Organizational Engineering Principles in Project Management

William Slabey, Ivon Corporation, 48720 Hanford Road, Canton, Michigan 48107 USA
Douglas Austrom, Turning Point Associates, Inc., 36 S. Pennsylvania Street, Suite 740, Indianapolis, Indiana, 46204 USA

Abstract

In the March 1996 issue of *Project Management Journal*, Ralph L. Kliem and Harris B. Anderson introduce a style survey tool and summarize a paradigm for its applicability to project management ("Teambuilding Styles and Their Impact on Project Management Results"). This article takes their work as a starting point and shows how the basic tendencies they outline can be extended, quantified and applied in a project situation.

The higher level application of the basic paradigm requires referencing the larger theory of Organizational Engineering, as developed by Dr. Gary Salton (1995) and cited in the previous article. Salton defines Organizational Engineering as "a branch of knowledge which seeks to understand, measure, predict and guide the behavior of groups of human beings. This is achieved by viewing human beings as information processing organisms. Groups of human beings are seen as an information exchange network which is guided by fundamental principals and observable structures." Dr. Salton has tested his theories and methods in field situations and currently has a database of over 700 teams and over 7,500 individuals. A portion of his work is codified in his 1996 book Organizational Engineering . Salton's current work is only available via invitation-only seminars that he conducts in Ann Arbor, Michigan. USA and which have been attended by both of the authors of this article.

Organizational Engineering begins by collecting information processing style data using the "I opt"ä Survey Instrument. The name of the instrument is intended to suggest its roots (i.e., as in "I choose) and is an acronym for "Input Output Processing Template". This tool provides the data to analyze a specific team's behavior and recommend optimization strategies. A brief review of "I opt" strategic styles and an introduction to their graphical representation precedes the case study.

Graphing "I opt" Strategic Styles

The "I opt" tool reveals four primary strategic styles used by individuals to accomplish tasks and process information. These styles do not focus on the "fuzzy" psychological processes involved in transforming input to output, but rather on the nature of preferred input and typical output, along with intervening processing parameters, such as speed of throughput, degree of certainty sought and specificity of execution planning among others.

The relationship between information processing theory and behavior can be illustrated by an example. Imagine two people, one of whom seeks optimal outcomes and attends to every detail in pursuit of that perfection. The other seeks only "satisficing" outcomes and is prepared forfeit detail as being unnecessary. Knowing nothing more about these people, it would be safe to predict that the person seeking optimal outcomes would be slower than the other would. He or she simply has more informa-

tion to process because more detail is being processed and must be evaluated in more depth if the objective is to be realized. All else equal, this is a necessary outcome of the information processing elections for the people involved.

Based on the responses given on the "I opt" Survey, individuals receive scores for each of four strategic styles. These scores are in turn plotted on a graph where axes gauge the strength of each style (see Fig. 1). In this fashion, a quadrilateral is formed to represent an individual's overall strategic profile. This "profile" describes the probability that the individual will use one or the other of the strategic styles Salton outlines in his work. These styles all have necessary behavioral consequences whose foundation is similar to that described in the aforementioned example.

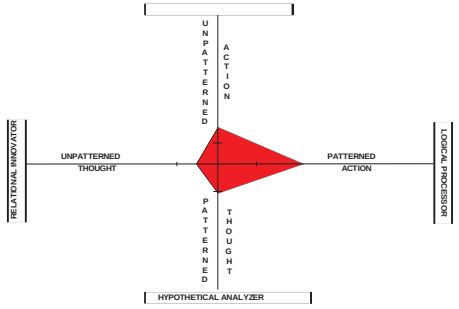

Figure 1. "I Opt" Style Graph

Looked at from a theoretical perspective, the axes of the graph have a relative, probabilistic correspondence to the individual's preferred choice in each of two main areas: 1) acting or thinking; and 2) using proven methods or using new methods (i.e. patterned vs. unpatterned methods). The four permutations of choices within these areas establish the graph's dimensions. The arrangement of the styles on the graph was chosen to allow inferences and predictions to be made on the simultaneous combination of individual styles. The names and characteristics of these styles are explained below.

