DEVELOPMENT OF STUDENT GENERATED CASES USING
COMPUTERIZED TEXT EDITING AND DATABASE TECHNOLOGY

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ABSTRACT

This paper presents a methodology by which many persons can participate through computerized text editing and database technology in the development of cases. We demonstrate how students interact as teams together with an instructor in the case development process resulting in (I) a student experience rich in logical and analytic training, (2) a shorter case development time, (3) a well scrutinized product; the developed case having been critiqued by a large number of people for logical consistency and completeness, (4) a potentially open-ended product; the developed case can itself be a starting point for further elaboration.

This methodology has been successfully applied in an MBA course in Information Systems as well as a combined undergraduate-graduate business course in Database Systems, where the course objectives include the development of skills in analyzing computerized systems in a business environment. The implementation of this methodology relies on the use of a computerized text editor for manipulating case text and the use of a database system to support the storage and retrieval of case information.

INTRODUCTION

The development of cases for business applications has had its strongest support at the Harvard Business School. The seriousness with which this development was taken is shown by the *fact* that for many years resources (supervised graduate students) were allocated for case development. These students gathered ease facts, organized these facts, and wrote at least an outline of each case. After a professor had established a case "lead" by locating a business situation which had the potential to become a case, the case developer conducted in-depth interviews with top and middle managers to determine the facts upon which the case was to be built. The interviewing, fact-gathering process was iterative in that as new questions evolved, the interviews were repeated. Each student met regularly with the professor to discuss the interviewing and writing process. Therefore, case development was divided between professor and student.

The case development process exposed the students to a wealth of learning experiences, each important to a future manager. The student learned how to prepare for and conduct interviews for gathering facts, how to separate facts from opinions, how to analyze facts for completeness, how to organize and interrelate facts, how to analyze facts to pin-point problems, how to identify potential solutions, and lastly, how to clearly communicate in writing the information that had been gathered. Therefore, while the case, viewed as the product of case development has learning value for students, the process of case development itself has pedagogical value for students.

Within schools of business there are not as many cases under development as there should be to meet the demand for good cases. The problem is not the lack of "leads". Business faculty consulting contacts usually

provide ample leads. Guidelines for determining good case leads exist [10]. There are also excellent references on how to write cases [3; 14]. The heart of the problem is that case development is very time-consuming for one or even two developers and funding for such development is frequently non-existent. Live cases [15] and case research [2j are very time-consuming for students, instructors, and clients. The use of cases is also time-consuming for the student [5].

In this paper we demonstrate that case development and the use of already developed cases are pedagogically complementary; each stresses a different aspect of the decision-making process. The purpose of this paper is also to demonstrate how the case development process can be managed using inputs and analyses simultaneously from multiple persons. Here we are referring to an instructor and a number of student teams working together to develop and structure background material for a case. The final structuring and writing of the case is the responsibility of the instructor.

THE DECISION-MAKING PROCESS

We divide the decision-making process of a business manager into three phases and six stages. The phases are analysis, solution-generation, and communication. These phases are somewhat related to Simon's classification of problem-solving into the Intelligence Phase, the Design Phase, and the Choice Phase [2]. While decision-making, as a sub-set of problem-solving, is specifically related to Simon's Choice Phase, our classification considers decision making more broadly; composed of fact collection, fact organization, analysis, selection among alternatives, and the communication of decisions which have been made.

In our classification fact-gathering is stage I and is within the analysis phase of decision-making. After an area of concern has been identified, a manager begins by gathering facts pertinent to organizational objectives, functions which support these objectives, standards which relate to the functions, and measurements which relate tc the standards, all within the defined scope of the study [11]

Fact-gathering is frequently in the form of questions and answers. The development of appropriate questions is critical to effective analysis Li]. The questioning can be informal like a directive to staff to supply certain information or it can be formal through questionnaires or personal interviews. The important. point is that the manager expects this questioning process to be iterative. Answers to one set of questions spawn new questions as more and more clarity is brought to the situation.

