CONTRIBUTING GROUPS:
AN EXTENSION OF THE SELF-MANAGED TEAM CONCEPT

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A Thesis

Presented to the

Faculty of

San Diego State University

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In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

in

Management

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by

Robert C. Hood, Jr.

Fall 1993

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DEDICATION

To my loving parents
for all the support and guidance
they have given me over the years

ACKNOWLEDGEMENTS

There are untold people who have contributed to the completion of this thesis. I want to thank all of them for their assistance whether it was thought provoking conversation or putting up with my lack of sociability during the preparation and writing of this document. While there are far more people than I could hope to mention here, some particular acknowledgements are in order.

First I want to thank Dr. Sanford Ehrlich, the chair of my thesis committee. His assistance and guidance were indispensable in the development of my thesis structure, my case study research, and the preparation, writing and editing of this final document. I also want to thank Dr. Alex F. De Noble, Dr. Kenneth E. Marino, and Dr. Milton M. Chen, the other members of my committee, who also provided valuable assistance and recommendations during the review and editing of this thesis.

Serge Issakov, Brett Phillips, Edward Krosky, Ted Bell and Mike Bell all played an invaluable service by criticizing my contributing group idea and forcing me to refine it in ever greater detail. Due to their critical

analysis, I believe this is a much better thesis than it would have been otherwise.

I owe a great deal to Mike, Row, Ted, and Carol Bell for their support and assistance, both in years past and during my studies at SDSU. They have made the pursuit of my MBA a financial and logistical possibility.

Throughout my MBA studies, Dave Krosky helped me keep a positive attitude, even through the trying times. He always made sure that I never lost sight of the lighter side of life.

My thanks also go out to Jennifer Ellis for enduring many months of having to constantly listen to me talk about my contributing group theory, my thesis progress, and how I would "be done with it any day now." Her support is truly appreciated.

A special acknowledgement goes to Northern Telecom, Northern Telecom Rancho Bernardo, the IC test group, and the many other people I encountered while doing my case study. Besides providing me with an excellent case study situation, everyone was incredibly helpful and friendly though they were under tremendous pressure to do more than seemed humanly possible (but were accomplishing nonetheless).

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CHAPTER I

INTRODUCTION

Globalization, technological advancement, and process innovation are all contributing to the rapidly changing business environment. Some have gone so far as to suggest that we are undergoing nothing less than a second industrial revolution (Fisher, 1993). Companies that have failed to keep pace with this "revolution" are finding themselves in trouble.

Deming (1982) points most of the blame squarely at the management practices of those troubled companies. Of the decline of American industry, he states quite simply, "only transformation of the American style of management . . . can halt the decline . . . " (Deming, p. x). Organizations are increasingly finding that involving their workers in the management of the business is a way to survive and thrive in today's world (Blinder, 1989; Lawler, 1986; Peters & Waterman, 1982).

Purpose of This Study

The purpose of this study is to contribute to the discussion and findings of how to alter organizational structures to make them more effective than contemporary structures. It does this by proposing a new structure and reporting on the investigations into its plausibility. The proposed structure, termed a contributing group structure, is an organization whose locus of control is made up of small, economically self-sufficient groups that perform the front-line work.

The validity of this structure was investigated by studying self-managed work teams, an organizational structure that has many similarities to the proposed structure. The study was conducted both from a review of the literature and through a case study. Throughout the study a focus was kept on obtaining facts that would support or weaken the contributing group concept.

Thesis Organization

The remainder of this chapter introduces self-managed teams, network organizations, and the contributing group structure. Chapter II contains a literature review of self-managed teams. Chapter III gives a detailed description of the proposed contributing structure. Chapter IV describes the methodology used to do a case study on a self-managed team, and chapter V details case study finding. Chapter VI presents discussions and conclusions on what the research suggests about the proposed contributing group structure.

<u>Self-Managed Teams</u>

<u>Overview</u>

Self-managed teams are a small group of people that have been given the responsibility, authority, and accountability for handling an identifiable piece of the organization's work (Donovan, 1986). These teams typically have no line manager. Instead, as the name implies, they manage, within bounds, their own activities. The management duties these teams take on can include work scheduling, problem solving, disciplining and firing problem employees, hiring new members, managing work-flow, communicating with other groups, analyzing feedback, planning, peer evaluation, and, to a limited degree, member compensation (Donovan; Harrington, 1990). The actual number of duties that a team assumes varies with the organization, the team, and the team's maturity (Orsburn, Moran, Musselwhite, & Zenger, 1990; Wellins, Byham, & Wilson, 1991; Wellins & George, 1991).

Members of self-managed teams are usually cross skilled. Each member learns many, if not all, the jobs that the team does in accomplishing its identifiable piece of work (Orsburn et al., 1990). Furthermore, members usually receive training in how to deal with their new management responsibilities. Such training includes group problem solving, meeting skills, communications skills, handling conflict, and self-managed team roles and responsibilities (Wellins & George, 1991).

The team's contact with management is typically a team facilitator. A facilitator is in some ways similar to a traditional supervisor or line manager (Orsburn et al., 1990). They provide a communications bridge between organizational management and the team. They inform the team of management's plans and what management will require of the team to meet those plans (e.g., product output levels, new equipment purchases and training). The facilitator also lets the team know when it is violating known laws or organizational policy, or exceeding its granted latitude. However, the facilitator acts more like a coach than as a disciplinarian. Often the facilitator can only recommend, not specify, how the group should handle an internal situation (Weis, 1992).

Nomenclature

The team structure known as self-managed teams has had many nearly interchangeable names applied to it. They have been called self-regulated teams (Cummings, 1978), self-directed teams (Orsburn et al., 1990), autonomous and semi-autonomous teams (Cordery, Mueller, & Smith, 1991), high-performance teams (Smith, 1992), and superteams (Dumaine, 1990). For reasons of consistency, this document will use the generic term self-managed team.

Historical Development of Self-Managed Teams

Under traditional management practices, managers did the thinking and workers did the work. The classical management perspective (Griffin, 1990), consisting of the classical organizational theory and scientific management, usually espoused such a relationship. Scientific management prescribed a procedure where management would find the "best" way to do a job, train workers to do it that way, and then supervise them to assure that the job was being done as instructed (Taylor, 1911). Classical organization theory established rules of management that vested authority and decision making at the top of the organization pyramid (Fayol, 1930; Weber, 1947). Arguably, this may have been the best structure for the times, with a stable environment and a predominantly illiterate work force (Lawler, 1986).

However, with a more educated work force and an ever more dynamic, complex, global environment, organizations are increasingly finding that they can improve their productivity, quality, and competitiveness by drawing upon the skills and knowledge of their workers (Barry, 1991; Blinder, 1989; Deming, 1982; Hirschhorn, 1991; Plunkett & Fournier, 1991). Worker participation is additionally leveraged by forming these workers into teams to tackle a particular situation or process (Byham & Cox, 1988; Deming).

The most empowered of these participative teams are self-managed teams. These teams can lead to even further improvements in efficiency and effectiveness (Fisher, 1993; Goodman, Devadas, & Hughson, 1988; Orsburn et al., 1990; Wellins, Byham, & Wilson, 1991; Appendix B).

Conceptually, self-managed teams come from an extension and combination of ideas like sociotechnical systems (Cherns, 1976), quality circles (Donovan, 1986), job enrichment, job rotation (Griffin, 1990), quality of work life (Lawler, 1986; Orsburn et al., 1990), employee participation (Lawler, 1986; Plunkett & Fournier, 1991), and employee empowerment (Byham & Cox, 1988). Usually, companies progressed through these stages to arrive at self-managed teams, while others are compelled by environment forces to skip many intermediate steps (Schilder, 1992).

The first known modern self-managed team was established in 1949 among miners in South Yorkshire, England, the brain child of the Tavistock Institute (Trist & Bamforth, 1951). Since then self-managed teams have spread to countries like India and Sweden (Orsburn et al., 1990). However, self-managed teams are a predominately US innovation ("Teams that score big on productivity", 1989).

In 1962, Procter & Gamble was the first large company to implement self-managed teams in the United States (Hoerr, 1989b). Proctor & Gamble has found self-management so successful that it has closed its plants to researchers because it feels these team

give it a competitive advantage that it does not want to share
(Lawler, 1986).

Table 1 - Major Companies Using Self-Managed Teams

Company	Year Started
Procter & Gamble	1962
Cummins Engine	1973
General Motors	1975
Digital Equipment	1982
Ford	1982
Tektronix	1983
Champion International	1985
General Electric	1985
LTV Steel	1985
Boeing	1987
A.O. Smith	1987

In the 1970s, a few more companies decided to try self-
managed teams. However, the 1980's saw a relative explosion of
companies using teams. 1 lists major companies that have
introduced self-managed teams. Taking the yearly sum of these
companies and constructing a histogram, as in 1, suggests the
rate of growth of the companies using self-managed teams. In
1986 a survey of 1,600 companies by the American Productivity
Center showed that 8% were using self-managing teams (Wellings &
George, 1991). (See APPENDIX A for a list of sample companies
that have implemented self-managed teams.)

Sample Major Companies Using SMTs

Companies

Figure 1 - Sum of 1 Companies by Year.
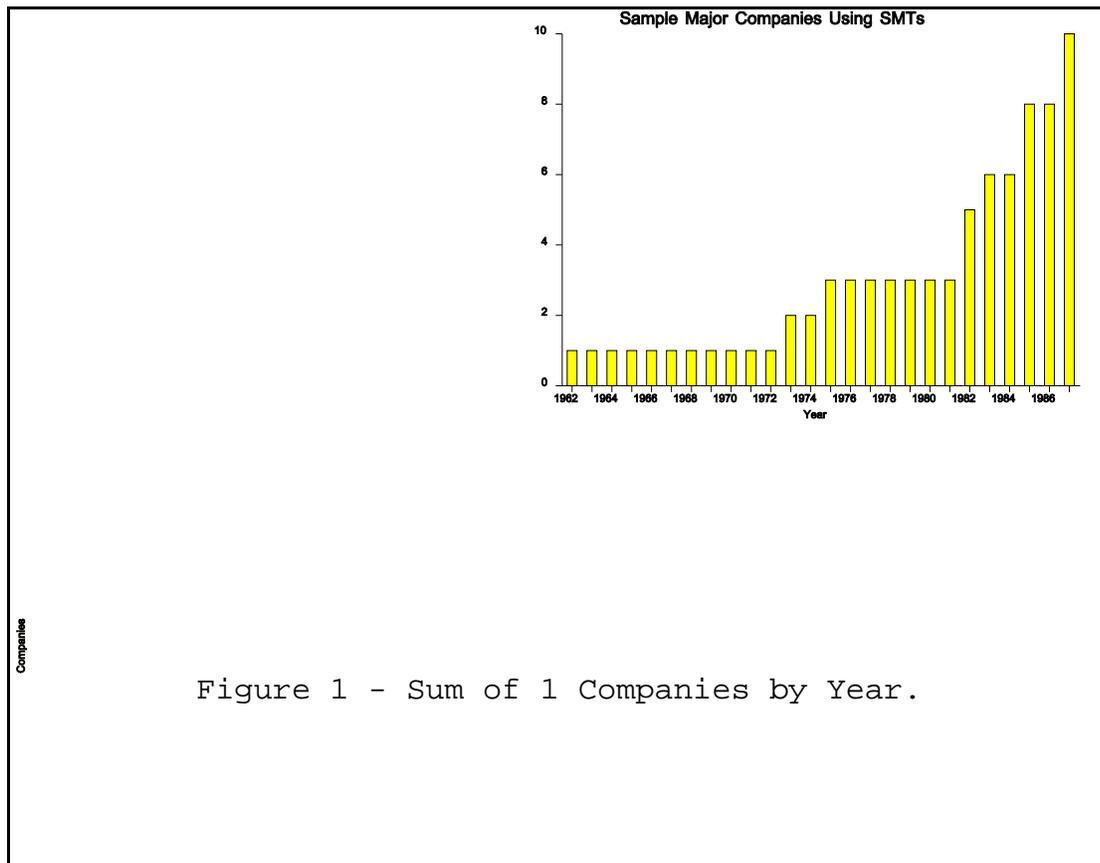
The four most common reasons companies try self-managed
teams are to improve quality, productivity, reduce operating
costs, and improve job satisfaction (Wellins et al., 1991).
Employees in self-managed teams usually build self-esteem, find
work more satisfying, experience personal development, and gain
job security (Donovan, 1986). Both the company and the employee
win.

The Current Situation

It is estimated that as many as 300 companies have implemented self-managed teams (Manz, Keating, & Donnellon, 1990). By November 1990, 26% of 862 executives surveyed by Development Dimensions International (DDI), the Association for Quality and Participation (AQP), and Industry Week (IW), said they were using self-directed work teams somewhere in their organization (Wellins & George, 1991). While the number of companies that have installed self-managed teams may sound impressive, the actual number of workers involved is still very small. In a 1990 American Participation and Quality (APQ) study of 476 of the Fortune 1000 companies, self-managed teams formed only 7% of the work force. However, in the same study, over half the respondents said they would be using self-managed teams much more in the years ahead (Dumaine, 1990). Furthermore, in the DDI, AQP, IW study, the same executives planned to have more than half their work force in self-managed teams by 1995 (Wellins & George). It appears that the use of self-managed teams may soon develop some depth as well as breath. In fact, Wellins et al. have predicted that self-managed teams will become the rule rather than the exception by the beginning of the next millennia.

Network Organizations

Network organizations consist of a network of organizations that combine their talents to achieve a specified end product (Snow, Miles, & Coleman, 1992; Thorelli, 1986). Also called satellite organizations, these organizations usually consist of a central core element that pulls together the various organizations into an organized stream of contributions (Goodmen et al., 1988). Originally this idea developed to explain the increased use of outsourcing and other similar inter-firm relationships (Thorelli). In recent years, Mile & Snow (1986, 1992), among others, extended it to a theoretical structure in which the network organization is more efficient and effective than traditional organizations (Snow et al., 1992).

Instead of using internal controls, directives and transfer prices, the interactions of the networks elements, or nodes, are dictated by market forces. Since each of these nodes concentrates on its core competency, with the resulting reduction in centralized planning and administration, these organizations should be flatter, more agile, and more responsive to market changes (Snow et al., 1992). Furthermore since all relationships are both external and voluntary to the nodes, these organizations are more likely to avoid internal managerial deterioration, and the inefficiencies that accompany such decay (Miles & Snow, 1992)

These networks can either be interfirm or intrafirm (Snow et al., 1992). Outsourcing and franchising are common forms of

interfirm networks (Thorelli, 1986). Intrafirm, or internal, attempt to capture entrepreneurial and market benefits within an existing organization (Snow et al.). In these networks, managers are encouraged or required to expose themselves to the disciplines of the open market. While these networks are more theoretical and are only now emerging, some initial success has been observed at companies like Blue Cross-Blue Shield, Alcoa, Clark Equipment, and Control Data (Miles & Snow, 1992).

Contributing Groups

Internal networks and self-managed teams are a revolutionary concept to the typical organization. Furthermore, the productivity and other gains found with established self-managed teams suggests that many businesses could gain a competitive advantage if they could overcome the fear and had the determination to implement them (orsburn et al., 1990; Wellins et al., 1991). This begs the question "If self-managed teams show such gains over traditional structures, would a further extension of this concept, drawing upon the benefits found in network organizations, show even greater gains?"

This thesis proposes such an extension. Just like with self-managed teams, a fundamental basis of the proposed structure is that the members of a small, autonomous work group, termed a contributing group, will be markedly more involved, dedicated, and concerned about the functions they perform.

Similar to a network organization, each contributing group would be independent and financially self-supporting. The members themselves would usually control their group and share in all group duties, decisions, and profits. Therefore this type of structure would involve the members even more then self-managed teams do, and allow them to directly receive the rewards of their increased productivity and efforts.

Unlike either a network organization or an organization wide self-managed team implementation, the contributing groups would contract management to provide them with support and coordination. In this way, the contributing groups could replace management that was not providing the satisfactory support and coordinations services necessary to market success.

If greater involvement and dedication can be linked to higher productive, a contributing group structure should, theoretically, create teams that are more efficient and effective than self-managed teams. A further hypothesis of this proposal is that an organization made up of a network of these efficient and effective groups, working cooperatively although independently, should result in an organization that is more effective and efficient than an organization using either self-managed teams or an internal network alone.

However, since a contributing group organization is fundamentally made up of small groups (e.g. no larger than 15 people), it has more similarities to an organization consisting of self-managed teams than a network organization in which each

node can be a fairly large division or company. Furthermore,
self-managed teams are more established, and more research has
been done on them, than internal network organizations. For
these reasons, this thesis will focus on self-managed teams to
either support or refute the contributing group structure
proposal.

CHAPTER II

LITERATURE REVIEW

Dimensions of Self-Managed Teams

Companies

While self-managed teams are predominantly found in manufacturing, they can also be implemented successfully in the service sector (Orsburn et al., 1990; Hoerr, 1989b). The applicability of self-managed teams seems more tied to the complexity and dynamics of the work than type of business. Teams make sense only when there is a high interdependency between three or more people (Dumaine, 1989). Professor Paul Lawrence of Harvard suggests that companies in slow growth, stable industries should stay hierarchical in nature (Dumaine, 1989). Even strong advocates of teams, such as Professor Edward Lawler, concur that the more complex the work is, the more it is suited for teams (Dumaine, 1990). However, a company not in a rapidly changing, complex business can still benefit from self-managed teams (Dumaine, 1989; Schilder, 1992). Appendices A and B respectively list sample companies and successes from a variety of businesses.

Workers

Although most self-managed teams are usually thought of as made up of blue collar workers, teams of white collar workers can also thrive (Orsburn et al., 1990; Wellins et al., 1991). Furthermore, teams have been composed of anywhere from executives (McKee, 1992) to unskilled, problem teenagers (Manz et al., 1990).

It is best to form a self-managed team with workers who want to participate (Plunkett & Fournier, 1991), work unsupervised and are willing to deal with the ambiguity that can arise with self-management (Orsburn et al., 1990). The more educated, knowledgeable and skilled the worker, the more likely they can work effectively in self-managed teams (Barry, 1991; Lawler, 1986; Plunkett & Fournier, 1991). Furthermore, if the team is going to be involved in problem solving, especially strategic decision making, it is generally a good idea to compose the team of heterogeneous members (Milliken & Vollrath, 1991).

Groups

Self-managed teams typically have between six and eighteen
members (Orsburn et al., 1990). Each team, whatever its size,
usually has a specific focus. Barry (1991) has identified three
generic types of self-managed teams: project based, problem
solving, and policy making. Teams may simultaneously overlap or
move between types. His main assertion is that each of these
types requires different leadership styles at different stages in
its existence.

Leadership

The most striking aspect of a self-managed team is the lack
of a line-manager. Although the team may not have a manager, it
requires even more leadership than traditional groups (Barry,
1991). In effect, the manager of a self-managed team "must
become a coach rather than a supervisor, encouraging
interdependence within the group while discouraging team
dependence on the manager" (Sims & Lorenzi, 1992, p. 213).
Orsburn et al. (1990) contend that team leadership transitions
from an external supporting manager in the early stages, to a
focused internal leader in its intermediate development, to all
members being leaders when the team matures. Fisher (1993), from
the prospective of someone leading teams, sees the leader hand-
holding and protecting at the beginning, then letting go of
authority and responsibility as the team matures, to becoming a
supporting role encouraging continuous improvement.

Barry (1991) asserts that teams are in need of four different leadership roles: envisioning, organizing, spanning, and social. The envisioning leader generates new and captivating visions. The organizing leader keeps track of the many details that the team must deal with to perform its duties. The spanning leader links the team with outsiders, providing two-way communications and facilitating boundary activities. The social leader helps the team psychologically, noting accomplishments when due and giving pep talks when needed. While one person can fill roles, generally a person who excels at one is not as accomplished in the others. Furthermore, since the team's leadership needs shift as it matures, so will the focal leader shift from one person to another.

Prerequisites for Self-Managed Teams

For self-managed teams to succeed and prosper in an organization, the environment in which the team operates must be conducive to self-management. There are an assortment of policies and conditions that should exist for teams to survive and reach their full potential.

Trust

     Trust is an essential element in making self-managed teams work. This trust must exist both between management and the team (Carr, 1991; Lawler, 1986; Orsburn et al., 1990), and between team members (Wellins et al., 1991). A high level of trust between management and employees can go a long way in assuring employees that management's efforts are sincere and not just a method of speeding up the assembly line or getting rid of employees (Hoerr, 1989a; Schilder, 1992).

Management Support

     A very important condition for self-management success is to have the full support of top management (Brown, 1992; Fisher, 1993; Lawler, 1986; Plunkett & Fournier, 1991; Orsburn et al., 1990; Torres & Spiegel, 1990). While it is not necessarily essential to have the unswerving support of the CEO, such support usually must be secured from the plant manager level (Orsburn et al., 1990). This support must be strong enough that management is willing to openly share information and strategic plans with the teams (Lawler, 1986; Orsburn et al., 1990). It is interesting to note that although there must be support at the top, the initial call for change may come from middle or front line managers (Fisher, 1993).

Union Support

       If teams are going into a union shop, it is equally
important to gain union support (Brown, 1992; Lawler, 1986;
Orsburn et al., 1990). Sometimes this can be difficult because
of the adversarial relationship between the union and management
(Lawler, 1986; Orsburn et al., 1986). While some union officials
are strong supporters of teams, others perceive, sometimes
correctly, that teams are used by management to break unions, win
concessions, or speed up the assembly line (Hoerr, 1989a; Hoerr,
1989b). Lawler (1986) suggests that, if possible, it is best to
gain the union's interest first and then approach management.
Otherwise, the union's suspicions of any management proposal may
kill the idea. Once management and the union have gone ahead
with teams, it is vital that management shares all planning and
information with the union. Failing to do so can destroy the
entire effort (Orsburn et al., 1990).

Job Security

       Another important requirement is that management assures job
security for satisfactorily performing employees (Orsburn et al.,
1990). While establishing self-managed teams can often lead to a
reduction in line workers, supervisors, and mid-management
(Cordery, Mueller, & Smith, 1991; Torres & Spiegel, 1990;
Appendix B), this should be done through attrition and early
retirement offers. Failing to do this can markedly decrease the
chances of success (Orsburn et al.).

Setting Team Boundaries

In establishing self-managed teams, management must set clear boundaries for the team. These boundaries should state what decisions are to be the domain of the team, which are that of management, and which are shared (Orsburn et al., 1990; Sims & Lorenzi, 1992; Wellins et al., 1991). Management should also specify how and under what conditions extra authority and freedom will be granted to the team as it shows increasing competence and maturity (Orsburn et al.).

Elimination of Status and Rank Symbols

Symbols of status and rank should be eliminated. These symbols, such as reserved parking spaces, executive wash rooms, and hourly time clocks foster a "we-they" mentality among the workers. This adversarial relationship will subtract heavily from the potential economic benefits of self-managed teams (Orsburn et al., 1990).

Team Compensation

Compensation needs to be changed to fit the new team approach (Goodman et al., 1988; Orsburn et al., 1990). Two popular systems employed for self-managed teams are pay-for-skill and gain sharing (Lawler, 1986; Plunkett & Fournier, 1991; Orsburn et al.; Wellins et al., 1991). The pay-for-skill system encourages a worker to learn as many skills as possible (Dumaine, 1990). It is well suited to production teams where members are encouraged to learn many or all the functions of the team (Orsburn et al.). However, this system is still base on the individual and can be difficult to administer (Wellins et al.).

