1980 INTERNATIONAL CONFERENCE

May 13-16
Dallas, Texas

presented by
SOCIETY OF AMERICAN VALUE ENGINEERS

INFORMATION
Additional information concerning any aspect of the conference can be obtained from the General Chairman:

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VALUE WORLD

Volume 3 No. 4 Jan./March 1980

Magazine for
AMERICAN SOCIETY FOR PERFORMANCE IMPROVEMENT
790 Broad Street, Newark, NJ 07102

and

SOCIETY OF AMERICAN VALUE ENGINEERS
220 N. STORY RD., SUITE 114
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EDITOR’S NOTE
by Boyd Cleaveland, Managing Editor

With this issue “Value World” begins a new policy of being published quarterly vice our previous schedule of bi-monthly. We are also going to restrict the size of VW to approximately twenty pages. This is due to—what else—rising costs of publication. However, we are value engineers here so the challenge is to reduce cost without reducing quality and perform the function! This means that we must look for shorter articles which still deliver an important message for the V E community. This depends on you the SAVE membership who do the work and acquire the experience to pass on to your associates. Please limit articles to two to three pages so that we can get several in each issue. We have Jim Vogl at Hughes aircraft who is doing a beautiful job of editing all material. Jim has much experience in this sort of thing and only does enough to give a good professional touch to our material.

The second change involves the National Association of Suggestion Systems. They will no longer be associated with VW since they feel that they must continue to have a bi-monthly publication. We wish them good luck for the future and assure all that the past joint effort of SAVE and NASS was enjoyable. The American Society for Performance Improvement does continue with VW and you will find two articles concerning activities of ASPI on page 13.

HUMANISTIC PRODUCTIVITY
by Carlos Fallon, CVS, FEL

There is an old Spanish saying that the Devil knows more from being old than from being the Devil. I have lived and worked in China, Colombia, Brazil, and Argentina, and I know inflation! What this country is facing now cannot be cured by tight money, hard credit, or more unemployment.

Too few products, chased by too much money, should be matched at the front end by more and better products. This brings us to productivity.

In the column MY TURN of the January 29 issue of NEWSWEEK, William C. Freund, chief economist of the New York Stock Exchange, calls productivity “an x-rated word,” and I quote further, “The idea of improving output per man-hour is apt to conjure visions of sweatshops, frantic assembly lines and other schemes for compelling decent people to work beyond their endurance. We need a new word—because that isn’t what productivity growth is all about at all.”

We do need a new term for it “More for the money,” is not good enough. Improved production has to be better for the money, and better for the producers themselves. To put it bluntly, we have to do better than the Swedes, the West Germans, and the Japanese. The forcible “opening up of Japan” by foreign navies precipitated a civil war in which the young and vigorous Emperor Meiji replaced the feudal system with a cooperative national government.

Shaken by sight of Western warships that could steam against wind and tide, he invited Western industry into the country. To safeguard basic Japanese values, the imperial court then handed down the Educational Rescript of 1890 which humanized productivity and assured that ethics and mutual loyalty continued as an integral part of Japanese industrial life.

This humanistic productivity is good for the producers themselves, for the customers, and for the enterprise. Does it not take more resources for humanistic productivity to be good for the workers, for the customers, and for the enterprise? It does.

Here is where value disciplines come in. Instead of converting hourly workers into bored machine minders, a humanistic value task group can make their work more interesting by letting them use their imagination, their initiative, and their judgement to improve the product—a product about which they may know more than anyone else in the plant.

I recommend that you value specialists pick up the banner of humanistic productivity. Here we have a positive, anti-inflation activity that is good for labor, good for management, and good for the currency which happens to be the measure of all savings, all insurance, and all pensions.
INTRODUCTION

In 1971 the Department of Defense introduced the Design-to-Cost concept into DoD contracts through DoD Directive 5000.1 “Acquisition of Major Defense Systems”. It states that “Cost parameters shall be established which consider the cost of acquisition and ownership; discrete cost elements (e.g. unit production cost, operating and support cost) shall be translated into “design to requirements.” DoD Directive 5000.28 “Design-to-Cost” (1975) established policy and guidance for the application of Design-to-Cost (DTC). This directive defines Design-to-Cost as “a management concept when vigorous cost goals are established during development, and the control of systems costs (acquisition, operating and support) to these goals is achieved by practical tradeoffs between operational capability, performance, cost, and schedule.”

The only action mentioned in the DoD definition is “by practical tradeoffs between operational capability, performance, cost and schedule.” That tells me that to achieve the established cost goals, we may have to reduce either operational capability, system performance, delivery schedule, or all three.

How then can we meet cost parameters and still achieve the other three parameters? We need a tool that will allow us to meet the performance requirements and still stay within the Design-to-Cost goals. The most obvious tool is function analysis or, as it is better known, Value Engineering (VE). I believe the most effective way to apply V.E. to Government Design-to-Cost Contracts is to include the VE Program Requirements Clause in the full scale development contract. The earlier VE is applied to a Design-to-Cost contract the more success there will be meeting the established goal.

CASE STUDIES

I will discuss several examples of Design-to-Cost contracts where VE was used with varying degrees of success. I will illustrate how VE was applied, the contractors activities, and the results to date. Each contractor was awarded a full scale development contract for a weapons system.

Performance specifications were to be met within a specific design-to-unit-production-cost based on “X” number of units, a known learning curve and a monthly delivery schedule.

Example #1

(a) Application of Value Engineering

A small division of a large corporation was awarded a full scale development cost-plus-inventive-fee contract. The contract included a design-to-cost incentive fee. The statement of work stated that function analysis shall be conducted and shall follow the VE methodology; also the contractor shall establish a VE program in accordance with specification MIL-V-38352. The contractor was allowed “X” number of hours to perform VE to help him meet his DTC goal. His activities were to be monitored through a monthly VE report, a Design-to-Cost report, and a Cost Schedule Status Report. The contractor had a free hand in setting up his program.

(b) Action by the Contractor

To establish his program the contractor reviewed three possibilities:

1. Use in-house personnel
2. Hire a consultant for workshops
3. Hire a full time Value Engineer

The contractor opted for a combination of “1” and “3”. He hired a Certified Value Specialist as a full time Value Engineer who reported to the System Effectiveness Manager. In-house personnel were identified who had some exposure to VE but were not necessarily indoctrinated in the methodology.

