USING ICONIZATION AND MIND MAPPING IN THE TRAINING AND DEVELOPMENT ENVIRONMENT OF THE MACRO-INDUSTRIAL ERA

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Our goal for the training and development environment is to be able to present as much information as possible that applies to the designated task and accomplish this in the shortest time so that the trainee or learner understands the material, retains the information, applies the concepts effectively, and optimizes their innovation potential. They are then able to pass on this information as accurately as possible and with minimal preparation to a new trainee.

In this paper, a methodology that has been used effectively for training for over 10 years in a large home health care corporation and in a university computer science / business administration program is presented. A small portion of a training curriculum will be described and illustrated with a real life example that is used to teach the principles and application of Total Quality Management (TQM) in a classroom and boardroom.

Conviction for the methodology described here was attained through the study and application of systems analysis techniques for describing the activities of businesses where the analyst understands the business, can interact with the user effectively to gain a thorough

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understanding of the business, can optimize the way the business is conducted, and then can ensure that software is written to implement all or a part of what has been learned. Good, clean diagrams have played an essential role in the design of complex systems and in the developing of programs. Philosophers, leading computer scientists (Iverson, 1982) and others have often stated that what we are capable of thinking depends on the language that we use for thinking and it becomes a "tool for thought". Mathematical notation succinctly describes complex processes and allows effective problem solving and communication. The diagrams that we draw of complex processes are a form of language. With computers, we often create processes that are more complex than those which we would perform manually. Appropriate diagrams help us to visualize and invent those processes. When the analyst is developing a system design for a program, the diagrams that they use are an aid to clear thinking. A good choice in diagramming can speed up their work and improve the quality of the results.

When a number of people work on a system or a program, diagrams are an essential communication tool. The diagrammatic technique is needed to enable developers to interchange ideas and to make the components fit together with precision. When systems are changed, clear diagrams are essential to the maintenance process. They make it possible for a new team to understand how the programs work (often highly complex) and to show their understanding by designing the required changes. A critical point occurs when a change is made. It often affects other parts of the program. In other words, the association of that one component to many other components must be made evident. This is not as clear in the linear statements of a programming language. A major competitive advantage in any corporation today is innovation (a second is quality service) and this requires the ability to think creatively, and the association ability is at the heart of creativity.

Given an appropriate diagramming technique, it is much easier to describe complex activities and procedures by using diagrams than by

using text. A picture can be much better than a thousand words because it is concise, precise and clean. It does not allow the sloppiness and woolly thinking that are common in text specifications.

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Diagramming techniques in computing are still evolving. This is necessary because when we examine the techniques in common use today, many of them have serious deficiencies. Flowcharts have fallen out of use because they did not present a structured view of a program, yet as a training tool they are very useful in describing decision processes.

The authors recall clearly the description of an entire university registration and billing system described on several blackboards using a data flow diagram methodology. It was easy to jump in and quickly gain an understanding of this rather complex process. Gane and Sarson (1979) have described an entire company on an 11 inch x 17 inch sheet of paper. Again the reader can quickly gain an excellent understanding of this complex process.

Of particular importance in computing today is the involvement of end users. We want them to communicate well with systems analysts and to understand the diagrams which are drawn so that they can think about them and be involved in discussions. Hence any diagrammatic technique has to be user friendly, and designed to encourage user understanding, participation and sketching. Much of the future battle in computer systems and business is a battle with complexity, and diagrammatic tools aid in this battle. Zey (1994) illustrates a situation at the Polaroid company in which

trainers use words on flashcards that correspond to camera parts to be assembled on the job. The results have been encouraging, with dramatic gains in worker versatility, ability to transfer their skills and attention from one job to another. This is a clear example of how a diagrammatic technique proves itself out in the business environment.

When one examines the challenges that the analyst faces in the complex and rapidly changing world of computers and business, it is very evident that all these same components characterize the trainer's challenge, and correspondingly the trainees' (used in analysts terms) challenge.

THE METHOD

In this paper, we propose expanding and combining several tools into the training arena. The first diagramming tool is the mind map. Other names by which this tool is known are spoke diagram, thought web, and clustering diagram (Buzan, 1989). The mind map as described by DePorter (1992) indicates that it provides the details that are easy to remember because they follow the brain's pattern of thought; hence, it is a simple but powerful diagrammatic tool. The surprising thing is that most of us have never been shown how to use a mind map during the course of our education.