Gainsharing, on the other hand, is much more team based and often tied to productivity. Gainsharing is currently considered one of the most effective systems ("Most effective variable pay plan: . . . ", 1992). Since gainsharing can be built around individual teams, they provide direct team incentives.

Huret (1991) maintains that team incentives have considerable advantages over individual or organizational based plans, and that they can be used in virtually all industries. Group incentives reward the individual in relation to their contribution to the team. They also promote openness within the group and group problem solving, which are fundamental to improving the group's productivity. Huret's keys characteristics of successful team incentives include 1) making sure that everyone on the team is included; 2) establishing understandable

performance measures; 3) setting realistic time frames for measurements; 4) insuring that the team members believe they can obtain the goals; 5) communicating the teams progress throughout the incentive period; and, 6) giving meaningful rewards.

Small group incentives, a method similar to gainsharing, are another new way to provide group compensation. A recent survey by the Hay Group of 468 companies found that the best group incentive contained four elements: 1) groups that are self-contained with their own sense of identity; 2) goals that, while ambitious, are reasonable; 3) a trade off between salary and incentive compensation; and 4) credible communications with employees that fully describe how the plan works ("Most effective variable pay plan: . . . ", 1992).

Effects of Self-Managed Teams

Many claims have been made about the positive impact of self-managed teams. For the employees self-managed teams can increase their satisfaction, self-esteem, personal development, and job security (Donovan, 1986). For the organization, self-managed teams may increase flexibility, responsiveness, employee commitment, ownership and moral, and innovation, reduce the work force, turnover, absenteeism, overhead, scrap, and operating costs, and improved productivity, quality, workmanship, and customer satisfaction (Donovan; Harrington, 1990; Orsburn et al., 1990; Torres & Spiegel, 1990; Wellins et al., 1991).

Unfortunately, little scientific analysis has been done to

confirm these claims (Cordery et al., 1991; Goodman et al., 1988; Sims & Lorenzi, 1992). However, a human resources executive survey by the American Society for Training and Development (ASTD) in November 1990 found respondents to have a favorable opinion of self-managed teams. Of those respondents, the following percentage thought that self-managed teams had "improved" or "significantly improved" these areas: productivity, 77%; quality, 72%; job satisfaction, 65%; customer service, 57%; and waste reduction, 55% (Wellins & George, 1991). The following sections look at some of these claimed benefits in more detail.

Employee Attitudes

Theoretically self-managed teams lead to increased employee moral, satisfaction, self-esteem, pride, etc. (Harrington, 1991; Torres & Spiegel, 1990). Allcorn (1989), in describing types of work groups, discusses members of "intentional groups", which are very similar to idealized self-managing teams. Members of these groups are:

"free of the need to defend themselves from anxiety and
    other member's aggression . . . understand their
    feeling and behavior, and participate in the group's
    work . . . do not fall victim to the defensive
    tendencies . . . because they are able to deal openly
    with group fantasies, unconscious motivation, personal
    needs, and defensive behavior . . . conflicts are
    acknowledged, members have little reason to flee from
    participation or resort to psychological defenses."
    (Allcorn, p. 30)

Actual studies and results seem to support some of the improved attitude hypotheses. Cordery et al. (1991) found that workers in two autonomous work groups had more favorable work

attitudes and higher commitment then did comparison groups under traditional management. Wall, Kemp, Jackson & Clegg (1986) found improvements in intrinsic and extrinsic job satisfaction. Fandt (1991) found that high-accountability teams become more interdependent and, consequently, are likely to exhibit greater satisfaction. Pearson (1991) found that extrinsic feedback on a group's ranking compared to other self-managed teams had a positive effect on job satisfaction. Furthermore, this satisfaction was positively correlated with productivity, and internal work motivation, but negatively with role stress and role conflict, and role ambiguity. Glass and Sanders (1992) noted that when teams were set up around an identifiable piece of work and not put in a traditional management structure, moral among team members improved noticeably.

However, the effect on worker attitudes is not clear cut. Goodman et al. (1988) concluded that although attitudes do change with self-management, the change is specific to the implementation. Cordery et al. (1991) reported no increase in trust in management. Wall et al. (1986) found no increase in work motivation and conflicting responses concerning organizational commitment. Furthermore, they found that many of the initial attitude benefits decreased over time. However both managers and members of the self-managed teams were supportive of the innovation.

As an indication of the preference that members have for self-management, it is often reported the once self-managed teams

have been established it is difficult to return to the
traditional structure. Besides destroying the credibility of the
company (Schilder, 1992), employees may resist, become
unproductively passive, or quit (Carr, 1991). Even if management
allows self-management to slowly decay workers can become
frustrated and hostile (Orsburn et al., 1990).

Absenteeism and Turnover

One expected benefit of self-managed teams is employees who, because they are more committed and involved, will demonstrate less absenteeism and turnover. However, Cordery et al. (1991) found the reverse correlation. Their research covered two groups at an established site, one traditional and one autonomous, and one autonomous group at an autonomous greenfield site. They found that absenteeism and turnover was higher for the greenfield site (absenteeism of 6.2% of hours worked; turnover of 11%) and than for the two groups at the established site, whose absenteeism and turnover were approximately equal (absenteeism of approximately 4.7%; turnover of between 6 to 7%). However, the authors noted that the greenfield site involved a considerably longer drive for its employees, and that their extensive overtime may have contributed to absenteeism during the test period. These finding confirmed earlier research by Wall, Kemp, Jackson & Clegg (1986), but contradicted that of others (Lawler, 1986). These findings also run counter to results reported by Volvo, where absenteeism has been reduced from 20% at its Gothernburg assembly line, to 17% at its Kalmar plant, to 8% at its new Uddevalla plant. The Uddevalla plant uses self-managing teams much more extensively than does the Kalmar factory (Kapstein & Hoerr, 1989). In their meta-analysis, Goodman et al. (1988) concluded that there was no clear relation between self-management and absenteeism and turnover.

Employee Performance

Another belief about self-managed teams is that on average the contribution of each member should increase. Antidotal evidence seems to support this in at least some cases (Appendix B). Milliken and Vollrath (1991) point out that group process losses can cause a group to achieve far less then its potential. One of the biggest losses comes from "social loafing", where a member rides along on the efforts of the rest of the group. This sort of activity increases where a person perceives their contribution to be anonymous. Because members of a self-managed team are accountable to their peers, who are often much more aware of their effort level then traditional supervisors (Plunkett & Fournier, 1991), it is much less likely that they will see their contribution as anonymous. Therefore this accountability would tend to decrease social loafing and thereby increase performance (Fandt, 1991).

However, the empirical evidence does not completely support this prediction. Wall et al. (1986) found no increase in worker performance. However, they did note an increase in productivity through elimination of supervisors.

Not surprisingly, compensation attached to performance can also increase employee contributions. In the previously sighted Hay Group survey, 55% of the companies said that small group incentives helped improve performance, 5% responded that they did not, and 41% could not tell. This was closely followed by

gainsharing at 50%, 7% and 43%, respectively. While broad based systems like profit sharing left employees feeling that they cannot control the outcome, small group incentives installed in the employees a sense of controlling their own fate ("Most effective variable pay plan: . . . ", 1992). Goodman et al. (1988) found that a problem with many self-management implementations was that the reward system was not adjusted to the new work system.

Extrinsic feedback can also have a measurable effect on productivity. Pearson (1991) found that teams who knew their productivity levels compared to other teams had significantly higher productivity than those teams who did not know how they compared.

Operations

The effect that self-managed teams have on operations can be from dramatically positive to unnoticeable. Seldom are negative results reported, although this may stem from failures being caught early or companies not wanting the negative publicity of a failure (Wellins et al., 1991). The improvements have been reported in areas like productivity, quality, scrap rate, and innovation (Wellins et al., 1991). Generally, the overall impact is positive, although it is often difficult to predict what and where the benefits, if any, will be (Goodman et al., 1988). Furthermore, most self-managed work team implementations are accompanied by other work place changes, making it hard to tell what is due to self-management and what is attributable to the other improvements (Wellins et al., 1991).

There are statistical trends, however. Six out of seven studies of self-managed teams report an improvement in quality (Torres & Spiegel, 1990). Lawler (1986) sights that fourteen out of fifteen studies showed in increase in productivity. Orsburn et al. (1990) claim that most companies report 20 to 40% increase in productivity eighteen month after going to self-managed teams. Others have similarly claimed that the general increase in productivity is between 30 to 40% (Hoerr, 1989b; Sims & Lorenzi, 1992). Professor Harvey Kolodny asserts that greenfield plants are 30 to 50% more better than traditional structures (Schilder, 1992). According to Orsburn et al., factories typically report

an 800% improvement in setup and tear-down time. Studies also show that automotive work teams that allow workers to participate can produce cars of better quality and produce them more efficiently than traditional auto workers (Hoerr, 1989a). In new plants, organization wide self-managed teams can reduce total production costs by an estimated 20 to 40% (Lawler, 1986). There are also many specific examples of the operational effectiveness of self-managed teams. Appendix B summaries reported quantified benefits of self-managed teams.

Overall, because a self-managed team is usually closer to the work, it can fix problems quicker and evaluate it's work flow better, then traditional work departments. Furthermore, since a team also adapts more of a business mentality about its operations, companies usually find that it is more efficient and effective to have self-managed teams, rather than departments, responsible for carrying out the work (Donovan, 1989).

<u>Staffing</u>

The use of self-managed teams usually translates to reduced need for supervisory, mid-management, and support personnel (Carr, 1991; Torres & Spiegel, 1990; Wall et al., 1986). Cordery et al. (1991) found that the greenfield site they were studying, which began life considerably flatter than its sister traditional site, experienced an additional 12% reduction in managerial and clerical-administrative support positions, and a 45% reduction in specialist technical and engineering support. While there were no reductions in supervisors, their span grew with a 50% increase in day workers. Fisher (1993) provides an example of a company with twenty-five supervisors that was transitioning to self managed work team, with only ten team leader positions available. In general, traditional organizations that adopt self-managed work teams can reduce one entire layer of managers or supervisors, sometimes even more (Orsburn et al., 1990; Wellins & George, 1991). For example, Dana Corporation reduced its levels of management from fourteen to six (Fisher, 1993).

However, line workers are not necessarily free from cut backs due to increase productivity. Going to self-managed teams often leads to many manufacturing job classifications, sometimes hundreds, reduced into one or two (Hoerr, 1989a; Orsburn et al., 1990). The added flexibility can amount to a need for fewer workers. This is one of the main problems unions have with teams (Hoerr, 1989a).

Management

In many ways management, and especially line-management, undergoes a much more traumatic role change than do members of self-managed teams. While workers have to contend with developing skills to handle their new management responsibilities, managers have to learn to give up the controlling actions that they have become so accustomed to and that have given them a sense of security and value within the organization (Wellins & George, 1991). Furthermore, they realize that many traditional management skills that they have mastered and used to become successful will, for the most part, become obsolete. In their place will be many new skills that these managers may be uncertain about mastering (Manz et al., 1990).

Accordingly, a manager's commitment to self-managed teams seems to decrease the closer the manager is to the worker. In a November 1990 survey done by American Society for Training and Development (ASTD), commitment to self-managed teams was rated as high or very high by 65% of senior managers, 66% of executives, 62% of managers, 43% of non-supervisors, and 31% of supervisors (Wellins & George, 1991).

Moreover, it is not uncommon to find managers openly resisting the change to self-management (Dumaine, 1990; Manz et al., 1990), or at least not participating in the transition (Plunkett & Fournier, 1991). Some managers and supervisors find it impossible to make the change and voluntarily leave the

organization (Schilder, 1992). The percentage of supervisors who opt out can be 20% or higher (Orsburn et al., 1990).

In assisting with a managerial transition, Manz et al. (1990) identified four stages that the managers went through in making the transition to self-managed teams. These are 1) initial suspicion, uncertainty, and resistance; 2) gradual realization of the positive possibilities inherent in the new work system; 3) wresting with a new role; and 4) learning a new language.

In their new roles managers become more like coaches (Torres & Spiegel, 1990) using influence and interdependence, instead of the traditional managers who use power/dependence relationships (Carr, 1991). This new role will also open new opportunities. For example, once middle managers have pushed-down some of their prior detail management responsibilities, they will have more time to be involved in the long term planning and success of the business (Orsburn et al., 1990).

While there are many new roles for managers in a self-managed organization, Carr (1991) specifies the seemingly five most important: 1) managing alignment; 2) managing coordination; 3) managing the decision process; 4) managing continuous improvement; and, 5) creating and maintaining trust. Managing alignment involves assuring that the people in the organization are moving in the same proper direction. In managing coordination, the manager must make sure that the teams are working together, meeting the customer's requirements, and are

receiving a fair allocation of resources. To manage the decision process, managers must both help individual teams make decisions when they are having difficulty, as well as bringing the ideas of various teams together when making organizational decisions. Continuous improvement through learning and training are requirements in any self-managed organization. The manager must assure that organizational members don't become static and complacent about gaining new skills and learning. Managers must also constantly and vigorously strive to build trust between management and the teams. This involves listening empathetically to all view points, always keeping commitments, maintaining open communications, and making integrity a way of life.

Profitability

Unfortunately, very little has been published on the overall profitability impact of self-managed teams (Goodman et al., 1988). There are limited examples like the Tektronics plant that went from the least profitable to most profitable division after going to self-managed teams. Similarly there are the Weyerhaeuser Manitowoc plant and the Northern Telecom Harrisburg facility where profits doubled (Fisher, 1993). In some cases, companies seem reluctant to divulge financial impact data relating to self-managed teams (Lawler, 1986). Although productivity generally rises, so do training costs. It is unclear if the benefits outweigh the costs (Goodman et al., 1988).

Success Rate

Again, data on the success rate of self-managed teams is difficult to come across. While successes may want to parade their self-managed teams, failures would probably just a well not have anyone know. One objective study was done by Barry (1991) who researched fifteen self-managed teams over a three year period. Of those 27% were gauged as "very successful", 33% "successful", 20% "problematic", and 20% "very problematic" with early termination. While far from a large enough sample size to be statistically indicative, these teams came from a cross section of industries and team types. Here, 60% of the teams were successes and 40% were failures.

As to the reasons for a team's failure, Barry (1991) proposes that a key cause is an unsuitable mix of leadership skills. Orsburn et al. (1990) state that the two biggest reasons for an otherwise successful team's failure are a weak market for its output and the extinguishing of the team by incoming new management that is hostile to the idea of self-managed teams. However, Lawler (1986) challenges that a successful, entrenched, plant wide implementation of self-managed teams can sometimes even survive a takeover by traditional management.

Concerning the barriers to successful teams, in November of 1990 Development Dimensions International (DDI), the Association for Quality and Participation (AQP), and Industry Week (IW), asked this question of 862 executives (Wellins & George, 1991).

Of the respondents, 54% stated it was insufficient training, 47% remarked supervisor resistance, 47% incompatible systems, 40% lack of planning (implementation was too fast); 31% lack of management support, and 24% said lack of union support.

Implementing Self-Managed Teams

Cautions

There are many challenges awaiting a company that is contemplating going to self-managed teams. These include overcoming the tradition of individual rather than team based rewards, easing managers' fear of turning over certain management responsibilities to workers, building trust between management and workers, building employee commitment to organizational goals, creating a system where teams get the information they need, and keeping people focused on the objectives rather than the teams (Orsburn et al., 1990). In general, the reactions people have to the self-managed team concept will depend in great part on the historical relationship management has maintained with workers (Schilder, 1992).

One reaction that can be expected is resistance by some employees (Orsburn et al., 1990). While this may be most pronounced in supervisors and middle managers, some resistance will also come from workers (Weis, 1992). Studies have shown that about 5% of workers oppose participatory teams (Hoerr, 1989b). The reasons for resistance include factors like fear of losing one's identity in a team, concerns of union busting,

apprehension about getting stuck with poor performers, being found out as a poor performer, becoming accountable, and beliefs about the ineffectiveness of teams (Plunkett & Fournier, 1991).

Companies that are considering self-managed teams should also be realistic about the time it takes to get results. While isolated cases have claimed to see results immediately (Weis, 1992), most content that it takes about two year to get consistent results (Plunkett & Fournier, 1991; Schilder, 1992). More specifically, a greenfield site can show results in about a year to eighteen month, versus several years for an existing plant (Dumaine, 1990). Furthermore, it can take a team from two to five years to become a mature self-managing team (Orsburn et al., 1990).

<u>Training</u>

Training is crucial to the success of self-managed teams.
Orsburn et al. (1990, p. 80) puts it bluntly: "Self-directed
teams will fail if team members do not receive the training they
need at start-up, throughout the transition, and during the long
period of mature self-direction." Romer, Olberding, &
Pidwerbecki (1987) insist that teams must have training before
they can be effective. This seems born out by the 1990 ASTD
survey that found that insufficient training was viewed as the
number one impediment to a successful implementation of self-
managed teams (Wellins & George, 1991). However, Orsburn et al.
go further, concluding that even an existing team will die if it
is not given ongoing training.

Team member training. Team members, especially those that
have never been in a team before, need training in social and
leadership skills as well as technical skills. Wellins & George
(1991) point out that training needs can be broken down into
three areas: Jobs skills; team and interactive skills; and
quality or action skills. Job skills not only include the
technical skills that members need to perform their duties, but
also certain business and managerial technical skills that a
self-managed team will need. Team and interactive skills include
interpersonal, communications and social skills. Quality or
action skills involve areas like problem solving, statistical
process control (SPC), quality tools and techniques, and an
understanding of the company's quality philosophy.

These skill areas encompass a variety of individual skills.
 Team skill training can vary considerably from one company to
the next. The ASTD survey found that the type of team training
being offered by companies included problem solving (by 83% of
the companies), meeting skills (65%), communications skills
(62%), handling conflict (61%), self-managed team roles and
responsibilities (58%), quality tools and concepts (56%),
evaluating team performance (39%), work flow and process analysis
(36%), selecting team members (35%), influencing others (29%) and
budgeting (14%) (Wellins & George, 1991).

Management training. Management also needs considerable training to make the transition from the traditional management style to that required by self-management. In the beginning stages of a transition this will include skills such as building trust, helping teams establish performance expectations, and developing a responsibility hand-off plan that specifies how and when responsibilities will be transferred from management to teams. Intermediate skills incorporate solving problems in cooperation with teams, coordinating efforts and communications among teams, and helping teams choose internal leaders. Later skills involve refocusing team effort on organizational goals when required, and coaching new team members in mastering their roles within the team (Orsburn et al., 1990). Just like with team members, the training is most effective when given just before the skill is required (Wellins & George, 1991).

Cost of training. The cost of training can be enormous and should not be underrated. At a Corning Glass facility, in the first year workers could spend a quarter of their time in training (Carr, 1991). Another example is a traditional plant of about 600 employees converting to a participative plant. To train and get buy-in from these 600 traditionally experienced employees took two years and cost $3,000,000. Furthermore, this plant saw its training and development budget go from 2% of salaries and benefits to 20% (Plunkett & Fournier, 1991).

Corning's Director of Education and Training recommends

mature self-managed teams spend 20% of their time in training.
Proctor & Gamble averages forty hours of train per year on each
employee (Orsburn et al., 1990).

A broader indicator of training cost was compiled with the
ASTD survey. It found that of the companies that claim to use
self-managing teams, 7% say that they give team members no
training, 65% limit the training to ten days per year, 9% give
eleven to twenty days, 8% give twenty-one to thirty days, 10%
give thirty-one to forty-nine days, and under 1% give fifty or
more days per year. While training costs may be high, no
organization claimed that it overtrained (Wellins & George,
1991).

Stages of Self-Managed Team Development

The implementation of self-managed teams is a complex issue.
 Instant empowerment of employees under a traditional system is
usually unwise (Orsburn et al., 1990). Such employees experience
a "freedom flush" that can result in undesirable effects. These
include abuses of freedom, acceptance of empowerment without
corresponding responsibilities, and use of empowerment as a
weapon against managers (Plunkett & Fournier, 1991).
Furthermore, Orsburn et al. caution that if managers either
control too much or merely order the team to manage themselves,
the transition to self-managed teams can stall. The key is to
give teams what they require to make the decisions that are
within their skill and experience to make.

Orsburn et al. (1990) have developed an implementation strategy that considers the various dynamics that organizations and teams experience when going to self-managed teams. Before actually putting teams in place, they recommend establishment of a steering committee to look to see if self-managed teams are really appropriate. If they are, a designing committee should be selected that will design the details of the implementation. Then the teams can be selected and put to work.

Once this is done, the implementation can be expected to go through five stages. The first is the start-up stage. High hopes and intensive training dominate this phase. The next stage is dubbed the "state of confusion". This stage is dominated by chaos, fear, uncertainty, and rapidly changing roles. Stage three is the leader centered team phase. Here the team looks to one of its members to act as a formal or informal leader and rallies around that person. In the forth stage, tightly formed teams, the teams become extremely internally focused. They have developed a unique identity and attempt to protect themselves even when the team's actions are contrary to the goals of the organization. The last stage, self-directed teams, finds that the members form a mature self-managing team. These teams work toward organizational goals and are fairly self-sufficient at handling internal decision making. Going from the start-up stage to mature teams can take from two to five years.

Wellins et al. have suggested a similar implementation strategy that begins with a steering committee, design team, and

team member selections and training. They, however, identify four stages of team development: getting started, going in circles, getting on course, and full speed ahead. The first two stages and last stage roughly coincide with Orsburn's. Orsburn's third and forth stages fall into Wellins' "getting on course." Wellins et al. also caution that once implementation is started, management should be prepared to see it through.

In contrast to Orsburn et al. (1990) and Wellins et al. (1991), Barry (1991) has analyzed the development of self-managed teams from a perspective of their leadership needs. Barry's analysis concludes that most teams go through a four-phase process. Phase one consists of the team getting acquainted and finding a common direction. In phase two, the team begins to deal with its social norming and gets down to the details of how it is going to complete its work. Phase three is the mature phase. Here the team is completing its work. On-going teams normally exist here. Phase four is the concluding phase leading to the disbandment of the team. The main thrust of Barry's analysis is that during each phase, each self-managed team type (project, problem solving, or policy making) has a particular need for one of four leadership styles (social, spanning, envisioning, organizing).

<u>Trends</u>

The use of self-managed teams has been rising constantly, and geometrically over the last two decades (Hoerr, 1989b; Wellins et al., 1991). They have been found very effective in many instances, far out performing similar traditionally structured organizations (Fisher, 1993, p. 17; Appendix B). Some management experts have gone as far as to say the self-managing teams are the wave of the future (Donovan, 1989; Dumaine, 1990; Goodman et al., 1988; Harrington, 1990; Harrington, 1991; Sims & Lorenzi, 1992; Wellins & George, 1991; Wellins et al., 1991). However, there are words of caution as well. Other management experts, even some strong proponents of empowerment and participation, such as Plunkett & Fournier (1991), have reservations about the usefulness of self-managed teams. Others have made personal observations that companies are starting to back off from the self-managed team concept (J. Spiegel, personal communication, October 10, 1992; J. W. Pfeiffer, personal communication, September 24, 1992).

There is little question of the expanding roles of teams and employee empowerment within organizations. However, the future of self-managed teams is not so certain, and will probably stay that way until more scientific analysis proves them a fad or a competitive edge. This being the case, it is difficult to tell if self-managed teams are the practical limits to what capitalistic organizational evolution will permit. Or, instead,

will there be even further extensions to team based
organizations, such as contributing groups, that will become a
tool for organizations to be even more competitive in the next
millennia.

