On Management Styles for a Concurrent Engineering Organization

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Introduction

The basic intent of any manufacturing company is to employ a skilled (or trained and talented) work force, machinery, capital, etc. that can make products. The traditional hierarchical systems for an organization, in the eighties, were designed to make it as easy as possible to keep track of people and the things they were doing, the machinery they were using, etc. [Steward, 1981]. The orientation was functional and vertical in nature. Employees as "experts" made improvements within the confines of a department or a functional area. The result of that expertise gave organizations tremendous marketplace advantage for a short while. Even the use of certain titles such as manager, director, supervisor, rather than leader, facilitator, coach, reflected this management bias [Freeze and Aaron, 1990; McGrath, 1984].

Today, products such as automobiles and airplanes are more complex than ever before. It is beyond the imagination of a single team, a single work group, or even a single department to comprehend fully all the life-cycle aspects of a product's needs. The nature of the organization developing the product, during the nineties, has not changed as much. It has been a challenge for the design and manufacturing engineers in many such traditional organizations (such as automotive) to work together as teams to improve quality while reducing costs (capital, investment, etc.), weight, and lead-time (time-to-market). In many organizations—particularly automotive industries—teamwork, productivity and efficiency gain have been very painstaking. There are many reasons cited for such difficult times [Walson, 1991; Prasad, 1996]. The most commonly cited reason is the "people" or the "human" component.

The "people's component" involves many constantly changing variables that are more difficult to control than any other organizational variable. This is because human behavior and corporate cultures are difficult to measure and quantify. Changing the corporate culture by *institutionalizing CE* does not guarantee that human behavior will be changed or that the two will work in close (and mutual) synergy and vice versa. The interactions with such issues, in general, and the lack of synergy in particular, tend to be underestimated or even un-addressed by companies as key organizational issues [Ashley, 1992].

Some Key Management Styles or Philosophies

Developing a coherent management style or a philosophy seems a daunting task, given the wide range of possibilities and practices that must be addressed. The job of managing is becoming very difficult due to a rising complex web of changes and mounting competitive pressures. Many managers would like to ride through the current waves of change, but they do not know—what to do; what policies they need to follow—to be successful. While others have realized that the current waves of change are blowing too fast—it would be very difficult to continue sustaining any old style of management. Changes are forcing companies to adapt to a more flexible management style and structure. Empowerment and responsibilities are shifting from the usual vertical setting to a horizontal setting. The chain of command is shifting from a tall silo structure (or pyramid) to a set of peer networks and cooperative teams. The three primary management styles often used in CE organization are:

(a) Directive Management Style
(b) Supportive Management Style
(c) Constancy-of-Purpose Oriented Management Style

These are shown in Figure 1.