The following is a summary of how a mind map is created. Starting at the center of a page, the goal, theme or purpose of the map is recorded. For example, if you are generating a mind map to introduce the Total Quality Management concept, you can draw this as shown in Figure 1. From this central theme, branches or lines are drawn towards the edges of the page. On these branches are printed any ideas that relate to the problem or project. Primary ideas are recalled on separate branches near the center of the page. In Figure 1, the focal point is TQM and efforts to improve performance. Primary ideas are the improvement parade which discusses why TQM is important, a historical background that discusses the

improvement parade, and the penalties if a corporation does not follow the improvement parade. Secondary branches are drawn exiting from the primary branches.

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This is where the secondary ideas that relate to the main ones are recorded. Many branches can be drawn adjacent to the secondary ones to record a third level of ideas.

The mind map is a powerful way of generating many ideas quickly. Rico (1983) calls it the design-minded shorthand because it uses a right-brain technique to release a person's natural expressive powers. Its advantages are:

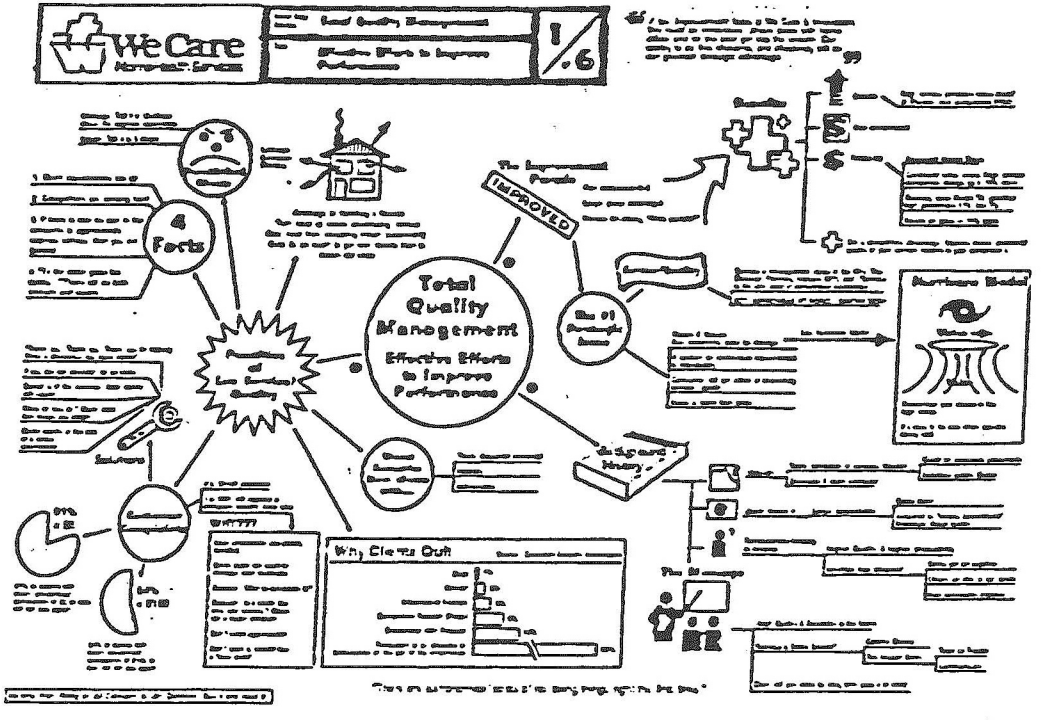
1. It is compact. Many ideas can be located on one page. If needed the mind maps can be expanded to additional pages where a secondary or tertiary node is the focal point for the new map. (In systems analysis, we refer to this process as leveling.)

2. Ideas are put into categories making it easier to group ideas. It also means that when new ideas are derived, they have a place to go. In linear text, it is difficult to add a new idea unless one does so in the margin.

3. It is a marvelous tool for innovation and/or creativity so that the user can think of new ideas. Seeing the whole picture and the association of one element to another facilitates creativity for the reader or trainee.

FIGURE 1

Training Mind Map for Total Quality Management at We Care®
(Reduced from Workable 11 X 17 Inch Size for Inclusion Here)



4. It is a long-term tool. After setting it aside for a day, week or month, the person using the map can come back and review the map in several minutes, and their recall is greatly enhanced. This is ideal for the trainer.

5. The mind map is useful because it is a picture (circles, lines, and text form a picture) and this stimulates the right brain and creative activity.

6. The mind map also lends itself to the left brain activities such as planning, speech plans, goals, and presentation notes.

All of these characteristics fit the trainer and trainee goal which is clearly specified in the abstract. It is important to note, as well, that mind maps have been used for a long time. People who used them effectively were Albert Einstein, Leonardo da Vinci, Thomas Jefferson, John F. Kennedy and Thomas Edison.

