as a decision analyst, to tactfully challenge apparent deviations between what on the one hand seems to be the most appropriate decision process, based on the decision task and setting, and what on the other hand seems to be the process implicit in the decision-maker's expressed preferences for data, decision aids, and other components of the DSS. Some managers would respect challenges to their expressed preferences for DSS features if the challenge followed from what the designer/analyst saw as the correct process. But it seems highly unlikely that very many managers would accept as admissible or credible challenges to their preferences if the challenges followed from the designer's opinion of what DSS features the manager should prefer, based on the designer's assessment of the decision-maker's cognitive style.

The third reason to question the value of further cognitive style research, for the purpose of developing DSS design guidelines, is associated with the fact that development of empirically-based bodies of knowledge is painfully slow. The problems associated with the existing cognitive style literature are so great that, by the time a scientifically satisfactory data base of empirical findings could be established, "DSS generators" [56] may well be so flexible and friendly and data accessing technology

may well be so advanced that the idea of a stable DSS design may be obsolete. Instead, users are likely to be creating, modifying, and discarding "specific DSS" [56] according to their weekly needs and whims.

This likelihood of the possibility is, of course, a matter of opinion. Given that it is, I would like to make it clearer. It seems to me that in the race between (1) management scientists aspiring to develop a cognitive style literature that is a satisfactory basis for deriving operational DSS design guidelines, and (2) management scientists and computer scientists working together to develop DSS generators and data accessing technology as adaptable as those suggested above, a person would be well advised to bet on the latter.

Finally, as a fourth basis for challenging the usefulness of further cognitive style research, again *for the purpose of deriving DSS guidelines*, consider the following question. "Even if we knew enough that we could design a DSS conforming to the decision maker's cognitive style, should we?" I am not so sure that we should. If we did design such a system, we would provide the decision maker a powerful tool for reinforcing his or her idiosyncratic predispositions. Do we want to do this? An examination of the literature on the acquisition and use of information makes clear that predispositions are often dysfunctional, at least in certain decision environments (cf. [21], [51], [64]). Given this, it is not at all clear that providing a DSS whose design conforms to the user's cognitive style is in the best interest of either the decision maker or the organization on whose behalf he or she is making decisions, as it may heighten the effect of dysfunctional predispositions. That is, if we design a DSS that supports the use of the cognitive style to which the decision maker is predisposed, but does not support alternative cognitive style(s), we may be reinforcing the use of the style that is the less appropriate, given the decision setting and task. On the other hand, providing a DSS whose features complement the user's cognitive style, i.e., whose features allow implementation of only the alternative cognitive style(s), would likely result in nonuse of the DSS or, if use is mandatory, may result in lower performance than that achieved through use of a DSS that does conform to user predispositions [5].

To summarize the point, we do not know if DSS designs should (1) conform to the user's cognitive style or (2) complement the user's cognitive style. De Waele's excellent analysis of this matter makes clear that sound arguments can be made on both sides of the issue [13].

As a consequence of this, it seems that knowledge of the user's cognitive style is unlikely to result in operational DSS design guidelines. More likely, future DSS will be sufficiently flexible that they will enable the users to employ or complement their predispositions at will, as argued above. If this is true, it suggests that it may be useful to direct cognitive style research toward the coaching and training of users concerning how they should think about and through their decision process, and how they can employ the DSS in that process. We will return to this thought in the following section.

Four arguments have been put forth in this section. Each supports the conclusion that further cognitive style research is unlikely to lead to operational DSS design guidelines. While I believe that each of the arguments has merit, it is important to note that if only one or two has merit, the conclusion has merit; each argument does not have to be valid in order for the conclusion to be valid.

Where should we go from here? Can cognitive style research be useful in the MIS/DSS field? These questions are addressed in the next section.

4. Comments and Suggestions for Future Research

At the outset we should make clear that the arguments of this article do not suggest that cognitive style research is of no use. Among the areas where its results may be useful are (1) career counseling [24], [28], [29], [34], (2) personnel selection [8], [20], [26]

and placement [35], [50], and (3) coaching and training [54], [72]. We discuss these possibilities and other matters in this section. In particular, we discuss the need and opportunity for additional cognitive style research.