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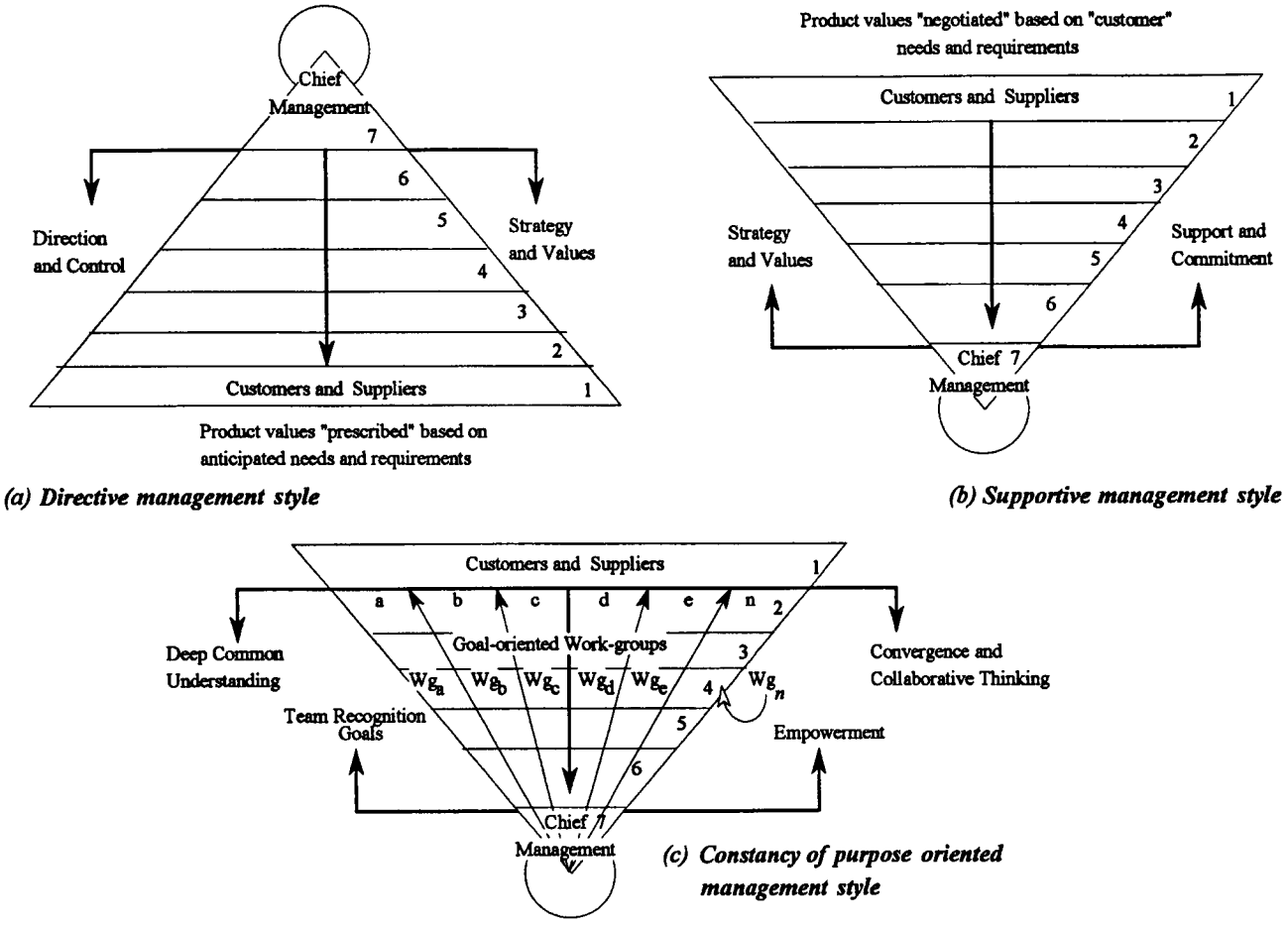

Figure 1. Management styles and philosophies.

Directive Management (DM) Style

Directive management (DM) style has no theory. It is a grab bag of techniques, rituals, customs and superstitious forms of management. Some examples of such techniques are setting a pyramid for reporting—as in Management by Objectives (MBO) or in Management by Results (MBR) [McGrath, 1984]. The concept is not based on any sound theory of cooperation or any theory of system optimization thus leading to the fragmentation of the organization. As Deming said in the course of fragmentation, each department or component becomes the individual profit center, destroying any hope of how they would contribute to make the system work better. Other techniques that belong to this style are buying

Table 1. Key features of the three management styles.