CHAPTER III

CONTRIBUTING GROUPS: A PROPOSED STRUCTURE

<u>A New Structure</u>

A contributing group structure would be original in many ways. It would be composed of small, financially self-sufficient groups, much like an internal network organization (Snow et al., 1992). At the same time, it would be similar in other ways to an organization wide implementation of self-managed teams, since the groups would be mandatorily small with no more then around sixteen people (Orsburn et al., 1990). However, the most striking difference from either of these structures, is that the contributing groups, collectively, would hire the organization's management. In essence, the groups would manage their internal affairs and management would act in a support role instead of a directive role.

Donovan (1989) proposes "hi-performance, hi-commitment business teams" that have multi-skilled jobs, integration of functions, and a whole job focus. Furthermore, these teams would plan, control and improve their operations. Harrington (1991) suggests that the future work place will be made up of business partners that will compete to sell products and services to other members. Goodman et al. (1988) submits that satellite

organizations-a core organization with autonomous, independently owned but linked support organizations-could evolve into an organization built upon self-managing teams. Snow et al. (1992) describe internal network organizations that are composed of market driven independent units or "nodes". All of these organizational constructs have some resemblances to contributing groups. However, they all lack a feature in which the groups contract, or hire, their management.

Structure Basics

The basic building block of a this structure would be a group of workers who would make up a "contributing group". Each of these groups, that could be made up of multiple teams, would be responsible for an identifiable product or service. These products and services would be sold to either internal or external customers. Out of the revenue generated by these sales the group would pay all expenses including compensation. Any group which wasn't providing an effective and efficient product to its customers would cease to exist, since other groups or outside suppliers would put them out of business by providing the product at a lower total cost. A contributing groups that was not profitable would go out of business, just like any independent business. The members in a group that "went out of business" would have to find employment elsewhere, either in a different contributing group or outside the organization.

Contributing groups that shared common traits could join

together and contract a contributing group. The purpose of the
contracted group would be to provide management and coordinating
services for the groups that were contracting it. These
contracted groups would be known as a "coordinating contributing
group", and would be similar to "brokers" in network
organizations (Snow et al., 1992). An "executive coordinating
group" would be a special case coordinating group that would fill
the role of traditional senior executive management.

As a condition of being part of the organization, each
contributing group would be responsible to pay royalty fees to
the "financial liaison group". This group would provide funding
to contributing groups and provide a return to investors.

These small contributing groups would make up the entire
organization. Just like a self-managed team, each would be
responsible for an identifiable piece of the organization's work.
 The basic structure is presented in 2. While each contributing
group would have to agree to certain limitations on its freedom,
these would intentionally be very limited to preserve the
flexibility that this structure is designed to achieve.
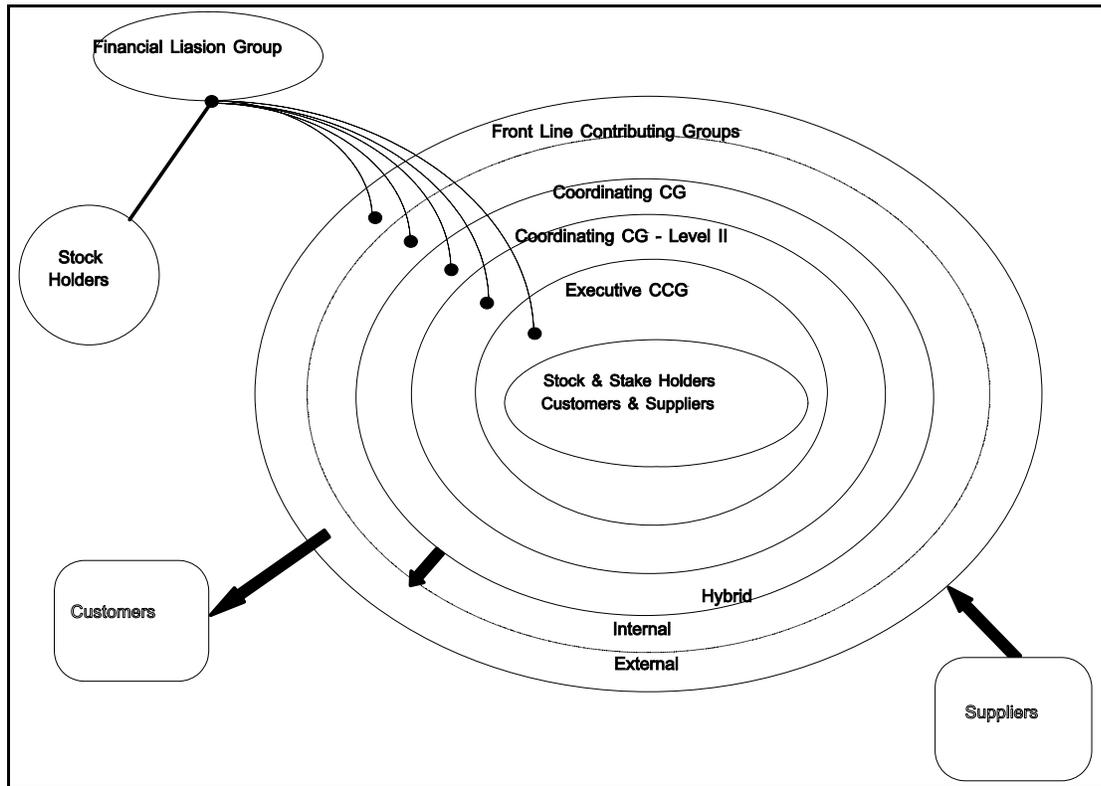
Figure 2 - Contributing Group Structure

Objectives

The contributing groups structure is designed to achieve a number of objectives, many of these similar to those of self-managed teams and network organizations. Just like with self-managed teams, these objectives are expected to be achieved as a result of the members' participation and involvement (Hoerr, 1989a; Lawler, 1986; McKee, 1992; Milliken & Vollrath, 1991; Orsburn et al., 1990; Wellins et al., 1991). However, with contributing groups, the participation and involvement should be magnified since each group would wholly control its internal functions and be responsible for its own economic survival and prosperity.

Build self-esteem motivation. Each group will be responsible for an identifiable product or service. This should cause other members of the organization to identify each group member with the group's product or service. Furthermore, people outside the group may associate each member's reputation with the group's reputation. Consequently, each member will likely link their own self-esteem to the group's effort. Therefore, group members could be expected to improve their work quality to improve their self-esteem (Pearson, 1991).

Increase worker ownership. Because each member will take a role in the decisions and responsibility of the group, the members should feel much more personal ownership of the group's

work (Dumaine, 1990; Fandt, 1991; Glass & Sanders, 1992; Harrington, 1991; Schilder, 1992). The fact that the group's existence, and each member's job, depends on satisfying its customers, should heighten the sense of ownership (Carr, 1991).

Utilize social systems. By limiting each contributing group to a few people (e.g., ten to fifteen), each member of the group can have a personal relationship with each of the other members. Combined with the fact that each group is financially self-supporting, the social systems may exert a strong force within the group. For example, peer pressure is often more effective than managerial threats (Donovan, 1986). In this structure, co-member pressure to perform could markedly increase the performance levels of traditional under-performers (Lawler, 1986). Similarly, the understanding and empathy of a member's individual circumstances should afford the group flexibility in dealing with individual situations.

Increase financial motivation. Each group will generate its income by providing product and services to both internal and external customers, and receiving payment for those products and services. Each group will be responsible for deciding how to use that income. Some income will, of course, have to go to pay expenses. Each group will also have to allocate some of its funds to the repair and investment of operating equipment.

Additionally, each group will also be responsible for using some of its income to pay its members. Since the members control

their compensation, and therefore can directly benefit from increased profitability, there should be a strong financial motivation to increase profitability (Huret, 1991; "Most effective variable pay plan: . . . ", 1992). In general, members could establish a direct relationship between their efforts and their compensation.

Reduce empire building. In many organizations there is an active effort by front-line and middle management to increase the size of the staff under their authority. In so doing, they control more of the organization's resources, have more of an influence on organizational policy, and improve their job security (Hodge & Anthony, 1991). The result of this empire building is typically inflated bureaucracy with marginal or unnecessary job positions. This is counterproductive to organizational efficiency.

However, with a contributing group structure the motivation for empire building is removed. A group should not want anything but necessary personnel; any such positions would require some compensation and costs that could instead be split among the other members of the group as additional compensation. Furthermore, since the size of each group is limited, a group may strive to keep the staffing level to a minimum. Otherwise, the group must split. If both new groups do the same activity as the old one, the two groups will be in competition with each another.

Emphasis on performance. In many organizations, a low or

non-performing employee may survive and even succeed by being
politically skillful or gaining social popularity among the
decision makers (social popularity should not be confused with
the social leadership function (Barry, 1991)). However, in a
structure where members are knowledgeable about the contribution
of co-members, and each member's financial benefits are
materially linked to the performance of the other group members,
there should be little tolerance for social-loafers (Milliken,
1991).

Display costs of perks. Increasing perks have traditionally
accompanied increasing management power. It is not unusual for
senior management to have large plushly furnished offices with
company cars and large expense accounts. It is not unusual to
find in those same companies front-line workers using obsolete or
inadequate equipment.

In a contributing group structure, the money used for group
or member perks could otherwise provide additional compensation
to the group members. Therefore the group must make a conscious
tradeoff, and establish a balance, between a pleasant work
environment and financial compensation. It is also unlikely that
a group would invest in perks to the exclusion of needed work
equipment.

Equitable downsizing. Traditionally when large
organizations faced economic difficulties one common response is
to layoff line workers. Besides causing a possible loss of trust

between management and workers, such a method of reducing costs also causes the loss of people with front-line skills. It may also instill insecurity and resentment in the workers. This can lead to inefficient work habits. Furthermore, pruning of front-line workers does not necessarily remove the most unproductive parts of the organization.

In a contributing group structure, each team would be responsible for dealing with the economic difficulties that confront it. This may lead to many different ways of handling cuts. For instance, because of the personal relationship that each member would have with their co-members, it is likely that there would be considerable resistance to laying off a productive co-member. Instead there would probably first be a shared reduction in pay (Lawler, 1986). Additionally, because each group exists by supplying products and services to its customers, the groups that are the least necessary would probably be the first ones to be eliminated through market forces. Also, since management would be just another contributing group that was supplying coordinating services, they too may have to face loss of clients, group eliminations, and reducing their pay to stay competitive against other coordinating groups.

Flexibility. A contributing group structure should be much more flexible to changing conditions then traditional organizations. Not only should individual groups show flexibility at adapting (Wellins et al., 1991), but the flexibility should be compounded by having an entire organization that is composed of these small groups (Snow et al, 1992).

Rapid response. Small groups can react much faster when they do not have a procedurally dominated bureaucracy to face (Peters & Waterman, 1982; Hodge & Anthony, 1990; Snow et al., 1992). Therefore a contributing group structure, built around small teams, should be able to react quickly to new demands and requests.

Product innovation. Most innovation happens in small companies (Hodge & Anthony, 1990). By forming an entire organization out of small, financially independent groups, each of which can financially benefit by innovation, the organization should have the advantages of both entrepreneurial effort, and the financial and image assets of a larger firm.

Retention of stars. One problem large organizations have is that their best performers sometimes leave to start-up their own businesses. Some companies have combatted this by letting innovators get a percentage of their ideas (Peters & Waterman, 1982).

In some cases, self-managed teams improve the retention of

workers (Lawler, 1986). Contributing groups should be even more effective because there would be no limit to how much a group and its members could make. At the same time, the organization would still benefit by getting a percentage of these increased revenues. Furthermore, by remaining in the organization, the group members would retain the name identification of the larger organization. Hence, their should be much more incentive for star performers to remain within the organization.

    <u>Appropriate bureaucracy</u>. Each group should find the appropriate bureaucracy that it needs to maximize its business operations. Since each group would pay for coordinating and support services, it would attempt to minimize the bureaucracy with which it was dealing. Hence the organization's bureaucracy should be smaller than traditional organization, and more efficient.

Advantages Over Self-Managed Teams

    Self-managed teams go a long way in providing workers with the motivation and ownership to maximize their productivity. However, the self-managed team concept has some weak points which the contributing group structure addresses.

<u>Control by front-line workers</u>. In an organization using self-managed teams, management still controls the vital resources that the teams need. Management can relocate these resources as they see fit. Also, management usually sets the compensation and bonuses for the team and its members. Management also always welds the threat, even if unstated, of disbanding the self-managed teams. On more than one instance a highly productive self-managed organization has been destroyed because of new management taking over that did not believe in the self-managed vision (Orsburn et al., 1990; Goodman et al., 1988). Moreover, trust is often sighted as fundamental to establishing productive self-managed teams (Carr, 1991; Lawler, 1986; Orsburn et al., 1990). This seems logical, as the only guarantee the workers usually have is management's word.

In a contributing group structure, management's power is only what is granted to it by the front-line contributing groups. Resources are allocated via a free market system. Groups set their own compensation. Groups are only disbanded when they decided to, or they become economically inviable. Since management no longer has ultimate control, trust is not so fundamental.

<u>Compensation linked to performance</u>. The compensation systems used for self-managed teams usually do not compensate the teams for any added profitability (Goodman et al., 1988). A lack of connection between increased output and compensation may result in sub-optimal performance (Goodman et al.; Lawler, 1986). Compensation systems such as gain sharing provide a better strategy for tying productivity to compensation, especially when allocated to small identifiable groups ("Most effective variable pay plan:...", 1992). However, such systems typically exist at management's discretion and, unless unionized, management may withdraw or change such systems at will.

Each group in the contributing group structure will be responsible for devising its own compensation system. Management will have no part in approving or denying a group's compensation system. It is expected that most often the compensation will be related to the profitability of the group. In such cases a direct connection between performance and compensation will exist.

Value added functions only. With self-managed teams, each
team's (or for that matter, each member's) function exists
because management believes that the function contributes more
value than it consumes. While this may be a bottom line decision
for production departments, the decision becomes clouded with
support areas. However, just as the workers usually know how to
do the job better than management (Dumaine, 1991), the consumers
of a product or service may be much better equipped to judge if
the function adds value. This judgement may best be represented
by whether or not the consumer is willing to pay for the product
or service. If the group cannot get the consumer to pay enough
to cover team's costs and compensation, the function probably
does not add value. In this case, from an economics standpoint,
the team's function should be eliminated.

The contributing group structure accomplishes this by
requiring that each group be financially self-sufficient. If it
is spending more than it is bringing in, it must change or face
market driven elimination.

Teams can select new management. Traditionally managers controlled the business, and the role of workers was to do what they were instructed to do. With self-managed teams, management's role changes to support the teams in doing their job (Carr, 1991; Orsburn et al., 1990; Torres & Spiegel, 1990). Yet the control situation is reversed. Although management supposedly supports the team, they also ultimately control the teams. If management's support effort is inadequate, the team has no alternative. However, if management's real role is to support the team, then the team should have the option of obtaining new support (i.e., new management, if the support is unsatisfactory). The focus of the entire organization should shift to supporting the teams who produce the products and services that the external customers purchase.

The contributing group structure does this by creating a system where the front-line groups contract management. Therefore the groups can replace management if it is not providing satisfactory support.

Two Layers of Contributing Group Structure

Because of the independent nature of each contributing group, the entire organization can be viewed from two different perspectives. The macro perspective, or corporate structure, consists of the organizational framework in which the contributing groups operate. It encompasses the culture, policies, and stipulations that the contributing groups accept to

be part of the organization. The micro perspective, or group structure, views how the contributing groups are expected to operate internally.

<div align="center">Corporate Structure</div>

Corporate Charter

A corporate charter would act as the embodiment of the organization. This document would define its purpose and its rules of membership. It would be a combination of mission statement and bylaws. Contained in it would the fundamental limitations, rights, and responsibilities of both the constituent contributing groups and individual members. This document would fuel the organizational culture and help guide policy making. It would also contain the checks and balances on the organizational power structure.

Contributing Groups

The basic building block of this structure is the contributing group. Each of these groups operates as a pseudo franchise, selling and buying products and services to other contributing groups or external customers or suppliers. Depending on the requirements that the contributing group works under, it may function as one or multiple teams.

Key common features. All contributing groups would have some common features and limitations to insure the integrity of the structure. The most important limitation would restrict all

groups to a small size (e.g., ten to fifteen people). This limitation is important to take advantage of group dynamics that happen when each member has a personal relationship with their co-members. Groups that needed to grow beyond this size would have to split into two or more groups.

Each group would also have to report financial information in a common format under accepted accounting principles (e.g., GAAP) and policies. Ideally the accounting information from each group could be electronically connected to a common system. The objective is to increase the ease, and reduce the cost, of auditing. As an internal control, periodic auditing would have to be done. This would assure each contributing group was making proper payments to the financial liaison group. Because of the potential complexities in conforming to a common mandatory accounting format, most contributing groups would likely enlist the services of an internal accounting contributing group to maintain its books.

It may also be advantageous for each group to be a separate legal entity. This would permit an easy and accurate reflection of the stake of all contributing group investors. Investors may consist of the financial liaison group, group members, or outside investors. For example, the entity of choice in the US might be the corporation, so that each investor would have shares of the group "corporation". The bylaws of the "corporation" and varying classes of stock can clarify the rights and benefits of each investor (Ross, Westerfield, & Jaffe, 1990).

Furthermore, each contributing group has to be financially self-sufficient. Each group must raise revenue by selling its products or services. Out of these revenues and any financial reserves, the group has to pay all its costs and compensation. Any group that cannot financially support itself over the long run will have to disband, its members finding employment elsewhere either within or outside the organization.

Some mandatory features are necessary to maintain order and prevent the misuse of the contributing group structure. However, it is still vital that these limitations be kept at a minimum to preserve flexibility and responsiveness, which are key goals of this structure.

Front-line groups. Front-line contributing groups are the core groups of the organization. They provide basic products and services to other contributing groups and external customers. Examples would include a group that provides accounting services, or one that assembles and performs final tests on a model of computer systems. The accounting group's customers would probably be other contributing groups, although they would be free to provide services to outside customers. The organization's distribution group or possibly even the final customer would purchase the computer assembly and test group's output. A part of the revenues of each group would go to the financial liaison group as a royalty fee for being part of the organization.

Each contributing group would be free to purchase its needs either from other internal contributing groups or from external suppliers. The accounting services group, in the above example, could purchase its supplies either from a business supplies contributing group or from an office supplies store or catalog. Similarly, the computer assembly and test group could purchase any of its products from internal contributing groups that manufactured or stockpiled components, or from outside component distributors. To encourage internal purchases, as well as prevent group flight, a percentage of the purchase price for any external purchases would be paid to the financial liaison group.

Because each group is free to decide where it gets its supplies and sells its output, a type of internal free market would exist in which most groups would face on-going competition. A contributing group that provides the service of stockpiling business supplies would have to be price and service competitive with outside suppliers. An accounting services group would compete with outside services that provide payroll or general bookkeeping services. Any group that provides products to external customers would have to compete against the external free market.

Furthermore, since each group's size is limited, if a product demand was too big for one group, more than one contributing groups might compete against each other for business. While it is possible that they would compete head-to-head, it is more likely that they would each develop their own

target customers.

However, not all contributing groups would face on-going competition. Such groups would often have a long term contract to provide a narrow function. An example of this would be a contributing group that was contracted to handle part of a continuous process operation. Even in these cases the group would have to face competition by bidding against other potential contributing groups when the contract came up for renewal, as well as meet on-going contractual requirements. The terms and conditions of such contracts would be negotiated solely between the contributing group and its client, although subject to the corporate charter and any superseding policy agreements.

Coordinating groups. Coordinating contributing groups are special purpose contributing groups whose primary function is to provide what could best be called management services for front-line contributing groups. Typically this type of group would service contributing groups which share a common feature or interest.

Coordinating contributing groups would also be charged with enforcing policies agreed to by its client contributing groups or the organization as a whole. This enforcement capability provides a check and balance against an otherwise out-of-control contributing group.

The genesis of coordinating contributing groups could originate from some contributing groups realizing that they share

a need for some common support service. This could include such considerations as boundary spanning, gate keeping, common resource procurement and distribution, scheduling coordination, etc. These coordinating groups would then issue a request for bids for a coordinating contributing group. Interested contributing groups, possibly new or proposed, would submit bids to take on this function. The winning group would become the coordinating contributing group for the contracting groups. Although the duration, policy enforcement, and fee schedule of the contract would be spelled out for each contracting contributing group, the same conditions would usually exist for each contracting group. From that point on, certain individual contracting group may decide not to renew with that coordinating contributing group, while other contributing groups may become new clients.

There may also need to be multiple levels of coordinating contributing groups. The organization may become large enough that coordinating contributing groups need a support layer in between them and the executive coordinating contributing group. In this case, some coordinating contributing groups would contract with a second level coordinating contributing group to provide many of the same services that they are supplying to their client front-line contributing groups. This could extend on to third, forth or higher levels of coordinating groups.

Of course, contracting a higher level coordinating contributing group would add to the costs of the lower lever

coordinating groups. It, in turn, would have to pass these costs along to its client groups in the form of increased fees, which may cause clients to look elsewhere for support services. Therefore, there would be a strong motivation for coordinating contributing groups to avoid contracting a higher level group unless it was absolutely necessary to provide adequate service to its clients. In this way management (i.e., contributing coordinating groups) would remain lean and the organization relatively flat.

Executive coordinating group. The executive coordinating contributing group is a special coordinating contributing group that in many ways fills the role of executive management in traditional organizations. This group has the responsibility of being the organization's spokesgroup to outside stakeholders. It is also expected to be the organization's visionary group, setting a general path to accomplishing its mission statement. Additionally, it is the ultimate enforcer of policy should a group or individual be acting beyond their license.

Because of the importance of this group, the entire organization would be involved in contracting its services (unlike higher level coordinating contributing groups which are only contracted by their immediate client coordinating contributing groups). For a group to be contracted for this position, it would need to submit a proposal to the entire organization, including how to calculate the fee from each

contributing group. Presumably, multiple groups would bid for
this position. All the contributing groups in the organization
would select one or none of the vying groups.

Being a high profile position, the contract length for the
executive coordinating contributing group should be of
significant length to allow continuity of leadership. While the
contract length for general coordinating contributing groups may
be on the order of one or two years, this group should be
contracted for between four to six years.

Financial liaison group. This group is not a contributing
group, per se, but an agent of the stockholders. It acts as an
intermediary between the organization and the organization's
stockholders. Since this group has exclusive initial investment
rights to all the organization's contributing groups, the
stockholders would be investing in this group's ability to
generate a return by effectively investing in contributing
groups.

This group would be similar to a financial holding company.
 It would focus on investing in profitable ideas of the
organization's contributing groups. In some ways it would take
the role of a traditional board of directors. However, besides
just setting long-term financial strategy, this group would be
much more involved in the day-to-day financial decisions,
deciding on individual projects to fund.

This group would be elected by the organization's

stockholders. Various groups may contend for this position. The
stockholders role would be to elect the group that seems most
capable of managing the finances that they will handle and giving
the investors a return on their investment.

The primary source of revenues for this group would come
from royalties received from the organization's contributing
groups. This group would also be empowered to raise funds by
issuing stocks and bonds in the name of the organization. These
funds would then be used for further investments or payments to
investor in the form of dividends or stock buy-backs.

Investments would consist of financing new contributing
groups or providing loans to existing contributing groups. New
contributing groups would have to show expected profitability,
much like someone seeking new venture capital, in order to
receive financing. Similarly, an existing contributing group
would need to show acceptable improved profitability to qualify
for a loan.