Initially the Value Engineer was given a free hand except, that he was cautioned not to take up too much of the engineers time with formal workshops. Consequently he applied VE by contacting individual technical personnel and taking part in the design review team meetings. The teams generally consisted of a mechanical engineer, industrial engineer, quality assurance and procurement personnel, chaired by the Systems Effectiveness manager. At these meetings problems were identified relative to achieving target costs. Suggestions were made for resolving the problems and items for further investigation were identified. The Value Engineer kept a record of all action and followed up on additional investigative items.
(c) Results to Date

The contractors first design-to-cost estimate was 25.6 percent above target. After a year of VE the estimate dropped to 12.9 percent above. Then slowly climbed to 22.7 percent above the target. This was caused by better definition and consequently more accurate quotes from vendors. Vendors are reluctant to give exact quotes when production is five years in the future. Once the critical design review was completed, VE began to take effect. The trend of the design-to-cost estimate is starting down and is at 21 percent above as of the last report. There were other VE studies not included in the estimate. These will bring the estimate down another five percent. We expect the estimate to be at or near the contractual target before the time for full production contract award.

(a) Application of VE

A division of another large corporation was awarded a full scale development contract which included a design-to-cost incentive fee. The contract did not include a VE clause nor did the statement of work indicate any function analysis or VE efforts.

(b) Action by the Contractor

The contractor attempted to meet the Design-to-Cost goal by making tradeoffs in performance. Unfortunately, many of the proposed tradeoffs were unacceptable to the procuring activity. Periodic meetings were held with the contractors technical personnel, encouraging them to submit practical tradeoffs and to use VE methodology to help achieve their design-to-cost target. The industrial engineer had been exposed to VE in the distant past. After 21 months into the contract the contractor hired a consultant firm to conduct a 40 hour workshop. However, this may be too little VE applied to late.

(c) Results to Date

The contractors proposed design-to-Cost estimate was 5.2 percent above target. About five months after contract award he revised his estimate to 103.9 percent above. This was due to his detailed evaluation, rigidly meeting the performance specifications and new quotes from the vendors especially for hybrid modules. The estimate dropped to 59.7 percent above during the next 12 months. Effective tradeoffs and continuous design re-evaluation contributed to this drop. During the next eight months the estimate increased about 14 percent. At that time the 40 hour value engineering workshop started. Note the last several months where the estimate has leveled off. This was partially due to the VE effort. Unless VE is continued it will be very difficult for the contractor to approach the design-to-cost target.

(a) Application of VE

Seven months ago two large corporations were awarded feasibility model contracts, (a prelude to full scale development) to develop independently the same weapon system based on a design-to-cost goal, with the usual performance, learning curve and delivery schedule criteria. However, VE was not included because the government procuring agency felt the contractors would achieve the target through competition and by the application of tradeoffs.

(b) Action by the Contractor

Both contractors met separately with the procuring personnel to define requirements for the design-to-cost program. The contractors were questioned about their VE knowledge and capabilities. It was apparent that the contractors did not have a value engineering capability nor did they have a correct understanding of the VE methodology. The contractors are not contemplating any VE during the initial feasibility model contract.
The Management of Team Development In Value Analysis/Engineering

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The quality of this investigation, as well as the final recommendations, is the result of human interaction through the phases of a VA/E Study. At times participants may have a vague, albeit valid, feeling that a particular VA/E Team did not achieve its potential for teamwork or creativity, although the important ingredients of knowledgeable and experienced individuals were present on the team. On other occasions tensions and misunderstandings within a VA/E Team may be visible, which detracts from teamwork. Given that the process by which something is accomplished directly affects the quality of what is accomplished, the VA/E Team Coordinator and sponsor are confronted with the issue of how to improve the human processes within a VA/E Team for optimal team productivity.

INDIVIDUAL ATTRIBUTES

An initial step in conducting a VA/E Study is the selection of a Value Engineering Team Coordinator and the appropriate team members.

Proposition 1

When interdependence is required among individuals for task accomplishment, selecting VA/E team members solely on the necessary technical competence is not sufficient to ensure the quality of human interaction required for effective teamwork. To broaden selection criteria, efforts have been made to identify individual attributes, other than technical expertise, that will contribute to a successful VA/E Study. One study, familiar to the authors, resulted in this ranking of non-technical individual attributes for Value Engineers:

1. Ability to Motivate Others
2. Sincerity
3. Creativity
4. Desire to Learn
5. Analytical Ability
6. Product Knowledge
7. Broad Background
8. Broad Education
9. Good Communicator
10. Teaching Ability
11. Business Knowledge
12. Situation Ability
13. Motivational Ability
14. Diplomacy
15. Perseverance
16. Constructive Discontent
17. Salesmanship
18. Depth Background
19. Persuasiveness
20. Aggressiveness
21. Maturity
22. Situation Ability
23. Depth Education
24. Personal Recognition

The identification of individual attributes has some merit, but it also has limited utility in managing teamwork in VA/E Teams. First, there is the problem of assessing the attributes of a particular individual. Most of the attributes listed are abstract concepts that make assessment impossible. For example, does the “Ability to Motivate Others” mean influence, control, possession of rewards, power, a charismatic personality, all of these mentioned, or something else? And how does this differ from “Motivational Ability” which was ranked number thirteen? Each of us holds a subjective understanding of these attributes which makes objective assessment impossible until there is an objective measure.

Social psychologists researched attribution theory. Attribution theory deals with how people make causal explanations of events, the information used in making causal inferences, and what is done with this information to answer causal questions. Research indicates that observers of behavior often assign enduring personality traits or dispositions to actors to give meaning and to explain the observed behavior. For example, an observer may attribute to an individual the characteristic of “sincerity” or “creativity” or even “success.” But the individual actor, when asked about his/her behavior, tends not to respond with these same labels, but rather explains his/her behavior in terms of the circumstances of the particular situation. The point is: what an observer “sees” as an enduring and constant personality trait in a particular individual, such as “creativity,” may in fact be more attributable to the specific situation rather than to a trait of the individual. In a different situation, the same individual may likely not achieve the same consequences of behavior that led to the at-
tribution of “creativity” in the first place. The assumption that an individual who has a record of “creativity” while working alone at his/her own pace will automatically exhibit the same level of “creativity” in a more structured group effort, such as a VA/E Study, may prove to be invalid. The situational circumstances are significantly different, and so may be the results of the individual’s behavior.