Stage 2, which is also within the analysis phase, is the detection of relationships among the facts gathered. Stage 2 is also iterative, since such analysis generates new questions, leading to new answers and therefore new facts. In this stage not only does the manager find that information is lacking, but also that information may be illogical or inconsistent.

The problem identification stage is stage 3. Here a

situational problem is put into focus and clarified. This stage too may involve iteration, since once the problem has been vaguely identified, additional information is frequently needed to produce clarity. The next two stages of decision-making are the determination of alternate solutions and the selection of a solution from among the alternatives. These two stages (stages 4 and 5) form the solution-generation phase. Lastly, the solution itself must be properly communicated through channels for implementation. This is stage 6 which, because of its uniqueness, Is also the third phase of decision-making.

We now examine the relationship between case development and the use of cases with respect to the phases of decision-making, extending from fact-gathering to decision communication.

CASE DEVELOPMENT AND CASE USE AS COMPLEMENTS

Case writing and the use of written cases are closely related. The particular slant of a case is determined by its use in the classroom [LO]. When viewing the decision-making process, the use of the written case and the involvement of students in case development are complementary. The objective of the development of a written case is to produce a coherent, clearly organized set of facts depicting a realistic decision- making situation. However, there is more factual ambiguity in the development of a case than in the use of a case. In this respect case development is different from the use of the written case, but similar to the live case. For, the live case stresses fact finding, fact recording, and analysis [9]. The application of analytic skills is needed to resolve this ambiguity. These analytic skills are related to fact-gathering and fact integration; stages 1 and 2 of phase I of decision-making.

Fact-Gathering

The analysis skills of fact-gathering can be broken down into finer grained skills. Fact-gathering, stage 1, forces the student to determine what information is needed, from whom, and just as importantly, when to stop gathering information. Effective fact-gathering demands a sensitivity to the scope of the area of concern. Irrelevant facts are wasteful of data collection time as well as analysis time. Effective fact- gathering also demands that the student weigh the potential benefits of further information versus the cost to obtain it. Fact gathering techniques depend heavily on questionnaire development and interviewing techniques. These skills are especially important to designers of business information systems. When a student works with an already developed written case, most of these fact-gathering analytic skills are explicitly not treated or implicitly assumed to have been learned somewhere else.

Most written cases, although touching on all of these stages of the decision-making process, stress stages 2 through 6, especially stages 3 through 5. Some types of cases can be supplemented with data through interviews [9] by using inference or research [6]. However, a written case is a "snapshot" taken at a point in time, while business problems are part of a living continuum [II. When written cases are used, the questioning part of the fact-gathering stage is usually closed to the students. An exception to this is the use of pre-packaged additional information which students may "purchase". In a written case one allows ambiguities, as in a good detective story, but not factual inconsistencies. Already written cases do not expose students to the iterative process between stages

1 and 2. Case development, similar to live cases, demands that fact-gathering be iterative L9]. However, in the use of written cases it is frequently frustrating for the students not to be able to obtain more information. It is also somewhat unrealistic, since the students know that a manager would be able to obtain additional information as questions arise.

Organization of Facts

Stage 2, determining relationships among facts, also demands the use of skills of analysis. Here facts must be sifted, organized and integrated. Fact organization is the most important part of stage 2. Without the proper organization of facts, it Is almost impossible to detect meaningful relationships among facts. To properly organize facts one must have a "suitable framework" Li]. Grids and categories have been chosen most frequently to support logical models for the organization of facts [5].

Although stage 2 Is an integral part of both the use of cases and the development of cases, different aspects of analysis are emphasized. The fully developed case is already in a highly organized form. The raw facts are already partially pre-digested. In using a case the emphasis of analysis is on how the given facts are interrelated. However, the analytic emphasis is different in the development of a case. The student is faced with more structural ambiguity and the organizational requirements for the facts are greater. Case development relies on the selection and sequencing of information *[7]* Such questions arise as: "Are the facts consistent?" "How can these facts be logically organized to depict the situation under study?" "Under what categories or topics should the facts be organized for understandability?" In developing a case a student is exposed to this different type of analytic experience.