Additionally, this group would be responsible for
periodically auditing contributing groups to assure that they
were properly reporting their financial condition and making the
appropriate royalty payments. It would also have the
responsibility for coordinating outside audits of the
organization's overall financial condition.

Hybrid front-line/coordinating group. Occasionally a type
of hybrid group may develop that is classified as a front-line

contributing group but acts as a coordinating group. An example of such a group would be one that originally did the work but had opted to contract out the production functions to other contributing groups.

Each stage of the production process would, in theory, be passed from the original group to a contracted contributing group, a value added function performed, and then passed back to the original group. The product would then go on to the next contributing group for further processing. This chain would continue until the original, controlling group sold the product to an external customer.   In reality, the product would probably go from one contributing group to the next without returning to the controlling group. This group would basically perform a clerical and administrative function, capturing some profits for itself in the process.

If the controlling contributing group held a patent or copyright that was essential to the production, this would be a legitimate relationship. However, if this was not the case, the contracted contributing groups would have the option of deciding to serially produce the same product. This would leave the original controlling group out of the arrangement, and their associated costs and profits.

If the original group was not providing a sufficient administrative, coordinating function to justify its financial cut, the contracted contributing groups could cost effectively take over the production process. In this case each group could

charge a slightly higher price for its contribution, and still supply the external customer with the product at a lower price. Hence there would be a natural tendency for this hybrid group to lose its role unless it evolved into performing just like a coordinating contributing group.

Contract Creation

The primary means of conducting business between contributing groups would be setting up intergroup contracts. These contracts could be either formal or informal, long or short term, or it may only be on a purchase by purchase basis. However, in all cases one group would be paying for the product or service offered by the other group. For example, a group may enter into a rental agreement with a facilities management contributing group to obtain office space. Similarly, a group may contract with a janitorial contributing group to obtain janitorial services.

In establishing contracts, only the supplier and client contributing groups would need to be involved in the negotiations. No approval would be needed from any other groups such as the executive coordinating contributing group or the financial liaison group.

Availability of outside suppliers or customers could play a major influence on the negotiations, since a group is free to sell to or buy from external businesses. Group size limitations could also play a role. A group that is near its maximum size

may be reluctant to take on additional or different work.

Corporate Revenues

Sources and uses of revenues. In a contributing group structure corporate revenues are primarily raised from royalty payments based on each contributing group's revenues. It also collects royalty revenues when a contributing group purchases something from an external source. Another revenue source is interest income from making loans to contributing groups. All this revenue goes to the financial liaison group. This group can then use these revenues to pay a return to stockholders or to invest in new contributing group ventures.

Royalty revenue. The royalty on each contributing group's revenues and external purchases are established when the group is created and can be modified as needed. If the financial liaison group provides financing for the contributing group, the rate will be set in negotiations between the groups, the higher the risk the higher the royalty fee. A customized royalty fee schedule may even be established during negotiations that could be based on such indicators as profitability, gross revenues, or sales level.

Nonetheless, the corporate charter should establish a minimum base royalty fee scheme. Even contributing groups that received no financing from the financial liaison group would still be subject to this royalty payment.

One possible royalty scheme would base the royalty payment on a percentage of gross profits and on a percentage of external purchase costs. This type of royalty structure has many objectives. These include generating corporate revenues, encouraging internal purchases, and preventing contributing group flight. At the same time it should not impede the economic viability of the organization or interfere with the free market forces that external suppliers allow.

Contributing group flight is prevented by charging a royalty on external purchases. Otherwise a group could retain more profits by becoming an external supplier and avoiding the revenue royalty payments.

In this royalty system, a contributing group would pay royalties of

$$Y = Pg * (R - Ci) + Ce * (Pe - Pg) + Pe * Ee, \quad (1)$$

where Y is the group's royalty payments, Pg is royalty percentage of the gross profits, Pe is the royalty percentage of external purchases, R is the revenue of the contributing group, Ci is the internally purchased cost of goods sold, Ce is the externally purchased cost of goods sold, and Ee is the external purchases except for external cost of goods.

To prevent contributing group flight, the royalty structure must be set up so that

$$(R - Ce) * (Pe - Pg) + Pg * Ci - Pe * Ee > 0, \quad (2)$$

using the above notation. (See APPENDIX C for derivations of the above formulas.) Equation 2 demonstrates that generally the external purchase royalty should be greater than the revenue royalty.

As an example, suppose a contributing group generates $800,000 per year in revenues (where these revenues come from is irrelevant). Furthermore, suppose that its annual costs of goods sold is $300,000, of which $200,000 is internally purchased and $100,000 is externally purchased. The group also spends $100,000 a year on external services and goods. If the corporate royalty fee is 3% on gross revenues and 4% on external purchases, the corporate royalty fee would be $27,000. The group also makes $5,000 more per year by being part of the organization rather than an external supplier.

On the other hand, if the royalty rates were switched so that 4% is charged on gross revenues and 3% on external purchases, the corporate royalty would grow to $29,000. However, in this situation the group would make $5,000 more by becoming an external supplier. Hence the group would have an economic incentive to leave the organization, in which case their royalty payments would become $0.

Contributing group loans. A secondary way the financial liaison group could generate corporate revenues would be to

provide loans to contributing groups. Such loans would go mostly to existing contributing groups that needed funds to purchase new equipment. However, operating expense loans might also be available if the financial liaison group believed that the contributing group was just going through a temporary cash flow problem. Just like loans in the private sector, the interest rate on the loan would increase with the its riskiness.

The financial liaison group would not have a monopoly on making loans to the organization's contributing groups. Just as contributing groups could make purchases from external sources, contributing groups could also go to external funding sources for loans. Being a legal entity, it would have the capability to do this, especially with capital equipment loans. Here the financial liaison group would compete with the banking industry.

Control. To assure proper collection of corporate revenues, a minimum set of internal control systems should exist. Among these should be a common core accounting system, internal audits, and mechanisms for dealing with market value bartering between groups.

The accounting system would consist of a common core of general ledger accounts and standard accounting policies. This would ease the analysis, and reduce the cost of obtaining the financial condition of a contributing group. Furthermore, this accounting system permits the consolidation of the financial condition of either a section or the entire organization by

combining the individual contributing groups. An automated system with a central database could almost make timely financial reports effortless.

From time to time, auditors would review and reconcile the financial books of each contributing group. This would act as an internal control to verify that a contributing group was not hiding revenue or external purchases, hence avoiding some of its corporate royalty payments. It would also provide an opportunity for the contributing group to receive feedback on how well it was managing its books.

Another area that would need to be controlled is bartering of products and services between contributing groups. Without such control, contributing groups could avoid paying royalty payment by exchanging goods and services instead of paying for those goods and services. Essentially, the corporate charter would have to specify that such bartering transactions would have to be reported by contributing groups at either full or partial fair market value. The contributing group would then pay a royalty on that value. Auditors would also look for the proper reporting of barter transactions.

Doubtlessly the accounting costs and complexity would be much higher under a contributing group structure than in contemporary structures. However, if the general productivity increases of self-managed teams are enhanced further by this structure, these costs may more than be compensated for by the increased productivity and reduced costs coming from groups of

dedicated, involved workers.

New Group Creation

An objective of the contributing group structure is for it be very fluid. One way this fluidness would be displayed is in the timely creation of new contributing groups as market and environmental conditions changed. New contributing groups would primarily originate either from group division or new ventures.

Group division. The demands upon a contributing group may grow to the point where it is impossible to do a quality job without growing beyond the maximum number of people allowed in a contributing group. Such a group may try to continue doing the job at a reduced quality level. However, competition from other contributing groups and outside rivals will force it to bring quality up to standards or risk losing its customers.

Faced with this situation, a contributing group will have no option but to split into two or more contributing groups. This separation could happen in a variety of ways. The groups could decide to split the equipment and personnel, thereby creating two new independent contributing groups out one. In effect, a contributing group version of cellular division. Alternatively, a few of the members of the contributing group may see a business opportunity to establish a new contributing group. These people would seek needed financing from the financial liaison group or other sources to set up the new contributing group.

Regardless of how the group splits, the two groups will

typically either compete with each other or the new contributing group will take over a function that the initial contributing group was handling internally. In the later case, the new group would take essentially take on a support function for the initial group. If other contributing groups in the organization required similar support, this new group would have the opportunity to solicit their business as well.

New venture groups. When an unmet need exists in the organization, typically an existing contributing group which is providing a similar product or service will attempt to fulfill that need. However, if the need is latent, requires an innovative solution, or is a major undertaking, a new contributing group may propose to take on the new venture. The people proposing this new contributing group could come from a single contributing group or from different contributing groups. In either case these people would be leaving their old groups to embark on the new venture. The people proposing the new venture could also be an external group of people who wish to join the organization.

Irrespective of where the members of the proposed group came from, they would need to find financing for the new venture. The prospective members could invest their own funds in the new venture, thereby reducing the level of outside financing required and retaining more of the profits for themselves.

The most obvious outside financing source would be the

financial liaison group. Typically the prospective members would approach this group first and negotiate a level of financing. Generally the greater the financing the higher the negotiated royalty fees.

If financing was still required beyond what the financial liaison group was willing to offer, the prospective group would have the option of obtaining alternative financing. Financing could come from other contributing groups or external sources.

Other contributing groups could invest some of their saving in the new venture hoping to reap a financial reward for their investment. The investing group would, of course, have to pay revenue royalties on any investment profits.

The prospective group could also seek funding from outside sources. These external sources could be banks, venture capitalist, outside companies, or individuals, including other members of the organization. Any investment profits that the contributing group paid to outside sources would be subject to external purchase royalties. If the new group did secure any external financing, the financial liaison group would have the first right of refusal under the same terms.

New group positioning. When a new group is created it would generally be a front-line contributing group, actually providing a product or service to customers, just like most start-up businesses. Periodically, though, a coordinating contributing group may be created, particularly when the organization is

growing.   Furthermore, if the new venture holds a vital copyright
or patent it may quickly establish itself as a hybrid front-
line/coordinating contributing group.

Corporate Support Systems

Since each contributing group in this structure is a self-
sufficient group, many of the blanket employee benefits that are
present in many traditional organizations will not automatically
come along with joining this type of organization.
Simultaneously, the focus on groups present new situations that
call for new support systems.

On the benefits side, employees of many traditional
organizations have, or have access to, health insurance,
retirement programs, or similar packages. In the contributing
group structure each group would have to concern itself with
obtaining these benefits for its group's members. Because of the
complexity involved with obtaining cost effective benefits, it is
likely that a contributing group would take on the task of
supplying benefit services to the organization's contributing
groups, for a fee. Larger organizations may even see
specialization of contributing groups to certain type of benefits
(e.g., health insurance and pensions). A contributing group
supplying health insurance expertise would help client
contributing groups find a cost effective carrier, and assist
that group's members with understanding their coverage and claims
submission. A retirement plan assistance contributing group

would help its client groups with the legal as well as logistical problems involved with setting up and maintaining retirement systems.

A new problem that arises with a contributing group structure is that entire groups (and hence its members) can find itself out of work; sometimes through no fault of their own. The personal cohesion of most groups should significantly reduce the frequency of isolated, individual layoffs (Lawler, 1986). In many ways, dissolution of contributing groups would be similar to a departmental or sectional layoff, except that the members here would generally not qualify for unemployment insurance. A formal layoff protection policy may or may not exist for organizational members (if a protection plan did exist, it would probably be funded by the financial liaison group and administered by a contributing group contracted by the financial liaison group). In any case, contributing group members would establish a reputation with other groups. Because of the independent nature of contributing groups, should a group disband, other contributing groups may be more active in picking up members with good reputations.

Group Structure

Overview

In a contributing group structure, each contributing group would be an independent entity and have control over its destiny. Each contributing group would be legally separate, having a

contractual and possible stock ownership connection with the umbrella organization. A contributing group would be responsible for its own finances and planning. Like a self-managed team, it would also take responsibility for a variety of tasks that traditionally have been the responsibility of management. These responsibilities would include such issues as member compensation, group leadership, group recruiting and membership, promotions, capital reinvestment, and negotiating contracts.

While each group would be an independent entity, it would have to work under a system of checks and balances to prevent abuses of the contributing group structure by groups or individual members. The most fundamental of these would be the corporate charter which would lay down the guiding principles and rules of the organization. Beyond this would also be external policy agreements and internal agreements. External policy agreements would consist of operational policy that was agreed to by a set of contributing groups under a common coordinating contributing group, or an organizational policy that was agreed to by a quorum of the organization's contributing groups. If required, the appropriate coordinating contributing group would be responsible for policy enforcement according the prescribed remedies. Each group may also set up internal policies, which would be enacted by members of the contributing group. The group itself would have primary responsible for administering policy enforcement. However, the contracted coordinating contributing group would have the capability to intercede if requested by

members of a group that was facing a dysfunctional internal breakdown.

Because each contributing group would be an independent entity no internal group structure could be forced upon the contributing group. The actual group structure would depend on a variety of factors: the product or service the group was producing; the skill level, education and personalities of the workers in the group; the particular environment the contributing group was facing; as well as the organizational culture. However, based upon the finding with self-managed teams, and the tenet that workers who become personally involved in the group's function are more productive workers who need less supervision (Donovan, 1986; Dumaine, 1990; Lawler, 1986; Manz et al., 1990; Orsburn et al., 1990; Plunkett & Fournier, 1991; Wellins et al., 1991), some theorization can be made on the internal structures the groups will actually assume.

General Structure

Because of the substantial benefits found with involved workers, the vast majority of contributing groups would assume a member managed structure, similar to self-managed teams, in which responsibilities and profits were proportionally shared among the group members. The lack of resistance from middle and front-line management in this structure help foster such an internal structure (Carr, 1991; Orsburn et al., 1990; Plunkett & Fournier, 1991). Furthermore, because of their presumed cost effectiveness, they would tend to displace traditionally managed contributing groups that they were competing against.

However, contributing groups with extremely routine operations or whose members either are not able, or are not interested in becoming involved in the teams activities, would most likely assume a traditionally managed structure (Dumaine, 1990; Orsburn et al., 1990). In such a case the manager or managers of the group would operate the group like owners of a small business. The owner or owners would run the group for personal profit, paying the workers a set wage. Contributing groups that were composed primarily of part-time workers, workers whose psychological focus was inveterately outside of work, and, to a lesser degree, unskilled workers, would be more likely to fall into a traditional structure (Orsburn et al.). Groups whose primary task was a very routine, unchallenging function would also have an increased tendency to form a traditional operation

(Dumaine).

Of course, there would also be groups that fell in between the decentralized and centralized structures. Contributing groups composed of skilled workers doing a very routine task, part-time college students working in their field of choice, or unskilled workers in a dynamic environment may be inclined to form a structure using a varying levels of employee involvement and empowerment.

Internal Operations

Leadership structure. Ideally, a member managed contributing group would adopt a group selected leader or leaderless structure (Barry, 1991; Milliken & Vollrath, 1991). A leaderless format would have members informally rotating leadership responsibilities, with members concentrating on their most competent areas. A group selected leader structure would have group members formally selecting a leader on a regular schedule. The leadership functions could even be broken down and its parts given to different members (Barry). For example, one member may take on the external liaison role, another the coordination role, and still another the arbitrator role. Regardless of whether the group was leaderless or had group selected leadership, because of the distribute nature of such groups, all members would probably still be expected to perform line roles.

At the other extreme, a traditionally managed contributing

group would be have a traditional leadership structure. A
manager would run the group, possibly with intermediate
supervisors, and line workers. The managers position would not
be up for discussion. However, the workers would always have the
option of setting up their own contributing group and going into
direct competition with their old manager.

Membership. Member managed contributing groups would have
all their members take an active role in deciding upon group
membership. All members would be involved in a decision to
layoff or dismiss a member. Similarly, all members would play a
role in recruiting, interviewing, and hiring of new employees.
Whether adding or removing groups members, because of the impact
such decisions have on the group members, this decision should be
a supermajority or unanimous (Plunkett & Fournier, 1991).

The manager of a traditionally managed group would handle
all hiring and firing. The manager would also control the
recruiting effort.

Promotions. Promotions within a traditionally managed group
would be handled by the group's manager. Because of the flat
nature of a member managed group, there would not be promotions,
per se, but instead lateral movements of people as their skills
improved and the needs of the group changed (Dumaine, 1990).

Responsibility/authority distribution. A member managed
contributing group would have responsibilities, authority and

accountability spread throughout the group (Fandt, 1991). Some groups may assign responsibilities for a function to the member most competent in that function (Barry, 1990). Other groups may rotate responsibilities to give all members exposure to the various group tasks (Orsburn et al., 1990). As a practical matter, most groups would be somewhere in between, assigning responsibility based on function importance, member's competence level, skills required, and need for members to be cross functional in that job.

The group would give authority to the appropriate decision maker (Plunkett & Fournier, 1991). Minor decisions could be made by individuals who felt competent to make the decision, or after consultation with knowledgeable co-members. Major decisions would be made by the group after group discussion. Intermediate decision making would be dependent on the timeliness requirements and the competence of the individuals. It could go to the group, made by a subgroup of members, or an individual if an immediate decision was required and the individual felt confident about his ability to make the decision. If a member was exceeding his authority limits, the situation would be reviewed by the group mediator and appropriate corrective action taken.

A traditionally managed group's responsibilities and authority would be vested in the group's manager. The manager would be responsible for assigning responsibility and authority as the manager saw appropriate. However, should the manager exceed their authority as specified by the corporate charter, or

internal or external policy, the coordinating contributing group could take corrective action.

Compensation. Traditionally managed groups would have a traditional compensation system. The manager would set the group members rates of pay, and determine raises, bonuses and benefits.

However, in a member managed group, the members would be responsible for selecting a method of assigning compensation to each other. Being such an important subject, the members are likely to come up with complex methods, each suited to the group's combination of circumstances and members (Fandt, 1991).

Members of a member managed group would be expected to have enough of a basic understanding of business to know that compensation is a cost that must come out of the contributing group's operating funds. Hence it is not unlikely that the group would periodically meet to review its financial condition. After this review, the group may establish a compensation pool budget for the next quarter to year. Since the group must be financially self-sufficient to survive, the group would have to weight the compensation budget against needs for reinvestment and building financial reserves. This means that the compensation pool, although probably sticky, would probably fluctuate either up or down from budget to budget.

Once the group budgets a compensation pool, it would have to decide how to best divide the pool between the group members. This may very well be allocated on a combination of skills,

seniority, or other quantifiable measurements (Lawler, 1986; Orsburn et al., 1990). However, one possible method would be for all members of the group to score the other members on their perceived contribution and value to the group. From this each member of the team would get a personal score. This score could be divided by the combined total of all the members' scores. This would be that member's fraction of the total of all the members' scores. Each member's allocated compensation would be the compensation pool multiplied by their fraction.

This type of compensation allocation method has many practical benefits. Since the compensation pool would fluctuate with business conditions, so would each members pay. Each member would appreciate a direct correlation between group performance and take home pay. Furthermore, each member's pay would be based on their current contribution rather than on their seniority or historical contributions. Therefore, if a member's contribution began to wane so would their pay. People who in traditional organizations become highly paid "deadweight" (i.e., people whose productivity dives after attaining high salaried positions and are kept on because of years of service or internal political affiliation) would find their pay going down under this compensation method. Such individuals would have to improve their contribution, accept the lower pay, or find employment elsewhere. Thus, the group could use this as an effective way to ease out unproductive members.

Capital reinvestment. The manager in a traditionally managed contributing group would make all capital investment decisions in the traditional way. If the manager did not have the expertise to make the decision, consultants could be used. Such consultants could come from other contributing groups which offered such services from consultants external to the organization. The capital investment decision would most likely be based on a bottom line analysis.

The decision process would likely be somewhat more involved for member managed teams. First, the members would have to balance the decision to reinvest against compensation; money tagged for investments could instead go to member compensation. Members would have to weight immediate compensation against expected future increased income from the investment. In order to make informed decisions, the members would need to become familiar with capital budgeting tools such NPV and IRR.

Second, the group would need to establish an acceptable trade off between pay and work life comforts. Creature comforts like plush or aesthetic furnishings, interior design, larger or windowed offices, coffee makers and refrigerators, may all make the work life more pleasant, but they would cost money and have an uncertain effect on group productivity. Better equipment also may make work less frustrating, more fun, and may improve worker attitudes and self-esteem due to the skills and learning involved with operating new advanced equipment. However, the costs may offset or exceed any increased productivity. In cases like these

the group would have to make a conscious balance between improving the work environment and taking home more income.

Regardless of whether the contributing group is traditionally or member managed, the people making the investment decision would be much closer to the product or service than the management that has traditionally made capital investment decisions. Investment decisions would theoretically originate from more responsive and intimately aware people. Hence the investment decisions may follow the product life cycle much more accurately, investing heavily in the growth stages and harvest the investment during mature or declining markets.

New products and services. Contributing groups could freely introduce new products or services as they saw fit. In fact, they may have to pursue new products or services if the market for their primary product is declining. Managers of traditionally managed contributing groups could unilaterally decide to introduce new products or services. In doing so the manager, just like the members of a member managed group, must be sure not to exceed the contributing group size limits or violate other charter rules or policies.

In a member managed group, the members would make the decision about introducing new products. Such group made strategic decisions are typically superior to individual decisions (Cordery et al., 1991).

Contributing groups that needed financing to roll out a new

product could pursue the same sources that are available for setting up a new venture. However, existing groups could also draw upon their savings or secured loans. Alternatively, a contributing group could use a mature or declining product as a cash cow to fund a new product.

Negotiating contracts. The manager of a traditionally managed group would have control and signature authority when negotiating contracts. Member managed groups would distribute the negotiating task and approval method depending on the scope of the contract (Plunkett & Fournier, 1991).

Negotiations could be handled by a group designated negotiator or by a team of group members. The necessary approval would depend on the significance of the contract. The group may authorize the negotiating individual or team to speak for the group on minor issues. On major contracts, group approval would probably be necessary. Group approval may require majority, supermajority, or unanimous member approval depending on the guidelines set down by the group.

It is unlikely that each contributing group will have all the expertise necessary to develop or evaluate every negotiated contract. Hence, the manager or group may find it necessary to consult outside legal advice or other knowledgeable professionals. Such professionals could either come from other contributing groups or external services.

Intergroup Relationships

In a contributing group structure the entire organization, whether made up of a thousand or a hundred-thousand people, would be made up of contributing groups. When contrasted to traditional structures, a host of new intergroup dynamics may develop.

Business arrangements. Whenever one contributing group does business with another, a business arrangement would occur. This arrangement may be on a purchase to purchase basis, an informal contract, or formally contracted. Purchase to purchase arrangements would be common with contributing groups providing general daily supplies, such a food service or business supplies contributing group. Informal agreements would tend to arise where the stakes were low or the groups had a high level of trust between them. For example, a business supplies contributing group may verbally agree to give one of its customers a 5% discount on all purchases as long as it buys all its supplies from them. Formal contracts would exist, for example, when the contributing groups had not developed a high degree of intergroup trust, when the contract involved multi-year agreements, or when the contracts were large and complex agreements (Glass & Sanders, 1992). Since formalized contracts can be costly and time consuming to develop and evaluate, contributing groups who were adept at using informal arrangements would have a competitive cost advantage over contributing groups that tended to use formal agreements.

