Management education researchers are increasingly recognizing the importance of mental models in the context of learning (Dehler, 1996; Resnick & Klopfer, 1989). Because mental models capture students’ knowledge structures relating to specific domains, they are particularly important in the context of learning. Mental models act as filters on how students make sense of a particular problem by serving to explain the “hows” and “whys” of specific issues in a problem situation. For example, Dehler (1996) concurs that building knowledge structures moves students beyond the mere recording of information toward developing thinking processes and skills in applied situations. According to Resnick and Klopfer (1989: 5), “before knowledge can be used to interpret new situations, to solve problems, to think and reason, and to learn—students must elaborate and question what they are told, examine the new information in relation to other information, and build new knowledge structures.” Despite the significance of mental models in student learning, empirical studies employing mental models as learning outcomes have been noticeably absent in the management education literature. My major objective in the current study is to illustrate the use of mental models as learning outcomes in an introductory management course.

To gauge the level of student learning in an instructional context, instructors need to focus on the breadth of a student’s conception and understanding of the domain. This breadth is reflected in the complexity of a mental model (Wilson & Ruthford, 1989). Complexity in mental models represents the breadth of an individual’s understanding and his/her conception of a specific domain and is reflected in the number of concepts and linkages between concepts in a mental model (Carley & Palmquist, 1992; Eden, 1991). The greater the complexity of a mental model, the greater the breadth of an individual’s understanding of a specific domain. Complexity of mental models provides both students and instructors with an insight into the stock of knowledge developed by students in an instructional domain. Complexity of mental models can help the students become aware of what they know, and thus, make the knowledge accessible and usable. Moreover, when the structure of students’ knowledge becomes accessible through mental models, they can improve it by paying more attention to acquiring or inventing knowledge. In short, complexity of mental models is an important indicator of learning because it reflects the ability of a student to identify key issues and make dense connections between these issues in solving complex problems.

This study illustrates how instructors can use the complexity of mental models to gauge the level of student learning in an introductory management course. I use the complexity of students’ mental models in an introductory organizational behavior course to evaluate the relative effectiveness of three different instructional styles in fostering stu-
dent learning. I do not imply that mental models should replace existing criteria used to measure the level of learning. Rather, the complexity of mental models can be used to supplement other operational learning outcomes—such as student satisfaction, achievement, and retention—to comprehensively assess the level of student learning resulting from different instructional styles (Beder & Carrea, 1988; Charkins, O'Toole, & Wetzel, 1985; Conti & Welborn, 1986; Graham, 1988).

This article is organized as follows. In the following section I present the theoretical overview of the study; whereas in the third section I present the research hypotheses. In the fourth, I describe the methods used in the study; whereas in the fifth, I report the results of the study. The final section elucidates the discussion, implications, and limitations of the study.

THEORETICAL OVERVIEW
Complexity of Mental Models as a Learning Outcome

Mental models of individuals serve as internal representations of the specific aspects of the world and reflect domain-specific knowledge structures in memory (Carley & Kauffer, 1993). According to Wilson and Rutherford (1989), a mental model is a representation of a domain formed by a person, which is based on previous experience and knowledge as well as on current observation and learning. In other words, a mental model reflects how the domain knowledge of individuals is arranged, connected, or situated in their minds.

Complexity of mental models is a key attribute that allows individuals to make sense of complex problems and engage in complex mental processing in problem-solving situations (Hong & O'Neil, 1992). Complexity affects problem solving through three mechanisms: problem identification, diagnosis, and evaluation. In the problem identification stage, individuals scan situation information to determine what constitutes relevant information for problem solving (Wilson & Rutherford, 1989). Mental models filter the information that individuals pay attention to and determine what constitutes relevant data for problem solving. The more complex the mental models of individuals, the more comprehensive their scanning of the information and the less likely they are to miss important variables relating to the problem situation. On the other hand, simple mental models lead to myopic problem identification based on limited information. In the diagnosis stage, individuals make sense of the now salient information, perceiving specific attributes of the problem and attaching meaning to it. Complex mental models allow better diagnosis of ambiguous and uncertain problem situations based on a broad range of cause–effect relations than narrow and simple frames (Wilson & Rutherford, 1989). Finally, evaluation and selection of alternative solutions are arrived at when the perceived attributes are viewed as information cues, which are combined to arrive at an assessment. Complex mental models allow evaluation of a broad range of alternatives based on in-depth identification and diagnosis of the problem situation. In other words, the mental processing in problem-solving situations is closely tied to the complexity of the mental models.

Complexity of mental models is an appropriate measure of student learning for three reasons. First, it captures an individual’s understanding of a specific domain and not the generic cognitive characteristics of an individual (Schneider & Schmidt, 1992). For example, a student may have a very complex mental model for one domain and a very simple model for another, depending on the knowledge gained by the student in the respective domains. On the other hand, generic cognitive characteristics of an individual such as cognitive ability or intelligence are generalizable across several contexts. Complexity of mental models can therefore be employed in specific instructional and learning contexts to gauge the stock of knowledge gained by a student in the course of instruction.

Second, the complexity of mental models is not stable. It changes from time to time as individuals gather more knowledge about a particular domain and learn (Carley & Palmquist, 1992; Eden, Ackermann, & Cropper, 1992; Hong & O’Neil, 1992). For example, Carley and Palmquist (1992) compared the complexity of mental models of a student at the beginning and end of a research-writing course. The number of concepts in the student’s mental model (comprehensiveness) at the end of the course was higher (29) than the number at the beginning of the course (23), suggesting that the student’s conception of research writing expanded over the course of the term. Educational psychology studies have used mental models to gauge student learning for domains such as statistics (Hong & O’Neil, 1992). For example, Hong and O’Neil found that the number of steps and the connections between the steps used by high-performance students in solving statistical problems were very different from those used by low-performance students. Hence complexity of mental models serves as an appropriate indicator of the level of student learning. Finally, the complexity of mental models is determined not only by the inter-
In instructional contexts, the complexity of students’ mental models can be modified through instruction and training (Carley & Palmquist, 1992; Hong & O’Neil, 1992). Mental models provide both students and instructors with an insight into the stock of knowledge developed by students in an instructional domain. By representing learning outcomes as mental models, the student’s knowledge can be (a) more accessible, that is, the student will be aware of what he or she knows and thus make the knowledge accessible and usable; (b) functional, that is, the mental model will allow the student to predict or explain what would happen if a problem situation occurred; (c) improvable, that is, because the knowledge of what the student knows is accessible and functional, the student can improve his or her knowledge or skills by paying more attention to, acquiring, or inventing knowledge or skills. Consequently, mental models can be effectively used to not only assess the level of student learning resulting from a particular instructional style, but also to evaluate the relative effectiveness of different instructional styles in fostering student learning, a point to which I now turn.

