DOCUMENT RESUME

ED 422 930 IR 057 088

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TITLE Using Theory of Constraints To Teach Introduction to MIS.
PUB DATE 1997-00-00
NOTE 5p.; In: Proceedings of the International Academy for Information Management Annual Conference (12th, Atlanta, GA, December 12-14, 1997); see IR 057 067.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Business Administration Education; Higher Education; Information Science Education; Information Technology; *Management Information Systems; Meetings; Models; *Problem Solving; Teaching Methods; Theory Practice Relationship

ABSTRACT

This paper presents a procedure for teaching Management Information Science (MIS) courses called the "Current Reality Tree" (a tool of the Theory of Constraints used to determine the major problem of a system) and proposes a methodology to use it to aid in instruction. The first part of the model (business problems) suggests initiating a session by clearly defining a specific problem of a business. The second part of the model is the solution offered by information technology; in this part, a specific MIS solution to the problem is explored, analyzed, and validated. Finally, new opportunities arising from the implementation of the MIS solution can be explored. An example applied to the problem of meetings is presented. Preliminary results of testing the approach are also given. (AEF)

USING THEORY OF CONSTRAINTS TO TEACH INTRODUCTION TO MIS

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Teaching MIS courses is a real challenge. This paper presents a procedure called the current reality tree (which is a tool of the Theory of Constraints) and proposes a methodology to use it to aid in the teaching of Introduction to MIS courses. An example applied to the problem of meetings is presented. The methodology is currently tested at a University and some preliminary results are given.

INTRODUCTION

Teaching Management Information Science (MIS) courses is a real challenge. First, MIS draws research and principles from different disciplines (i.e., psychology, economics, sociology). As a result, instructors must master a large variety of subjects and be able to present them in a meaningful and interrelated sequence. Due to the variety of subjects, students may tend to be confused and lose focus.

Another problem comes from the fact that students coming to an introductory MIS course have different educational backgrounds (computer science, business, etc.). Therefore, students expect a different prospective as to what MIS entails. Computer science students usually expect some technological focus and hands-on type activities. Business students like to see the business and managerial implications of information systems.

Finally, students have different levels of knowledge about computers. A regular class may have students with high level of programming skills in different languages versus students who are still afraid they may break a computer if they touch it. Finding a balance in the level of technology coverage becomes a challenge.

Several approaches can be used to teach Introduction to MIS courses, including lectures and case studies. Teaching MIS courses using a lecture approach can be extremely boring for students, especially for computer science students who may be used to "do" as opposed to just listen during the whole class. Case studies are a better alternative because they allow students to do some creative work on their own. This paper offers one alternative that can be used along with case studies: the use of Theory of Constraints.

THE MIS PROBLEM SOLVING MODEL

Before explaining TOC, the following model is presented as a framework within which Theory of Constraints can be used. The model presented in Figure 1 assumes that a problem solving approach is the main focus of the MIS class and serves as an outline for the different sessions.

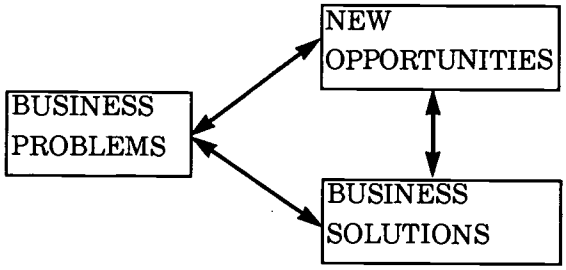
The first part of the model (business problems) suggests initiating a session by clearly defining a specific problem of a business. These problems can be within company's functions, among functions and even among firms. An example of a classical problem could be lack of knowledge about customers' needs. This is a marketing problem and it can be found at most businesses. The objective of this part is to have students understand the characteristics, magnitude and importance of a given business problem.

The second part of the model is the solution offered by information technology. In this part, a specific MIS solution to the problem is explored, analyzed and validated.

Finally, new opportunities arising from the implementation of the MIS solution can be explored. MIS solutions not only help solving specific problems but also, by their own nature, bring new opportunities to the table. This part of the model implies making students aware that Information Systems go beyond solving current problems.

FIGURE 1

PROBLEM SOLVING MODEL



THEORY OF CONSTRAINTS

Theory of Constraints (TOC) is a set of logical tools known as the thinking processes and their applications to Production, Marketing, Project Management, Distribution and Management Skills. TOC was developed by Goldratt (1990), a physicist by training. The specific applications of TOC have been reported in a series of novels (Goldratt, 1992, 1994 and 1997). Also, a study illustrating several applications of TOC was written by Noreen, Smith and Mackey (1995).