Cross group employee recruitment. Cross group employee recruitment, traditionally known as hiring from within, is sometimes avoided in traditional organizations for both practical and political reasons (Scarpello & Ledvinka, 1988; Hodge & Anthony, 1990). However, it also produces many benefits. It assures that valued employees are rewarded for their exemplary performance by offering them ever more challenging functions. By learning new skills, the employee gathers more general knowledge and personal development, making the employee even more valuable to the company (Donovan, 1986; Wellins & George, 1991). It also keeps valued employees from getting bored and looking to other companies for the next challenge (Lawler, 1986).

Active recruitment of employees also provides a check that a highly productive employee is receiving fair compensation for their work. Recruiting managers may need to offer such an employee more money, whereas the employee's current manager may need to match or exceed any recruitment offer to keep the employee from leaving.

Such a free market approach to intracompany employee recruitment should help assure that an employee is receiving fair compensation for their contribution. For these reasons, the charter of a contributing group organization should encourage this type of activity.

Shared members. It would not be uncommon for a contributing group to need a specially skilled person for less then a full

time position. In this case one or more groups could decide to
share a common member. In effect, this member would have
multiple part time jobs. Each contributing group sharing that
member would be allocated a partial person against its limit
size. The allocation would be proportional to the fraction of
that members time they were using.

Specialty contributing groups. If enough contributing
groups had a part-time need for a particular skill, a
contributing group could be formed that specialized in that
skill. That contributing group would then offer its consulting
services out to the organization's contributing groups. In this
way, the client groups could receive the benefits of part-time
assistance without that person counting against their size limit.
 Moreover, if a market existed outside of the organization, such
specialty groups could offer their services to external
customers.

Such skill specializing contributing groups would likely
appear in any contributing group organization. Standard types of
skill specialized contributing groups would be legal service,
accounting service, business development, and training groups.
Marketing assistance, specialist engineering, and management
information services (MIS) contributing groups would be other
typical specialist groups that would develop in larger
organizations. A small organization may just have a professional
services contributing group, whose members would consist of, for

example, an attorney, computer systems expert, CPA, and business
manager. The executive coordinating contributing group may
provide these types of services for a very small organization.

Checks and Balances

Each contributing group, as a part of the organization,
would operate under checks and balances. This would assure that
no group, even though it is an independent entity, or an
individual member, could drift out of control and become
unhealthy to other groups, organization members, or the
organization's external reputation. In this way the manager of a
traditionally managed contributing group, as well as the selected
leader or mediator of a member managed contributing group, would
have to operate within certain specified bounds.

If a contributing group member is acting outside of the
organizational charter or stipulated policy, and that group does
not or cannot correct the situation, the coordinating
contributing group would be empowered to take corrective action.
 Such coordinating contributing group power would be specified
either in the corporate charter, in policy approved organization
wide, or by the its contracting contributing groups.

Any powers which were stated in policy declarations, could
be rescinded at the appropriate level. For example, if the
powers were granted by the contracting contributing groups, they
could agree to revoke those powers. However, the contracting
contributing groups could not revoke powers granted in

organizational policy.

Should a coordinating contributing group not act to correct the problem, or a coordinating group is causing the problem, the executive coordinating contributing group would have the ultimate enforcement power to correct charter or policy violations. Of course, by acclimation of the organization's contributing groups, policy could be repealed, and along with it any enforcement powers. Likewise, the corporate charter could be changed if decided by some supermajority of the groups.

Organizational Impacts

A contributing group structure will have a marked impact on the requirements and dynamics of the people that make up the groups. This in turn will propel some organizational changes.

Increased accounting sophistication. Each contributing group would need timely financial information to improve their decision making ability (Lawler, 1986; Orsburn et al., 1990). This alone should cause the members to become more literate about accounting methods. However, the requirement of a core accounting system would put much more demands upon the group and for at least one of its members to understand how the group's royalty payments were calculated. Furthermore, if the groups did not contract with an accounting contributing service to do its bookkeeping and prepare its financial statements, at least one member of the group would need to have a working knowledge of the corporate core accounting system. Not only would this be

necessary to produce accurate financial statements, it would also be necessary to work with auditors should the group be audited by the financial liaison group or an outside service.

Self-unionization. In unionized plants that successfully implement self-managed teams, the union's relationship with management typically changes from being an adversarial worker's advocate to a cooperative employee liaison and spokesperson (Lawler, 1986; Orsburn et al., 1990). In a contributing group structure, this role would be changed even more so that the need for unions would be questionable; the contributing group structure would, in many ways, be self-unionizing. All members of a member managed contributing group would, in effect, be managers. They would have the ability to set their own pay and have a tremendous impact on their own destiny through productive work and planning. Since the workers in the front-line contributing groups would contract management, they could effectively fire them when their contract came up for renewal. Giving group members real power also overcomes some of the legal hurdles to establishing teams (Bernstein, 1993).

There should be so few, if any, traditionally managed contributing groups. Therefore, the workers in them should be far below the critical mass to introduce unions. Even if they did, the union would have no unified management to confront. Moreover, if the members of a traditionally managed contributing group found the manager to be unacceptable, they could establish

their own contributing group. The organizational charter should
set the tone and guidelines to encourage and support the
conversion of traditionally managed groups to member controlled
contributing groups. Hence managers in these groups would have a
high motivation to be agreeable with the workers or face losing
them to a possibly competing contributing group.

Require general knowledge members. Current empowered team
systems, such as self-managed teams, require the team members to
markedly increase their knowledge of how their work impacts the
work of others and the costs the team incurs (Donovan, 1987;
Plunkett & Fournier, 1991). A contributing group structure would
not only require this, but it would be necessary for each group's
survival. The group's knowledge of the customer's needs and
their cooperation in working with customer requests would be
fundamental in attracting customers. The goal of generating long
term profits would require the group members to understand its
uses of revenues, not the least of which is its costs (Donovan,
1989). While the motivation may increase how quickly the members
learn, they would have so much more to learn that it would often
be unreasonable to expect all members to understand it equally.
Hence, while all members would need to understand their business
to make intelligent decision, it is reasonable to expect that in
each contributing group someone would take on the task of
understanding their business in depth.

Also like self-managed teams, the members of contributing

groups should become cross trained in the various jobs the group performs (Orsburn et al., 1990). By itself, the general desire for variety at work would cause members to tackle each others jobs (Griffin, 1990; Lawler, 1986). However, with an understanding of where their profits come from, the members could not afford slowing an order down because no one could fill in for an absent member. Hence, cross training would be necessary to obtain the member flexibility to fill-in for one another.

CHAPTER IV

METHODOLOGY

Case Study Approach

Researching the plausibility of a contributing group structure, when no similar organizations exist, presents many challenges. The approach used here was to find a structure as close as possible to a contributing group structure, and concentrate resource efforts there.

As suggested in chapter I, an organization wide implementation of self-managed teams is similar in many ways to a contributing structure. Furthermore, just as self-managed teams are at the heart of a self-managed organization, self-controlling groups are at the heart of the contributing group hypothesis, except that contributing groups collectively control the organization in a contributing group structure. Consequently, the best research approached seemed a study of a self-managed team within an organization that widely used self-management.

Duncan (1979, p. 425) states that "if it is unclear just what the phenomena are, then qualitative research techniques are more relevant." Furthermore he asserts that the qualitative, or case study, approach is concerned with understanding human actions from their point of view. Therefore this affords the

collection of data which allows the researcher to see the situation as the players see it.

While the case study approach may uncover the process phenomena, it does not focus "on the facts or causes of [the] social phenomena . . ." (Duncan, 1979, p. 424). Such facts and causes are more the providence of the quantitative method, which uses questionnaires, inventories, and demographic analysis. However, without a knowledge of the processes involved, the quantitative method may fail to understand what is really happening (Duncan).

The goal of this study was to investigate the phenomena and human processes involved with the benefits and detriments of self-managing teams and their environment. The human behaviors and reactions were considered important aspects of understanding how self-managed teams work. Therefore, the case study approach was selected as the most appropriate research method.

This type of case study would allow for observations of a semi-autonomous team and how they interact with their organizational environment. The goal of the observations would be to see in what ways the dynamics of the group would support or weaken the argument for contributing groups. A general question in this approach was whether the group, having experienced self-management, had the desire or capability for far greater autonomy-autonomy in such areas as controlling compensation and business planning. Furthermore, would the group be willing to stake their collective jobs for the opportunity to have this

greater freedom and responsibility. The group would have to answer both affirmatively to support contributing groups.

Another question concerned the reversal of the control relationship between management and the teams in a contributing group structure. Would such a reversal, in the study situation, be a benefit to the effectiveness of the organization or would it subtract from it?

Selection of a Case Study Site

Optimally, the case study site would have implemented self-managed teams throughout the entire organization, and the case study team would be a mature team. Furthermore, the teams would have a high degree of autonomy, including control over such areas as peer performance evaluations, compensation and capital budgeting. To allow for extended studies, the site also needed to be in the San Diego vicinity.

The eventual team and site selected for the case study was the first weekday shift of the IC Test Group at the Northern Telecom facility in Rancho Bernardo. Access to this site was obtained via talking with its Human Resources Manager and, after an initial tour, getting permission from the plant manager and Northern Telecom's corporate management. (This site was discovered through doing phone research on the highly publicized Northern Telecom Morrisville and Santa Clara Plants which have established self-managing teams. A Northern Telecom public relations person accidently referred me to the Rancho Bernardo

site instead of the Santa Clara facility.) The Rancho Bernardo

site only had about 15% of its work force (59 employees out of

about 400) in self-managed teams (Ross, 1992). The teams had

been in existence for only about seventeen months and were not

mature teams according to the definition of Orsburn et al.

(1990).

An initial restricting factor was the limited number of

known San Diego area sites using self-managed teams. Besides

Northern Telecom, the only other known sites were at the San

Diego Zoo, reportedly at General Dynamics (which was undergoing a

change in ownership and downsizing at the time of the study), and

other companies that were secretive about their use of self-

managed teams.

Besides the geographical advantage, the Northern Telecom

site had other advantages in its favor. While the Rancho

Bernardo facility was only using self-management in the IC test

group, Northern Telecom had other facilities (e.g., Morrisville,

Santa Clara) where the implementation was organization-wide.

Furthermore, the teams in the IC test group did manage some

advanced topics such as administering their own peer reviews and

controlling compensation increases among the team members.

<u>Observations</u>

Besides the original site visit on October 29, 1992, the Northern Telecom Rancho Bernardo (NTRB) IC test group was observed over a six week period from December 8, 1992 to January 18, 1993. Observations were done twice a week, with each observation being approximately four hours long. The goal was to arrange the observations to evenly observe the group throughout its work week. A slight emphasis was placed on Mondays because of the team meetings that were held every other Monday.   2 presents the observation schedule. Although the schedule does include times when interviews were done, the predominate amount of time was spent observing the team in action.

Table 2 - IC Test Team Observation Schedule at NTRB.

Date	Day	Hours
10/29/92	Thursday	10:00 - 13:15
12/8/92	Tuesday	11:00 - 14:00
12/10/92	Thursday	9:45 - 13:00
12/15/92	Tuesday	9:30 - 13:30
12/18/92	Friday	8:30 - 12:30
12/21/92	Monday	7:00 - 11:00
12/23/92	Wednesday	9:00 - 14:00
12/28/92	Monday	11:30 - 15:30
1/4/93	Monday	7:00 - 11:00
1/6/93	Wednesday	9:00 - 13:00
1/11/93	Monday	7:30 - 11:30
1/14/93	Thursday	10:00 - 15:30
1/15/93	Friday	12:30 - 15:30
1/18/93	Monday	8:00 - 11:30

The method of the observations was essentially team immersion. On my December 8th visit (the first four hour observation visit) I was train how to use a type of automated testing machine by one of the team members. This abbreviated, specific training took approximately 20 minutes. Thereafter, upon arriving I typically took a position at one of the testing machines and performed the same types of jobs that the team members routinely performed. Since these machines were highly automated, I would be able to load a machine with product to be tested and then have five to fifteen minutes to walk around the

test floor and observe others working (The team members typically operated more than one machine, so that they were almost constantly occupied). This also allowed me to engage in minor "chats" with members of the team, either individually or in small social groups.

On days that I conducted interviews, I would excuse myself from machine responsibilities until the scheduled interviews were completed. After this I would return to a machine for the duration of the day.

I also attended all meetings that the team held during my observations. The team had a bi-weekly Monday morning with the team facilitator. The team was also supposed to have a daily 10:00 A.M. information exchange meeting, which I would attend if there. (As a practical matter, the team usually neglected to have these meetings; I only saw two take place during my observations.)

Table 3 - Case Study Interviewees

Name	Department or Section	Position
Ann	First shift test team	Support Member
Betty	First shift test team	Support member
Brett	First shift test team	Core Member
Bryan	First shift test team	Support Member
Carol	First shift test team	Core member
Charlie	Test Engineering	Engineer
Chris	First shift test team	Support member
Donna	First shift test team	Core Member
Ellan	Second shift test team	Core Member
Frank	Test Engineering	Engineer
Hal	First shift test team	Support Member
Jackie	Weekend shift test team	Core Member
Jane	First shift test team	Support member
Janet	First shift test team	Core Member
Jenny	First shift test team	Core Member
Jim	Test & Assembly	Director
Luke	Second shift test team	Support Member
Lynn	First shift test team	Core Member
Mary	First shift test team	Support Member
Phil	First shift test team	Core Member
Roger	Human Resources	Manager
Sandra	Test	Facilitator

The net effect of this observation scheme was that by the conclusion of my observations I felt at ease with the team members. Likewise, the team seemed to accept and be comfortable with my presence. As one team member put it, I had "became a familiar face." This allowed me to observe and take part in many frank discussions about the team, management, and interpersonal group dynamics that an outsider would not normally have had the opportunity to see and hear.

Interviews

I attempted to conduct interviews with NTRB employees who were either members of the self-managed team, the team's management, or those that had substantial contact with the team. This essentially broke down into three groups, the self-managed team members, management, and engineering support. Because of the organization of the self-managed team, the team members could further be divided into core members and support members. 3 lists the interviewees.

Originally the goal of the interviews was two fold. First, it attempted to uncover information about how self-management had impacted the organization and the individual. Organizational issues included areas like business performance indicators such as costs, productivity, staffing requirements. Individual issued concerned worker attitudes like job satisfaction, pride and ownership in their work, and the general psychological impact self-management had on the team members and external

stakeholders. This, by itself, was deemed to be valuable knowledge, not only from the contributing group perspective, but from the perspective of gathering more data on self-managed teams that could in turn be shared with the academic community.

The second objective was to solicit views from members and stakeholders as to how the self-managed team concept could be extended and improved. The goal here was to see if they would offer any ideas that would support or undermine a contributing group structure, without the interviewees having knowledge of the proposed structure. This required that there be no discussion of the contributing group theory during my observations. Unfortunately, the site did not seem to have enough in-depth experience with self-management to offer advice on how to improve and extend the self-managed team concept.

General Questionnaire

To obtain some background information on the team members, a very limited questionnaire was given to all case study team members. This questionnaire asked general questions like age, years at Northern Telecom, years in the testing department, and education. Appendix D contains the actual questionnaire. The responses to the questionnaire are presented in 4 in Chapter V.

CHAPTER IV

CASE STUDY

Introduction

Northern Telecom, Rancho Bernardo (NTRB) produced integrated circuits (IC) that were used in Northern Telecom telephone switching systems. Because of the inherent difficulties with manufacturing ICs, a vital part of the production process was testing the ICs.

NTRB had a testing group that was dedicated to performing and supporting these tests. The testing group was separated into five shifts. Each shift was a self-managing work team. The first weekday shift, which worked from 7 A.M. to 3:30 P.M., was the largest of these teams. Furthermore, there was an attitude among some members of management and engineering that this team was the best trained, educated, and experienced of all five shifts.

This case study evolved from observations of this team and interviews with its members and stakeholders. The first shift team members, their roles, and some biographical data are presented in 4. The history and cultural change of Northern Telecom, Rancho Bernardo was developed from personal interviews and Spraul's (1987) and Deerstone's (1989) works.

Table 4 - First Weekday Shift Team Members

Name	Position	Years in		Age	Education
		Test	NTRB		
Core Members:					
Carol	Operator	.5	8	36	Assoc. Degree; Keypunch-Typist Certificate
Betty	Operator	11	11	45	College; Dental Assistant
Susan	Operator	8	8	39	B.S. Park Admin.
Jenny	Operator	8.5	8.5	29	College
Janet	Operator	5	9	*	B.S. Education
Lynn	Operator	7	9	39	College
Terry	Operator	8	8	34	College; Micro Computer Accounting Certificate
Phil	Technician	8	8	51	A.S. Electrical Technology
Donna	Technician	*	*	38	Electronics Technician Certif.
Support Personnel:					
Bryan	Parts Inventory	2	4.5	32	College; Technical Certificate
Chris	Probe Card Repair	8	11	55	Technical Certificate
Jane	Finished Goods	4	8	*	College
Mary	Finished Goods	8	8	*	High School Diploma
Hal	Planning	8	8	45	B.S. Education
Ann	Planning	3	12	*	High School
Brett	Planning	5	10	33	A.S. Agriculture

* Information not provided

NTRB Test Teams

Because of the volume of product that was being produced, testing went on twenty-four hours a day, seven days a week, except for major holidays. The work was split up into three weekday shifts and two weekend shifts. The weekday shifts were scheduled for eight hours a day, Monday through Friday. Weekend shifts worked twelve hours per day, three days a week. The first weekend shift partially overlapped the second shift on Fridays, and the second weekend shift partially overlapped the first shift on Mondays.

Approximately 59 full time test personnel covered all five shifts. These were all non-union, hourly wage employees. Because these teams were self-managed, each member theoretically reported directly to the Director of Test and Assembly. However, there was also a full time facilitator that acted as an intermediary between the teams and management. The facilitator, besides being an intermediary, also acted as a conflict mediator, coach to the team members, and occasional liaison. (Please see 3 for an abbreviated NTRB organizational chart.)

Figure 3 - Abbreviated NTRB Organizational Chart.
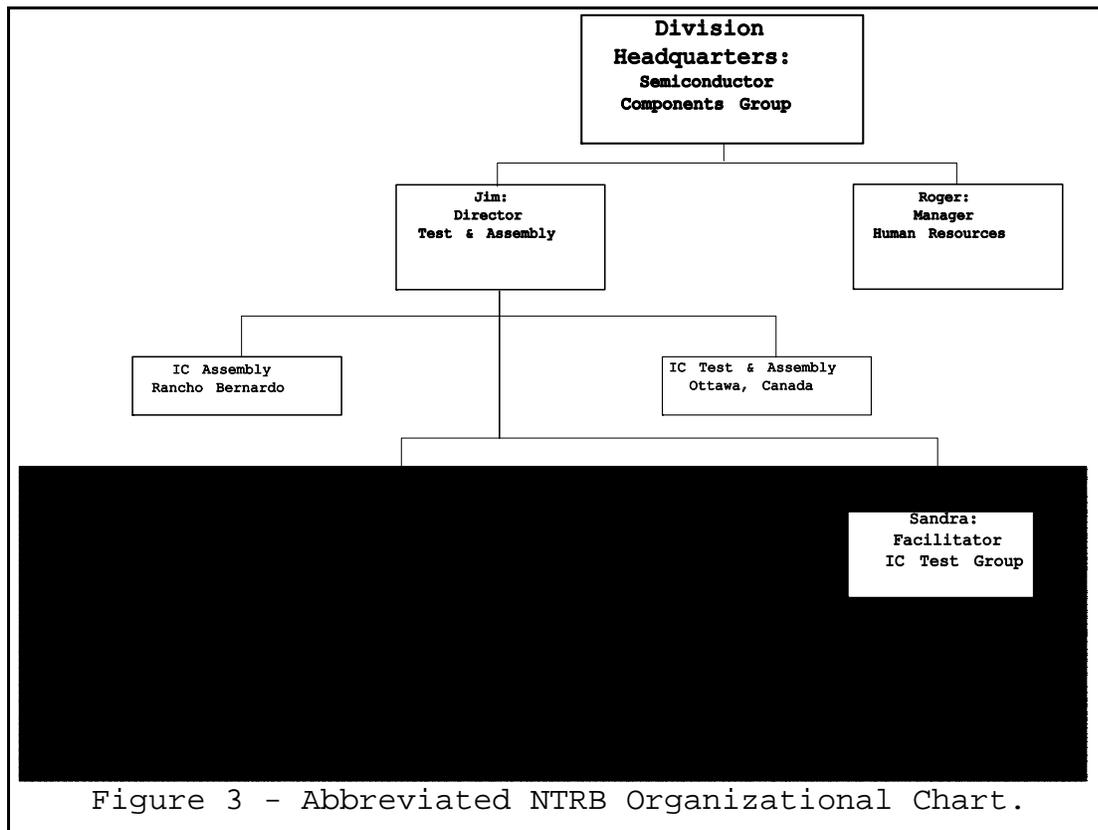
fTeam Composition

The teams could be viewed as composed of two type of
members, core members and support members. Core members
consisted of technicians and operators. The weekday shifts had
two technicians and around eight operators. The weekend shifts
had one technician and five operators. The first shift team had
six support members in it. The second and third shift teams each
had one support person.

Operators. The operators operated the various pieces of
testing equipment. This involved loading and configuring the
appropriate software to run the test. It also required certain
statistical samples be taken from each run for statistical
process control review, as well as intelligent monitoring of the
test run. Because either the software or the hardware could
cause faulty test runs, the operators had the front-line
responsibility of quickly catching such problems.

Technicians. Technicians were responsible for keeping the
test equipment up and running. When a machine was not operating
properly, the technician performed diagnostics and other
troubleshooting techniques to isolate the problem. They then
either fixed the machine or, if unable to determine the problem,
called in engineering support for additional assistance.

Support. The support functions included planning, finished goods, parts inventory, and probe card repair. Finished goods prepared IC wafers for shipment to offshore assembly sites, received assembled chips, readied shipment of qualified chips to systems manufacturing sites, managed inventory of finished goods, and assisted engineering in obtaining certain IC products. Parts inventory ordered spare and replacement parts, attempted to keep the computer inventory records accurate, and balanced availability of parts against minimizing inventory. Probe card repair repaired and realigned the probe cards that were used in testing the individual IC's on wafers.

Support personnel were assigned to whichever team's shift was closest to their shift. The second shift had one parts inventory person assigned to it. Third shift had one card repair person. The rest of the support personnel, three planners, one parts inventory person, and two finished goods handlers, were assigned to the first shift team.

Even though these support employees were assigned to teams, they typically provided services to all the testing teams. Some of these people had a background as test operators, and would occasionally help out on the test floor. Except for these occasions, most support members were noticeably absent from the test floor and informal team interactions.

The support members were full team members as far as team peer evaluations and compensation adjustments were concerned.

However, some support members felt they were members in name only. Other support members were openly irate at being subject to a team that they felt had no understanding of their jobs.

Test Team Work Areas

The preponderance of the team's activity took place on the test floor. The test floor was a room roughly one-hundred feet wide by forty feet deep. The room contained twenty separate test machines as well as various shelves, book racks, computer terminals and technician repair stations. The arrangement had stayed essentially the same since testing moved here in 1990.

Approximately half-way down the length of the room was a wall. This wall had two large roll-up doors that were always open. These doors were large enough that when they were opened the two sections seemed to merge into one room. Between the two doors was a white board the group used for communications.

The floor also had a small office area with desk, chairs and tables. The front of this room had a door to the adjoining hallway. In the back was a door to the actual test floor. This office acted as a kind of reception room and information center for the test floor. Documentation was kept at the desk and notices were attached to a cork bulletin board. Members could use this room to have a cup of coffee, eat a snack, and put on their smocks.