Reactive Stimulator (RS): RS individuals are action-oriented, focused on near-term results, and highly productive in initial stages of their work. When it comes to problem solving, they will employ means readily at hand, and will generally prefer experimentation to analysis. Inattention to detail and frustration with long-term processes are common downsides to the RS style. The ability to respond without hesitation and rapid completion of tasks are common upsides (see Figure 2a)

Logical Processor (LP): Pure LP individuals display an orientation toward methodical action using proven methods. Process repetition makes LP's expert in their specific job function. "Straight-ahead" work and a focus on task completion are generally to be expected from LP's. LP's can be resistant to change which is not explicitly and logically justified, and will sometimes overlook the long-term for their focus on operationally-related matters at hand. Positive outcomes of this style include performance consistency, dependability and careful attention to detail (see Figure 2b)

Hypothetical Analyzer (HA): Pure HA individuals tend to be thought-oriented, approaching problem solving with a great deal of analysis and planning. Contingencies and multiple viewpoints are considered, so errors are usually minimized. Problems are typically broken down into subunits. The HA will typically prefer to leave the action phase of a project to others. Because so many "bases are covered" by the HA, processing speed can be slow. (see Figure 2c)

Relational Innovator (RI): Pure RI individuals generate new ideas and think associatively when problem solving. They tend to move quickly from one idea to the next, but may maintain focus while inventing a solution to a given problem. The RI's attention to detail will depend on the level of commitment to the idea or task at hand. On the downside, RI's can become stuck in a self-propagating cycle of idea-generation. (see Figure 2d)

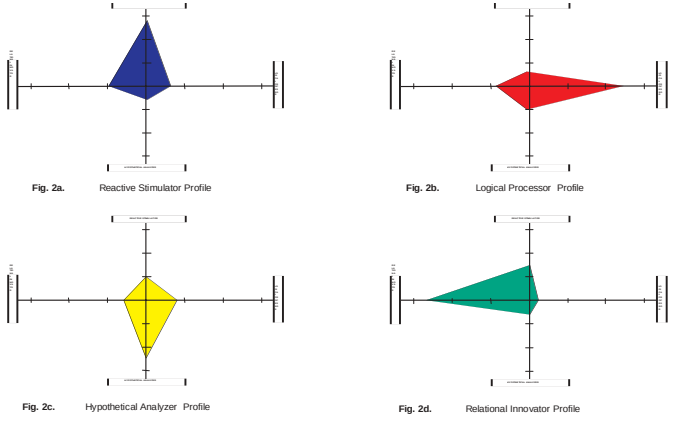

Figure. 2. Examples of Illustrative Style Profiles

Strategic styles are not evenly distributed in the corporate population. Rather, certain strategic styles are more available than are others. This can be expected to reflect itself in project team if team members are selected without reference to the "I opt" strategic styles of the people involved. In other words, a team randomly selected from the corporate population can be expected to be dominated by deliberate, cautious, methodical people who see more merit in perfection than they do in speed of execution.

Figure 3 measures the percentage of the total sampled population on the basis of the individual's dominant style. It does not measure how strong the dominant style is, rather only that it is the individual's most preferred style. The low representation of the RS style is probably attributable to the sample source. Most of the population comes out of corporate environments. This environment would not seem to be especially attractive to the RS who is typically rule averse. In addition, the larger firms would probably not find the RS a particularly attractive employee for the same reason.

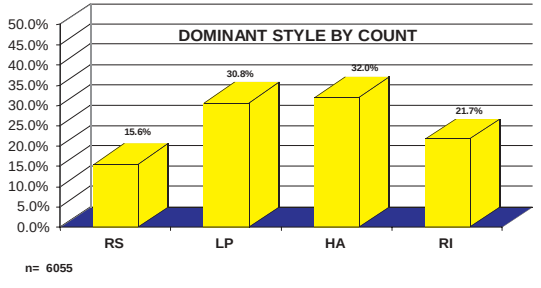

Figure 3. Proportion of Strategic Styles in the Corporate Population

Principles for Improving Project Teams with Organizational Engineering

The principles of organizational engineering extend beyond the level that can be addressed in this brief paper. For example, Salton (1996) describes probable sequencing of strategic style application in complex projects, the creation of coalitions, the impact of project sponsors, and the effects of various decision-making strategies (such as majority rule and consensus). The application extends from the design of corporate cultures to the explanation of why trusted, old paradigms of team development such as Tuckman's "Forming, Storming, Norming and Performing" model works as it does and how its stages can be controlled (Daly & Nicoll, 1997). As applied to this case study, the following four principles for building high-performing teams can be used to illustrate the process:

1. Recognize that each person on the project team one part of a system. Every person's output is someone else's input.

A project team is created because the project charter cannot be realized without the cooperation of multiple people. If multiple people are involved in any common purpose, they must coordinate their actions and contributions. Activities are coordinated by exchanging information. One person must communicate (a transmitter) information to another (a receiver). A project team can therefore be seen as a system of people who are acting with a common purpose and sharing a common destiny of success or failure (see Figure 4)

2. Identify your team members' strategic styles (RS, LP, HA, RI). Knowing a person's profile gives you a gauge for understanding and predicting choices made between: (1) thinking and acting; and (2) using new or proven methods. These choices will characterize the person's typical output and preferred input.

The "I opt" Survey instrument is needed for this process. There is always a probability that a particular issue the project team faces will require a strategic style that is unavailable as a primary posture. In these cases, the team can employ the secondary styles of its team members. The smaller the team, the more likely it is that this condition will be encountered.

3. Arrange the team so that the output characteristics of a person can or group at one stage of the project are aligned as much as possible with input preferences of the person or group at the next stage.

Imagine Person 1 as an RS who tends to work without detail and Person 2 as an LP who needs operational detail in order to use his or her preferred strategic style. The detail would be unavailable since it is likely that the RS had not collected it. The LP would be forced to suboptimize the process he or she was best at, to go out and collect the detail, or to attempt to get the RS to revisit the process just concluded. In these cases the project cost, schedule, quality and/or speed might be compromised. Had the team been designed so that one person desired output was aligned with another's desired input these potential penalties could be avoided. Alternatively, Salton (1996) outlines structural methods)e.g. roles, rules, processes, allocation methods, etc.) that can be introduced to mediate individual, subgroup, and project team alignments.

4. Configure the process so that the deliverable (i.e. team output) matches the needs of the customer-or the input needs of the next project team in the line. Depending on the context, this principle may be considered throughout the process or may be handled as a final stage in itself.

In other words, the structure of the team must not only consider the internal input-output needs of the team members but also that of the entire team considered as a unit or single entity. Since this is the end purpose of the group, it is usually the dominant priority. There are cases where the internal processes of the individual team are suboptimized to realize this result.

For example, Tampa Electric consciously chose to suboptimize team cohesion in operating teams (intra team effectiveness) in order to realize higher level of between team (inter team) effectiveness (Stepanek, 1998). Tampa Electric did this by making

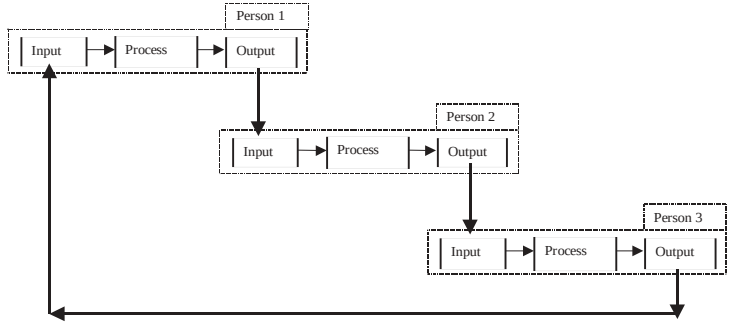

Figure 4. Simplified Example of a Project Team as a System

the teams more like each other at the expense of making the people like each other within teams. A report from Stepanek (1996), the author of an article, in early 1998 indicates that the electric generating plant at which this strategy was applied continues to enjoy the benefits of this strategic decision.

Case Study: Engine Design Team

An engine design team for a major automotive corporation was charged with producing a new engine to deliver greater horsepower and reliability. Because the anticipated number of production units was relatively small and because tooling is so costly, an initial decision was made to use existing components in a modified design. After design plans were completed, the team signed-off on the OEM's six-month time horizon for product delivery-half of what is normally required.