There is a tendency for some managers to view the selection as their primary management tool. Once the individuals with the “ideal” attributes have been selected, some managers believe that the quality of teamwork is then out of their control to influence beyond a very limited range. Again, individual attributes are viewed as enduring traits and dispositions that are accepted as constants that cannot be changed or influenced. This, of course, is not the position of the authors.

**Proposition 2**

Selection of individuals creates the potential for successful teamwork, but selection does not replace the need to manage group dynamics to realize the latent potentials within a group.

**TEAMWORK**

Without the management of group dynamics, much of the positive and productive potential may not contribute to the task. There is a group exercise, the NASA Exercise, which illustrates this point. Imagine that you have crash landed on the moon two-hundred miles from the mother ship that is your only possible rendezvous point if your group is to survive. Due to the crash, most of your equipment is destroyed except for fifteen items: a box of matches, food concentrate, a portable heating unit, one case of dehydrated Pet milk, a stellar map of the moon’s constellations, a life raft, five gallons of water, fifty feet of nylon rope, some parachute silk, two .45 calibre pistols, two 100 lb. tanks of oxygen, a first aid kit containing injection needles, a magnetic compass, signal flares, and a solar-powered FM receiver/transmitter.

The task in this exercise is for each individual to determine a rank order for these items in terms of their importance to the task at hand—survival. Once these individual lists have been established, they are compared and discussed with the group to determine a group list arrived at by consensus. The group is given fifteen minutes to develop their consensus list. Each individual list and the group list is then compared against the answers developed by NASA and a score is determined for each individual list and the consensus list.

The goal of this exercise is to compare the results of individual decision-making with the results of group decision making, as well as to diagnose the level of development in a task-oriented group. A realistic and attainable goal is to develop a group so that the group score is better than any single individual’s score. A better group score indicates that the group effectively utilized its internal resources and that group dynamics allowed the individual potentials in the group to successfully contribute to the task. On the other hand, if the group score was not as good as several members’ individual scores, this indicates that the group had not benefited from several individual’s potential contribution to the task of survival. The NASA Exercise has great impact on the participants learning the potential power in group decision-making over individual decision-making, and the effect the quality of human interaction within a group has on that group’s task accomplishment.

**Proposition 3**

An interdependent group whose team development has been managed, will be characterized by more cohesiveness, mutual support and trust, have higher expectations on task accomplishment, and have, at the same time, respect for individual differences in values, personalities, skills and idiosyncratic behavior.

**Proposition 4**

A group whose development is being managed will achieve the benefits of team development more effectively and efficiently than a group whose team development is not assertively managed.

**GROUP DEVELOPMENT AND THE VA/E STUDY JOB PLAN**

Many writers and researchers in human relations, small group work in business and industry, group counseling and group psychotherapy have recognized predictable and manageable stages, and sequences, that move through towards becoming a more or less cohesive and effective group. Several group development models have emerged from this work, most based on two distinct realms or dimensions. The Interpersonal Realm involves the way group members relate and act to one another during this transformation of a collection of individuals to becoming a group or team. The second is the Task-Activity Realm which is the content of their interaction, such as a VA/E study project. Each group comes to some balance between these two realms to accomplish their task without great human expense. The model below is an adaptation of work done by Tuckman (1965 and 1977) and John E. Jones (1973) and can be viewed as a life-cycle of a VA/E Team.

**STAGES OF GROUP DEVELOPMENT**

<table>
<thead>
<tr>
<th>Interpersonal Realm</th>
<th>Task-Activity Realm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dependency</td>
<td>1. Orientation</td>
</tr>
<tr>
<td>2. Intragroup Conflict</td>
<td>2. Organization</td>
</tr>
<tr>
<td>3. Cohesion</td>
<td>3. Data-Flow</td>
</tr>
<tr>
<td>4. Interdependence</td>
<td>4. Emergence of Solutions</td>
</tr>
<tr>
<td>5. Adjournment</td>
<td>5. Closure</td>
</tr>
</tbody>
</table>
In the first stage of this model, interpersonal relations are characterized by the individual members resolving dependency issues. These issues involve depending upon the leader to provide structure in terms of ground rules, establishing agenda, and to do all the initiating and “leading.” The parallel stage of development in the Task-Activity Realm involves the group members becoming oriented to the work they are being asked to do. The behavior common to this stage is questioning what are the goals, what are we supposed to accomplish, and how are we going to get it done. This stage is completed when there is common understanding and acceptance on both the emotional and intellectual levels as to what the group has been organized to do.

Stage two is characterized by conflict in the Interpersonal Realm, and organization in the Task-Activity Realm. Conflict is an inevitable aspect of small group interaction whether it becomes visible or remains hidden. In the Interpersonal Realm, we bring with us unresolved conflict from previous experience with regard to authority, dependency, rules and agenda. In organizing to get work done, we may experience conflict over who is going to be responsible for what, what is going to be the reward system, leadership and leadership structure, and power. Conflict has constructive potential for group development if it is effectively managed.

In stage three the Interpersonal Realm is characterized by cohesion, and the Task-Activity Realm is dominated by data flow. It is during this stage of group development, assuming the group gets this far, that the people begin to experience a sense of groupness and cooperation. Ideas and feelings are shared and individuals begin giving each other feedback. Actions related to the task are openly explored and task-related information is shared openly. Feelings are positive toward other group members and to the task itself.

Stage four is not achieved by many groups. Group members at this stage are interdependent, which means they can work effectively as individuals, in sub-groupings, and as a total team. Team members are both highly task-oriented and highly person-oriented, which results in the team’s activity being characterized by collaboration, functional competition, high commitment, support for experimentation in problem-solving.

Stage five is the conclusion and is marked by feelings consistent with the realization the group’s existence is coming to a close. The intensity of these feelings involves the emotional investment made by each member. In the Task-Activity Realm, this final stage is characterized by proving whatever closure is necessary for task accomplishment. In many settings this stage is identified by important and valuable rituals that are expression of celebration.

The backbone if a VA/E Study is the Job Plan that organizes and delineates the techniques, procedures, tasks, questions, admonitions, and time allocations of a Value Analysis and Engineering Study into discrete phases. In principle, the Phases of a Job Plan are similar to other problem-solving and decision-making processes used by individuals and groups in other settings. The Job plan organizes events and time into a manageable task-oriented structured process to solve a VA/E problem. Variations exist from one Job Plan to another, but their function is essentially the same regardless of these minor differences.