Qualities	Directive Management Style	Supportive Management Style	Constancy-of-Purpose Oriented Management Style
Power	Authoritative	Teams	Goal-oriented teams
Information	Withheld/screened	Support and commitment	Open/available
Representation	Political	Selective/mutual	Open/need-based
Competencies	Position-based	Technical	Technical/interpersonal
Partnership	Personal	Mutual	Goal-oriented
Commitment	Management—high Team—low	Management—medium Team—medium	Management—high Team—high
Product values	"Prescribed" based on anticipated needs and requirements	"Negotiated" based on customer needs and requirements	"Defined" based on goals
Customer priority	Management on the top	Customers and suppliers first	Customers and partners first
Boundaryless	Low	Medium	Maximum
Colocation	Needed	Needed	May not be neccessary
Participation	Empowerment	Convergence and collaborative thinking	Deep common understanding

materials and services at lowest bid, setting numerical quota for sales, performance measures, ranking, etc. In this style, the chief management sets the direction and control. Management defines the strategy and values from top-down for the customers and suppliers. The differences among the three management styles are contained in a matrix in Table 1. The three columns list the distinguishing qualities of the management styles against eleven measures-of-merits. In directive management style, product values are "prescribed" based on anticipated needs and requirements.

Supportive Management (SM) Style

Supportive management is based on the principles of total employee cooperation and involvement. Product values are "negotiated" based on customers' needs and requirements. The effects are reflected in Figure 1(b) by an inverted triangle—depicting the "customers and suppliers" at the top and the management at the bottom. A strong multi-disciplinary team effort, with continuous interaction between the customers and team members, and a clear focus on goals is the most important. Simultaneous processing and problem solving, along with effective project management, are the keys to continually improving life-cycle time [Steward, 1981]. Instead of setting numerical quotas, management works with the teams and defines a method to improve the process. The long-term vision of Supportive Management style involves 7Cs: *Collaboration*, *Commitment*, *Communication*, *Compromise*, *Consensus*, *Continuous Improvement*, and *Coordination* [Prasad, 1996]. These are referred as "cooperative team characteristics" in [Prasad, 1996].

Management by Fact

The Supportive Management style is frequently based on "management by fact." This means giving information to the supported teams so that decisions are based on facts. Dr. Deming calls this "a theory of profound knowledge" in his book *The New Economics* rather than a "gut-feeling." The information could provide some valuable steps towards supporting management style, but all by itself these steps are not enough. We need to know where we are starting from (facts) and what are the current levels of our products and services that are in our customers' hand (profound knowledge). Having the facts or profound knowledge necessary to manage the business at all levels is the second principle of supportive management style. Having both principles, a company is in a better position to manage and discharge its responsibilities based on customers' needs.

In the past, some companies have institutionalized Supportive Management styles by planting "tiger teams." A tiger team consists of the best and the brightest talent from the different areas or disciplines that were essential for the project. NEC followed this approach for developing a new laptop computer. They set a ninety-day limit to prevent apparent loss of market share to their competitors. They instituted a "tiger team" consisting of experienced management and personnel from various computer development projects. They gave this tiger team full authority over all aspects of product development. A "backward scheduling" technique was used to assure that the product would meet the ninety-day target. The success of the NEC tiger team is a significant example of what a highly motivated group with a strong experience-base from related disciplines can do in a short while. A highly cooperative team with decision-making authorities and a high urgency and strict enforcement of target can do many things. It was certainly a challenge since the "infrastructure and culture" were not in place. Does this mean that planting a "tiger team" is the answer? Many argue that the tiger team worked well in that special setting because they were the best and brightest people, there was ample peer respect and management visibility. People knew it was a one-time deal. One cannot expect the same result by applying this scenario to everyday work life because not everybody works well together, or possesses the same level of competency and respect among their peer groups. In everyday work, what is necessary is an open team system or something close to it. This refers to a team system that is open and capable of implementing the pertinent features from these ad hoc operations and to their work practices. What would be ideal in an empowered team system as opposed to the "tiger-team"? It is the establishment of an infrastructure that facilitates 7Cs (*Collaboration*, *Commitment*, *Communications*, *Compromise*, *Consensus*, *Continuous Improvement*, and *Coordination*) on a regular basis. There is no need to strictly enforce all targets. As a part of the CE infrastructure, among other things, the team receives the training on how to work together and achieve an understanding of product, processes, tools, teamwork, capabilities, and limitations [Cleetus, 1992]. Once the team members have a common understanding, they can work together better. The infrastructure is equipped to minimize the impact of variation on any of the above elements. It insulates the outcome so that their effects would not be felt as much.