### Instructional Styles and Learning Outcomes

Literature on adult education characterizes adult learning as a proactive process. Learning is an activity that students engage in to acquire particular skills and knowledge (Brookefield, 1984). The type and range of activities that students undertake to acquire domain knowledge reflects the learning style of students (Beder & Darkenwald, 1982). The basic premise of the adult learning literature is that the better the fit between the learning style of students and the instructional style, the more favorable the learning outcomes resulting from the activity of learning (Beder & Darkenwald, 1982; Brookefield, 1984; Delahaye, Limerick, & Hearn, 1994; Knowles, 1984). A match between the instructor’s conception of learning and preference of instructional formats and that of the students creates a positive learning environment for students and enhances their motivation to learn. This in turn may result in better learning outcomes.

Knowles (1984) identified two contrasting instructional styles in adult education: andragogical and pedagogical. Pedagogical styles are more teacher-driven and directed methods, whereas andragogical methods are more learner-centered or self-directed styles. Knowles (1984) argued that andragogical methods are universally more appropriate for adult education than pedagogical methods. This is because adult learners are more often the initiators of their own learning experience; they exert more control over learning processes and outcomes, and therefore prefer more power and autonomy in the learning context (Brim & Wheeler, 1966). However, Stuart and Homes (1982) argue that learner maturity is an important consideration in selecting appropriate style of instruction. Learning maturity is distinct from age of the students (Smith & Delahaye, 1987). It consists of the learner’s past learning experience, expectations, attitudes to the forthcoming learner event, and prior knowledge of the domain. According to Smith and Delahaye (1987), learner maturity includes the amount of knowledge the learner already has in the subject area, the level of interest in and need to organize the learning process, and the degree to which the learner is willing to accept the responsibility to learn. The relative emphasis on andragogy versus pedagogy will depend on the learning maturity of the learners.

The connectionist psychologists argue that learning occurs in steps, each part building on simpler content learned earlier (Henson, 1995; Smith, 1995). They insist that each part of the content should be tied to old learning. Thus as students progress through the curriculum and assimilate more knowledge and maturity, the instructors’ role changes. For lower level introductory courses, the instructor’s primary function is to build strong conceptual understanding in the students. This is because students in these courses have limited opportunities to connect new learning to old courses in very different areas. Additionally, students with low maturity have a more dependent personality and possess a high degree of “subject-centeredness” that further precludes them from making connections between different courses. Thus undergraduate students who are low on learning maturity may not be comfortable in accepting the responsibility of learning and therefore may prefer pedagogical rather than andragogical instructional context. On the other hand, as students gain maturity through an array of “connected” learning, they accumulate a growing reservoir of experience that becomes an increasingly rich reserve for learning. Additionally, mature adult learners have a self-directing personality and are learning-centered rather than subject-centered. They are willing to take the responsibility of learning and therefore may prefer the andragogical instructional context because they are clearer in their learning goals and prefer autonomy in learning.

Another important consideration in selecting an instructional style is the domain of instruction.
Miglietti and Strange (1998) underscore the importance of disciplinary differences in assessing the outcomes of teaching styles mediated through learning styles. The inherent contrast between different subjects such as pure versus applied, quantitative versus qualitative, or analytical versus perceptual suggests that more subtle differences may prevail across different disciplines such that the dynamics of teaching and learning may manifest themselves in characteristic ways. Furthermore, courses require different degrees of student participation and varying modes of instructor strategies. Consequently, results examining superiority of an instructional method in one subject or domain cannot be extended to other domains that may require different instructional strategies. For example, the results of studies evaluating the relation between instructional styles and learning outcomes in subjects such as mathematics and statistics that are quantitative, conceptual, and analytical may not be applicable to management domains such as organizational behavior or strategic management that are qualitative, perceptual, and practical in orientation.

This stream of research suggests that the choice of instructional emphasis (andragogy or pedagogy) is contingent on the domain of instruction and the maturity of learners. A customization of instructional styles to suit specific subject domains and maturity of student learners will significantly enhance learning outcomes. A myriad of studies have shown that instructional context strongly influences learning outcomes such as student satisfaction, achievement, persistence, and retention (Beder & Carrea, 1988; Charkins et al., 1985; Conti & Welborn, 1986; Graham, 1988). Drawing on this stream of literature, I hypothesize that the complexity of mental models of undergraduate students with low learning maturity exposed to different instructional methods will differ.

**HYPOTHESES**

Literature on adult learning suggests that instructional methods that focus differently on andragogy and pedagogy in teaching lead to different learning outcomes (Beder & Carrea, 1988; Charkins et al., 1985; Conti & Welborn, 1986; Graham, 1988). This is because the learning needs of the adult students match differently with the instructional focus of the approaches. Studies in educational psychology suggest that instructional styles influence the mental models of pre-adult students enrolled in middle school courses through the process of learning for domains such as mathematics, statistics, and English (Glaser & Bassok, 1989; Greeno, 1983; Hong & O'Neil, 1992; Mayer, 1989). In other words, mental models are outcomes of learning and therefore reflect the level of student learning resulting from instructional methods. The three instructional contexts presented in this study—lecture–discussion, experiential, and hybrid—have different instructional focus. The differences between the three methods are shown in Table 1.

The first method, lecture–discussion, is more instructor-controlled with predefined objectives, and it provides students very little autonomy in learning. On the other hand, the experiential method is flexible and inductive in its orientation, providing students a high degree of autonomy in learning. The hybrid method combines the clarity of objectives and deductive orientation of the lecture–discussion method with the flexibility and customization of learning emphasized by the experiential method. Literature on management education suggests that the lecture–discussion and the experiential methods provide diverse learning contexts and lead to different learning outcomes (Boje, 1991; Bowen, 1987; Christensen, Garvin, & Sweet, 1987; Miner, Das, & Gale, 1984; Naumes, 1993; Van Eynde & Spencer, 1988). Each method has its strengths and weaknesses. The hybrid method I used in this study attempts to combine the conceptual emphasis of the lecture–discussion method with the practical emphasis of the experiential method, thus providing a learning context that is different from that provided by either.