Career Counseling

There are studies where a significant degree of association was found between cognitive style and some occupation (and, also, where no significant degree of association was found between cognitive style and other occupations) [24], [28], [29]. Before we can use such findings in career counseling, however, we must address four questions. (1) How replicable are the findings? (We note here that there is some evidence [15a], [15b] that these findings would not be replicable.) (2) What is the domain of such findings? (3) Do the apparent associations exist because people of that style choose that occupation, or because people of that occupation are trained and "conditioned" to use that style? (While both explanations may be valid, the counseling implications may be quite different.) (4) Do the outstandingly successful people in a given occupation conform to the prevalent cognitive style, or do they hold to it even more strongly than others in the occupation, or do they manifest a style different from the run-of-the-mill member of the occupation, or have they modified their style after they become more successful? (We note here Keen and Bronsema's finding [24] that top managers had cognitive styles different from those of middle managers.)

The answers to such questions are important to managers and management scientists, as members of these occupations are often involved in the career counseling of subordinates or students. Clearly there is a need for cognitive style research bearing on these questions. Whether management scientists should lead the way is an issue best left for another forum.

Selection and Placement and the Predictive Validity of Cognitive Style Assessment Instruments

One way that organizations attempt to increase the quality of decision making is through personnel selection and placement. This may become an important area of application for cognitive style research. "The most direct application of this work (on cognitive style) appears to be in matching managers to decision situations where their natural styles are most effective" [58]. Especially in view, however, of our earlier remarks concerning the large number of other relevant individual differences, it is clear that the instruments for assessing cognitive style must be highly predictive of decision-making behavior and performance in order to be of practical value. To date, the proportion of empirical studies that have found cognitive style to be highly predictive is very small. Let us consider the nature of the research that might lead to an increase in the predictive validity of cognitive style assessment instruments.

There are a variety of instruments for assessing cognitive style [24], [49], [61]. Unfortunately, management scientists have viewed this almost exclusively as a problem rather than, at least in part, an opportunity. The facts that the intercorrelations of scores on these instruments tend to be low [66], [73] and that some of the individual instruments assess multiple constructs [51] indicate that cognitive style is a generic construct possessing a number of subconstructs. Thus, it is somewhat surprising that there are very few studies where the predictive validity of various instruments is compared, and I am aware of no instances where it is explicitly recommended that cognitive style instruments should be compared and a choice made based on a match between instrument features and the nature of the decision setting and task. It seems that much of practical value could be gained if research were undertaken to examine the validity of the various instruments for predicting behavior or performance in different types of decision situations. What is needed is the development of a

contingency theory of cognitive style subconstructs, a theory or at least a body of empirical research that relates subconstructs and instruments to decision settings and tasks.[6]

Related to this point is the observation that today's DSS are helpful primarily in the information-retrieval and choice-making phases of the overall problem solving effort. Relatively less support is given to the problem formulation and needed-information identification phases. It may be that it is in these phases that cognitive style plays a more important role. Research that treated different problem-solving phases as different decision tasks could tell us if this were so, especially if a variety of instruments were used to aid in making this judgment.

Let us summarize what has been said here with the following. (1) It can be argued that, holding all else constant, knowledge of a person's cognitive style may be useful in selection and placement. (2) Since in almost any real situation, "all else" will not be constant, cognitive style will not be useful in selection and placement unless the predictive validity of the cognitive style assessment instrument is quite high. (3) Predictive validity will, in general, not be high unless cognitive style research moves in the direction of relating the predictive validity of particular instruments to particular types of decision situations.

Coaching and Training DSS Users

A number of studies (cf. [43], [67], [68]) and authorities [51], [55], [58] indicate that task considerations tend to dominate style considerations as predictors of decision-making behavior. In addition, for at least some tasks, this dominance may be quite appropriate, as the range of functional approaches to the decision task may be quite narrow and may not include approaches that are congruent with the decision-maker's naturally cognitive style [5], [6], [12].