It is important to observe that the mind mapping technique that Buzan (1990) advocates uses one word or two word descriptions of a concept. We propose here that longer phrases be used where appropriate. We found that a word by itself in summarizing a concept is very cryptic and, although they may be useful for the quick generation of ideas in brainstorming, they often lead to associations which are not necessarily correct when a person uses the map at a later date.

The second observation is that the size of the paper is very important. We use 11 by 17 inch paper in training. Letter size paper (8-1/2 by 11 inches) does not allow the mind mapper to place many ideas on one page. This leads to fragmentation when text and diagrams are presented over several pages. Additionally, association—one of the most powerful abilities of the brain, and one that distinguishes it from the computer—is inhibited.

If smaller sheets of paper are utilized in any situation, this further inhibits effective learning.

The second tool that we propose can be termed "iconization". This involves summarizing a concept in the form of a picture. In the book, *The Fifth Discipline*, Peter Senge (1990) states that our success as leaders depends on our ability to create mental models. He indicates that our mental models determine not only how we make sense of the world, but how we take action. The icon for a concept fits that category. Apple Computer Corporation used this idea to gain a competitive edge over IBM, where pictures or icons were used instead of word commands (e.g., DIR for "directory"). In his excellent text, NcNeil (1988) proposes the hurricane concept as a mental model for the importance of vision and values in a corporation. In Figure 1 is a diagram of these important components of the model: the eye in the center; the wind coming in at high speeds; and the values feeding the hurricane and the vision guiding its movement. If one examines a hurricane, it is similar to the operation of most businesses. In the home health care corporation, We Care Home Health Services, several thousand employees deliver services to thousands of clients. The activity in the office is very much like the high winds that funnel into the center of the hurricane (McNeil, 1988). The hurricane gets its strength from the water, and if it stayed over water it would maintain its strength; that is, over land it no longer has the warmth and the moisture that the ocean provides. The parallel for the director in a We Care office is that they are very busy, and if they forget their vision, which is expressed in their mission statement, they too will lose out in the long run just as a hurricane does. Additionally, at hectic times in the day (the high winds), the director might lose his/her composure. We recommend that the director go into the eye of the hurricane; that is, we recommend that the directors remember their values which are summarized in the guiding principles associated with the mission statement. In summary, these guiding principles are: to respect individuals; to provide the best service; and, to expect and demand excellence form every employee. As a result of this mental model, we often hear directors saying in a hectic time, "I stepped into the eye of the

hurricane". Additionally, directors in training describe their office in terms of the hurricane model so that the staff does not see "chaos" at busy times, but sees activity that is carefully guided.

We term the above process "iconization"; that is, a body of text is represented by a picture. The picture by our definition can be circles and lines with text, or it can be a rough sketch such as the hurricane in Figure 1. By changing the text into a picture and text, the user has processed the data and created an picture which is easy to remember. The exercise itself facilitates memory. An important side effect when we perform this process is that we make the material our own. We believe that many trainers do not "own" the material and hence can not convey the material with the emotion, confidence and enthusiasm that is required for high quality training and speaking. To paraphrase a point that Sagan (1989) makes in the excellent text, *The Dragons of Eden*, we have survived as a species by being very effective picture processors. It is our belief that text alone is deadly to the training process and that text and icons form the most effective combination for the training environment.

An Example

The challenge for the training division of We Care Home Health Services is to take nurses, most often with no business background, and after several days of intensive training, mould them into effective business people. This requires an innovative training method. We not only have to train these individuals, but we also have to give them the tools to train others. The corporation has manuals to describe the business process and the trainee is asked to read them prior to training. Training takes place using the Mind Mapping Method combined with the iconization concept. Figure 1 is an example of the introduction to the Total Quality Management lesson. Our research has shown that Clemmer's text (1992), *Firing on all Cylinders*, is the best text for the Total Quality Management effort due to Clemmer's extensive use of mental models. Indeed the title

connotes the fact that to be effective like a car, your corporation's motor must fire effectively on all cylinders.

When we examine the mind map in Figure 1, we start reading at the upper right corner, and proceed clockwise around the map. Just as a clock, where timing is important, this drives the order in which we proceed through the map.

The first icon is a simple rectangle representing a sticker that says essentially, "in this package is the new improvement parade". The text to the right laments the fact that few corporations are doing it or are walking the talk. At the right we see plus signs standing for positive benefits, the first being an upward arrow. This signifies growth. If the trainer does not remember the facts associated with the growth, the facts are stated to the right in the text. The next icon is a dollar sign behind bars which stands for cost containment. The trainer expands on the many ways that TQM saves on costs and finally the dollar sign indicates that there is a monetary benefit to the corporation that adapts its business to effectively employ TQM concepts.