During the first few months of the project, the group working on the project found itself grossly behind schedule. Miscommunication and inefficiency plagued the process. Meetings were attended by up to 30-35 "team" members, but no one spoke the same language. Finger pointing and impatience mounted as the deadline approached.

Team Composition- Three months into the process, organization engineering principles were introduced to the team and an initial decision was made to call out certain members of the group to form a central management group. Ten of its 11 members were preselected because of their specific expertise and managerial experience. The eleventh and remaining position, a liaison with the OEM, was open to be filled be the best candidate.

"I opt" Surveys were administered to the 10 preselected leadership members and also to three candidates for the eleventh position. "Kite graphs" for all of these individuals appear below along with a graph for the average of the 10 preselected team members (Fig. 5).

Evaluating the group with the "I Opt" instrument revealed only moderate resources in the action-oriented RS domain. This fast-action component would be of great importance in the time-constricted situation. The missing position on the leadership team was therefore framed as an opportunity to augment that resource. Of the three candidates one, Tim, was clearly ill suited. Tim would have further skewed the team toward the analysis-heavy HA component and toward the idea-generating RI component. Neither bodes well for fast action. Another of the candidates, Myra, would have brought some action-oriented through methodical LP capabilities to the group, but would also have brought in significant quantities of the slower HA component. The best choice in the situation was Carol, who displayed the "do it now" RS component in abundance. Once instituted as liaison, Carol was able to communicate and respond "on the fly" with the right action-oriented terms the OEM wanted to hear. She was also able to keep the group focused on its deadline.

Because the "I Opt" tool accurately measured each individual's predilection for

initiating action, the management group was enabled to make another wise choice- this time for its leader. Given the several members on the team with the requisite experience and know-how, the deciding factor came down to the "I Opt" measurement of the RS action-initiation component. The one candidate, John, with the strongest RS score tapped as leader.

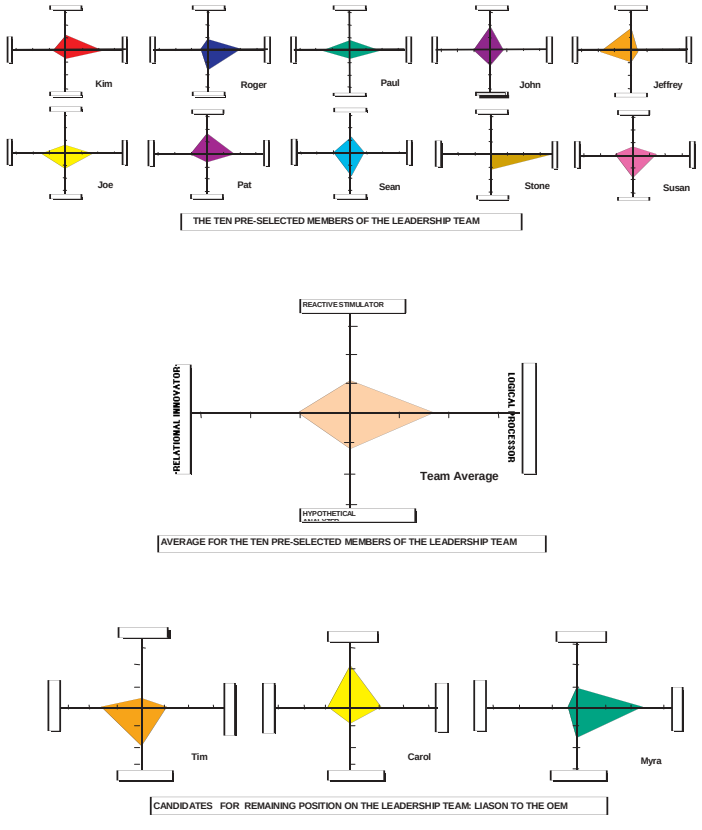

Figure 5. Kite Graphs for the 10 Preselected Members and Three Candidates

Role Focusing- Now that the leadership team was constituted and refocused on the issue at hand, "the tracks were greased" for real progress. Experimentation, with rapid feedback of success or failure, predominated the testing phase and drove the group toward refinement of the prototype.