The test floor maintained a very clean, anti-static environment. No food or drink was allowed on the test floor and

anti-static smocks and shoe pads had to be worn at all times.

The support personnel had work areas separate from the test floor. The parts inventory area, finished goods handling, and card repair facilities were adjacent to test floor. The group facilitator and planning support staff had offices about 200 feet down a hall from the test floor.

Group Responsibilities

Each team had responsibilities for an assortment of duties. These were technical as well as many managerial.

Technical. The technical duties included testing various ICs and documenting the test results. There were two basic types of product testing, wafer testing and chip testing. A wafer was a round disk, 100mm in diameter, which contained hundreds of individual integrated circuits (ICs). (An IC was termed a "die" or "chip" at NTRB.) Each wafer required a testing procedure, called probing, to see if its ICs had suitable electrical properties for assembly.

In the assembly process, these wafers were cut into the individual ICs. Each IC was then assembled into a chip (known as a "device", "finished product", or "package" at NTRB). These chips could later be plugged into a socket on a circuit board. (Each telephone handled by an NT switching system took one of these chips.) Each chip had to be individually tested prior to customer shipment. Standard sized, high volume chips could be tested using automated handlers. Low volume or unusual chips

required hand testing.

Automated handling machines could be loaded with a couple hundred chips. The machine would then automatically test each chip, separating out passes from failures. Hand testing required that each chip to be manually inserted into a socket, a performance test ran, and the chip placed either in a pass or fail stack. Overall there were fourteen test procedures that required training and certification in that procedure before an operator could conduct those tests.

Managerial. Team management responsibilities included cross training of members, assigning workers to testing stations, day-to-day work prioritization, handling problem behavior and performance, conducting peer evaluations, and assigning peer compensation increases. The teams did not handle production planning, business budgeting, or cost analysis and control.

The team did not punch a time clock (and never did, even before becoming self-managing). Nevertheless, because employees were paid hourly, each member was required to track their hours on a time card. The card, though, was used to mark departures from their standard hours. Departures would be vacations, overtime, late arrivals, or the like. If a team member worked their expected shift, no entry was required. Although members were individually responsible for keeping accurate time cards, one member of each team was assigned to verify the team's attendance cards. This permitted the group to track patterns, as

well as provided a double check against oversights. This
verification assignment was done on a rotating basis.

Corporate Setting

Northern Telecom

Northern Telecom Limited produced fully digital
telecommunications switching systems and was based in
Mississauga, Ontario, Canada, near Toronto. Its mission
statement was "To be the world's leading supplier of
telecommunications equipment by the year 2000." It had six
stated corporate core values: excellence, teamwork, customers,
commitment, innovation and people (Northern Telecom, 1993).

In its 1992 annual report, Northern Telecom reported $8.4
billion in revenues, $536 million in net earnings, and 57,955
employees. Composed of thirty-five principal subsidiaries, NT
had a presence in over 90 countries throughout the world. It
also operated 52 manufacturing plants worldwide, with research
and development facilities in 6 countries.

One of its subsidiaries was Northern Telecom Electronics,
which was further divided into four divisions. One division was
the Semiconductor Components Group. The SCG division filled a
role in NT's vertical integration strategy by providing ICs that
went into NT's end product telephone switching systems. Northern
Telecom, Rancho Bernardo was a member of the Semiconductor
Components Group. All of NTRB's sales were to other Northern
Telecom companies.

As part of NT's ongoing efforts to pursue process as well as technological innovation, Northern Telecom had been a leading experimenter with self-managed teams. Its Morrisville, North Carolina and Santa Clara, California facilities are plant-wide implementation of self-managed teams (Schilder, 1992). These two sites are high profile sites. Morrisville was featured April 18th, 1991 on CBS News' "Eye on America". NT corporate management supported and encouraged these operations.

NT, Rancho Bernardo maintained a much lower profile about its pilot implementation of self-managed teams. According to the human resources manager and the test and assembly director, the primarily motivation for keeping a low profile was that these teams were introduced without corporate management's support or knowledge. Instead, they were the product of some visionary, risk taking managers at NTRB who had a firm belief in the benefits of self-management and in the people who would constitute these teams.

Northern Telecom, Rancho Bernardo

NTRB was located 20 miles northeast of San Diego. It was located in a industrial complex with other high-tech companies such as Hewlett-Packard. It employed approximately 400 people. The plant operated 24 hour a day. In addition to normal production operations, most of the research, engineering and administrative functions took place during the weekday morning shift. The second, third and weekend shifts were primarily devoted to fabrication and testing.

Production responsibilities. NTRB was responsible for developing and prototyping ICs, fabricating IC wafers, wafer testing, limited assembly of wafers into chips, chip testing, and final product shipments. Shipment of the final chips were to forty-five Northern Telecom manufacturing facilities which use the chips in telephone switching systems. The facility also handles intermediate shipping and receiving to eleven off site assemblers and testers.

Background. NTRB began life in 1980. The founding management was made up of ten people. Only one of these ten, the comptroller, was from NT. Another one of the founders, Jim, was the test and assembly director at the time of this study. He gave a personal accounting of the development of NTRB. The following is based on this interview, except were otherwise referenced.

Production at NTRB began in 1981 with fifty-seven employees. The management style at this time was entrepreneurial, highly autocratic, and functionally structured. For the first two years the employment stayed under one hundred (Spraul, 1987). The upstart mentality captivated employees with a high degree of commitment, and the small size allowed considerable hands on management (Deerstone, 1989).

However, between 1982 and 1984 the demand for chips exploded. This resulted in a large increase in unit production as well as workers. Employees went from about 140 at the beginning of 1982 to about 470 at the end of 1984 (Spraul, 1987). In 1984 alone, direct laborers increased from 80 to 210 (Spraul).

Throughout this time management continued to rule as they had always. However, as the organization became larger, the start-up psychology ended and the culture became an "us versus them" mentality. The same ten senior managers became called the "cabinet" and micro-managed the organization. Mid-managers and line managers merely carried out the cabinet's orders. Management by fear was practiced, information did not flow, and distrust flourished (The cabinet's "boardroom" was sound proofed three separate times). Employees had no idea how their work fit into Northern Telecom's product line. Turnover was high. The typical worker stayed between six months and one year (Spraul, 1987).

The problem came to a head in 1984. In 1983 NTRB produced

2.4 million chips. Corporate asked for 6.5 million in 1984. Jim
recounted how he and rest of the senior management thought that
they could easily do this just by scaling up the operation. They
set out to hire 400 additional people and increase production.

However, things began to break down at this stage. Quality
went down and production lagged. Management could not personally
make all decisions and things started to speed out of control.
In 1984, NTRB was only able to produce 4.5 million chips.

Because of this shortcoming, in August 1984 NT corporate
sent an audit team of fourteen people from NTRB's sister plant in
Ottawa, Canada. This team concluded that the problems were
systemically caused by the NTRB's management style (Deerstone,
1989). The general manager was removed and a new one installed.

This new manager set about the task of changing the cultural
environment using organizational development intervention
(Deerstone, 1989; Spraul, 1987). The objective was to transform
the hostile employee-management relationship into a cooperative,
mutually supportive relationship. This was done in three
overlapping phases. Phase I, in 1985, was aimed as executive
development. Phase II, covering 1985 to 1986, set out to make
employees aware of the changes that management was trying to
establish and what part they played in the change effort. Phase
III, from 1987 on, was meant to institutionalize these changes
and constantly reinforce them. This cultural change effort is
notable in that it successfully transformed the organizational
culture from one of mistrust and fear, to trust and cooperation.

A major focus of the transformation was the heavy use of employee involvement teams starting in 1985 (Spraul, 1987). In fact, "participative management" was one of nine core values published by NTRB management (Northern Telecom Rancho Bernardo, 1985). Employee involvement teams were cross functional, mixed level teams that played a major role in setting new pay practices, promotion opportunities, and policies for handling substance abuse problems (Spraul). These teams planted the seeds for the introduction of self-managed teams.

Development of self-managed teams. The success experienced with participative management built strong advocates of employee involvement among some managers. They saw self-managed teams as the next logical step. Principle among these were the Manager of Human Resources, and the Director of Product Assurance (who later became the Director of Test and Assembly). During their interviews, both talked about how self-management began at NTRB.

By 1990 events were starting to be set in motion that would prepare the stage for the introduction of self-managed teams. This included employees receiving basic teamwork training, and learning, via presentations, how self-management operated at other locations.

Self-management was first implemented in the testing and assembly groups. Self-managed teams were later introduced into fabrication and site services. However, the fabrication and site services teams were both been gradual, fairly orderly

implementations.   Neither of these were as unorthodox an
implementation as the unsanctioned, crash program with which self-
managed teams were introduced onto the IC test floor.

IC Test Background

Prelude to Self-Management

Interviews with long term employees, and principally one
engineer who had worked his way up from an operator on the test
floor, revealed that at the same time senior management was
starting to see the benefits of worker participation, interest was
also developing at the worker and line management level.   In
October 1986 a new floor manager was hired for the test floor's
first shift. When under pressure, this manager acted in a very
autocratic style, expecting high commitment, high quality, and
"correct" decisions from his workers.   He had his assistant
compile numerous reports that tracked the progress of individuals
and the shift.   Surprisingly, however, he fervently preached
empowered, participative management.

As a result, in early 1990, a group consisting of one
manager, one technician and two operators went to NT's Morrisville
plant to investigate how self-management worked there.
Unfortunately, Morrisville was not expecting them, and the visit
was chaotic.   Furthermore, after the group returned there was no
concerted effort to present what they had learned. Although a
presentation was finally made in summer of 1990, it attracted
little interest, and some workers were hostile to the idea. Some

people thought that this presentation essentially got lost in the shuffle.

About the same time, the test floor workers began to get some half-day training session in team skills such as group decision making and handling conflict. While no time table was set, most workers knew that there was talk of organizing the test floor into self-managed teams.

In June of 1991, the Director of Product Assurance also took over Test. Shortly thereafter Northern Telecom corporate management instituted a broad downsizing across several plants. The director recounted how, despite his attempts to forego layoffs, corporate management insisted that NTRB layoff 18 people out of approximately 400 employees. The director saw this as an opportunity to implement self-managed teams.

Creation

Most of the test floor worker easily remembered the one monday in July of 1991 when all the test floor and assembly managers were laid-off and escorted out of the building. The next day their director and human resources manager held a meeting with all the test floor workers. They were informed at that time they were now teams and that they were self-managing. They were told that each shift would be responsible for handling its own internal affairs, although management would be available to provide whatever help they requested.

The immediate reaction of the test floor workers was that

this was just another management program that was unrealistic. They believed that soon another manager would be hired and things would be back to the way they always were. At the same time, most employees were uneasy with their new role. Having been told what to do on a daily, even hourly basis, many members were completely unprepared to deal with self-management. They questioned how they were to decide what needed to be done, who would work at what station, when to take their lunch, who to ask for vacation time, and if they called in sick, who would they notify?

Some of the people found it impossible to cope with the lack of directive leadership. Those that could not handle self-management either transferred to another part of the Rancho Bernardo facility, or, in rare cases, quit. All in all, though, the human resources manager estimated that 95% of the test floor workers eventually accepted and embraced the self-managed format.

Team Leadership and Facilitation

The test and assembly director recalled that when the test group was first organized into self-managing teams, he appointed two managers as co-leaders for the group. These co-leaders took the role of facilitating decisions by the group members, typically pushing back the decision process onto a member or the team. A few test workers recounted that when a team member would ask one co-leader for a decision, as they often did in the beginning, the reaction of the co-leaders were to engage a question and answer session that would guide the member into making their own decision.

The first weekday shift team members remembered that during this same time they experienced considerable problems adjusting to the line management void. Many members thought that it would only be a matter of time until management tired of this self-management concept and appointed a new manager. Several strong personalities on the team saw this as their opportunity to show that they should be that new manager. A power struggle ensued for two to three months in which the strongest personalities tried to establish themselves as the de facto leader of the group. These people tried to direct the actions of their co-workers and assume a traditional manager role.

The director and human resources manager saw this as a continuing problem. In their interviews they talked of how they decided to call a team meeting to resolve the situation. Without

naming names, they pointed out that some members were trying to take managerial control of the team. They followed this by stressing that the team had no manager - "no one is in charge, and everyone is in charge." They stressed that further attempts by anyone to act as the team's manager would not be tolerated.

Interviews with team members disclosed how this meeting seemed to have effected the team in two ways. First, the power struggle largely subsided almost immediately. Second, the team began to accept that self-management was not just a fad, but that management had made a long-term commitment to it.

During this time, the director recalled how he sought to find a single full time facilitator for the teams. To reinforce the self-management theme, the director went to the teams and asked them if they wanted a manager transferred from another group to be their facilitator, to select their own facilitator, or to accept an anonymous peer of the group that the director thought would make a good facilitator. The director described this person to the teams, a former test operator who was at that time an engineering administrative assistant. The team opted to defer to the director's choice, although many on the team knew who the person was from the description.

Having received the group's endorsement, the director then offered the position to the candidate. The candidate, who claimed to have been taken by surprise by the offer, accepted and became NTRB's first self-managed team facilitator.

Performance Dip, Climb and Reward

Immediately after the change over to self-managed teams, the recollection of the human resources manager was that the test floor's performance dropped for about three months. It then returned to prior levels and soon started to climb above to new levels. Not only was the team operating with less people (no managers), but they were also testing more product.

In February 1992 the test and assembly director decided to hold some dinners sessions. Besides the members, the director invited each member to bring their significant other. The director explained that he took this opportunity to elucidate the concept of self-management to the members' partners. Since the team members were taking on more responsibility, improving performance, and often spending more hours on the job, a member's partner often put pressure on the member to ask for more money. By explaining the other benefits that come along with self-management, such as higher self-esteem, increased job satisfaction, and more personal development, the director wanted to reduce the focus on compensation by each members' partner and make them realize the intrinsic benefits of self-management.

To acknowledge the teams' accomplishments, in August of 1992, the director held celebration dinners to congratulate the teams. The director recounted that all test group members and their significant others, in sections of forty-five people each, were treated to a thank you dinner and given a net bonus of $500 each.

 Some members said that this was the first bonus they had ever
received.

Testing Operations

Work Flow

NTRB handled the production of both prototype and production
ICs. Prototype ICs were developed, fabricated, assembled and
tested at the NTRB facility. This was an engineering dominated
process and the work flow varied from project to project.

Production process. Production ICs, contrastingly, went
through a standard production process. First the ICs were
imprinted onto wafers in fabrication. Testing then took these and
probed the ICs on the wafer to see if the wafer should be cut and
assembled into chips.

Standard assembly was done offshore. Finished goods took all
qualified wafers and prepared them for shipment to one of eleven
offshore plants. After the wafers were assembled into chips, they
were shipped back to Rancho Bernardo.

Finished goods received these chips and transferred them to
testing. Each chip was then individually tested. Qualified chips
were then passed back to finished goods which prepared the chips
for shipment to one of forty-five Northern Telecom manufacturing
plants for incorporation into telephone switching units.

While NTRB did most of the testing, the test floor could not

keep pace with the high production levels. Therefore some overflow testing was done by outside contractors. In this case, finished goods prepared the ICs, in either wafer or chip form, for shipment to the outside test site. When the testing was completed, the contractor would ship the tested product back to NTRB.
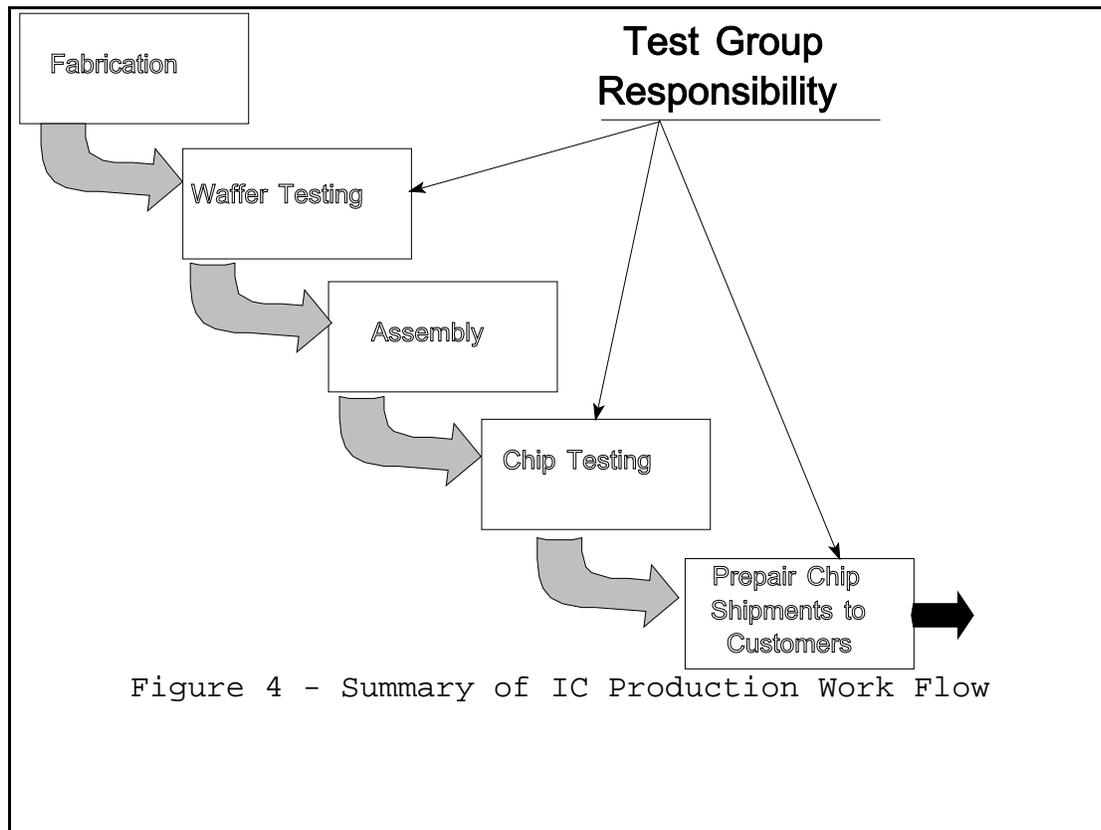
Figure 4 - Summary of IC Production Work Flow

Note that the testing teams, which included finished goods, provided two separate quality checks on the ICs. 4 overviews the work flow.

Quality. Throughout the testing process, a faulty batch required a retest of the faulty units. If necessary, the batch would be placed on an engineering hold. A retest was done when faulty equipment was possible. A engineering hold was done when the testers determine that engineering needed to investigated the cause of the problem.

Delivery. There was also a critical time element to the work flow. Northern Telecom used a highly integrated system of Just-In-Time (JIT) delivery. For example, there was a daily 3 P.M. shipment of tested chips which the receiving plants would rely on to keep from shutting down their manufacturing line.

Planning. Because of the JIT delivery system, testing needed to precisely estimate the time it would take to test the wafers coming out of fabrication and the chips arriving back from assembly. Furthermore, to estimate deliverable units, they required a clear estimate of the failure rate.

Planning, another part of the test teams, had the responsibility for making these projections and communicating them with other parts of NT. These projections would then be integrated with the production plans of NT switching systems manufacturing sites.

Machine Operation

Before the switch over to self-managed teams, the first shift's floor manager tightly controlled the work assignments of his workers. Each day every worker would begin by asking the floor manager what they were assigned to do for the day. Generally, a test worker would specialize on one or two types of machine and would not be allowed to learn or use other equipment.

Not only did the workers find that this made their days monotonous and unchallenging, it also caused animosity between some of the operators. Instead of focusing their displeasure on the floor manager for preventing them from being able to switch around, some of the workers would become envious of their co-workers and develop some resentment towards them.

As a self-managed team, not only did the members get the opportunity to learn to operate other equipment, such multi-skill development became a primary focus of the team. All together the team identified fourteen separate skills. When members learned a variety of skills, it provided the team with a great deal of additional flexibility. Instead of a machine sitting ideal while its operator was on a break or lunch, another member could monitor the machine in the person's absence. In fact, one of the rules that the team developed was that before a member leaves, they must inform someone who can cover their machine. Similar advantages were realized when someone called in sick or does not put in a full day.

This cross functional flexibility also reduced how many workers were required to operated a shift. While hand testing always required a dedicated operator, automated testing required only periodic attention. In spite of this, before self-management, a worker was assigned to a single machine. After self-management, workers began to simultaneously operate two, three, or even four automated testing machines. This type of productivity improvement played a major role in reducing the test work force from 127 at the end of 1990, to 59 in December 1992 (Ross, 1992).

Skill Certification and Cross Training

Before a team member was allowed to perform a particular function, they first had to get certified in that skill. A member received certification by obtaining training from a team member who was certified in that skill. Members certified themselves when they felt that they knew the skill well enough to train someone else. To keep everyone's skills in practice, the team decided to rotate stations every 6 weeks.

Another reason members rotated was that the test software was constantly being enhanced. Hence a member who had not performed a particular type of test for an extended period, could find themselves unfamiliar with the updated software. To prevent this, and as a inducement to rotate to a variety of jobs, the team decided that anyone who had not practiced a skill in one year must be recertified in that skill before they can perform it

unassisted.

Work Load

Throughout the case study's observation period the team was under tremendous pressure to get product tested and shipped. Although NTRB had secured some testing contractors, these contractors did not have the staffing or skill to absorb the excess. As a result, the testing group was constantly falling behind the corporate production requirement. This was true despite heavy voluntary overtime.

The demand to test and ship seemed to make the first shift team think very-short term and be job focused. There appeared to be very little mention of, or interest in, developing additional group skills. Scant attention and time was paid to long term issues or problem solving. For example, the test group facilitator, also titled the Test Continuous Improvement (CI) Coordinator, had difficulty getting team members to form a CI committee and seriously look into the usefulness of the statistical process control charts they were using. The facilitator had similar problems getting the second shift to convene the same type CI committee.

Moreover, except for one of the technicians, first shift members received little, if any additional training, technical or otherwise, during the case study period. Combined with other general observations, it seemed that the same short term, job focus problems were wide spread throughout the test teams. This

seemed to somewhat confute the director's stated emphasis on long-term thinking, and the significant budget the human resources manager thought he made available to the teams for training and development (40 to 50% of human resource's annual non-compensation budget was earmarked for training).

Team Self-Management Issues

Group Communications

Bi-weekly round table meetings. The first shift team held general meetings every other Monday morning at 7:30 A.M. These meetings were expected to last no more than one hour except on special, prearranged occasions. The testing group facilitator chaired these meeting, and was responsible for convening them. The facilitator began the meetings by relaying any information management wanted passed down to the team. Any general information which the facilitator believed the team might find interesting was also passed along. After this a round table discussion was initiated. Each person was invited to bring up any issues that they had. If applicable, the team would then discuss it. The meeting was concluded when all members have had their chance to speak and no one had anything further to offer.

Daily team meetings. The first shift team was also suppose to have a daily information exchange meeting at 10 A.M. This time was strategically placed immediately after two cross functional "Excellence Team" meetings which discussed customer requirements. (A test team representative participated in each of these "Excellence Team" meetings.) One of the main purposes for these daily meetings was for the team representative to update the team on any changes in their delivery requirements. Other members could also bring up any general interest points.

In reality, however, the team seldom held these daily meetings. Since the team members felt constantly under pressure to get product tested, most members saw these meetings as distractions from their primary priority of testing product. Hence the members often forgot or avoided these meetings. No one on the team seemed particularly concerned when they were not held.