These differences in the instructional styles are likely to lead to different levels of student learning (Beder & Carrea, 1988; Conti & Welborn, 1986; Graham, 1988). The breadth and stock of knowledge gained by the students from the three instructional contexts are likely to differ considerably because each style is different in course content and organization, mode of learning, and the nature of teacher–student interaction. Each method, therefore, matches differently with the learning needs of the adult students. This difference in the level of student learning will, in turn, be reflected in the complexity of mental models of students.

*Hypothesis 1: The complexity of students’ mental models exposed to the lecture–discussion, experiential, and hybrid methods will be different.*

Studies in educational psychology relating to instructional applications of mental models have shown that a strong conceptual emphasis leads to more efficient mental models (Hong & O’Neil, 1992). Mayer (1989) concluded that conceptual models help learners build comprehensive mental models of the system being studied by improving their recall of conceptual information and by increasing
TABLE 1
Differences in the Modes of Instruction Between the Three Instructional Groups

<table>
<thead>
<tr>
<th>Mode of Instruction</th>
<th>Lecture–Discussion Method (N = 60)</th>
<th>Experiential Method (N = 60)</th>
<th>Hybrid Method (N = 45)</th>
</tr>
</thead>
</table>
| 1. Content orientation | Primarily theoretical emphasis:  
• Primarily formal lectures  
• Regular reading assignments determined at the beginning of the semester  
• Rare use of videos and no use of cases  
• No discussion of personal experiences  
• No in-class group exercises except a group project  | Primarily practical emphasis:  
• Primarily informal discussion  
• Few reading assignments not determined in advance  
• Heavy use of videos and cases in every class  
• Long discussion of personal experiences in every class  
• Heavy use of group activities in each class, (e.g., group discussions, panel discussions and role playing)  | Both theoretical and practical emphasis:  
• Both formal discussion and informal discussion  
• Regular reading assignments broadly specified in advance  
• Periodic use of videos and cases  
• Short discussion of personal experiences on relevant topics  
• Selective use of group discussions on topics expected to invoke divergent views  |
| 2. Mode of learning | Primarily deductive:  
• Major emphasis on concepts in the textbook  | Primarily inductive:  
• Major emphasis on learning from experience and real-world events, (e.g., daily newspaper articles, guest lectures, sharing individual experiences, etc.)  | Inductive as well as deductive:  
• Emphasis on tying experiences and real-world events to concepts in the text book  |
| 3. Classroom Management | Teacher control  
Schedule, content and format of lectures, course requirements, formation of groups for group project, and grading scale decided by the teacher. No formal input from students. In-class teacher–pupil communication controlled by the teacher.  | Laissez faire  
Regular student input incorporated in the schedule, content and format of lectures, number and format of tests and grading scale. Students choose their own groups. Free communication in class with no domination from the instructor.  | Teacher and student involvement  
Schedule and theoretical content of lectures, format of tests and grading scale determined by the teacher. Student input requested twice during the semester and incorporated in format of lectures, type of questions in the test, and experiential activities. Open discussion with students on suggestions not incorporated. Guided group and panel discussions in class.  |
| 4. Course organization | Predetermined structure  
• Course syllabus outlined specific course objectives, course requirements, schedule of lectures (by chapter) and the grading scale  
• Regular formal (test grades and quizzes) and informal feedback (face-to-face discussions) to students regarding their performance  | Loose Structure  
• Course syllabus outlined broad course objectives, course requirements and no schedule of lectures or grading scale  
• Emphasis on self-evaluation: students grading their own tests or their peers' tests  | Clear and flexible structure  
• Course syllabus outlined specific course objectives, course requirements, schedule of lectures (by broad topic) and the grading scale  
• Regular formal (test grades and quizzes) and informal feedback (face-to-face discussions) to students regarding their performance. Review of group projects and suggestions for improvement provided prior to final submission  |
their creative solutions on analytical problems. Greeno (1983) also argued that conceptual instruction facilitates formation of conceptual entities in the problem representation, which, in turn, aids in the interpretation of problems. Similarly, White and Frederiksen (1986) advocated that the conception of a domain makes cause–effect relations between different concepts within the domain obvious to the student. Glaser and Bassok (1989) indicated that a strong theoretical foundation helps students understand the underlying principles or concepts. The lecture–discussion method is especially suited for pure and quantitative undergraduate subjects such as physics and mathematics that are primarily objective in nature, and student learning is centered around conceptual and analytical understanding of the domain.

Management education literature suggests that the lecture–discussion method emphasizes conceptual knowledge of the domain by focusing on the relationships among facts and examining the major themes associated with them (Jones & Jones, 1998; Thornton & Cleveland, 1990; Whetten & Clark, 1993). This conceptual emphasis is especially important in teaching introductory management courses to students with low learning maturity and should contribute to the students’ complexity of mental models by providing them a strong foundation to acquire formal knowledge. However, because of its emphasis on theoretical principles, the lecture–discussion method has been criticized as an "information dump" of principles and conclusions that the teacher or the text has previously distilled from management literature (Whetten & Clark, 1996). Management courses are qualitative, applied, and subjective, where student learning is comprised not only of the conceptual understanding of the domain, but also of the application of these concepts in a variety of "real" situations. Additionally, there is no one correct solution for a given organizational issue. The same organizational problem can be resolved in a variety of ways and therefore it is important to help students develop a deeper practical understanding of the domains.

In contrast, the experiential method emphasizes personal application wherein students develop their own beliefs, feelings, and behaviors (Jones & Jones, 1998). It enhances the students’ practical knowledge by engaging them in different action-oriented tasks and by helping them learn through their individual experiences. However, the experiential approach emphasizes an inductive mode that can, in case of inexperienced students, result in lack of clarity in knowledge transfer (Thornton & Cleveland, 1990). This lack of clarity can adversely affect the development of conceptual knowledge embedded in the student’s cognitive map. Because the inductive process is inherently less predictable and reliable, students whose learning is restricted to experiential exercises often arrive at invalid conclusions. This is especially likely for students with little work experience and low learning maturity, who, when asked to generate principles of effective management may simply end up "pooling their ignorance" (Whetten & Clark, 1996: 155). This is because they tend to be biased in judging the representativeness of their experience, leading to overconfidence in spurious conclusions.