As with any team process, however, disagreements and impediments naturally arose. Organizational engineering principles gave the team members a common language for discussion and appreciation of the value of their differences.

One notable center of friction was Jeffrey; the most committed idea-generating RI in the group. Drawing also from his secondary RS style, Jeffrey wanted to generate and implement new ideas at every step of the process (see Figure 6). Given the short deadline, evaluation of his ideas proved cumbersome for the group. So strong was the team's dissatisfaction with his performance that upper management actually came close to firing him. But after examining Jeffrey's situation using the "I opt" information as a guide, the leader of the group, John, ended up recommending against Jeffrey's termination. John helped the group recognize that Jeffrey's ideas had in fact been a significant contribution to the team. Jeffrey had designed the prototype they were working on. After some discussion, some of Jeffrey's duties were reassigned to allow him and the group to better utilize his idea-generating talents. Anticipating further orders, the group positioned Jeffrey on preliminary design projects whose inputs drew from a "wish-list" compiled by Carol in her communications with the OEM.

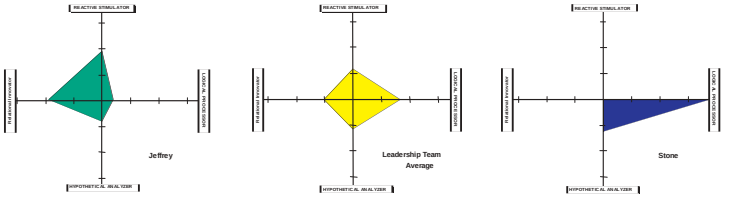

Figure 6. Comparison of Jeffrey and Stone to the Leadership Team Average

A second source of in-group rumbling came from Stone's insistence on passing each new phase and experiment in the project through an "ultimate workability" test. Unlike Jeffrey, who concentrated on the "front end" in product design, Stone was concentrating on the "back end" of product delivery. Nevertheless, Stone's predisposition slowed the group just as much as Jeffrey's. Using "I opt" and its associated analysis, John was able to understand, anticipate, and utilize Stone's HA/LP style to the common good of the team. Stone was subsequently assigned to work on the testing and ultimate configuration of the nearly finished components of the final product.

Role Sequencing- Not surprisingly, given their divergent focuses, Stone's and Jeffrey's kite show as opposites (see Figure 7). These graphs can serve as excellent indicators for the optimum positioning of team members, especially with respect to the function and stage of their involvement. In this case, Jeffrey found optimal placement in the initial design stages while Stone was best placed in the final implementation stages.

Generally speaking, product development and delivery will move through the joint profile in a predetermined way that is governed by the specific process being addressed. Here the evolution starts in the RI dominated "idea stage," passes downward through the analysis-oriented HA and/or upward toward the experiment-oriented RS stages for testing and configuration, and is finally delivered to the steady, task processing LP stage for final delivery.

Structural Device- The "I opt" instrument and Organizational Engineering analysis can also help point to various "structural devices" which can gear a team to its specific purpose and help it to side-step potential obstructions. Salton (1996) defines "structural devices" as anything that can alter the behavior of a group without requiring any individual to change their preferred internal processes. While structural devices are only limited by the human imagination, he cites roles, rules, processes, awareness (i.e., making a variable like strategic style visible to all), segmentation and working environment variables as frequently used tools. The institution of three simple rules proved of particular value for the engine team.

In order to help redirect the tendency of the team to over-analyze-a tendency measured in especially in the strong HA component of Roger, Sean, Susan, and Joe- the Rule to Encourage Timely Analysis was implemented. This means that all commitments to analysis should be reported at every team meeting. Each will then be subject to a "go/no-go" decision every seven days. A maximum of one month will be spent on any one-analysis commitment.