At the same time, the Excellence Team representatives frequently showed little interest in sharing changed testing responsibility with the rest of the team, a central purpose of the meetings. Instead they appeared more comfortable with, and in some cases took pride in, taking personal responsibility for seeing that the daily quota of product was tested.

White board. On the wall in the middle of the test floor was a white board that was used as a general, informal communications board. It contained notes from members to the team or teams, messages for individual members, what each machine was being used to test, and what testing needs were "hot". It was not uncommon for a message to go up and come off in thirty minutes, or for it to remain up for weeks.

Control charts. Control charts were used as an indirect means of communications. The team used two primary control charts, a plan chart and machine utilization charts.

The plan chart showed the weekly planned production for each IC model and how much the testing floor had actually tested. This information was updated in the computer throughout the day, and any member could call up the latest real time report. In addition, each morning a large blow-up of this chart was posted on the test floor.

The utilization chart showed each shift's machine utilization as a percentage of available time. This utilization was broken down into uses like testing, engineering use, maintenance, waiting for attention, and idle. This multi-colored utilization chart was posted weekly near the plan chart. Each utilization chart remained up for about three weeks, which allowed the teams to notice any trends. There was also a net weekly utilization chart, but it had not been updated since September of 1992, and was never changed during the case study.

The usefulness of the utilization charts was questioned by the teams. There was an ongoing, albeit slow, effort to put together a committee to look into this and make recommendations. Notwithstanding the chart's usefulness, the first shift's utilization was constantly below the second and third shifts'. Some thought the first shift's higher interaction with engineering was the cause; others attributed it to the team's interpersonal dynamics.

Handling Team Responsibilities

Each test team had responsibility for tasks like cross training members, assigning workers to testing stations, day-to-day work prioritization, and handling problem behavior and performance. During the case study period, certain examples were either observed or recited which indicated how the team handled team responsibilities.

Job rotation. During a first shift bi-weekly meeting a member noticed that some team members would be on leave or vacation during the next meeting when rotation would normally be done. The member then recommended that, because of this, the team should plan the rotation schedule before adjourning. There was general consensus that this was a good idea. With the facilitator's assistance, the members started signing up for their primary assignments on an assignment by assignment basis. Part way through this process, the member commented that most people were signing up for the same assignment that they were currently doing. The member further pointed out that the reason for rotating was to practice a variety of skills. The team agreed that was a good point, and then proceeded to reassign duties. However, instead of going assignment by assignment this time, many members voiced what they wanted to sign-up for, most commenting that they had not performed that task recently. The other members then took the available remaining assignments, choosing tasks other then what they were currently doing.

Impromptu work rescheduling. In one of the Excellence Team meetings in which both the team facilitator and representative were attending, the Excellence Team realized that the current product testing did not match current customer needs. After an attendee reviewed what the current customer needs were, and after some discussion, there was agreement on what changes needed to be made in testing to meet delivery requirements.

The team facilitator and representative then returned to the test floor and called for one of the 10 A.M. daily meetings. Instead of telling the team what had been agreed upon in the Excellence Team meeting, the facilitator recited the customer requirements to the team. Without the facilitator leading them, the team quickly noticed that the requirements did not correspond to the current product testing. There was then some suggestions and discussion about the best way to shift the work to meet these requirements. The team then rapidly decided on a strategy, with some members moving from their current testing tasks to a "hot" product. The daily meeting had started at 10:00 A.M. and by 10:10 A.M. the operators were at their reassigned stations doing what was needed to meet customer requirements.

Overtime assignments. Overtime is not technically required of any team member. However, the attitude of the team was that if the company needed overtime help, members should eventually step forward and volunteer for the overtime slots. If the first round of volunteers did not fill the available slots, there was increasing internal pressure until all slots were taken.

One case where overtime was requested was during the week of December 28th, 1992 to New Year's Day, 1993. Although overtime was a standard operating procedure during the study, normally a list would be put up on a flip chart of available slots, and sign-ups would go to the first operators to sign up. However, this was a holiday week and double and triple pay rate overtime was being

offered.   In this case there was competition for the limited overtime slots.   Some operators had already signed up, however, and there were only a few slots open, one of them on New Year's Day.

The prior Thanksgivings Day overtime had also been needed. At that time the team decided that whoever got overtime then would have last priority for the New Year's week.   When the last operators were signing up, a problem arose.   Because of the combination of skills and slots available, one member could only work on a day other then New Year's Day.   The other operator was already committed to sponsoring a gathering of friends on New Year's Eve, preferring not to work on New Year's Day.   However, after an agitated discussion, that member agreed to work on New Year's Day if it was absolutely required.   At that point someone who was already signed up offered to switch around so that everyone was satisfactorily accommodated.

Although it was evident that some people were exceptionally unhappy at first, at no time was there any coercion, attempts to intimidate co-members, or any try by management to force a particular compromise.   Although present, the team facilitator only helped guide the process according to the rules that the team had established; rules which the facilitator had originally urged the team not to adopt.

A second case of an overtime request happened one day towards the end of a shift.   A type of IC was on the hot list, but it was not expected to arrive from fabrication until after the end of the

shift.   However, the product arrived a couple hours before the shift's end. Suddenly there was a need for some operators to work overtime to test the product and ready it for shipment. The team facilitator first went around to see how many people wanted to work overtime. The next step was to check with planning to see how many operators would be needed. Although the overtime request was cancelled at this point because of existing inventory at another site, the following step would have been to see if the number of operators matched the need. If there were not enough, the facilitator would go around again until the required number was reached. If there were too many, those operators would be called together and would decide amongst themselves who was going to work the overtime slots.

Transfers. Occasionally management would dictate that one or more team members would have to transfer to another shift or department. This first happened shortly after the self-managed teams were formed. Initially management told the team they could choose the members to be transferred. Furthermore, they were told they could use whatever selection method they wanted, so long as it was fair, simple, and understood by everyone. The team then used a selection process based primarily on seniority. When they used this formula, it selected a person who successfully argued that their selection was unfair.

At this point management intervened and instructed them to develop another method that conformed to the three conditions. In

so doing, the team devised an anonymous matrix to help them decide. The person that they selected this time was acceptable to management.

Towards the end of the study, part of the wafer testing responsibility was being transferred to the fabrication department. It looked at first as if one of three operators was going to have to transfer to fabrication along with the testing responsibility. When this was announced, the facilitator told the team that they would again be allowed to choose the method for selecting the operator to transfer. However, this was tempered with advice that the selection process be based on skill rather than seniority.

None of the operators, however, wanted to transfer. So the team members began looking at options. By talking with fabrications and doing some "on paper" personnel juggling, the team was able to devise a method under which no one would have to transfer; a fabrication worker would take over the transferred testing duties.

Team discipline.   The team handled member discipline.
Everyone was responsible for monitoring each others performance.
The group had a protocol for handling problems.   First, if a
member realized that they were doing something wrong, they were
suppose to give themselves a warning in the team attendance book
and then correct the behavior.   If a member saw another member
doing something unacceptable, the procedure was to first talk to
the person directly.   If that did not solve the problem, the
observer then checked with some co-workers to confirm that they
also saw the behavior as a problem.   If so, the observer and the
problem person sat down with the group facilitator to discuss the
problem and resolve it.   When needed they would discuss the
problem with Human Resources to get professional guidance or to
clarify legal and corporate policy issues.   If the problem
behavior was repeated, the member could receive a written warning.
 If the problem behavior continued, despite repeated warnings, the
member could be terminated.

However, policing of members by other members was not always
necessary.   At one point in the group's life, because of problems
with some members unreasonably arriving late, the team decided on
a rule that all workers had to arrive on time, unless there was a
valid reason for the tardiness.   Shortly after this policy was put
in place a member was late.   The member understood the reasons for
the policy, agreed with it, and realized that they had violated
the policy.   Therefore, the member thought it appropriate to act

as an example for the team, and submitted themself for disciplinary action to the team facilitator. The facilitator and the member went together to see the human resources manager to file the proper formal paper work. As it happened, because of certain corporate employee polices no paper work was necessary. However, throughout the process there was a complete acceptance by the member of their responsibility to abide by group rules, and no animosity was directed at the disciplinarians for enforcing the rule.

Dismissals. The group also had de facto responsibility for dismissing problem employees when a member has repeatedly failed to correct problem behavior or when the member committed an act that was cause for immediate termination. As an example, when the teams first formed one worker had a history of questionable absences. There was general knowledge among the team members that the person's excuses were bogus. However, the former floor manager had let this go on, just reassigning that person's work to someone else whenever the worker was absent. When the shift became self-managed, this member's co-members were not willing to absorb the extra work generated by this worker's absence or tolerate that member's dishonesty. One time the worker called in to notify the team that they would be absent due to jury duty. However, another member realized that one of the days in question was a government holiday. Upon returning, that person was confronted and fired by the team. While it was necessary to get signatures from human resources and the team's formal manager, both the human resources manager and team members agreed that this was only a formality.

Peer Evaluations

The team administered its own peer evaluations. Since the team did evaluations on a yearly basis, and the team was only a year and a half old at the time of the case study, the process they were using was still in its infancy and undergoing considerable change.

Last year the peer evaluation was conducted by giving a review sheet to any six people in the team. Some people made a point of giving their peer evaluation sheets to people who they felt would be harshest on them. They saw this as the best way to assure that they got honest and useful feedback.

After they were completed, the evaluators turned the feedback sheets into the team facilitator, who at that time was one of the original co-leaders. The facilitator would then anonymously report to the evaluatee what their evaluation sheets said.

Some people used this anonymity to attack their co-members. Some of the comments included "you're so old you should retire" and "you could move faster if you lost weight." The facilitator passed all comments back to the evaluatee unedited. Understandably, this caused some very hurt feelings and prompted some members to question the value of the peer review.

With some exceptions, most members believed, overall, that their peer assessments were close to what they had expected. Nonetheless, some feedback did prove useful. One of the technicians, who spent much of the time in the technician's room, was viewed as distant and unsympathetic. They commented that they would like this technician to spend more time on the test floor. Because of this feedback, thereafter, the technician was almost constantly on the test floor.

The second peer evaluation was being completed as the case study observations concluded. The updated evaluation sheet, which was jointly developed by the teams and the test and assembly

director, was given to all members of a team rather then to just six selected members. Hence each member evaluated, and was evaluated by, every member of their team. Furthermore, evaluation forms for the team facilitator and director were given out to a random sample of members from all five teams. Appendix E contains the evaluation form that was distributed.

As with the first peer evaluation, the team facilitator was going to compile the results, list any comments, and anonymously report them back to each member. However, this time each member would get feedback on their evaluation from three team co-members. The feedback groups were randomly assigned so that the getting-feedback/giving-feedback role would not be reversed between any two members.

The members were expected to use the feedback from the evaluations in many ways. The feedback should help them to align their view of themselves with that of how others viewed them. It should also permit them to better understand their strengths and weaknesses. If the evaluation showed that they were weak in an area, they could ask for training. Finally, even though the evaluations were not going to impact their compensation assessment, they were cautioned that their feedback should predict the compensation adjustment that the team would give them.

Compensation

The team was also charged with assigning the annual raises each member would get. Management first told the test group the average raises, in percentage terms, that could be given out. The individual raises could vary, just as long as the average stayed the same. This percentage increase was the same as was allotted to NTRB from the corporate headquarters. The group received no pay increase for increased productivity, reduced costs, or increased quality. Furthermore, no group incentives were offered.

In 1992, 50% of the pay raise was decided by the team's director, who is technically the direct manager of each member, and 50% was decided by the team. Each team's portion of the compensation increase was pooled. Each team then allocated each member's raise, based on a team developed formula. This formula awarded compensation increases by the members answering a set of questions which had either a + or - answer. Some math was then be used to calculate the portion of the compensation increase pool that each team member would receive.

A few members got only the 50% rewarded by the director; their teammates rewarded them nothing. Nonetheless, the raises were viewed as fair. Never once throughout the case study did a member mention that they felt the raise they had received was unfair. Moreover, the human resources manager noted a marked decrease in complaints from the test group about that year's raises. What complaints he did get were somewhat deflated when

the members conceded that they had had a part in forming the formula that the teams used to calculate compensation increases.

The team was far for doing the next compensation adjustment at the conclusion of this case study. However, the director had already decided that each team would have control over 100% of the raise on the next compensation review. Furthermore, the plan was to have the members from each team rank all their co-members' contribution on a scale of 0 to 10. The scores would then be normalized and the raise pool accordingly allocated to each member.

Difficult Aspects of Self-Managed Teams

Team members almost uniformly agreed that the hardest thing about self-management was handling conflict (e.g., pointing out unacceptable behavior to a co-worker, or confronting a person about their inadequate team social skills) and, to a far less degree, making group decisions. Handling conflict was an area in which most members would have liked to have a manager to whom they could defer this unpleasant task. Team members felt that this became even more difficult when the issue involved gray areas such as insensitivity or personality traits.

The main difficulty with group decisions was having to convene a team meeting to discuss the topic and come to a conclusion. Members thought making decisions was a time consuming process, both in waiting to have a meeting to discuss the topic, and in round table discussions during the meeting. Furthermore a

strong personality with a vocal view point would sometimes frustrate the other members and impede quality group decisions. On more than one occasion the team accepted a decision that was not the preferred team decision, but the decision sought by the outspoken member. As one member put it, "often the group will go along just in the name of cooperation."

Interactions With Other NTRB Groups

Handling External Communications

The team facilitator was the link to management, and often was the impromptu external liaison for the group. However, the team handled much of its own communications with other parts of NTRB. The facilitator did not necessarily act as the group's spokesperson.

Informal communications were generally done on a direct personal basis. This created some confusion when the teams first went to self-management. Outsiders did not know whom to contact, and there was no floor manager to ask. As employees in other sections of NTRB gained experience with the teams, they identified members with particular skills and knowledge. Hence when these outside employees had a question or needed to relay information, they began contacting the appropriate team member directly rather then going through a central person.

When more formal communications were required, such as when a team member was requested to serve on a committee or the team wanted to make a request of another section, the team would

appoint someone as the team representative. Such appointments normally happened in one of the bi-weekly meetings. When an issue came up that required a team representative, the team would ask for a volunteer. Members were not always anxious to be a team representative as it only increased their work load. Sometimes there would be no initial volunteers. In these cases there would be an increasing call for a volunteer until a member reluctantly stepped forward to assume the position. In cases where a particular member's skills were needed as part of the representative role, that member would good-heatedly be "volunteered" by the team.

One example of this formal boundary spanning was with the Excellence Teams. There were two such teams that dealt with the production scheduling and delivery of the B44 and E99 type ICs. These were cross functional teams with members from material management, planning, finished goods, shipping, engineering, and testing. These teams met on a daily basis. Two test operators, one for each team, acted as the testing representatives. The function of these teams were to make daily updates to the production and delivery schedule as required. The test representative would let the Excellence Team know what the test floor situation was (e.g., equipment that was down, testers that were out, other demands on their time). The Excellence Team members would, in turn, provide information to the representatives that they would bring back to the team.

The representative on the B44 team was primarily testing that

IC type.   Similarly, the E99 representative was testing those.
Although these representatives were suppose to share testing
demands with the rest of the team, often they would assume
personal responsibility. If the demands were small enough that it
didn't absolutely require a concerted team effort, this personal
responsibility would manifest itself by the representative member
doing the testing themselves rather then sharing or delegating the
task.

Engineering Interaction

There was a great deal of interaction between engineering and
the first shift test team. Engineering needed to use the test
equipment to develop, upgrade, and test new testing software.
They also needed access to the machines to isolate and correct
problems reported by the technicians. It was not unusual to have
four to ten engineers on the test floor during the shift.

Because both engineering and the test team used the test
equipment, they had to share access. When possible, engineering
would schedule the equipment ahead of time so that engineering and
planning could anticipate for the machine being unavailable.
However, when engineering needed the machine on short notice, or
testing had a critical need for a piece of equipment when
engineering had it reserved, informal negotiations would go on
between the engineer and the operator to assess who needed it
more.

The interaction between engineers and the test floor team

members was characteristically very friendly and casual; it was always on a first name basis. This had not always been the case. Prior to self-management there was an artificial gulf between engineering and the test operators. Engineers would go to the floor manager when test equipment was needed. The floor manager would then make the determination and remove an operator from a system if necessary. Because of this, there was little interaction between operators and engineers.

After becoming self-managed, the engineers had to deal directly with the operators. Some operators said that dealing directly with engineers was at first awkward and intimidating. These operators added that while still there, the unintentional intimidation of engineers on operators has noticeably decreased since the transition to self-managed teams.

Engineers and operators alike commented that this interaction has contributed to a more pleasant, personal atmosphere. Here, self-management has played a part in making NTRB a better place to work.

Obtaining Advanced Training

Northern Telecom devoted considerable funding to training. In NTRB's case, 40 to 50% of human resource's annual non-compensation budget was earmarked for training.

The testing teams obtained training on a pull, rather then push system. That is, the team or a member of the team would have to ask HR for training in a particular topic. HR would then see

if and when it was available. Neither management nor human resources took a proactive role is observing the team's performance and suggesting training topics that might be advantageous to the team at their current stage of development. Likewise, because the team did not have knowledge of team development strategies, they would, in some cases, not know that they needed training in that skill, and hence they could not ask for it.

<center>An Uncertain Future</center>

Since going to self-managed teams the testing department has undergone a steady decrease in personnel, from 127 at the end of 1990, to 59 in December 1992 (Ross, 1992). These reductions were a consequence of increasing productivity and an intentional slimming of what was initially an excessive testing work force. These reductions were accomplished by attrition and transfers to other department; no operators, other then temporaries, were laid-off.

In late 1992, the team learned that NT management was considering transferring some testing jobs to offshore plants. One team member understood that management's stated reason for this possible transfer was to get the testing closer to the assembly facilities, and not to take advantage of the lower labor rates, which the member believed to be around sixty-five cents an hour.

At the same time the team facilitator was voicing that this

was not certain, it was only being considered, and if it did happen there would be no impact until June or July of 1993. Furthermore, because of the low cost of testing at NTRB, the teams might be able to grab testing business away from other facilities such as its sister plant in Ottawa, Canada. The director also assured the team that even if the offshore shift did cause a further reduction in testing at NTRB, everyone would still have a job by transferring to fabrication or some other department.

Despite these assurances, most of the members felt uncertain about their position. They all had seen the assembly department go from over thirty people down to five when the assembly jobs were transferred offshore. Although they all felt secure that they would have a job at NT, many of them liked their job and work environment and did not cherish the thought of transferring to another department. Overall this uncertain future was a very demoralizing influence on the team and left them feeling like they had no control over their work life. Many team members seemed resigned to a fate in which the team would be disbanded.

None of the members expressed any connection between the productivity of the test team and its ability to compete with other facilities for testing business. This was true even though the facilitator pointed out that their productivity possibly made them competitive with even offshore plants. Moreover the members did not perceive that they could increase the chances of preserving testing jobs by further increasing productivity or decreasing testing costs.

This also had a noticeable effect on the team's efforts to improve the team. Because many members felt that the team would be disbanded eventually, they saw investments in the team to be wasted energy. One engineer who worked closely with the team noticed that they stopped progressing as a team in spring of 1992 when some team members were transferred out of testing.

<div align="center">Self-Managed Team Members</div>

In conducting the case study it became apparent that the personalities who made up the team played a major role in the team's effectiveness. Furthermore, there was a definite change in attitude about the team the further the team member was away from the test floor.

Team Core Members

Carol. Carol, a member of the team for only six month, was the newest member of the first shift team and the only member to join it after it went to self-management. She had worked in assembly for over seven years until her position was eliminated when assembly jobs were transferred offshore. She commented that she did not see much difference with self-management, but suspected that was because her assembly manager had allowed a great deal of worker independence. Her biggest complaint about self-management was that the whole team had to be convened to make any decision. On the plus side, the team had always been very understanding when she asked for something.

On Wednesday December 23rd, the day before NTRB began its Christmas holiday, Carol hosted a holiday lunch for the team at her house. She refused any payment or offers to bring food by the other team members.

Betty. Betty joined NTRB as a tester at about the time the test department was established. She was very concerned when the group first went to self-management. She had no concept about how to self-manage, was very skeptical about the idea, and saw it as another fad that would soon pass. However, as she adjusted to self-management and saw its benefits, she became an advocate. After having experienced it, she didn't think she could ever go back to the traditional structure. With self-management she felt that she was making an important contribution to the organization, and had much more job satisfaction. She was one of the people most fearful about the possibility of testing going over seas and having to go to a different job.

Susan. Susan commented that she had a tendency to take on more than she could handle, and often volunteered to act as a team representative with other groups. In one case she meet with another section that took the tested product and was making requests that the team increase their output. Susan's assignment was to get them to help with some testing so that they could test more product. As she retold it, when she met with the group, they refused her request and became hostile at her for asking for help from them. She then went back to the team for support, and, in her eyes, they backed away from the issue and left her unsupported and looking like the bad person. She felt slightly abandon by the group after she had reluctantly volunteered to plead the team's case with the other group.

She saw the group as self-regulated rather than self-managed. Her justification was that management would occasionally send down a unilateral order about the team's operations without even consulting them. For example, management once ordered a shift of one person from the day shift to the third shift, and she felt that this order was not open to discussion.

Susan admitted to being one of the people who tried to assume a "manager" role when the team first went to self-management. She also commented that management effectively put a stop to anyone playing manager when Jim and Roger gave their talk to the team emphasizing that the team had no manager.

Jenny. Jenny was the youngest of the members. She was a strong advocate of self-management. Since she was often tied to one machine under the old structure, she very much enjoyed the opportunity to learn different skills and work throughout the test floor. Jenny was a very outgoing person with a effervescent personality.

Isabel. Isabel transferred from assembly four years ago. Her support for self-management was rather shallow. While she said she liked it better, she also said it did not matter whether or not she was under a supervisor. As far as the work goes, she claimed she did not like it any better or worse, since she was doing the same job as before.

She claimed not to feel any more responsibility about her work then before self-management. However, she noted that production had gone up since self-management while the numbers of workers had went down. She attributed this to two primary causes. First, she believed that the team members felt more direct pressure to get the work out without an intermediate supervisor to bear the weight of production responsibilities. Second, she believed that management had come to trust the team to get the work out, and that the trust was important to the team members. Hence they were willing to work harder to maintain that trust.

As a team, she did not seem to sense much camaraderie. Of the relationship among members she said "they are what you would expect of a group of people who have to work together." She also

thought that there were still some strong willed people who tried to be the team's "boss", although it was substantially reduced from when the team first went self-managing. Furthermore, she felt that these people played a disproportionate role in team decision making.

Lynn. Lynn had been in NTRB's quality department when that department was disbanded due to NT's philosophy change to building in quality rather than inspecting it in. Although she had always liked working at NTRB, she said that after becoming familiar with self-management, she would not like to go back to a managed environment. As an example of why, she pointed out that she was one of the three people that was being considered for transfer to fabrication. While the team would make the eventual decision, at least she would have some say in the decision. A manager would have just made the decision; she would have been completely at the manager's mercy. She also felt that the team based evaluations were fairer then by a single manager who might be biased.

Terry. Terry was an operator who was also working towards earning a degree and becoming an engineer. She took a lot of pride in people feeling that they could trust her to get a job done. She sometimes expressed irritation at co-workers who were not as dependable. She preferred to work independently when possible, and liked self-management because it allowed her more freedom to attack a problem in the way that she thought best.

Unfortunately, she was undergoing considerable personal

stress and difficulties at the time of the study. Because of this, she received an unusual amount of phone calls during the day. While this would probably not have been accepted of most team members, her co-workers understood her position and were willing to make allowances in her case.