The hybrid method combines the conceptual orientation of the lecture–discussion method with the practical orientation of the experiential method and therefore contributes both to students’ conceptual and practical knowledge. When experiential activities are used as illustrative exercises in which certain theoretical concepts are introduced, students get the opportunity to gain a deeper understanding of why events occur and how people may react to these events (Miner et al., 1984). Furthermore, these activities also prepare students to "learn to learn" from their personal experiences, thus making them more adaptable to contexts beyond those introduced in the classroom. Carefully structured exercises and experiences can be extremely powerful in illustrating theories, assuming that knowledge acquisition and application are equally important goals (Ramsey, 1984). The hybrid method would, therefore, combine the strengths of the lecture–discussion and experiential methods and reduce the limitations of either.

Second, in terms of classroom management, studies in educational psychology have shown that student achievement in relatively unknown domains is maximized when instructors emphasize instruction as basic to their role, expect students to master the curriculum, and allocate most available time to academic activities (Brophy & Evertson, 1976). In this respect, the lecture–discussion method facilitates the clarity of the instructor’s role and the student’s expectations and provides a structure to course organization and management. This approach is especially suited to the "dependent" personality of students with low learning maturity who are unwilling to take the responsibility of learning and prefer significant guidance from the instructor. However, an overemphasis on a formal structure can result in rigidity that can preclude an instructor from adapting to different learning styles of the students. For example, researchers such as Knowles (1984) and Brookefield (1984) strongly argue that the informal and student-centered approach leads to better
learning outcomes among adult learners. This is because adult learners bring to the classroom unique learning interests and clear educational goals and therefore prefer autonomy in learning.

Heavy use of the experiential mode of instruction reduces the formal structure of a course. The advantage of a loose structure is the flexibility it provides in accommodating the diverse learning needs of students. Stuart and Holmes (1982) and Smith and Delahaye (1987) argue that mature learners can benefit from experiential methods because they are able to draw on their diverse domain knowledge and engage in proactive and self-directed learning. However, this lack of structure in the experiential method possibly may have a negative influence on motivation of students with low learning maturity that results from frustration. Thornton and Cleveland (1990) point out that a lack of structure can make inexperienced students (a) disoriented, (b) more likely to act out in a dysfunctional manner, and (c) confused about what the instructor is doing, and why. Thus, the experiential mode may not be effective in cases of adult learners with low learning maturity because adult learners with little knowledge of the domain and mode of instruction may not feel comfortable in accepting the responsibility of self-learning emphasized by the experiential mode.

In the current study, I focus on developing an instructional method that best suits undergraduate students enrolled in introductory management courses. As mentioned earlier, two major factors influencing the choice of instructional method are instructional domain and learning maturity of students. Most management courses are qualitative, subjective, and applied. Student learning in these courses comprises not only the conceptual understanding and theoretical mastery of the subject, but also the ability to apply the concepts in a variety of different organizational situations. Students enrolled in introductory management courses possess a relatively low degree of learning maturity in the domain of instruction for four reasons. First, the students’ knowledge of the instructional domain is minimal, and the opportunity to connect new learning to earlier courses outside of the business school is indirect and limited. Second, their familiarity with the different tools and techniques used in teaching business courses is also minimal, and the teaching approaches and tools used in the course are also new to the students. Third, a majority of the undergraduate students do not have rich on-the-job experiences that they can draw on to engage in proactive learning. Finally, these students have a dependent orientation and are subject-centered and are therefore not comfortable with proactive learning.

Consequently, these students need instructional styles that combine the conceptual emphasis and clarity of the lecture–discussion method with the practical emphasis and flexibility provided by the experiential method. In a recent study conducted to elicit perceptions of undergraduate adult learners with low learning maturity on what constitutes good teaching of applied and qualitative subjects, Reid and Johnston (1999) found that characteristics of good teaching entailed both conceptual and practical elements. For example lecture–discussion elements such as diverse theoretical knowledge, clearly defined course goals, and well-organized lectures were considered as important as experiential elements such as promotion of interaction, encouragement of student participation, and sharing of experiences. Another study conducted by Miglietti and Strange (1998) that linked instructional styles to student satisfaction in an introductory college course showed that students preferred elements of both the lecture–discussion and experiential approaches. This suggests that instructional methods that combine both the lecture–discussion and the experiential instructional elements will result in better learning outcomes for undergraduate students with a low or medium degree of learning maturity than instructional approaches that focus on either one of the methods.

The students in the hybrid method are likely to have a greater motivation to learn than those in either the lecture–discussion method or the experiential method. This is because the learning style of these adult students with low learning maturity is more closely matched to the hybrid method than the other two methods. As a result, students in the hybrid method will achieve a broader knowledge base and will develop the ability to apply the concepts taught in the class in complex problem situations better than the students in the lecture–discussion and the experiential methods. These differences in the level of student learning will permeate the students’ complexity of mental models in the three instructional methods. These arguments suggest that:

Hypothesis 2: The complexity of students’ with low learning maturity mental models exposed to the hybrid method will be higher than that of the students with low learning maturity exposed to either the lecture–discussion or the experiential method.
METHOD

Overview of Research Design

The current study used a quasiexperimental design because random assignment to the three instructional methods was not possible. It was a simple comparison group design where the lecture—discussion, experiential, and hybrid sections received forms of instruction different from each other. To address the problem of bias due to nonrandomization, I collected additional information from the students and made comparisons between the two instructional groups in the following areas:

- demographic variables (i.e., gender, age, race, year in school, work experience, prior management coursework and major)
- relevant personality variables (Big Five personality construct and cognitive ability)
- incoming GPA
- timing of class (all were early morning sessions)

There were no significant differences in variables across the three instructional groups. The differences in the three instructional methods are discussed in greater detail in the instructional methods section.

The three instructional groups were taught by four instructors—two instructors taught the two sections of the lecture—discussion group, one instructor taught both sections of the experiential group, and one taught the hybrid section. To partially control for the instructor bias, instructors with consistently above-average teaching ratings (given by students) were selected. There were no major differences in student perceptions regarding the subject knowledge and enthusiasm of the instructors or the class workload. The three instructors were familiar and comfortable with all three methods of instruction and had used these methods from time to time. Additionally, the instructors had consistently changed their style of instruction and had not used any one instructional methods for extended time periods. As a result, it was difficult for incoming students to associate the instructors with any single teaching style. Additionally, the instructional methods were randomly assigned to the three instructors, and hence the students who dropped each class section was low and consistent across all sections.