**Proposition 5**

The VA/E Study Job Plan is a task-oriented process that guides a VA/E Team through the stages of group development in the Task-Activity Realm toward task accomplishment in a structured and systematic manner.

But as we have discussed, the quality of task accomplishment is also dependent upon the quality of group dynamics, the level of interpersonal skills demonstrated among team members, and the effective and efficient development of the group through the stages in the Interpersonal Realm which are not an integral part of the VA/E Study Job Plan. For the most effective progress through the stages of the Interpersonal Realm, these interpersonal skills which facilitate development in the Task-Activity Realm should be skills possessed by all team members. Just as the VA/E skills are acquired in a seminar, so can these interpersonal skills be acquired and developed by a VA/E Team.

The Veteran Coordinator has a particularly important role in terms of these interpersonal skills. As discussed above, the team members will depend on and take their lead from him during the Dependency stage of group development. If the Coordinator demonstrates poor interpersonal skills in listening or conflict resolution, team members will follow this behavioral model and norm may be established that will adversely effect teamwork. Norms tend to be self-reinforcing in groups, whether they have positive or negative impact on task performance. However, norms can be changed by a direct intervention by a group member or a trained facilitator, who points out the negative consequence of the norm and assists group members in identifying alternatives that result in consequences that have higher value among the group members. For example, if group members tend to not listen to each other’s contribution before presenting their own, most groups realize, once confronted, the negative effect this type of nonlistening behavior has on their potential for synergistic task accomplishment.

A Team Development Scale developed by William G. Dryer is presented in Appendix A to assist VA/E Teams in determining their level of group development. This can be used as a diagnostic tool. It can be used most effectively where each team member rates the Team individually, the individual responses are tabulated, presented to the group, and discussed. The tabulation can be done either confidentially or openly within the group. In either case, the discussion that follows the presentation of the data is the most important event. Questions similar to “where do we want/need improvement” and “how can we
achieve this improvement” are the sort that should be asked.

THE MANAGEMENT OF TEAM DEVELOPMENT

Just as there is no single universally applicable Job Plan that can be used in all VA/E Studies, there is no universally ideal design for building a VA/E Team. A number of considerations, however, are involved in designing the most effective approach, and in this section we will discuss some of these considerations.

There are several goals to team development or team-building, each of which can be emphasized or de-emphasized depending on the particular needs of the group and the task before the group. The following list is adapted from work done by Larry Solomon and represents a general set of team-building goals:

1. A better understanding of each team member's role and potential contribution.
2. A better understanding of the VA/E Team's charter—its purpose and function in the total project or organization.
3. Increased communication among team members about issues that affect the efficiency of the VA/E Team.
4. Greater support among team members.
5. A clearer understanding of group process, the behavior and dynamics of any group that works closely together.
6. More effective methods of working through problems inherent to the team—in both the Interpersonal and Task-Activity Realms.
7. The ability to use conflict within the team in a positive rather than a destructive way.
8. Increased collaboration among team members, with reduction of competition that is costly to team member effectiveness and task accomplishment.
9. Increased ability of the team to work effectively with other individuals and groups outside the VA/E Team.
10. A sense of interdependence and confidence among team members.

VA/E Teams have, in our perspective, a clear advantage over many other teams. No matter how complex the Study, each VA/E project normally has a clear start-up date. Team-building can assist new teams in becoming organized quickly when conducted early in the life of a new team. Issues that typically hinder team performance can be anticipated and dealt with before the team becomes deeply involved with the task at hand; before pressure is felt to meet deadlines. Conducted early in the life-cycle of a VA/E Team, these issues and questions can be resolved and the norms of the group can be openly established by the group. One option available to Coordinators and sponsors is to include team-building into the Orientation Phase of the VA/E Study Job Plan. This will increase the probability of the VA/E Team's development being at a more advanced stage in the Interpersonal Realm when the team moves into the task-activity during the Information Phase of the Job Plan.

On the issue of who should conduct the team-building of a VA/E Team, there are at least three choices: 1) a VA/E team member, 2) a VA/E team member who consults with a consultant trained in the behavioral sciences and team-building, or 3) an outside consultant in the behavioral sciences. Each choice has its own trade-offs which will change depending upon the needs of the VA/E Team and the project. The use of a consultant is generally advisable if a manager is not exactly sure what to do or how to proceed with team-building, but feels that some action is necessary to increase the quality of teamwork on a VA/E Team. The ultimate responsibility for building a team rests with the manager. A consultant can assist the manager in getting the process started and provide a relatively objective and experienced perspective.

There are obviously costs to conduct team-building. These include consultant fees, when one is used, as well as the time of the team members. The critical management question is, "What's the return on investment (ROI) in conducting teambuilding?" This question cannot be answered directly because it is basically a question of determining the anticipated value of improved team productivity. There are, however, certain conditions of a VA/E Study where it appears that a multiplier effect may exist. These conditions result in a greater probability of larger cost savings attributable to increased team productivity per dollar spent on conducting teambuilding. These situations include:

1. A VA/E Team that will conduct a number of VA/E Studies in a relatively short period of time.
2. A large and complex study that will involve a number of VA/E Teams, particularly if there is a need for interdependence among the various VA/E Teams.
3. When new members join an existing and experienced VA/E Team.
4. If the VA/E Study is of such importance that the maximum productivity is essential (e.g. a project that has a very high total cost).