As for countering the bias of the team to rely on proven methods, measured in

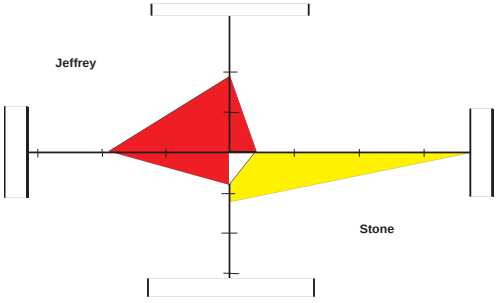

Figure 7. "I Opt" Style Overlay of Jeffrey and Stone

the strong HA and LP components, the team instituted the Rule to Encourage Risk Taking. If at least four members of the team deem an innovative idea worthy of consideration, then the idea will receive a quick test-run or provisional analysis.

Finally, the Rule to Encourage Expedient Options was adopted in order to keep the team moving at a rapid pace. At least two ideas for a "quick fix" be offered and considered before any analytical alternative is undertaken.

These three rules helped propel the team forward. When explicitly deployed in manageable numbers, and, when duly enforced, rules can be one the most helpful structural devices that organizational engineering can generate. However, they do not apply in every situation. For example, it is very unlikely that a team dominated by RS's would follow rules-even ones they had agreed to abide by.

Even when rules do not apply, Salton (1996) points out that other structural devises can be substituted to arrive at the same end. For example, roles which mandate the discharge of a certain responsibility are usually more acceptable to the RS strategic style. This is because roles are more general and allow the RS the discretion and variety he or she enjoys. Each of the other strategic styles can be handled in the same general manner but using different substitutions. In the final analysis, there is no group whose "natural" output cannot be redirected by the imposition of appropriately designed structural devices.

Decision-Making Structures- In this medium-to-large sized group (the average team size in the United States is 8.7 people according to Salton's latest figures) with its extreme time constraint, the method chosen to make decisions was enormously important. Because the team was under hands-on management from above, the team needed to delegate its decision-making power within. Typically, this kind of delegation is handled by establishing either majority rule or consensus rule, requiring agreement from team members to make a decision.

Overlaying each of the team members' kite graphs provides a composite picture of the team's strategic style resources (see Figure 8). The gray area of the graph represents the strategic style "common ground" for at least 50% of the team. This area characterizes the probable nature of decisions the group would make under a majority-rule system. The white area of the graph represents 100% commonality for the team. This correlates with the probable nature of decisions made under consensus rule. Whereas the majority-rule medium gray area of the graph is quite balanced, the consensus rule area is small and skewed toward the conservative HA/LP components. The group immediately recognized the disadvantage of the consensus option.

Given this comparative information, the majority rule system was elected by the group. With the rules instituted above, and the use of other structural devices, the group was able to further skew its behavior toward responsive action.

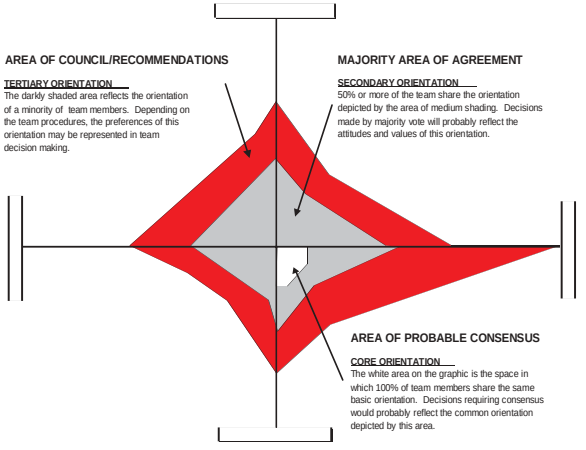

Figure 8. Overlay of Leadership Team's Strategic Style Graphs

Intra-Team Communication- In addition to the "real" gains enjoyed by the group because of its awareness of its various processing styles, it should be noted that the team worked together with greater ease and overall comfort. With a concretized understanding of one another's preferences, each individual could act and react with informed sensitivity. No longer were particular behaviors ascribed to personal merits and defects; they were understood as part of a larger personal strategy. With the increased understanding came increased morale and, in turn, an increase in the overall "gain" of the group.