Fully developed written cases stress stages 2 through 6. Case development, however, stresses stages 1 and 2 as well as the iterative nature of the fact-gathering and fact organization stages. Case development and already written cases are, therefore, complementary when viewed in terms of the entire decision-making process.

Stage 2 and Cognitive Sets

The organization of facts is not a simple cut and paste procedure. It is a high order mental function involving cognitive sets and models. The objective in developing good systems analysts is to replace narrow cognitive sets with better models of fact organization and problem solving. Each person not only views a problem situation differently, but also approaches a problem differently. In addition, different personality types demand different amounts of information for effective problem solving. The development of such organizational skills is aided by

(1) applying a present cognitive set to a situation and then receiving feedback on its appropriateness.
(2) observing other people organizing facts. Such observation provides new models which may be internalized.

CASE DEVELOPMENT ADMINISTRATION PROBLEMS

The administration of the case development process

involving many participants is a critical problem. The case development process shares with the use of cases the fact that the administration of both is difficult. While the administration of cases has been aided by such communication techniques as brainstorming and nominal grouping [13], the current literature is devoid of administrative aids for case development.

This writer found that the administration of the case development process includes the following problems, after the case 'lead" has been established and after authorization from a target firm has been obtained.

(1) An initial proper focus to the <u>scope</u> of the system study is necessary; the case objectives, its actors, and its functions.

(2) Questions that each team wishes to ask members of the target firm must be collected and stored. Lee, working with live cases, mentions the importance of capturing and controlling all the questions which students ask, especially those for which more fact-gathering is needed [9]

(3) Redundant questions must be minimized. Before a team adds its questions to the already accumulated set of questions, the team should check to see whether another team has already asked a similar question. Therefore the questions collected to date must be disseminated to each team. This dissemination has the additional benefit that each team gains insights into other potential questions, when viewing other teams' questions.

(4) Questions must be screened and critiqued before being asked of members of a firm.

(5) The accumulated and updated (critiqued) questions must then be disseminated to every team. This helps to insure that each team knows what the other teams are doing.

(6) Questions must be stored, associated with their answers, and each question-answer pair, considered as a fact, must be associated with its respective team.

(7) Facts become intelligible when organized around a set of categories. Yet, each team will wish to have its own categories. If the case facts are to be organized according to the different subjective categories submitted by each team, a problem arises. To handle this presupposes that these organizational categories for the facts are also able to be stored, associated with the appropriate team, and that each category can be associated with one or more facts. This selective individualized organization of the facts allows each team to analyze the facts according to its own collective framework. This organization forms the basis for supporting the analysis of stage 2, that is, the determination of relationships among the facts.

(8) The instructor may wish to disseminate to all teams one or more exemplary category sets selected from the teams.

(9) The repository of facts and their organization must be able to be updated as the teams go through multiple iterations of fact collection and fact organization. Yet, this updating should keep to a minimum the rewriting of facts and fact categories.

(10) Each of these administrative problems, when taken together, produce two other sub-problems. Although feedback is helpful in the learning process, care must be taken that the teams are not buried in factual or feedback data. Control of the amount of feedback data is necessary.

It is important to point out that consensus is not completely necessary for the success of the case development process. What is important for the student is the <u>process</u> not the <u>product</u>. Each team may come to an understanding of the case material through a

different set of mental constructs. There is no right or wrong path. At this point, it is both the instructor and the students who learn. By discussing the different organizations of the facts of the case, both the instructor and the students can modify their approach to the organization of the case. They come to see the case from a number of different angles. Nevertheless, the instructor here is considered the final arbiter when it comes time to write the case.