The authors recognize that these situations may cover most VA/E Studies. But again, the management decision involves anticipating the probability of achieving a breakeven point where the cost of conducting team-building will be offset by cost saving ideas resulting from improved teamwork and team productivity. From the authors' viewpoint, the chances are very high that the rather marginal costs involved in conducting a team-building session increase cost savings by a significant multiple! It is time that team development become an integral part of the VA/E Job Plan.
<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To what extent do I feel a real part of the team?</td>
<td></td>
<td>1: Completely a part all the time; 2: A part most of the time; 3: On the edge, sometimes in, sometimes out; 4: Generally outside, except for one or two short periods; 5: On the outside, not really a part of the team</td>
</tr>
<tr>
<td>2. How safe is it in this team to be at ease, relaxed, and myself?</td>
<td></td>
<td>1: I feel perfectly safe to be myself, they won’t hold mistakes against me; 2: I feel most people would accept me if I were completely myself, but there are some I am not sure about; 3: Generally, you have to be careful what you say or do in this team; 4: I am quite fearful about being completely myself in this team; 5: A person would be a fool to be himself in this team</td>
</tr>
<tr>
<td>3. To what extent do I feel “under wraps,” that is, have private thoughts, unspoken reservations, or unexpressed feelings and opinions that I have not felt comfortable bringing out into the open?</td>
<td></td>
<td>1: Almost completely under wraps; 2: Under wraps many times; 3: Slightly more free and expressive than under wraps; 4: Quite free and expressive much of the time; 5: Almost completely and expressive</td>
</tr>
<tr>
<td>4. How effective are we, in our team, in getting out and using the ideas, opinions, and information of all team members in making decisions?</td>
<td></td>
<td>1: We don’t really encourage everyone to share their ideas, opinions, and information with the team in making decisions; 2: Only the ideas, opinions, and information of a few members are really known and used in making decisions; 3: Sometimes we hear the views of most members before making decisions and sometimes we disregard most members; 4: A few are sometimes hesitant about sharing their opinions, but we generally have good participation in making decisions; 5: Everyone feels his or her ideas, opinions, and information are given a fair hearing before decisions are made.</td>
</tr>
<tr>
<td>5. To what extent are the goals the team is working toward understood and to what extent do they have meaning for you?</td>
<td></td>
<td>1: I feel extremely good about goals of our team; 2: I feel fairly good, but some things are not too clear or meaningful; 3: A few things we are doing are clear and meaningful; 4: Much of the activity is not clear or meaningful to me; 5: I really do not understand or feel involved in the goals of the team</td>
</tr>
<tr>
<td>6. How well does the team work at its task?</td>
<td></td>
<td>1: Coasts, loafs, makes no progress; 2: Makes a little progress, most members loaf; 3: Progress is slow, spurts of effective work; 4: Above average in progress and pace of work; 5: Works well, achieves definite progress</td>
</tr>
<tr>
<td>7. Our planning and the way we operate as a team is largely influenced by:</td>
<td></td>
<td>1: One or two team members; 2: A clique; 3: Shifts from on person or clique to another; 4: Shared by most of the members, some left out; 5: Shared by all members of the team</td>
</tr>
<tr>
<td>8. What is the level of responsibility for work in our team?</td>
<td></td>
<td>1: Each person assumes personal responsibility for getting work done; 2: A majority of the members assume responsibility for getting work done; 3: About half assume responsibility, about half do not; 4: Only a few assume responsibility for getting work done; 5: Nobody (except perhaps one) really assumes responsibility for getting work done</td>
</tr>
<tr>
<td>9. How are differences or conflicts handled in our team?</td>
<td></td>
<td>1: Differences or conflicts are denied, suppressed, or avoided at all cost; 2: Differences or conflicts are recognized, but remain unresolved mostly, them through by 3: Differences of conflicts are recognized and some attempts are made to work with them in our some members, often outside the team meetings; 4: Differences and conflicts are recognized and some attempts are made to deal satisfactorily with them in our some members, often outside the team meetings; 5: Differences and conflicts are recognized and the team usually is working them through</td>
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APPENDIX A

Team Development Scale by William G. Dyer
10. How do people relate to the team leader?

1. The leader dominates the team and people are often fearful or passive.

2. The leader tends to control the team, although people generally agree with the leader's direction.

3. There is some give and take between the leader and the team members.

4. Team members relate easily to the leader and usually are able to influence leader decisions.

5. Team members respect the leader, but they work together as a unified team with everyone participating and no one dominant.

11. What suggestions do you have for improving our team functioning?

REFERENCES


Those of us who are proponents of Value Engineering to obtain optimum value for our construction dollar must now reassess our methods and goals. If it is a truth that the VE study can uncover the cause of an unnecessary or excessive cost then a more important research into the competence of the designer may be in order.

We have established that the trap of the cliche roadblock such as “We have always done it this way”, or “The boss will never allow it”, or “Why bother, the old method is sufficient” or one of the many negative expressions, can be the reason for a costly design approach. Or, on the other hand, can it be that these cliches are offered to mask a lack of understanding into the basic principle of good design. That is to say, good design must be esthetically pleasing while functionally correct, dynamic yet within the realm of sensible cost.

Our method of examining a project during the early stages of design, while apparently successful, seems to be a corrective process rather than one that will instruct the designer in his future endeavors. Some people have criticized our analysis as a “reflection on my effort or ability”. Let me further quote from a letter written by Richard Schindler, F.A.S.C.E. of Northbrook, Illinois, Mr. Schindler said, “To achieve the most economical, integrated design has always been the professional responsibility of consulting engineers. If a VE analysis results in significant savings, it would seem that this responsibility was not fully exercised”.

Mr. Angelo J. Polvers, F.A.S.C.E. of Chicago, Illinois wrote to A.S.C.E. News: “My own experience in doing jobs with formal VE provisions is that they do not produce the intended results. In large part they are ignored simply because the construction team is concentrating on timely completion of the project and scrupulously avoids any “wave-making” that will delay progress”.

It would seem to me that in the light of such comments, our methods and even our goals must be reevaluated. Can our function as another “set of eyes” stand much questioning of this sort? I doubt it!

The construction industry, a nearly one hundred billion dollar a year effort, is in the throes of a crisis that can effect its entire structure. The pressures of inflation, shortages of fuels, the everchanging patterns of our urban areas, all have caused serious depressions in the economy. Those responsible for the investment in capital improvements are looking very carefully into the needs for improvements before expending construction dollars. In a question of priority, survival in the face of reduced profits takes precedence over expansion. The designer, given the responsibility to create in such an atmosphere, must be aware of cost to maintain his credibility of competence. How can we fit into his picture as a team member?

We must extend our efforts in those directions that will enhance our position as analysts. First, let us offer our methods to the designers to aid them in their professional responsibilities. The approach to a design commission are sorely in need of VE. More A/E firms, even those who have reached an enviable level of success, use archaic procedures. The voluminous paper work, the inordinate number of meetings and the internal requirements for forms, memos, and letters may be the primary reason for neglect in assembling the cost data essential for the proper execution of the commission. Perhaps an extensive VE study should be made to streamline the general operation of the architects/engineer. Those Value Engineers who are now soliciting the A/E firms, large corporations, and government agencies should make a concerted effort to offer their services to the designer firms, at a reduced fee, to help them overcome their procedural deficiencies.