Informal discussions with group members confirmed an increased level of understanding and a decrease in inappropriate attributions (e.g., "slow witted" might be attributed to a strong LP; "spacey" to an RI; or "flighty" to an RS). These attributions did not arise in personal discussions. In addition, the change in the character of team operations was visible during team discussions. It was not unusual to hear statements like "Okay. You're an RS so lets cut right to the bottom line" or similar gestures of recognition for the other strategic styles. This phenomenon is a practical illustration of the process that Salton (1996) calls the "awareness" structural device. While its contribution to team performance can not be specified, it is clear that the direction it took the group was positive.

Engine Team Retrospective- Unfortunately, the engine design team did not meet its deadline. However, they did deliver their product just one month behind schedule, which is five months ahead of normal products of this type. In addition, the organizational engineering process was launched after the team had already "burned" three months of their allotted time. With organizational engineering principles in place from the start, it's probable they would have delivered their engine on time-or even more probable, ahead of schedule.

The Value of All Styles. It should be noted-last and most importantly-that this case study represents just one application of organization engineering technology done in a wholly specific context. Though the RS component can be understood as the "premium" component in this case study, each of the other three components may also serve as most important, depending on the situation. A nuclear reactor design team, for example, will probably do well to give first priority to the analytical HA component. A heart surgery team will likely draw most heavily from the methodical LP component. An advertising campaign team will look for the idea-generating capabilities of the RI. And in many situations, there will be no discernible mandate for valuing one style over another.

Ultimately-no matter what the context-each and every strategic style will be of value for every team addressing issues of any degree of complexity. In the end, the team's goals will determine their optimum relative levels.

Conclusion

This paper describes the application of a new theory of organizational design that has been extensively tested in teams of all sizes, all industries and all geographic locations. The foundation of the theory rests on information processing principles and the interventions are sourced from sociological theory. The methodology can be seen as complementary to the psychological tools that now reside in the project manager's tool kit. Nothing need be "thrown away" to use the new technology.

An especially attractive aspect of the technology is that there is no effort to change any individual's beliefs, values or strategic posture. The interventions are applied to the relationships and not the people. The authors have found that teams at all levels immediately grasp this and see themselves as contributing to the design of a system of which they are a part and in which they have a stake. As in this case study, team member's reticence quickly changes to focused enthusiasm. The project manager spends less time "selling" and more time working in cooperation with other team members toward the achievement of their common goal.

In the authors' judgment, the case shows a fairly typical application of the technology. Most cases, from the authors experience, benefit from multilevel interventions all targeted at the objective of the project team. In this case roles, rules, processes and human asset allocation were used to facilitate goal achievement. All of these structural adjustments were focused by the common threads provided by organizational engineering, the project objective and the specific assets available for deployment.

The Organizational Engineering paradigm is not a "one size fits all" approach to project team design. Rather, it is more akin to the resource histograms, PERT technology, work breakdown methods, estimating procedures and variance based control methods which typically reside in the project managers tool kit. The successful project manager pulls out the tools that are needed when they are needed. The design and control of the team through which these traditional project management tools are being applied deserves no less of a professional approach.

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William R. Slabey is president and founder of Ivon Corporation, a consulting firm specializing in Organizational design and development with an emphasis on its application within quality systems. He has a BA from the University of Michigan and Organizational Engineering Level III certification. He has worked with the American Supplier Institute at its Center for Taguchi Methods and Quality Function Deployment and serves as a guest lecturer for the University of Michigan-Dearborn. Bill has over 27 year

Ivon Corporation Phone: Phone: 734-354-0472
48720 Hanford Road Fax: 734-459-6183
Canton, MI 48187Email: wslabey@aol.com

Douglas R. Austrom, Ph.D., is president and co-founder of Turning Point Associates, a consulting firm specializing in organizational change, effectiveness, and customer satisfaction. He has over 15 years experience with a wide range of organizations. He received his BA fro the University of Waterloo and his MA and Ph.D. from York University in Toronto. He also holds an Organizational Engineering Level III certification. Prior, he was a faculty member at Indiana University's Graduate School of Business, where he won several excellence awards in both undergraduate and MBA programs.

Turning Point Associates, Inc. Phone: 317-633-8745
36 South Pennsylvania Street Fax: 317-633-8748
Indianapolis, IN 46204 Email: daustrom@iquest.net