To confirm the learning maturity of the students, I provided the list of previous courses they had taken to the three instructors and asked them to rate the degree to which each course was connected to their introductory organizational behavior course in terms of subject knowledge and teaching approaches on a 7-point Likert scale. I also collected work experience information from the students. The low ratings on the connections between the organizational behavior course and previous courses taken by the students (M: 1.92–2.71) and the lack of work experience confirmed that the students had low learning maturity.

Toward the end of the semester, narratives were elicited from students in the three instructional groups to an organizational problem situation represented in a modified version of the Dashman Company Case (Dashman Company, 1947). Cognitive maps were constructed from the narratives, and the structural properties of the maps were then compared across the three instructional groups.

Subjects

Participants were undergraduate students at a major midwestern university enrolled in five sections of an organizational behavior course. After a brief classroom presentation on the details of the study, volunteers were solicited for participation. The resulting sample consisted of 165 students (80% response rate)—60 in the lecture—discussion group, 60 in the experiential group, and 45 in the hybrid group. The average age of the participants was 22.01 years, with a range from 19 to 34 years. Sixty-four percent of the participants were males. A majority of the students were business majors (58%); others were drawn from nonbusiness majors including communication studies, sports management, and economics. The participants were predominantly Caucasians (79%); the remaining were Hispanics, Asians, and African Americans.

Instructional Methods

The mode of instruction differed across sections: Instructors in two sections predominantly used the lecture—discussion method. Experiential learning was the primary mode of instruction in two other sections; whereas the hybrid method was used in the final section. There were no significant differences in student demographics across the three instructional groups. Additionally, instructors used comparable books in the three sections. Differences in the three instructional methods were derived using multiple data sources including course syllabi and other relevant hand-outs provided in the class, in-depth interviews with the instructors, and actual observation of instruction sessions. Based on management education literature and the data collected from the instructors (described
above), the differences in the three instructional methods were represented across four dimensions: content orientation (Jones & Jones, 1998; Naumes, 1994); mode of reasoning (Boje, 1991; Bowen, 1987; Christensen et al., 1991; Miner et al., 1984; Van Eynde & Spencer, 1988; Whetten & Clark, 1996); class interaction (Adams, 1970; Whetten & Clark, 1996); and course organization (Adams, 1970). Table 1 provides a description of these four dimensions.

The instructional content of the lecture-discussion section was primarily theory driven and focused on conceptual understanding of the domain through predetermined tests, reading assignments, and formal lectures. The use of videos was rare, and experiential exercises such as role playing and group activities were not used in the course of instruction. In contrast, the experiential section emphasized practical application through use of videos, experiential exercises, and group activities in which students shared their experiences in groups in every class. In the hybrid section, theory and practice were closely tied. Relevant role-playing exercises were used to illustrate concepts, and personal beliefs and experiences were shared through structured discussions and participating in simulations of “real-world” situations. Formal lectures were primarily used to provide a systematic framework for discussions and practical exercises.

In the lecture-discussion section, students were exposed to existing theory and then were encouraged to identify specific and narrow examples relating to specific theoretical concepts. This led them to reason primarily in a deductive mode. The discussions were short, structured, and guided by the instructor. For example, instructor posed questions such as “Can you give me examples of intrinsic motivation?” or “Can you identify an organization that has a geographic organizational structure?” In other words, the emphasis was on the “what” aspects rather than the “why” aspects. In the experiential section, the inductive mode of reasoning was emphasized by using simulation and role-playing activities and by encouraging students to share personal experiences. Long and comprehensive case discussions were used frequently with minimal intrusion from the instructor. In the hybrid section, both the inductive and deductive modes were used sequentially depending on the subject area covered. In some instances, the inductive mode was used first, followed by a deductive mode wherein role-playing exercises were used as a basis to introduce topics using an inductive mode. The results of these activities were then grounded in theory (deductive mode). In other instances, the deductive mode followed by an inductive mode was used wherein theoretical concepts introduced to the students were then illustrated using simulation exercises. Long and comprehensive discussions were used frequently in analyzing broad and complex case situations. However, the instructor moderated these case discussions by emphasizing both the “what” and the “why” elements. For example, students were provided about 15–20 minutes to form groups and discuss issues such as “What are the important elements in designing an incentive plan?” or “Why did a particular strategy fail in an organization?”

In the lecture-discussion section, the instructor retained control over communication through formal lecture delivery and the structuring, leading, and guiding of class discussions. The experiential method encouraged free communication through group activities such as class simulation and role playing where the instructor adopted a laissez-faire approach. In the role-playing activities, a group of students acted out specific organizational situations. This was followed by unguided discussion sessions with active student involvement. In the hybrid method, the instructor was primarily a facilitator and the emphasis was on collaborative learning. There was close interaction between the instructor and students wherein the instructor guided rather than dominate it the communication.

Finally, the lecture-discussion section provided a structure to course organization and management wherein the course syllabi offered clarity of course goals, student expectations, and instructor role. Moreover, in addition to formal tests, instructors provided regular feedback to the students regarding their performance in the form of written memos and face-to-face discussions. In the experiential section, the syllabi was loosely structured with evolving course objectives, and student expectations were not predefined; rather, student expectations evolved over course period. In the hybrid section, the course was structured so that course goals, student expectations, and instructor role were clear. However, within the broad guidelines, the instructor provided a degree of flexibility. For instance, the lecture sessions evolved based on the mutual interest of the instructor and the students.

**Data Collection**

**Case Analysis**

Case analysis was selected as a data source to elicit cognitive maps of students because it evaluates the ability of students to apply what they have learned in course work to an actual business situ-
ation, analyze the situation, and identify the critical issues or problems that must be addressed (Christensen, 1987). The length of the analysis was restricted to two pages to control for differences in the length of the narrative. The choice of the Dashman Company Case was based on three reasons. First, the instructors judged that the content of the case and the timing of the analysis were appropriate for the course they were teaching in terms of course content as well as course objectives. Second, the case was sufficiently concise for students to comprehend it without difficulty. Finally, the case allowed varying interpretations by individuals regarding “what happened.” Also, the questions posed to the students were broad and open ended so as to reduce the intrusiveness of data source. The students were encouraged to develop their own frameworks in diagnosing and analyzing the case and providing their recommendations.

The case was administered in the five sections toward the end of the semester. The students were instructed to analyze the case and submit a 2-page essay. A week later, responses to the Dashman Company Case were collected.