TOC tools include current reality tree (CRT), future reality tree (FRT), conflict resolution diagram (CRD), prerequisite tree (PRT), and transition tree (TRT). Most of these tools intend to represent complex systems as a set of cause-and-effect relationships. A complete treatment about these tools can be found on Dettmer (1997). In this paper, a proposal of the application of the CRT to teach MIS will be presented.

The Current Reality Tree (CRT) is a tool used to determine what is the major problem of a system. It starts with a set of problems and/or symptoms, also referred to as undesirable effects (UDE's), observed in the system being analyzed. These UDEs are then connected via cause and effect relationships. The objective is to have a logical tree where all UDEs are connected to a common cause. If this is done, the analyst can argue that the common cause is the root of most undesirable effects of the system (i.e., the core problem), and that solving or removing the common cause can help improve the system as a whole.

The CRT can be used in an MIS class to find the core problem of a specific system, and then, to demonstrate why an Information System technology approach can be part of a solution. The CRT can also be used along with case studies as part of the business problems part of the problem solving model. Using a CRT gives students a systematic way to analyze case studies. The following procedure is proposed:

1. Explain the nature of the system to be analyzed
2. Find a series of undesirable effects of the system
3. Guide the students in the construction of the CRT
4. Agree on the core problem of the system
5. Explain the corresponding IT solution

By developing a CRT, students will gain a deeper understanding of the core problem of the system being analyzed. Selling a specific IT solution may then be easier. Let's consider an example.

EXAMPLE OF AN APPLICATION OF THE CRT

Meetings

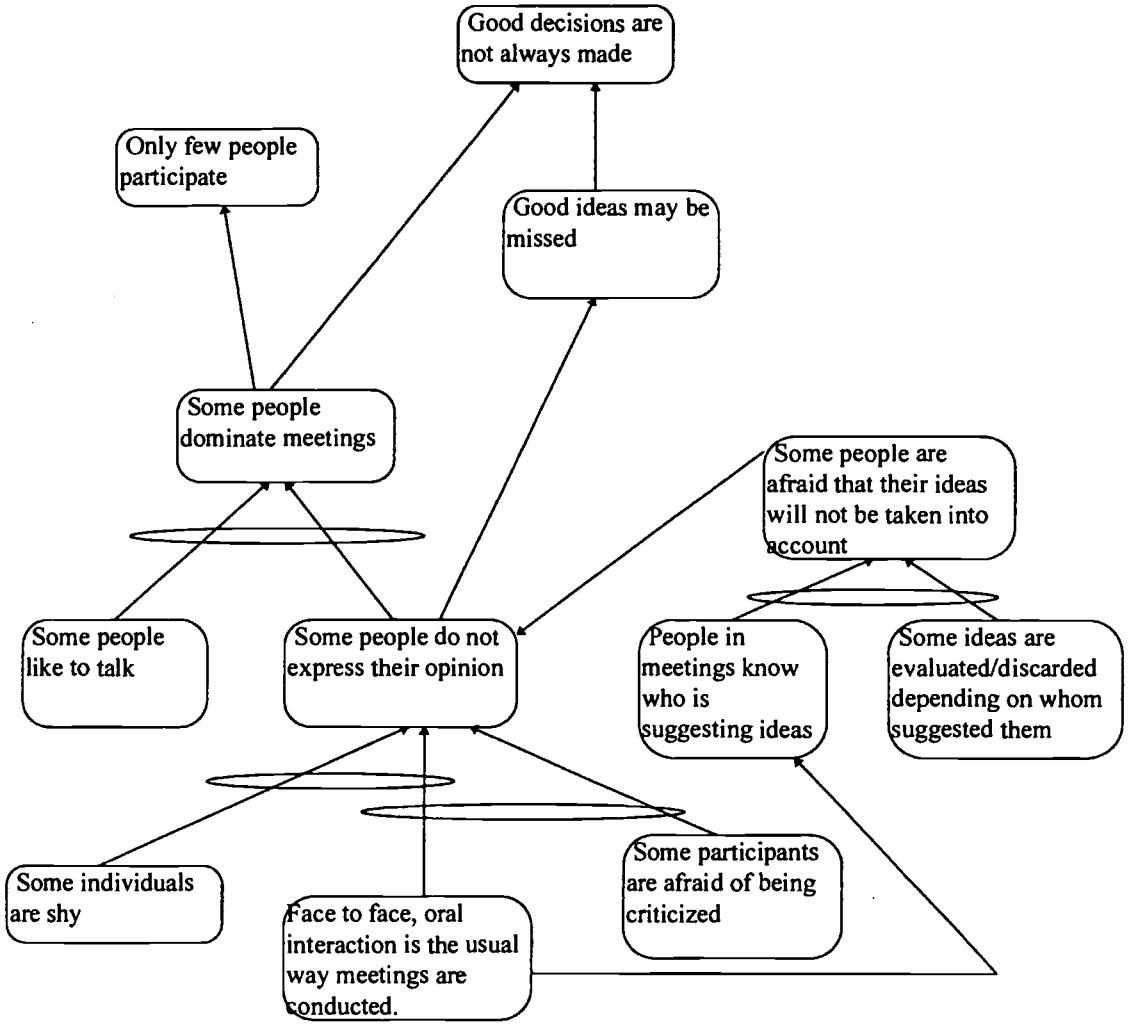
In explaining the subject of meetings within organizations, an instructor may talk about the importance of having meetings due to teamwork, etc. According to the model presented in Figure 1, the beginning of the class should be used to convince students about problems businesses encounter whenever meetings are conducted. From the discussion, students can be asked to develop a set of undesirable effects that they have observed in meetings. A potential list follows:

1. Some people are afraid their ideas will not be taken into account
2. Only a few people participate
3. Some people talk too much
4. Some people do not express their opinion
5. Good decisions are not always made

More UDEs are possible, but these are enough to demonstrate the use of CRT. Figure 2 shows a version of a CRT that could come from the analysis. The tree is read from the bottom-up. An entity at the tail of an arrow is the cause and the entity at the head is the effect. If two arrows are connected to an entity and if there is an ellipsis connecting both arrows, that means that both causing entities are necessary to produce the effect. All entities without arrows coming into them are candidates for a core problem.

FIGURE 2

MEETINGS' CURRENT REALITY TREE



As the CRT suggests in Figure 2, there are several entities (no arrows coming into them) that can qualify as core problems:

1. Some individuals are shy
2. Some people like to talk
3. Some ideas are evaluated depending on whom suggested them
4. Some people are afraid of being criticized
5. Face to face oral interaction is the usual way meetings are conducted

At least in theory, it is possible to intervene on entities 1-3. For example for entity 2, some people like to talk, it is possible to give a limited and

equal amount of time to everyone in the meeting as is normally done on political debates. However, entities four and five are good candidates for core problems as they are directly or indirectly responsible for most undesirable effects. The undesirable effect coming from entity four were minimized by the breakthrough called brainstorming whereby people are not allowed to criticize an idea until enough ideas have been identified. Entity five also offers a great opportunity to improve meetings, if an alternative way can be found to communicate/ interact during meetings.

Up to this point students have agreed on the nature of the problem and they have explored some of the potential solutions as guided by the current reality tree. Hopefully, at this point, they understand that to solve some of the problems encountered in meeting a new way to interact in meetings needs to be found. This smoothly leads to the MIS solution: Group Decision Support Systems (GDSS) whereby people participate anonymously.

WHY SHOULD THIS WORK

The CRT is a hands on activity very similar to a programming job. The hypothesis is that computer science students may feel comfortable when making a tree. In addition, computer science students who may be familiar with graphical packages can help business students with less computer experience. This should promote team building.

Most undesirable effects and problems presented are related to business-related issues such as customer satisfaction, cycle time, profitability and cost. Therefore, business students can see the relevance of the relationship between the core problem, as found by the CRT, and its business implications.

Also, the causalities involved in building a CRT requires knowledge about business subjects such as organizational behavior, marketing, and personnel. For example, the problems of business meeting can be related to political implications of criticizing one's boss, etc. Business students may be more familiar with those subjects and they can bring their expertise and share it with other students.

In short, the CRT is a tool that can allow students to work in a systematic manner and combine different level of experience. Additional bonuses include the ability to work in teams and the experience of building a CRT which they can use later in their future jobs to solve real problems.

SOME RESULTS

The approach is currently being tested and some preliminary results follows.

1. It is difficult to find case studies that present scenarios where a company is trying to solve a specific problem. Most cases are solutions that have already been implemented. This makes the application of the CRT difficult.
2. Students in general find some problems when constructing a CRT. It is a little surprising the level of difficulty they encounter when asked to think using logical cause-and-effect relationships.
3. Students understand and easily follow a tree that is presented to them. Some students say that the logic of the tree is "straightforward" once is completed.
4. Some teams work fine with the trees some do not. Usually there is a dominating person who builds a draft of the tree and the other team members just scrutinize the logic.

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