Second, let us examine our involvement in the design process. The A/E is presented with criteria by the owner; then develops plans and specifications to conform to the needs and desires dictated by that criteria. As each discipline selects the design, methodology and equipment to satisfy those requirements that are its responsibility, little or no consideration is given to the other disciplines. There are a series of long and complicated “coordination” meetings where each discipline vies with the others for space, function and priority. Each designer, in his review of his requirements, establishes the importance of his sphere of influence. If a VE analysis is made, even in the preliminary stages of design, an inherent resistance is encountered. Whether it be pride of authorship or reluctance to accept a valid critique, the haggling that follows generally negates any advantage offered by the VE study. Once the design has reached a stage of development where drawings exist, no matter how incomplete they may be, the resistance to change is significant. Changes in design are costly both in dollars and time. The compromises reached to avoid these changes, generally reduce the advantages produced by the VE study. The Value Engineer should enter into the project in the earliest conceptual stage. The VE study begins the session wherein the owner reveals his criteria and the designer states how he intends to meet that criteria. Even a broad brush approach to a cost estimate can be examined to see how each requirement will affect the total cost. It is at this early stage that general life cycle studies can be made to point out the direction for the design team. The
owner has become aware of the costs incurred by his requirements. The next step is the development by the individual disciplines to formulate a plan for the Contractor.

As these plans evolve to approximately fifty percent complete, the third and crucial analysis should be made. The designers should be an integral part of the VE team and have the opportunity to offer changes. At these studies unnecessary costs that have crept into the design must be identified. At this multi-disciplined workshop, the owner must be encouraged to be a participant. There, he will be given another opportunity to re-evaluate his criteria. Even code requirements can be re-examined and re-interpreted. For example, in a recent VE workshop it was found that the Washington, D. C. Fine Arts Commission did not permit alteration of the exterior of that type building for central air conditioning. The project was a four story office building with a red tile roof reminiscent of the Georgetown type. One problem that surfaced was the placement of equipment. If a cooling tower were to be used, the architect feared that placing it on the roof would cause changes to the design objectionable to the Commission. The HVAC designer selected air cooled equipment placed behind and approximately 150 feet from the building in a parking lot. To conceal the large air cooled chillers, a berme would be constructed to surround the equipment and a decorative screen erected on top of the berme. To transport the chilled water to and from the building, a system of insulated pipes would be buried in the ground. The total cost of the berme, decorative screen and underground piping system was in excess of $250,000 and space for six autos was lost. During the initial briefing of the VE study, a master plan was discussed that revealed plans for future expansion to the building. If these plans became a reality, the parking lot would be the site of the expanded building. Then a costly relocation of the underground piping system would be necessary. The HVAC designer presented, as an alternate to the pipe relocation, a system of bridging in the foundation of the future building that was in violation of existing codes. The entire presentation of the site for the air conditioning equipment, was on the basis that the Fine Arts Commission standard was in-violate and, furthermore, interpreted correctly.

Our Value Engineers decided to question the Commission ruling and a telephone call requested a representative from that organization at our next session. When our plans were shown, the Commission engineer voiced his objections and suggestions. He objected vehemently to the berme and screen arrangement, which would be very visible to the passersby. He pointed out that the Fine Arts Commission ruling stated "minimal alterations" to the existing roof appearances were allowed. He suggested a roof well to conceal the equipment and still maintain the general appearance. A design team quickly set forth a preliminary plan. A cost estimate over $150,000 savings was noted with a favorable life cycle cost potential exceeding $200,000. Had we not questioned the criteria governing the designer's decision to place the equipment in the remote site he chose, this item would be a continued problem for the life of the project.

Let me illustrate another case of criteria questioning. The project was a laboratory building for a large eastern chemical company. In this building was a special classroom to contain a computerized training aid. This equipment was eight foot wide, two foot deep and over nine feet high. Construction of the building was started before the decision to purchase this machine was made and the walls and door to the classroom were completed as was the entrance door to the building itself. To get this large computer into place and provide electrical access a complicated alteration would be necessary. The exterior door, corridor ceilings, classroom door, classroom ceiling, classroom lighting, ductwork and one large structural beam, would all have to be removed and replaced. All of this work was predicated on the information provided by the professor of instruction. Our task consisted, in part, of examination of costly removal and replacement. The cost for this work was estimated to exceed $635,000 and would cause a four to six month delay in the occupancy. An intensive examination was made into the methodology and materials to affect the alteration to this yet unoccupied building. A number of VE proposals were prepared indicating potential savings of $150,000. Finally, another "brainstorming" session was held. The criteria set forth by the instructor was questioned. Was it absolutely necessary to bring this piece of equipment into the building completely assembled? A telephone call was placed to the manufacturer. The information received was stunning. The equipment was to be shipped in two sections consisting of one piece eight foot wide, two foot deep and four feet - nine inches high. The second section consisted of the upper portion to complete the computer. The cost of the machine included assembly at the site by factory technicians. Total cost to bring the machine into the building — none.

If we, as professionals, are to apply our methods of examination and logic to critique a professional designer's output, we must be prepared to encounter resistance. In my dealings with architects and engineers, the objection to VE that is most often voiced concerns this concept of looking into another man's ideas. They will admit to the use of tried and true design, archaic approaches to design problems and the re-use of old details. This, they claim, is done to maintain reduced design costs. When, during a workshop, an innovative idea is formulated, they embrace it with open arms. But, they say in defense, the inability of the owner to recognize the impact of the unreasonable criteria upon construction costs is the major reason for high square foot cost. "Let us be part of the program forming process", they cry, "Apply your VE at the conceptual stage of the program and we will have less of a
sophisticated problem to solve”.

We must point out to the design sector of our professional macrocosm our responsibility to the construction industry. It is the same responsibility we have shown the electronics industry, the manufacturer and the government. We are trying to point the path to sensible costs. To “identify the unnecessary cost, i.e. cost which provides neither quality, nor use, nor life, nor appearance, nor customer features”, in the words of Larry Miles. To obtain this result we must apply our expertise where it will do most good. It is my contention that in the earliest stages in the planning of a project, our concept can have the greatest cost savings impact. With a prudent set of criteria as his guide, the designer can concentrate on cost savings devices as part of his plan.