### Representation of Mental Models

Mental models of individuals are typically represented as cognitive maps (Carley & Palmquist, 1992; Ford & Hegarty, 1983). A cognitive map is conceived to be a specific way of representing a person’s assertions about some limited domain such as a policy problem (Axelrod, 1976). It is designed to capture the structure of a person’s causal assertions and to generate their decision consequences by focusing on both the concepts and the causal linkages between those concepts that are salient in individuals’ minds (Hambrick & Finkelstein, 1996).

Following Axelrod (1976), the cognitive maps were derived from the essays submitted by the students in a 3-step procedure. In the first step, the statements from the student essays that explicitly contained a cause–effect relationship were identified. Examples of key words used in identifying causal statements included “if–then,” “because,” “so,” and “as.” Two raters independently identified causal statements, and their interrater reliability was assessed using Kendall’s coefficient of concordance ($W = 0.80$). In the second step, the causal statements identified in the first step were broken into “causes” and “effects” to identify the “raw cognitive maps.”

An important issue in using a cognitive map as a measure of student learning is to determine the accuracy of its content. For example, a cognitive map may contain a number of inaccurate or redundant concepts that may increase its complexity. In such cases, a complex map may not necessarily be an accurate map. To ensure that only accurate and relevant concepts in students’ case analysis are included in computing complexity of cognitive maps, a coding scheme was designed to identify a list of concepts most critical to the case. I used the comprehensive list of 24 critical issues in the Dashman Company Case identified by Hodgson and Dill (1970) in an article published in Harvard Business Review. Issues considered included organizational structure, personnel management, communication procedure, human relations, and long- versus short-term goals. This list is shown in Appendix A. Hodgson and Dill (1970) used this list of issues to assess the degree to which company managers effectively organized their thoughts on the case. This prescriptive list of concepts was therefore useful in filtering accurate and relevant concepts in the essays from inaccurate and redundant ones. I also showed the list to the different instructors and requested them to add any additional concepts or issues they thought appropriate and relevant to the case. The instructors did not make any additions to the list of concepts. Finally, three raters independently recast the causes and effects in the essays into the concepts in the list identified by Hodgson and Dill ($W = 0.84$). Only the cause-and-effect phrases in the essays that conformed to Hodgson and Dill’s list of critical issues were included in the analyses.

### Measures

#### Complexity of Cognitive Maps

The measures of complexity were computed from the cognitive maps using a computer program (NetAnalysis). Two measures have been used in prior literature on cognitive maps to represent complexity: (1) comprehensiveness, and (2) density. Comprehensiveness of a cognitive map is defined in terms of the number of concepts it includes (Carley & Palmquist, 1992; Hackner, 1991). The more concepts in a cognitive map, the more complex the map. Figure 1 (a and b) shows maps that have the same degree of comprehensiveness. Because both maps contain four concepts, they both have a comprehensiveness index of four.

Density of a cognitive map is measured as the ratio of links between concepts to total concepts in a map (Carley & Palmquist, 1992; Eden et al., 1992). Thus a higher ratio indicates a densely connected map and supposedly a higher level of cognitive complexity. The computation of density measure is
illustrated in Figure 1. Figure 1a shows a highly connected map. The density of this map is obtained by dividing the number of links in the map (7) by the number of concepts in the map (4). This map has a density of 1.75. The map in Figure 1b has a density of 0.75 (3 links in the map divided by 4 concepts). Based on the density measure, the map in Figure 1a has higher complexity than the map in Figure 1b.

I validated the two measures of complexity by correlating them to a measure of quality of case analysis. A 5-item measure of quality of case analysis was developed based on prior literature on essay writing (Adams, 1970), case analysis (Daft & Sharfman, 1990; George & Jones, 1999), and consultations with the two instructors, an experienced instructor familiar with the use of case analysis as a teaching tool, and a senior educational psychology professor. The five measurement items were: diagnosis of critical issues, novelty of analysis, creativity in writing, degree of redundancy, and overall quality of case analysis. Each item was measured on a 5-point scale. Two raters (a researcher and an instructor) graded the case reports ($W = 0.78$). The internal consistency of the items in the scale was assessed by the coefficient alpha (student sample $= 0.87$). Because of high correlations between the items, I averaged them to create a composite score for the quality of case analysis. The measure of quality of case analysis was highly correlated with comprehensiveness ($0.52, p < 0.01$) as well as density ($0.49, p < 0.01$), thereby suggesting that complex maps were also high in quality.

### Control Variable

Cognitive ability measure was used as a control variable because past research indicates a relationship between the cognitive ability of individuals and their ability to learn (Hambrick & Finkelstein, 1996; Myers, 1982). Cognitive ability, also called mental ability or intelligence, represents an individual’s ability to gather, retain, and process information and to reason with information. It reflects an individual’s level of mental manipulation of words, figures, number, symbols, and logical reasoning (Gatewood & Field, 1994). Studies in cognitive psychology argue that the cognitive ability construct is distinct from complexity of mental models (Chi & Glaser, 1984). Cognitive ability captures generic and inherent cognitive characteristics of students, whereas complexity of mental models captures the domain-specific knowledge of students. However, cognitive ability may affect the learning ability of students (Chi & Glaser, 1984). For example, students with higher cognitive ability can better understand, reason, and analyze information presented by the instructor in any given domain than students with low cognitive ability. As a result, students with high cognitive ability achieve a higher level of learning than that of students with a relatively low cognitive ability.

An established cognitive ability instrument—Wonderlic—was used to measure the cognitive ability of participants. The Wonderlic test is a 50-item measure with a limit of 12 minutes to complete the questions; it measures cognitive ability (E. F. Wonderlic and Associates, Inc., 1983; see also,

---

**FIGURE 1**

Complexity of Cognitive Maps

(a) A cognitive map with a relatively high degree of density. Complexity measures: Comprehensiveness $= 4.00$; Density $= 1.75$. (b) A cognitive map with a relatively low degree of density. Complexity measures: Comprehensiveness $= 4.00$; Density $= 0.75$. (W/H11005 0.78)
Gatewood & Field, 1994; Hunter, 1989). Studies have indicated that Wonderlic has a reliability of 0.73 to 0.95 and an internal consistency of 0.88 to 0.94 over different questions (Dodrill, 1983).

Data Analyses

Analysis of variance (ANOVA) was used to investigate the significance of between-group differences in the complexity of cognitive maps of students. In the ANOVA, the factor was instructional method, coded as lecture–discussion method (0), experiential method (1), and hybrid method (2). This analytical method allowed controlling for cognitive ability variable by including it as a covariate in the analysis.