The rest of this map is very self explanatory. One point that we make is that a negative concept is put in the upper left corner (we do not shake hands with ones left hand; the origin is a sanitary one where we did not want disease to spread). This can be used for negative concepts off the secondary or tertiary nodes. For example, the penalties of not following Total Quality Management principles appear to the upper left in this diagram.

CONCLUSION

Mind maps have been effectively used for training at We Care Home Health Services for ten years. From Figure 1, it is evident that when the trainer prepares for a session., it takes only a few minutes to review the

material. Recall the effect when someone shows you a picture from the lake ten years ago. You can suddenly remember the day, the people that were there, the temperature, and some of the events that you had long forgotten. The icons quickly bring the trainer's mind to bear on this aspect of their portfolio since they may train only periodically (every other month or two) and might have many areas of responsibility, such as TQM or computer work, that they need to recall. The ideal situation is one in which the trainer has created the mind map, for they now own the material. It is an interesting phenomenon that when you create an icon for a body of text it becomes yours. You speak with conviction and emotion. We believe that many trainers do not "own" the material and as a result do not speak with conviction.

Buzan (1990) states that after two days we remember ten percent of what we have read and he stresses the importance of timely reviews. In today's world, we are fortunate to find the time to read a book only once. This inhibits the review process. The trainer, by providing a mind map, allows the trainee to review the material and commit it more readily to long term memory. We have found that our trainers remember more using these associative networks (Buzan, 1990), or mind maps.

Training the trainer is an important ingredient in an effective corporation. Zey (1994) indicates that in order to thrive in the Macro-industrial Era, society must be blessed with a strong and flexible educational system. With the use of this flexible methodology, the We Care directors can train their staff very readily with the map. Also, we want them to be able to give public talks about how the corporation implements TQM. One incident will serve to illustrate the effectiveness of this system. A director of one franchise in the We Care system had attended a TQM training session. The trainer could not attend a morning portion in the next training session and asked the director to attend the morning session. This was done and when the trainer walked into the session after two hours, the conference room was alive with enthusiasm and the material had been reviewed. This suggested the ready

transferability of the material. As Bloom (1956a, 1956b) indicated, this was an illustration of the affective domain (receiving, responding, valuing, organization, and a characterization by a value or value complex) working with the cognitive domain (application; if the student really comprehends something, then he/she can apply it).

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What is most rewarding is that while doing the training session a lot of material is in front of the trainee. The availability of all this material leads to the generation of new ideas which can be readily added to the map. We have found that the trainees are constantly adding new ideas that are discussed, and not only is the material being covered, but also the trainees are thinking, processing, and brainstorming for new ideas. We believe that this is an ideal state for optimum learning.

We have discussed the point that the process of iconization allows the trainer to take ownership. We have found that an effective way for a trainee to take ownership is to ask them to color the map using fluorescent-colored markers. The resulting effect, in addition to ownership of the material, is to make the material much more attractive to the trainee when they review. It is most interesting to see executives color maps and we have found that it also increases their attention span.

In another application, this process is used in a third year systems analysis class at Brandon University. Computer Science students are often

not noted for their sociability. We ask them to read and mind map the text by Carnegie (1940), *How to Win Friends and Influence People*. This simple exercise has made these classes much easier to work with and facilitate. The applied section of the course involves the students analyzing a real business. They are asked to make a presentation on the results of their analysis. Again, this presentation must be mind mapped. Prior to using this method, the instructor would often wonder why he was teaching these people since the presentation caused them so much stress. Once the mind map and iconization methods were used, the presentations were more organized, clearer, more enthusiastic and less stressful.

It is helpful if the mapper can sketch pictures to facilitate the iconization process. Hand-written diagrams were used effectively for over five years in training situations. The only requirement was that they be readable. In converting the training materials, we use a large data base of icons that are commercially available, and we retain the services of a graphic artist to draw any additional ones that we require. These drawings are scanned in to become part of an icon data base.

The method has been used in a variety of computer and business situations (for example, to teach data structures in a computer science curriculum), so that it applies in a variety of areas.

We Care has used texts such as Blanchard's (1984) *The One Minute Manager* for training. We have found that it was popular for several reasons: it was a quick read (we are all under time constraints), and the material is good. We have found that people who read this book could most often not recall the essential components nor the system that was described. We mind mapped texts such as this and each book is adequately summarized on one map. Directors often frame them for easy review on their office walls prior to applying a concept.

In conclusion, the authors have investigated a variety of new methodologies such as computer based learning, distance education using

computers and so on. The most effective of all the methodologies for us is that described here. Using iconization and mind mapping in training and development environments of the macro-industrial era is the progress towards the next age of universal participation in the creation and production process of our future.

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