To an extent these facts are often the consequence of coaching and training, two processes that organizations use to increase performance. Although the intended goal of coaching and training is in general to direct behavior, in many instances it, in effect, calls for a modification of behavioral propensities (one of which may be cognitive style). An outcome of coaching and training, then, is that those trained will have a larger repertoire of behaviors upon which to draw. A number of authorities are quite explicit about the desirability of such an outcome. Taggart and Robey, for example, offer supporting quotes from Chester Barnard, Harold Leavitt, and Henry Mintzberg, and they themselves state that managers should be able to employ "flexible, situationally dependent styles and strategies for decision making" [58, p. 188]. "Managers should be flexible in processing style . . . they are more effective if they can change their style to fit their problems" [58, p. 191].

If this is true, if managers should have (1) a repertoire of approaches to decision making, and (2) the ability to appropriately select from this repertoire, what are the implications for cognitive style research? It seems that the implications include the following:

(1) There is a need for more and better research concerning the assessment of cognitive style, as suggested by Taylor and Benbasat [61] and Zmud [73], so that coaches, trainers, and decision makers will have an accurate assessment of "natural" propensities;

(2) There is a need for contingency-focused research, research relating particular cognitive style subconstructs to different decision settings and tasks, as suggested

[6]Such contingency-focused research would cause the resulting literature to be more readily interpreted, and thus would help to alleviate the criticism that the current literature is inconclusive. In addition, the increased proportion of variance that would undoubtedly be explained would help overcome the criticism that cognitive style is of little practical significance.

earlier and by Payne [44], so that decision makers will have available a taxonomy of decision situations that is useful for matching styles to situations; and

(3) There is a need for research that will show how decision makers can be trained to employ cognitive styles other than that to which they are naturally predisposed. It may be useful, before initiating such research, to examine two sets of studies: (1) studies where training was effective in enhancing cognitive complexity (cf. [16], [17], [54]), and (2) studies examining cultural differences in cognitive style (cf. [19], [31], [47]), especially studies relating acculturation to changes in cognitive style (cf. [9], [27], [46], [71].)

It seems reasonable to believe that when the range of decision tasks is small, cognitive style will explain a larger proportion of the variance in behavior or performance than when the range of tasks is large. This fact, plus what we know about behavior modification in applied settings [23], suggests that the measurable success of coaching and training in alternative cognitive styles will be a function of the range of decision situations involved. The transfer of learning (to use other than the natural cognitive style) will be greater if the application situation is similar to the learning situation than if the situations are dissimilar. This observation reinforces the need for research such as that noted in (2) and (3) above. Clearly, there are needs and opportunities for further research on cognitive style.

The above discussion focused on an outcome, the enlargement of a decision maker's repertoire of approaches to decision situations. Let us turn now to a focus on process. Specifically, let us consider the use of cognitive style in designing training programs for decision makers in general and DSS users in particular.

Although "learning style" has received more than a moderate amount of attention from psychologists [28], [29], [30], and while Taggart and Robey have suggested that management education should be directed toward the enhancement of nonanalytic as well as analytic decision styles [58], management scientists have apparently not considered the possibility that training in the use of decision aiding techniques (e.g., operations research) or decision aiding devices (e.g., DSS) should be different for people of different cognitive styles. It is not at all clear, for example, that the procedure for teaching intuitives to perform analyses should be the same as the procedure used to teach analytics, or that the career management program to develop analytics into general managers should be the same as that used to develop intuitives into general managers.

Historically, managers, management educators, and instructors in the area of computing have addressed this matter as if it were one of "slow learners" and "fast learners." They had no choice. There were no research results to use as a basis for designing different training programs. This is another area, then, where there is a need for cognitive style research.[7] In particular, (1) there is a need for more and better research concerning the assessment of cognitive style, so that the coaches and trainers of decision makers in general and DSS users in particular will have accurate assessments of natural propensities, and (2) there is a need for research relating particular cognitive style subconstructs to different decision situations and learning situations.

DSS Design

Nothing said in this section has contradicted the two conclusions put forth at the beginning of this article. What has been said, however, does have implications for DSS

[7] I would suggest that management scientists or educators who choose to explore it begin by examining the literature related to learning styles (cf. [15a], [15b], [28], [29], [30]), as these seem to be very closely related to cognitive styles.

designs. One implication is that DSS designs should enable users to employ a variety of approaches to their decision tasks. In practical terms, this means that the DSS design effort should be directed toward creating a DSS that is flexible, friendly, and that provides a variety of options. If this focus is adopted, the matter of an *a priori* determination of the user's style *as a basis for identifying the most appropriate design* becomes largely irrelevant.