It is apparent that we must be prepared to chip away at the reluctance shown by A/E firms to participate in our program by joining forces with these astute colleagues. The fresh ideas we can generate during our workshops must be uninhibited. Pressures created by cumbersome administrative procedures are a damper which shuts out the flow of ideas. We should be prepared to alleviate these pressures by assisting the designer in making his operation a more efficient one. Indeed, we must also attempt to streamline the inordinate administrative demands placed on him by his client. Then, the concept of VE at the earliest stages of program and criteria development will have the greatest effect on cost. The continuance of a VE program through completion of the design and even into the contractor participation stage is important. Incentive programs designed to make our application of ideas more attractive must be expanded to include designers and peripheral participants. But, the impact on unusual and unnecessary costs can only be strongest when VE is applied from the start.

Ours is an awesome responsibility. We have reached the time when our impact on the economy can spell the difference between acceptance or rejection of our tenets by the construction industry. This industry can generate millions of dollars in VE fees while saving tens of millions in construction costs. Our involvement cannot take place in an air of hostility born of blunt and crude criticism of a man’s design. It must be with understanding and complete cooperation.

Jerry Crain, Manager of Productivity, Motorola, Inc. spoke on “The Quasar Story” the development and results of quality circles at Motorola. Tom Gardner as ASPI Vice President and served as Co-Chairman of the regional conference. Bob Schwartz spoke on the Honeywell Corporations suggestions systems and profit improvement programs. Bob is the Manager of Employee Motivation Programs for Honeywell. Other speakers were Mr. Edwin Klaus — “Creating a Spirited Organization”, Mr. M. J. McDonough — “The Senior Management's Role in Productivity Improvement”, and Mr. Ernie Stecker — “Attitude and Expectations”.

ASPI HOLDS
NATIONAL
CONFERENCE

The American Society for Performance Improvement held a National Conference at the LeBaron Hotel, San Jose, California on October 18, 1979. The theme of the meeting was “Productivity + Quality = Profitability Insurance”.

Mr. Philip Crosby, author of “Quality is Free” was the keynote speaker.

The creation of a new ASPI Chapter in Northern California was announced at the conclusion of this conference.

Next year’s conference will be in Lexington, Kentucky on June 20-24, and will be co-sponsored by the Improvement Institute and ASPI. For additional information, contact Tom O'Connor, Merck Sharp & Dohme, West Point PA, 19486, (215) 699-5311, ext. 6404.

Three of the featured speakers are shown here addressing the conference.
One Firm's Experience with Quality Circles

by

Gerald E. Swartz and Vivian C. Comstock

Quality Circle Facilitators

Westinghouse Defense and Electronics Systems Center
Baltimore, Md.

In the Spring of 1978, the management team at the Westinghouse Defense and Electronics Systems Center (D&ESC) near Baltimore, Md. took an important step by deciding that the quality control circles concept could be the best solution for work-related problems facing the facility's 9,000 employees. For some time, managers in the quality assurance and manufacturing organizations had been considering employee participation programs as a possible means for easing the problems. Then, with Rolph Townsend, manager of Quality and Reliability Assurance, in the forefront, the decision was made to go ahead.

In late August, after months of planning, commitment building, and staff development, a pilot program of seven circles was inaugurated. Now, there is a proven program involving 14 active circles, with plans for careful expansion until every employee has the option of becoming a circle member.

By generally accepted definition, a quality control circle is a small group of people who perform similar work and meet voluntarily on a regularly scheduled basis to identify, analyze, and seek solutions to work-related problems. This may seem a simple concept that can be established easily and quickly. As basic as it may seem, however, such a program is not easily implemented. Most American companies traditionally have considered the solution of problems as being the responsibility of supervisors and technically trained professionals. The know-how and creative intelligence of workers generally have been ignored. And, in this traditional work environment, establishing a quality control circle program requires careful planning and development.

The primary reasons for introduction of the program at D&ESC were:

1. The demonstrated success of the concept in Japan and in the U.S.
2. The employee-oriented nature of the idea; not only from the aspect of worker involvement in participatory problem solving, but also from the point of view of personal development and recognition.
3. The strictly voluntary nature of involvement.

Concomitant with the decision to introduce quality control circles at the D&ESC came ancillary decisions to eliminate the word "control" from the concept title, and to place responsibility for administering the incipient program within Operations. These moves, anticipated the possible negative effect of having Operations view the programs as a means for the Quality function to force an additional control mechanism on Manufacturing Operations. Instead, quality circles was to be a viable way for Operations personnel to seek solutions to their work-related problems with an instrument under their own direction.

Gaining Commitment

Having committed themselves to the idea of instituting a quality circles program at the D&ESC, the key managers moved to gain the commitment of other top Operations managers, as well as the executive-level managers at the Center.

To help secure this broadened commitment, aid was sought from a well known consultant who came to the D&ESC and gave two presentations based on his personal experiences with quality control circles. The first was to top level managers of Operations; the second was to the executives of the Center. By early Spring, firm commitment to a quality control circles program in Operation had been assured.

At this point, Earl B. Crehan, manager Manufacturing and Purchasing, D&ESC and Joseph S. Dollard, manager, Manufacturing C&CD, concluded that implementation of a quality circle program as they envisioned it would require full-time direction; consequently, a quality circles manager was appointed. The person selected for the job was Howard R. Ferguson, a manufacturing manager with 18 years of diverse experience in supervision and management.

Initially, Ferguson set about familiarizing himself with the background of the quality control circles movement in order that the program at the D&ESC could profit to the fullest from the experiences of others. To acquire this knowledge, he studied available literature and visited companies in the U.S. and, later, in Japan, where the concept had been originated. This done, he set about taking the remaining major steps deemed essential to launching a pilot program. These steps were:

- Giving informational presentations that would provide a clear understanding of the company's intent to groups whose reaction toward the program would affect its chances of success. These groups were the Air Force Plant Representative's office, the leadership of the three unions representing the hourly and salaried employees at the Center, and the middle management and first line supervisors of operations. It was judged necessary to give each of the three groups an understanding of the basic precepts of quality circles. In addition, it was recognized that each group had particular interests to which the company had to respond. The Air Force Plant Representative's office required assurance that the Center's commitment was to an effective, results-oriented program rather than to a
"window dressing" exercise. The union leaders had a need for reassurance that the company's intent was to create a program that would give interested employees a voice in solving work-related problems to the mutual benefit of the employees and the company and that there was no intent to undermine the union's role as elected representative of the employees in disputes over contractual and working-condition matters. Middle managers and first line supervisors had to be made aware of top management's genuine commitment to the program principles.