This does not imply that case development is reduced to a conglomeration of viewpoints. Fact organization within the final product, the case, is expected to be unique. For, one can err in case development just as much by presenting the case's facts <u>too clearly</u> or <u>too</u> ambiguously A developed case should be challenging.

COLLECTION, CRITIQUE, AND ORGANIZATION OF CASE FACTS

Two tools are introduced to help solve the ten administrative problems mentioned above. These tools are computerized text editing and database technology. Many schools of business are introducing computerized text editing packages. They exist over the whole spectrum of computers; from large mainframes to minicomputers and even to micro-computers. Database systems exist on most large mainframes and many of the popular mini-computers like those of Hewlett Packard and Digital Equipment Corporation.

<u>Text-editing</u>

Computerized text editing is used to control the first six administrative problems mentioned above. The centralization of information in the case development process is paramount, if these administrative problems are to be solved. Information must be accessible from a common repository. Information must be able to be easily inserted, corrected, and disseminated. Computerized text editing provides the basis for these requirements to be net. Text editing software allows many individuals to access a common data file of textual Information. Most such text editing programs allow text to be inserted at the beginning or the end of the text or between already existing lines of text. Language commands exist for easy changing of words, phrases, and paragraphs.

The case development process begins when an instructor at a CRT, using a text editor program, enters into a blank text file background information on a case situation. Then, student teams are selected and during class time a verbal overview of the project's objectives and scope is given. Each team is given the responsibility of determining relevant facts pertinent to one or more of the persons within the firm under study. A graduate assistant provides 15 minute demonstrations in groups of 3 to 5 students to students who do not know how to use a CRT.

Each student at a CRT enters the commands necessary to produce a written printout of the text file. After studying this information each team meets to develop a set of questions to be asked of its person(s) in the firm. Then within a week period each team displays the already accumulated text file before adding its own questions to the text file at a CRT. Each team compares its questions with the already accumulated text in the data file. Each team is instructed to add only non-redundant questions to the text file.

In addition to questions a team can add to the text file comments directed at other teams. In this way

teams can communicate with each other; pass hints and areas of possible exploration. These questions can become the basis upon which an interview or questionnaire is built.

After all teams have submitted questions and comments, and received a new printout of the file, the instructor then inserts into the text file a critique of any or all of the questions. Each student then obtains a printout of the entire updated text file.

The questions can be considered adequate or not. The first round usually needs considerable improvement. Important questions are left out. There are many irrelevant and still redundant questions. The critique highlights these and can be used to direct attention to areas not yet investigated. Our experience has shown that there is a need for a minimum of three times through these questioning steps. At each iteration each team gets feedback from both the instructor and the other teams.

After the questions are considered acceptable and after the teams return with answers to the questions, each team inserts each answer under its respective question in the text file. Also additional facts gathered during the interviews or from the questionnaires are appended to the end of each team's block of text. Then the instructor critiques the text file to whatever extent desired. Each student, then, outputs the updated text file which has each team's questions, answers, comments, and the instructor's critiques. The instructor at this point can decide to return to the fact-gathering stage or proceed to stage 2 of the analysis phase.

Database Processing

The case development methodology then enters stage 2 of decision-making and the administrator is faced with a new set of problems, mentioned previously as problems (7) to (10). These problems center on that part of the analysis process in which the organization and integration of facts among the teams is important.

Database technology is used to solve these problems. Database technology is more applicable to case development than is traditional computerized file systems, because a Database Management System (DBMS) has as one of its aims the centralization of the logical structure of data. Data in a Database Management System can be so structured that the same physical data can be logically viewed by different persons, as if it were differently organized. We have mentioned that in stage 2, each team will have a different way of categorizing and organizing a set of facts. The database techniques useful in implementing the storage and access of such diverse viewpoints go well beyond computerized file systems. Such techniques are described in [4;8].