The second implication follows from the first, and also from what was said earlier in support of the second conclusion. Whether it is desirable to reinforce the user's employment of his or her natural cognitive style, or to hinder its employment in favor of an alternative style, such reinforcing or hindering should not be accomplished by constraining the nature of the DSS design. In the words of Eric Carlson, "we conclude that if a DSS is to support varying styles, skills and knowledge, it should not attempt to enforce or capture a particular pattern" [10, p. 5]. Instead, the directing of approach or style should be accomplished through coaching and training. Besides the arguments made earlier, there are two additional observations that support this position. One is that many DSS have multiple users, either at one point in time or across time as job incumbents move through the position. Thus a flexible rather than an idiosyncratically constrained design seems called for. The other observation is that not all decisions will be made using a DSS. To the extent that decision quality is increased by consciously selecting approaches or styles, there will be more opportunities for increased decision quality if this strategy of consciously selecting can be applied to both DSS and non-DSS related decisions. As a consequence of the above arguments, it seems that coaching and training may be the more desirable approach for implementing the style-selecting strategy, as its payoffs are less limited in scope than are those obtained through DSS design.

In closing this section, let us address the possibility that in some situations, at least in the near future, cost or technological considerations will not allow the flexibility in design that Taggart and Robey [58] and others suggest is called for and that technological advances suggest will be forthcoming. If choices among DSS design features must be made, should not the users' personal characteristics, such as cognitive style, be considered when making these choices?

Let us be clear that nothing that has been said here should be interpreted to mean that individual differences will not affect user preferences for DSS design features. They undoubtedly will. While the nature of the decision settings and decision tasks will often suggest to the designer/consultant that certain information items, decision processes, and decision aids should be used, DSS users will have preferences concerning, at the very least, how and when they should be used. These personal preferences will be the result of many individual differences, one of which might be cognitive style. How can the DSS designer/consultant account for all of these differences? Certainly not, as we noted earlier, by relying on an unavailable and unforeseeable multivariate model.

There seem to be at least two approaches. Both are already being used. One is for the designer/consultant and the user to employ the evolutionary approach, where components or features are added to (or deleted from) a "first-cut" DSS as the user, through experience, develops an opinion concerning their usefulness in light of the task and in light of his or her approach to the task. The other approach is for the DSS designer/consultant to work with the user during the initial design process to identify what the user thinks would be the most appropriate features. When employing either of the approaches (and they can be combined), the DSS designer may emphasize his or her role as a decision consultant and counsel the user about which features seem to be good candidates for inclusion in the DSS design, especially if the user's judgments

about these features seem incompatible with other information, such as the nature of the decision task or the proven usefulness of certain data or decision aids. Both approaches allow the user's personal characteristics (i.e., individual differences) to affect the DSS design, but only to the degree that the user feels that they should, given his or her perception of their relative importances in his or her decision situation.

In employing either approach, we are essentially taking the position that a large number of user's characteristics may be important and that the idiosyncratic and interactive importance of these individual differences to the DSS design is more readily determined by the user rather than by the designer/consultant. Whether the user's numerical score on a marginally predictive cognitive style assessment instrument would be of much value to either the user or the designer/consultant seems highly problematic. Instead, it seems that task considerations and the user's expressed preferences for specific DSS features should be the factors that determine DSS design.

5. Summary

In summary, this article suggests that (1) the study of cognitive style as a basis for deriving operational guidelines for MIS and DSS designs has not been fruitful and (2) such study is likely not to prove fruitful. Six bases for the first conclusion were identified, four of which are also bases for the second conclusion. In aggregate they offer support for the beliefs (1) that the designs of future DSS will not be determined from the designer's knowledge of the user's score on a cognitive style assessment instrument, and (2) that our current fancy, of focusing such a large proportion of our research resources on studying the user's cognitive style as a basis for MIS and DSS designs, is quite possibly a misallocation of these resources.

In part as a consequence of the above, the article goes on to suggest some new directions for cognitive style research that could lead to important contributions to the fields of management in general and DSS in particular.[8]

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