Constancy-of-Purpose Management (COPM) Style

Constancy-of-purpose Management style is a variation of supportive management style in which most of its structure, including an inverted triangle style are shared (see Figure 1). Here, the individual goals are targeted toward providing a constancy-of-purpose—where goals are supportive of other goals. This style requires the most significant change and it is quite a departure from the traditional approach of management. Here, all personnel may report technically to the same manager and work toward a common set of consistent goals. For instance, one goal is to manage a large and diverse organization to operate as if they were one intimate and cohesive work force. This may require a shift in allegiance of an employee from their parent functional organization to a strategic business unit or to a product development team (PDT). If the employees are not a member of the same PDT, the probability is higher that some of

the eight CE principles will be violated (see [Prasad, 1996] for the listing of these principles). All members of various teams are expected to owe their allegiance to the company's or Strategic Business Units' (SBUs) goals (a constancy-of-purpose-oriented management). This requires a change in thinking beyond the goals of one individual department or work-groups to those of the SBU's or the company's goals. The arrangement is very much the same as the inverted triangle style of Figure 1(b). The customers and suppliers remain on top and the chief management on bottom. The roles of management are, however, changed. The obligation of any supporting unit management is to empower the unit so that they can contribute its best toward the system's goals. The aims of the units are not to suboptimize their own performance (such as units' profit potential or sales) without a clear and direct relationship to the company's overall goals. The project's goals must be supportive of the team's goals. Team goals must be supportive of the PDT units' goals. PDT units' goals must be supportive of company's goals, and so forth—ensuring a constancy-of-purpose. This way everyone contributes its best toward a common set of consistent goals. Within a team, for example, everyone must understand the team's objectives, which could be to produce a high quality product on time and within the budget. The management role is to improve continuously the processes that work toward ensuring a better set of "constancy-of-purpose" objectives. Management should reject compromise when decisions are detrimental to the company's goals, even though it may be supportive of teams' or project's goals. Participants should accept compromise when it is permissible and is a better strategy overall (when everybody wins—stockholders, employees, suppliers, customers, community, environment—over the long term). Engineers work closely as teams, orchestrating their special expertise, talent and experience, while retaining their individuality. In the beginning this may not be easy for some, while for others it may provide opportunities to have equal say in decision making and becoming contributing partners in the growth of the company. In the constancy-of-purpose-oriented management style, among other things, team training is directed toward agreeing on a mission. This consists of goals, the role of each individual, work-group, team, department, and management, processes of getting things done including communication plan. Mission also includes relationships among 7 Ts (talents, tasks, teams, time, techniques, technology, and tools) [Prasad, 1996].

Concluding Remarks

The best laid constancy-of-purpose-oriented plans and the most prodigious efforts, however, will not prove effective without four key elements: team commitment, convergence and collaborative thinking, team recognition, and deep common understanding. As shown in Figure 1(c), these are critical elements that are considered part and parcel of a successful constancy-of-purpose oriented work force.

The team member must follow a constancy-of-purpose project management style (managing the project in the context of its overall purpose and not just based on its short-term gains). As W. Edwards Deming said in his book *The New Economics,* setting a particular numerical goal accomplishes nothing—only the method to achieve a common set of consistent goals is important [Deming, 1993]. Clear and consistent goals provide "constancy-of-purpose." Without a common set of consistent goals, there is no system. Each team and its members must contribute towards the success of the company mission or its purpose by participating in the methods—setting layout schedules, with all of its tasks and due dates, including resource requirements. The team leader is also responsible for administering the budget and maintaining the schedule. If the tasks are not completed on time, adjustments ought to be allowed in timing or in resources.

In this style of management, the concurrent teams manage the project in the context of its overall purpose and not just based on its short-term gains or based on needs of one team alone.

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