I also used the Tukey’s pairwise comparison test to examine the significance of the mean differences between comprehensiveness and density of the mental models of students in the three instructional methods.

RESULTS

The means, standard deviations, and correlations among the study variables are shown in Table 2. Results indicate a high degree of correlation among the measures of complexity. Results also indicate differences in the means of complexity measures across the three instructional groups. As expected, the means of complexity measures are higher for the hybrid group than either the lecture–discussion, or the experiential group. However, the lecture–discussion group has higher means for comprehensiveness as well as density than the experiential group. The correlation matrix shows that complexity measures are not correlated to Wonderlic score.

I examined the between-group differences in complexity measures using ANOVA. Results, provided in Table 3, indicate that the complexity measures (p < 0.01) differed significantly across the three instructional groups after controlling for cognitive ability. These results provide support to Hypothesis 1 and also indicate that “Wonderlic” is not related to complexity.

The results of the pairwise comparison tests are shown in Table 4. They suggest that the mean comprehensiveness and density of the students‘ cognitive maps in the hybrid method are higher than those of students in either the lecture–discussion method (p < 0.05) or the experiential method (p < 0.001). The mean difference for the two

Table 2: Descriptive Statistics of the Study Variables

<table>
<thead>
<tr>
<th>Study Variables</th>
<th>Lecture–Discussion</th>
<th>Experiential</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>23.78</td>
<td>22.24</td>
<td>24.87</td>
</tr>
<tr>
<td>SD</td>
<td>5.22</td>
<td>5.06</td>
<td>5.51</td>
</tr>
</tbody>
</table>

Table 3: Results of ANOVA Analysis

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Complexity</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comprehensiveness</td>
<td>Density</td>
</tr>
<tr>
<td>Cognitive Ability:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wonderlic Test</td>
<td>21.346</td>
<td>0.019</td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>21.457</td>
<td>0.021</td>
</tr>
<tr>
<td>Mean Square</td>
<td>0.529</td>
<td>0.673</td>
</tr>
<tr>
<td>df</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Mode of Instruction:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>24.783</td>
<td>0.265</td>
</tr>
<tr>
<td>Mean Square</td>
<td>24.783</td>
<td>0.265</td>
</tr>
<tr>
<td>df</td>
<td>7.872**</td>
<td>9.243**</td>
</tr>
<tr>
<td>Explained Variance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>26.567</td>
<td>0.281</td>
</tr>
<tr>
<td>Mean Square</td>
<td>4.412</td>
<td>0.094</td>
</tr>
<tr>
<td>df</td>
<td>3.921**</td>
<td>4.408**</td>
</tr>
<tr>
<td>Residual Variance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>147.142</td>
<td>3.119</td>
</tr>
<tr>
<td>Mean Square</td>
<td>1.212</td>
<td>0.027</td>
</tr>
<tr>
<td>df</td>
<td>1.212</td>
<td>0.027</td>
</tr>
<tr>
<td>Total Variance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Squares</td>
<td>172.565</td>
<td>3.345</td>
</tr>
<tr>
<td>Mean Square</td>
<td>1.174</td>
<td>0.278</td>
</tr>
</tbody>
</table>

* N = 120.
* * p < 0.05. ** p < 0.01. *** p < 0.001.
complexity variables is highest between the hybrid method and the experiential method; however, the mean difference for the two complexity variables is significantly higher in the lecture–discussion method than the experiential method.

**DISCUSSION AND CONCLUSIONS**

My primary purpose here was to illustrate the use of complexity of mental models to gauge the level of student learning in different instructional contexts. Using complexity of mental models as a measure of student learning, I compared the relative effectiveness of three instructional methods that differ significantly in the mode of instruction as well as classroom management. Here I discuss the results of this study, outline the implications of these results for management education practice, and address the limitations of the study.

**Discussion and Implications**

The study yielded two major findings. First, the complexity of students’ mental models was not related to the cognitive ability of the students. The lack of a relation between complexity and cognitive ability confirms the distinctiveness of the two constructs. Cognitive ability represents general cognitive characteristics of individuals, whereas mental models represent domain knowledge of individuals (Chi & Glaser, 1984; Hong & O’Neil, 1992). Moreover, the complexity of mental models was also strongly related to the quality of case analysis. The quality of case analysis represents students’ ability to successfully and comprehensively analyze a complex case by diagnosing critical issues in the case and to effectively organize their thoughts on the problems presented in the case (Adams, 1970; Daft & Sharfman, 1990; George & Jones, 1999). This suggests that the complexity of mental models is related to the students’ ability to apply the concepts taught in the class in complex analytical situations and thereby justifies the use of complexity in gauging the level of student learning.

Second, students exposed to the hybrid method had more complex mental models than those exposed to either the experiential or the lecture–discussion method. This result sheds some light on the relative effectiveness of the three instructional methods in maximizing adult learning. In the current study, neither the experiential method that emphasized self-learning nor the lecture–discussion method that emphasized a teacher-centered approach contributed effectively to the complexity of students’ mental models. Student learning was gauged by the students’ ability to diagnose key issues in a broad and complex organizational case and make causal connections between these important issues. The students exposed to the hybrid method identified most relevant issues of the case and also made comprehensive connections between the key issues. Thus, these results do not support the traditional view on adult education that self-directed, experiential instructional methods are most suitable for adult learners (Brookefield, 1984; Cross, 1981; Darkenwald & Merriam, 1982; Knowles, 1984).

The instructional mode (or content) of the hybrid method provided clarity of objectives as well as a theoretical emphasis that allowed students to understand and master important concepts in the organizational behavior domain. These two elements are especially important in teaching undergraduate students with a low level of learning maturity (Hong & O’Neil, 1992; Smith & Delahaye,
1987; Stuart & Holmes, 1982). Most students enrolled in the course were new to the organizational behavior domain as well as to the instructional style employed in management courses. They also had very little work experience. As a result, they were not familiar with the domain and mode of instruction. The formal and conceptual orientation of the hybrid method helped students in gaining a broader understanding of a diverse set of concepts in the organizational behavior domain. On the other hand, a strong emphasis on the practical understanding without adequate theoretical emphasis utilized in the experiential method may have resulted in lack of clarity in knowledge transfer because of the unpredictability and lack of formalization of the course content (Thornton & Cleveland, 1990).