- Recruiting two full-time facilitators who would have the responsibility for coordinating the operational aspects of the program. The type of person sought as a facilitator was a well organized self-starter who cared about people and could motivate them, who believed in participative problem solving, and who could comfortably communicate with both employees and management.
- Obtaining from management a roster of first line supervisors with the potential for being leaders of quality circles.
- Contracting with the consultants for instructional materials and consultant services to provide training for facilitators and prospective circle leaders.

These actions were carried out in June and July. During the third week of August representatives from the consultant's firm conducted training sessions for two facilitators and 16 first line supervisors. Seven of the trained supervisors volunteered to be leaders in implementing quality circles at the D&ESC.

During the final week of August the quality circles concept was introduced to all employees in the work areas of the seven supervisors who had volunteered to be circle leaders. At the conclusion of the introductory sessions each employee was given a form to sign and return to the supervisor if the employee wished to become a circle member in each of the seven groups ten or more employees volunteered to become members. The consultant recommended that for maximum effectiveness, a circle should contain no fewer than four members, or no more than ten. To conform to this guideline, groups having more than ten volunteers used a random drawing to select their membership. By the first week of September seven circles, with full complement of members, were ready to begin training.

### Diverse Areas

The seven pioneering circles were located in diverse work areas; four in different types of manufacturing areas, and one each in Production, Electrical Test, and Purchasing. This diversity offered the program staff the opportunity to develop the program to meet the particular needs of various operational sections, as well as Operations as a whole.

The first six to eight weeks of program implementation were spent training the circles in the methodology of problem identification and analysis. The training, generally following the principles developed in Japan and at Lockheed, centered around the techniques of brainstorming, cause-and-effect diagramming and other analytical processes. The occasional minor deviations from the methods recommended by the consultants were introduced to respond to special needs of individual circles.

Each week the hour of meeting time was divided between instruction and practical application. By the end of the training period, most circles were well advanced into their first round of problem solving and soon demonstrated positive results of the quality circles program to their middle and upper management.

### Management Support

The support demonstrated by middle and upper management in attending circle presentations and in responding to circle recommendations was of major benefit in maintaining a high level of involvement by circle members.

From the inauguration of the quality circles program the staff was determined to avoid the onus of extravagant claims that had marked other programs, and recognized the need to establish the means for measuring results of circle projects if the program was to be equitably judged on the basis of concrete accomplishments. It was decided that statements of actual or estimated results, both tangible and intangible, would be reported to management on a quarterly basis. Statements of dollar savings were to be verified by Industrial Engineering.

Discussing the results of the quality circles program after the first nine months of operation, Howard Ferguson, manager, quality circles, said, "I am convinced that a well-run quality circles program will more than pay for itself in tangible results — increased efficiency, reduced scrap, improved quality, etc. I feel that it's safe to say that the company can anticipate at least a five to one return on investment."

"The intangible results — increased employee job satisfaction, improved employee-management communication, enhanced safety, etc. — are immeasurable objectively but I feel the return is even greater than for tangible matters."

The following are examples of tangible accomplishments of circles:

- Several circles have attacked the problem of lost time in their work areas, and savings have been verified at more than $52,000. The enacted solutions have included work area rearrangement, improved work flow, paperwork simplification, and purchase of additional inexpensive tools.
- Improved workmanship quality has resulted from the adoption of such circle proposals as improved on-the-job training methods, job checklists, and work flow charts.
- One outstanding example of a circle accomplishment is a huge (4' by 8') material identification chart. Visible to all workers in the area, the chart provides a ready reference which will reduce the use of wrong materials (solder, epoxy, etc.), and, at the same time, the chart saved a significant amount of time previously lost as workers thumbed through voluminous specifications searching for material identification information.

In the area of intangible accomplishments, measurement is of course more subjective. The following examples, however, attest to what the circles concept achieved for us:
• Additional safety precautions were taken in an electrical test area to give warning and prevent exposure to high voltage.
• Increased quality consciousness has resulted from displays initiated by some circles in their work areas.
• Many managers and supervisors have recognized the improved morale and communications, but the best testament to this was given by the responses to the attitude survey made of all circle members. Typical examples of questions and answers taken from the comprehensive survey are:
  - Has the quality circles program made your job more enjoyable? Yes, 82%.
  - Has the quality circles program made an impact on the quality of workmanship within your work team? Yes, 92.
  - Have you spent some of your own time (lunchtime, breaks, at home, etc.) on quality circle matters? Yes, 88%.
  - Should the quality circles program be continued and extended to other groups? Yes, 100%.

Since the quality circle concept was inaugurated, the Westinghouse corporate staff at Gateway Headquarters in Pittsburgh has observed its development with keen interest. The obvious success of the pilot program at DVESC reassured the Headquarters staff that the concept could aid in solving work related problems at other locations.

Having closely watched the progress of the program from its inception, Earl B. Crehan, manager, Manufacturing and Purchasing, states, “I am immensely impressed with the results of our quality circles program to date, and I am looking forward to its expansion and continued success. Of course, I recognize that it is not a panacea for all of our problems, but I am convinced that the involvement of interested employees in participatory problem solving will provide unprecedented aid to managers.”

Gerald Swartz has worked in the fields of industry, education, and social experimentation. He has been employed as a mill worker, first level supervisor, quality engineer, operations analyst, and teacher. Swartz holds degrees from Ashland College, Ashland, Ohio, and the Johns Hopkins University, Baltimore, Md., and has done additional graduate work at the University of Wisconsin, Madison. He is a member of ASQC and the International Association of Quality Circles.

Vivian Comstock has worked in various elements of quality engineering. She has had intensive involvement in the development and implementation of training courses for quality assurance personnel. Comstock has a BA degree from the University of Maryland, and is working toward a graduate degree in Applied Behavioral Science at the Johns Hopkins University, Baltimore, Md. She is a member of the International Association of Quality Circles.
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