The instructor begins the second part of case development by entering at a CRT a roster of team names. Neither the instructor nor the students need be familiar with database processing. A program picks up the roster names and enters them into the database. This is followed by the execution of another program which moves the text file into the database.

Meanwhile, each team analyzes the text file and determines a set of appropriate categories according to which it wishes to organize the case facts. Three commonly used category types are single, multiple, and hierarchical. An example of a single category is cost. An example of a multiple category is cost/effectiveness. An example of part of a hierarchical set of categories is as follows:

Total Cost:
Costs of Department A
Personnel Costs of Department A
Machine Costs of Department A
Costs of Department B
Personnel Costs of Department B
Machine Costs of Department B

Each team then analyzes the text in order to divide it into blocks of text according to its chosen categories. Facts may now be selected or discarded by any team without affecting the other teams. Since each line of text is numbered, the procedure of selecting blocks of text is relatively easy. Each team inputs through the CRT into the database its chosen categories along with a category number to be associated with each category. The order in which the categories are entered is later taken as the desired order in which the textual information will be organized for printing. Within the database each category of each team is associated with a team name in the roster.

Each team then inputs a succession of category numbers, each number followed by one or more designated blocks of text from the text file. For example, assume a block of text begins at line 110 and extends to line L35 of the text file and this block is related to a team's category "Personnel Costs of Department A." Further assume that "ABCD" is the category number. The input entry becomes

ABCD, 110-135

There is no restriction on the number of times a category can be input. Therefore a team can input category and text line numbers according to the physical order in which they appear in the text file, while the database will organize the text logically according to the order in which the original categories and category numbers alone were entered. When each team outputs the text file, it receives a copy of the text with the information organized according to the categories it has chosen.

In the next step the information within each category is organized and the administrative burden is again kept to a minimum. After each team decides the sequence of the facts within each category, a program prompts each team at the CRT for each sequence under each category. Each team inputs merely a set of sequence numbers, e.g. (3,1,2). The sequence numbers represent the order in which the blocks are to be output within a category. The output is a fully organized individually tailored text file. This textual organization is performed in two passes in order to reduce input errors and to demonstrate to the teams that, when one is faced with a large number of facts, multiple integration of the material is helpful.

At this step the instructor can decide that the initial organization of facts has generated too many additional unanswered questions and so a return to stage 1 is necessary. If so, the instructor selects one of the team's organizations of the facts as a starting point for the other teams and causes these facts to be moved outside of the database as in stage 1. The teams would then return to the fact-gathering stage. Another possibility is that a better organization of the facts may be deemed necessary. If so, each team is allowed to view the categories of every other team. This is done so that each team will be helped in developing the analytic skills of category construction. Then the teams return to recreate their categories. When the textual organizations look promising, the last step is taken. Each team analyzes the

facts and writes a report that includes:

(1) An analysis of the situation studied.
(2) *An* identification of the problem(s) in the situation.
(3) The facts to support the analysis and the problem identification.
(4) Acknowledgements of indebtedness to other teams.

It is important to note that the report is not a fully developed case, nor is it a listing of the organized text *file.* The report is the culmination of the team's analysis of the facts behind the future case. The multiple logical organizations of the facts provide the instructor with many insights into how the case can be organized and written from the accumulated facts.

Conclusion

The case development process uses many analytic skills which are not emphasized when written cases are used. The combined use of computerized text editing and database technology provides a means by which students can be exposed to these important parts of the decision-making process. The methodology presented in this paper also enables the instructor to administer the case development process simultaneously to multiple teams, while preserving the individual analytic style of each team.

The administrative burden of case development as expressed by problems (1) to (10) is lifted from the shoulders of both the instructor and the teams through the use of text editing and database technology. The text file can simultaneously be viewed from many different angles, organized, and displayed to each team as it wishes to view the information. Lastly, the methodology provides the foundation upon which the instructor can develop a written case based on the combined participation of the students.

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