At the same time, the hybrid method did not restrict student learning to the conceptual understanding of organizational behavior as did the lecture–discussion method. The students were provided with ample opportunities for applying organizational behavior concepts in practical situations through the use of activities such as case analyses, role playing, and simulations. Past research has underscored the importance of such activities in increasing the level of understanding as well as the level of learning motivation of students (Ramsey, 1984). The long and comprehensive guided discussions held in the class focused on the “what” as well as the “why” aspects of case situations. These instructional elements may have helped students in not only comprehensively applying theoretical concepts in practical case situations, but also in making critical connections between diverse concepts. The emphasis on both knowledge acquisition and application may have helped students in the hybrid class to (a) become very good diagnosticians, and (b) formulate causal explanations.

Another facet of the hybrid method that may have contributed to a higher level of student learning is classroom management or instructional process. The hybrid method avoided the rigidity and teacher-centered approach of the lecture–discussion method by emphasizing both the teacher and student involvement, while avoiding the loose structure of the experiential method. Literature on adult education suggests that a teacher-centered approach in the lecture–discussion method can result in rigidity that can preclude an instructor from adapting to different learning styles of students. Consequently, the lecture–discussion method may have negatively affected the learning process of undergraduate adult learners who are independent (Brookfield, 1984; Cross, 1981; Darkenwald & Merriam, 1982; Knowles, 1984). At the same time, undergraduate students with low learning maturity such as the students in the current study, may not feel comfortable in taking the responsibility of self-learning (Beder & Darkenwald, 1982; Conti & Welborn, 1986; Reid & Johnston, 1999). The loose structure of the experiential mode may have made inexperienced students confused about what the instructor was doing and why (Whetten & Clark, 1996). The hybrid method combined the clarity of the course goals and consistent feedback to students in the lecture–discussion method with a flexible structure that allowed instructors to change instructional format to suit the learning needs of the student. As a result, the hybrid method matched the learning needs of the students more effectively than either the lecture–discussion or the experiential methods. This, in turn, may have resulted in a higher level of students learning.

**Limitations and Conclusions**

This study has some limitations. First is the lack of random assignment of subjects to the two instructional groups. A lack of such randomization creates a possibility that the results on the outcome variables occurred because of incoming differences between the groups. However, given the extensive review of the possible “alternative explanations” of the variation in the outcome variables, I do not think that this was a serious problem. Nonetheless, future research should attempt to control for possibility of such a bias. Second is the possibility of bias due to differences in the instructors rather than the instructional method. Although instructors with similar teaching ability and experience were selected, one cannot rule out the possibility that the differences in the instructor explained some of the variation in the outcome variables. Third, the cross-sectional rather than pretest–posttest design used in the study precludes one from making causal inferences about the relationship between instructional methods and mental models of students. Future studies should evaluate the directionality in this relationship using a pretest–posttest research design by focusing on the change in the complexity of mental models. Third, this study explored a synthesis of only two approaches to instruction. There are other approaches that could be considered for potential synergies, such as case method, behavior modification method, and so forth. More empirical studies exploring an integration of other instructional methods are required to address the issue of balancing andragogy and pedagogy in teaching management courses.
The results of this study underscore the need for instructors in the management discipline to move away from the traditional notion of the universal effectiveness of the andragogical approach in teaching adult students. Instructors need to achieve an optimum balance between theory and practice in teaching introductory management courses comprised of students with low levels of learning maturity. This is especially important given the evidence that instructors use highly andragogical approaches in teaching students with high and low learning maturity (Beder & Darkenwald, 1982). Although the current study focuses on introductory organizational behavior courses, future studies may examine the relative effectiveness of andragogy and pedagogy in teaching higher level courses to mature students. Second, domain of instruction plays an important role in determining the relative success of andragogy and pedagogy in teaching higher education courses (Miglietti & Strange, 1998); hence, the results of the current study may not extend to domains that are inherently different from the organizational behavior domain. Future studies should investigate the link between instructional methods and mental models of students in other domains. For example, highly quantitative, analytical, and conceptual domains such as management science and operations research may require very different instructional emphasis.

REFERENCES


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### APPENDIX A

Coding Scheme Developed to Derive the Cognitive Maps

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The fact that the suggestion of personal meetings with purchasing directors was not taken up</td>
</tr>
<tr>
<td>2</td>
<td>The type of appointments made by the president</td>
</tr>
<tr>
<td>3</td>
<td>The fact that the Dashman Company has 20 centrally located plants</td>
</tr>
<tr>
<td>4</td>
<td>The decision to centralize purchasing</td>
</tr>
<tr>
<td>5</td>
<td>The encouragement of independence given by the head office</td>
</tr>
<tr>
<td>6</td>
<td>The relevance of the previous experience of the new vice president</td>
</tr>
<tr>
<td>7</td>
<td>The latitude given the new vice president by the president</td>
</tr>
<tr>
<td>8</td>
<td>The assistant’s personal knowledge of the purchasing executives</td>
</tr>
<tr>
<td>9</td>
<td>The board of directors’ forecast of increasing difficulty in purchasing</td>
</tr>
<tr>
<td>10</td>
<td>The letter issuing a directive on purchasing procedure</td>
</tr>
<tr>
<td>11</td>
<td>The fact that a few purchasing executives did not reply</td>
</tr>
<tr>
<td>12</td>
<td>The president getting the board’s approval for the scheme</td>
</tr>
<tr>
<td>13</td>
<td>News of the appointment of the new vice president disseminated only formally</td>
</tr>
<tr>
<td>14</td>
<td>The inability of the new vice president to leave the head office</td>
</tr>
<tr>
<td>15</td>
<td>The imminence of the annual peak purchasing period</td>
</tr>
<tr>
<td>16</td>
<td>The fact that purchasing procedures had never been completely coordinated</td>
</tr>
<tr>
<td>17</td>
<td>The notification only of orders greater than $50,000 a week in advance</td>
</tr>
<tr>
<td>18</td>
<td>The fact that the new vice president signed the letter</td>
</tr>
<tr>
<td>19</td>
<td>The typical letter of response from the purchasing executives</td>
</tr>
<tr>
<td>20</td>
<td>The selection of a new vice president from outside the organization</td>
</tr>
<tr>
<td>21</td>
<td>The assignment by the president of the vice president’s assistant</td>
</tr>
<tr>
<td>22</td>
<td>The attitude of the new vice president to the purchasing executives</td>
</tr>
<tr>
<td>23</td>
<td>The assistant’s appraisal of the vice president’s plan and letter</td>
</tr>
<tr>
<td>24</td>
<td>The submission of the vice president’s plan to the president</td>
</tr>
</tbody>
</table>