Phil. Phil claimed that work life had not changed much for him since the switch over to self-management. As a technician, he said he had always worked somewhat independently. He noted that when the teams first went to self-management, the team members would go to one of the co-leaders and look for manager type decisions. However, instead of doing that, the co-leader would push the decision back onto the team. He also mentioned that team moral was about the same as it was just before the floor managers were let go. While the moral had significantly dropped right after the managers were first laid-off, it had worked its way back up to the prior level.

Donna. Donna was the other first shift technician responsible for keeping all the team's equipment up and running. She was an outspoken person who, throughout the study, routinely wore political buttons on her smock. As a single mother of two school aged children, she was sometimes late to work because of taking her children to school. While the team had a rule against being late, the team understood her situation and accepted the occasional tardiness.

She was up-front about the fact that she thought she

sometimes came across with a very strong, sometimes intimidating, personality. She said that this was confirmed on her last peer review sheets, which she intentionally gave to the six team members with whom she had the least amicable relationship. Furthermore, she realized that sometimes she was abrasive in dealing with others. She attributed this to speaking without thinking, and was careful to apologize when this happened.

Team Support Members

Bryan. Bryan had only been in test about two years, which made him the second newest team member. His primary duty was parts inventory. At the time of the study, parts inventory was taking over this same function for some other NTRB sections. Hence test would be providing this service to other departments in order to make NTRB more efficient.

Although his function was parts inventory, he still had managed to learn most of the test floor skills. When needed, he would help the team by doing some testing.

Because he had predominately worked in an unmanaged or distantly managed environment while at NT, he did not personally feel much effect from the change to self-management. However, philosophically he was very supportive of the premise. As he saw it, "People don't need to be managed; they don't need somebody looking over their shoulder."

Chris. Chris was the first tester at NTRB and had tested the first IC produced there. She came to NTRB from the testing department at Burroughs (which later became Unisys), and had went to school to study testing. Seven years of her time at NTRB, up to 1988, was spent as a supervisor either in test or in assembly. In 1988 she wanted to get away from the stresses of supervising and decided to go back to an front-line role. Because of her training and experience, probe card repair seemed like the best assignment. However, she was skilled in most of the test floor operations and would provide assistance when the team required it.

Chris asserted that she drove herself hard at work, and she often would set personal goals and challenges to overcome. Likewise, she found herself annoyed by workers who appeared lazy and inefficient.

She said that Self-management had not affected her position. She was rather dispassionate about self-management, and thought that the old structure was just as good. However, she did not see the team as being any less productive overall then the members had been under traditional management.

Jane and Mary. Jane and Mary handled all the finished goods support for the testing department. Each of them, in addition to a team core member representative, served on one of the Excellence Teams. These two had been working together for about two years. They, along with intermittent help from Brett, were handling the same type of work as eight people were in 1989, although the detailed redundant counting had been markedly reduced since that time. They had also significantly reduced the paperwork since they had essentially taken over this section. They asserted that, between the two of them, they covered a work schedule from 5 A.M. to 5 P.M. Monday through Friday, and 5 A.M. to 8 P.M. on Saturday. They arranged their work schedule between themselves.

They stated that they felt separated from the rest of the team, were only on the team because Jim had set it up that way, were often the last to know about changes, and were only included by the rest of the team when it was to their advantage. They felt that when they brought up concerns to the team they were ignored, and were only paid attention by the group when they made an error.

They did not like that peer assessments were being done by all team members. They expressed a concern that the other team members did not know enough about the requirements of finished goods to be in a position to evaluate them. They conceded that the reverse was also partially true, and wished that their evaluations were only being done among the team support members.

As far as the teams being self-managed, their opinion was

that the team was being carried by a few high performers. They did not believe that the team would be truly self-managed until the team was reduced to those people who really cared and performed. Eventually, they felt that this would happen.

   <u>Hal</u>. Hal was one of the test department planners. While he was part of the first shift team because of the hours that he worked, he did planning for all the testing teams. Some of this planning was long range planning on what the test floor and the contracted testers could produce. He would work with other sections and departments, such as fabrication and the offshore assembly sites, to arrive at projections of how much the NTRB plant could deliver to NT switching systems manufacturing plants. He also would keep up on the day to day needs of NTRB's customers and let the test team know when there was a change in delivery requirement.

   Hal was strictly a planner and never did any product testing like the probe card repair and parts inventory control members. However, he was frequently seen on the test floor interacting with the individual test floor workers.

   Of all the people who worked with the test team on a daily basis, Hal seemed to have the most presence-an apparent combination of referent and expert power. While he sensed this, he made a conscious effort not intimidate or put too much pressure on the testers when there was a rush shipment needed. However, he seemed to take his duties very personally, and his intensity was

usually sensed by the operators when he would make a request of them.

He found his job to be much more fun and enjoyable since the transition to self-management. Before the change he dealt almost strictly with the floor managers. With self-management he began to have much more interaction with the operators. That interaction has caused him to have much more respect for the individuals on the team, as well as for the jobs that they do. He commented that he could not "say enough about the individuals."

Hal noted that the team was still learning to deal with people issues and the self-management style. Some members were having problem letting go of the single person direction. He saw some members as somewhat disinterested in self-management; all they wanted to be were test operators. Others wanted more, and self-management gave them an opportunity to achieve more with time.

Overall he thought that the members were becoming more self-confident and independent. This had manifested itself in a reduction of the questions that members had, and had strikingly improved the quality of their independent decisions. He also thought that people were taking more ownership in their work. When asked about productivity he first said it was about the same, but as he thought about it, he realized that they were doing more with less people, and thus it had improved.

He saw the eventual possibility of the team taking on some of the planning that he was performing. However, it would take time,

training, and more general business knowledge before they were ready. He stated that self-management had been so beneficial that they needed more self-managed teams at NTRB.

Ann. Ann performed the same type of duties that Hal did. She, though, tended to work on more of the detail components. She echoed many of Hal's comments about self-management, agreeing that it had been a good thing for her, the testing floor, and NTRB.

She pointed out that since going to self-management there was less "game playing" then there was before. Game playing was a reference to employees who skirt the system by just staying within the bounds of the rules and policies, while taking as many liberties (e.g., time off, being late, taking long breaks, etc.) as possible. There was the perception that some "game players" put a considerable amount of effort into being very knowledgeable of the rules and riding just under the limits.

Game playing, although reduced overall, was still very present in some shift, while being mostly eliminated in others. Moreover, she sensed that the teams were getting better at disciplining such members and reducing it further.

Brett. Brett was also a member of the planning support staff. His main focus was on developing and enhancing software tools that would make more accurate predictions and allow improved planning. He would also occasionally help Jane and Mary when they were overloaded and he had some spare time. He too supported the switch to self-management, although he said it really had not had much of an effect on his work life.

Other Test Team Members

Lucy. Lucy and Bryan made up the parts inventory crew. At the time of the study, she had been with NTRB for nine years and was a support member of the second shift team. She worked from 1 P.M. to 11:30 P.M., Monday thru Friday, which meant that she overlapped the first shift for the beginning two and a half hours of her shift. Like Bryan and Chris, Lucy knew how to operate test equipment and helped out on the floor when needed.

Of all the people in the test team, Lucy's job had changed the most. In many ways she used to be an administrative assistance to the old floor manager. Under the floor manager, she was responsible for producing 23 monthly reports on topics ranging from system productivity to attendance. When a piece of equipment malfunctioned, the process was for the operator to notify her, then she would notify the technicians. She would make weekly reports to the manager on the technician's progress. When an operator made a mistake, she had the responsibility of changing

the system to so the operator could not repeat the mistake (i.e., changing the system to a poka-yoke design). Under the floor managers, the parts room was secured from everyone except the parts control employees and the floor managers. Even the technicians did not have access, although they often needed to get parts and tools to fix the test equipment.

After the switch to self-management this all changed. The parts room was open to all technicians and operators. Technicians were responsible for dealing directly with the operators to fix the equipment. Operators were given the responsibility to understand the cause of any mistakes and not repeat them. Moreover, with self-management, Lucy was only writing one memo per week, which concerned what work orders were due.

The old tight controls on technicians and documenting their progress seemed exceptional unnecessary to Lucy. According to her, the testing technicians were the most productive in the plant, and were just as productive with "no manager riding them;" they understood the importance of getting the test equipment operating.

When testing switched over to self-managed teams, Lucy found that they needed to ask "do we need to do it," of just about everything she did. After eliminating the unnecessary, her paperwork went down 50%. Moreover, her computer work decreased 75%, although some of this was shifted to other employees.

Lucy spoke with exceptional pride about an ISO audit that took place after the group went to self-management. Managers did

not stress to employees how important this audit was, nor did she think there was any need for management to emphasize this. All the members understood that they needed to pass this audit in order to sell NTRB's chips in the European market. Everyone did their part to work with the auditors on the pre-audit to make sure that they met all the requirements. As it turned out, Rancho Bernardo was the only Northern Telecom plant to pass on the first trip.

Ellan. Ellan was a nine year NTRB employee. At the time of the study she had been an operator on the second weekend shift for about six months. Before that she had been on the first weekday shift.

She recalled a talk she had attended. This talk, sponsored by Pacific Bell, was held at the San Diego Zoo and concerned self-managed teams. One member of the Zoo's self-managed team "went on and on about how the team had done this, and the team had done that." Ellan said that this was how she felt about self-management at NTRB.

One of the problems she saw with teams in the beginning was the constant meetings they had. She said that Sandra had taken on a liaison role in major meetings with other groups and would inform the team what went on. In this way Ellan saw Sandra's role as very helpful because it saved the team members from having to go to so many meeting.

One of the benefits that she saw with self-management was

that it was much more of a caring atmosphere, with the members taking a personal interest in each other. For example, she needed to get some extended medical care. After explaining it to her team, they gave her time off as needed. Furthermore, somebody from the first weekday shift volunteered to cover for her, working both until the volunteer could in turn get someone to cover some of their normal hours.

She found working much more enjoyable under self-management. She also claimed to feel much more responsibility and ownership of her job under the new structure.

Jackie. Jackie was another long time NT employee. Like Betty, she was very concerned when the group first went to self-management, having no idea what that really meant. Yet, after coming to terms with the new system, she was able to benefit from it by choosing a much more flexible, independent work schedule. Although she was officially on the weekend shift, she was able to work a split weekend, peak weekday work schedule. This meant that she would theoretically work a full shift on Saturday and Sunday, and then a partial shift on a couple of peak weekdays. In reality, though, she claimed that she ended up working much more then this. Part of the reason she put in so much overtime was that, since the change to self-management, she found her job much more interesting and felt much more responsibility to get work done.

General Attitudes

All the members said that Northern Telecom had always been a good place to work, and they were glad to be there. Nevertheless, the overwhelming attitude was that self-management made it even better; no one said that the change made it worse.

Most members said that they did not feel any additional pride or ownership of their work. At the same time, however, they said that self-management made them feel more responsibility about getting product tested. Most members also asserted that self-management made the work more interesting and the work environment more enjoyable.

Team Management and Support Personnel

Management

Jim - NTRB's visionary. Jim was the Director of Test and Assembly at both Northern Telecom's Rancho Bernardo and Ottawa, Canada facility. Between the two sites, he had eighty direct reports. Fifty-nine of these were the members of the test teams who used their facilitator as a liaison between them and Jim.

Jim was the primary force behind the implementation of self-management at NTRB. The team members were very appreciative of the risks and heat that Jim took in giving them the opportunity to self-manage. His commitment to the self-management vision arose out of a phenomenal personal transformation.

Jim pointed out that he had started out in time and motion

engineering. He used to believe that line workers were "too dumb to know which hand to use to pick up a tool."

In retelling some of the history of NTRB, he said that in 1980, as one of the original ten managers, he had felt comfortable with a heavily autocratic management style. In 1984, as the company grew above 500, this autocratic style started to deteriorate the company's effectiveness. At that time, the general manager of NTRB was removed by corporate management, and a new general manager installed. This manager believed in employee participation. Slowly, Jim said he began to see the benefits of employee empowerment, both human and financial.

The new general manager, having presided over a successful cultural transformation at NTRB, left in 1988. Jim, however, said he continued to become an increasingly strong believer in people's ability to make valuable contributions and correct decisions. He stated that he became such an ardent believer that, in 1991, along with the human resources manager risked their positions by doing an unsanctioned implementation of self-managed teams in the testing department of Rancho Bernardo. When NT corporate management learned of the implementation, while still not supporting it, they agreed to look the other way because of its success.

As Jim saw it, trust was the most fundamental component of making self-management work. Without that trust, the relationship maintains an "us versus them" framework, and the entire basis of cooperative efforts begins to break down.

Part of this trust comes from not stepping in and making decisions. Jim made a concerted effort not to intervene in the teams' decisions. But occasionally he would feel the inclination to return to his authoritative roots. He talked about one incident in which two team members on a weekend shift were calling in for vacation time just before the shift started. This left the shift without 40% of their operators. After this went on for a while, Jim stepped in, told the two employees that this was unacceptable, and told them that if they did it again, not to come back to work until they he had talked to them. When they did do it again, his first inclination was to terminate them. However, the human resources manager convinced Jim that an alternative corrective strategy would be better. In retrospect, Jim was disappointed with these members' team for not thinking about the impact their absences were having on production and for not correcting the problem on their own.

Jim's biggest surprise with the self-managed teams was some of their immature decisions. He saw this mostly arising from an attempt by each team to get what the other teams got. For example, one time Jim sponsored a dinner for the all the teams. Because of the dinner scheduling, two of the weekday shift got four hours off with pay. The other weekday shift decided that every member of their shift also deserved four hours off with pay. When Jim found out about this he met with that shift and let them know of his displeasure with the idea, although he did not tell them that they could not do it. To the best of his knowledge, he

did not believe that anymore people took their four hours off after his talk.

Another similar incident happened when an electrical shutdown made it impossible for two weekday shifts to work. Rather than have everyone come to work and stand around, Jim had them just take the day off with pay. The other shift thought that they too deserved a day off with pay. In this case, their plans were halted.

The biggest implementation problem Jim saw with self-management was what to do with supervisors and line-mangers. Before the gradual implementation of self-managed teams in fabrication, that department had four supervisors. One of these was becoming a facilitator, one a scheduler, and two left, one on medical, one was laid-off. An implementation of self-management in the site services department of NTRB had lead to the departure of two of four front-line managers (Smith, 1992). Jim said he knew of other facilities that claimed to have success transferring supervisors to facilitators in other departments. However, Jim saw these as long, drawn out and problematic retraining attempts, and that usually it was better to make a clean break with the former supervisors.

In summary, even after the transition to self-management at NTRB Jim was still a believer in the idea. However, he fully realized that self-managed teams were no panacea; they had their own characteristic problems that presented new administrative challenges.

Sandra. Sandra was the facilitator for all five testing teams. Sandra had been at NTRB for 7 years. Until she became an administrative assistant for engineering in 1989, she had been a test operator. When testing went to self-management, Jim, who had a very high opinion of Sandra, proposed to the teams that she be their collective facilitator-a proposal that they were pleased to accept.

As a facilitator, she assisted the teams with conflict resolution, mediated disciplinary actions and provided guidelines, informed the team of relevant company policy, and worked as a liaison between the teams and Jim. She also helped coordinate team activities and chaired each of the five team bi-weekly meetings.

She generally worked a first shift schedule, 7 A. M. to 3:30 P.M. However, serving as the facilitator to all five teams meant that Sandra had to keep her schedule fairly flexible. Just chairing each team's meeting required being at NTRB outside the normal first shift hours. There were also times when she needed to assist a team during their shift. For instance, one time during the case study she came in at 2 A.M. to assist the third shift in using Continuous Improvement tools. The fact that she was also a new mother did not make these schedule changes any easier.

Sandra saw herself as part of management. However, she was careful not to impose a decision on the teams or its members

unless it was dictated by law or NT policy. As an example, one team was having a conflict between the team's vacation policy and NT's vacation policy. When she first informed them of this, and told them that they had to abide by NT policy, they accused her of trying to make a decision for them. She then advised the team that they could either change their team policy or attempt to change NT's, a long and complex procedure. At first the team pursued changing corporate policy, and Sandra informed the team what procedures they had to go through to do this. Eventually, however, the team opted to change its policy rather than go through the effort of challenging corporate policy.

On another occasion a team wanted to take a day off with pay. However, the way they proposed to do this involved falsifying their time cards, an offense that under NT policy is grounds for immediate termination. In this case Sandra did tell the team they could not do it.

Human Resources and Engineering

Roger. Roger was the Manager of Human Resources at NTRB. He, along with Jim, were the key people in establishing self-managed teams at the NTRB facility. They developed the idea and made the decision to layoff the floor managers and go directly to self-managed work teams.

He had visited the other self-managed Northern Telecom facilities at Morrisville and Santa Clara. In his opinion, the Rancho Bernardo facility was far ahead of the other, high profile

implementations.

Charlie. Charlie was a test engineer who worked closely with the first shift team on a daily basis. He had been a member of a task force that investigated NT work cells. These work cells were the self-managed structure that the Morrisville facility used. Members in these cells interacted more directly, supported each other, and shared a common goal. His impression was that the test floor had many goal. The task force presented their findings in February of 1992.

He saw the implementation of self-management at NTRB as a generally positive event. He thought that the teams were more productive, and that the change had improved moral and the happiness level on the test floor.

However, he also saw troubling signs. He thought that the teams had stagnated and had developed a short term focus. In the area of personality issues, he thought the team was regressing. At first they dealt with each other, but now the members were tending to let things build up between them.

As a team he thought they were capable of handling much more than they were. In his opinion, the members could handle support functions like planning and product scheduling. He also believed that the teams could help improve customer deliveries if they knew more and were more involved.

One aspect of self-management which had made his life more difficult was not having the floor managers as a single

communications person. Under the old system, engineers would have a weekly meeting with the floor managers to discuss issues. However, under self-management, they had to meet with each team, and there was no day-to-day focal person to contact. On the other hand, he liked the more cordial, personal, and direct interaction he now had with the test floor people.

Charlie also told me that originally the test engineering group of twelve engineers were going to be converted into a self-managed team. However, they seemed to operate fairly well with their current structure and there did not seem to be a need to go to self-management.

Frank. Frank was a test engineer who started with NTRB in 1986 as a test operator. He had the opportunity to see the self-management idea evolve, and recited much of the history of its development from the test floor perspective.

He was one of four NTRB employees who participated in an off-site visit to NT's self-managed Morrisville facility, which eventually lead to a self-management presentation to test floor workers and managers in the summer of 1990. Although he felt this presentation had little impact on management's ultimate decision to implement self-management, it did make the flow workers more aware of what self-management was.

General Attitudes

All management and external support professionals interviewed in this case study said they supported test's conversion to self-management. The endorsement was usually along both humanistic (e.g., moral, job satisfaction) and business (e.g., productivity, cost reduction, decision quality, employee commitment) lines.

Another interesting comment was almost universally voiced-it was perceived that, although the first shift had the most skill and experience, it had a significant problem with cooperation and cohesiveness among its members. Therefore, while on paper the first shift team should have out performed every other group, their interpersonal group dynamics seemed to cause a break down of team synergy, resulting in much lower performance than expected.

Effects of Self-Management at NTRB

Employee Attitudes

Most employees, both internal and external to the self-managing teams, said that self-management had made their jobs more interesting, more personal, and had increased their job satisfaction. Surprisingly, most people did not believe that the test group's moral was any higher then it was before going to self-management.
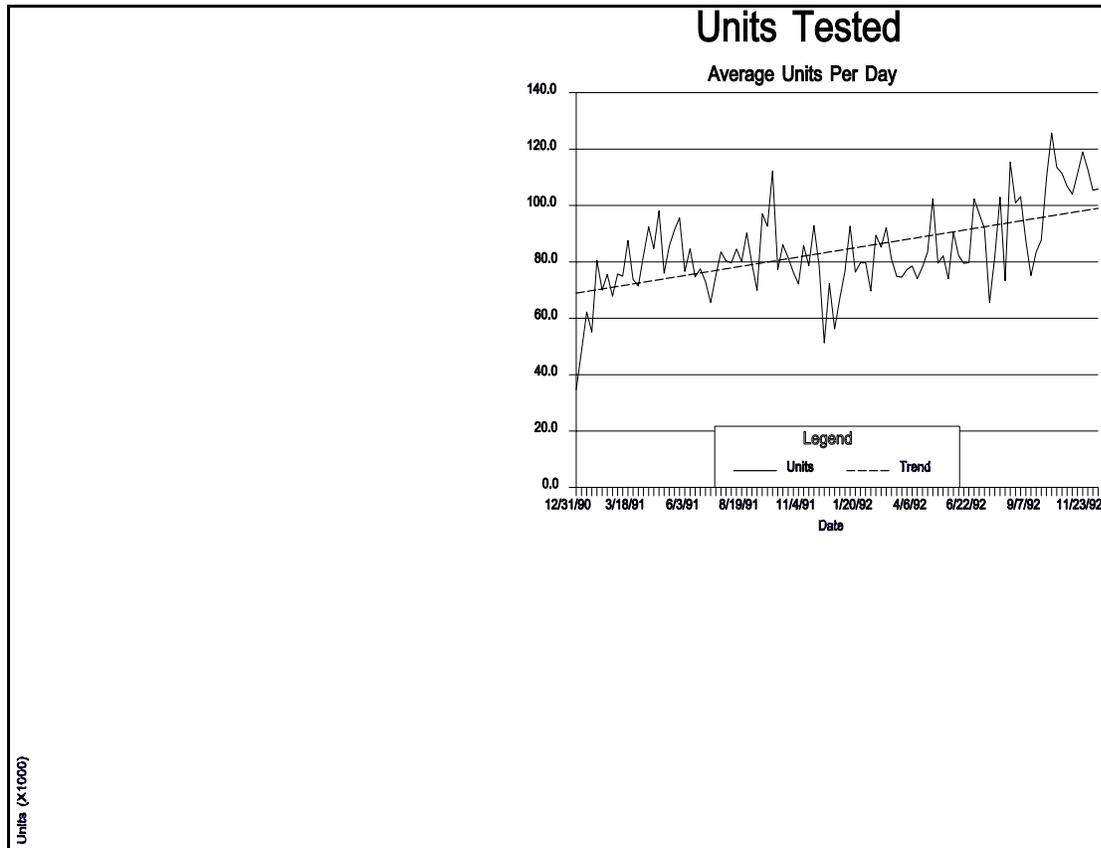
Figure 5 - Average Daily Units Tested

Worker Motivation

Self-management increased worker motivation primary through social peer pressure. The peer pressure to perform in this setting could be significant, and it had a norming effect that did not exist under the old management system. Once incident was recounted about how the change to self-managed teams was enough to cause one underperformer to quit.

That worker was known for getting to work late and working slowly. The floor manager had been willing to put up with her poor performance. There was no pressure from the group to perform. In fact, the worker self-admittedly was underperforming under the old management system. After going to self-managed teams, the other team members saw that this worker was hindering the group's output. The team then put pressure on the worker to increase their performance. Ultimately, the worker felt so uncomfortable under this pressure that the worker chose to quit rather then increase their performance level.

Costs

Parts usage reduction. Accounting practices over the two years prior to this case study did not allow practical retrieval of cost data for expenditures on tools and equipment parts. However, the two team members in parts inventory control were adamant in their conviction that expenditures had decreased substantially since changing over to self-management. They estimated a net reduction of 30%, and as high as 70% for some items.

To explain this reduction, they provided two examples. First, there was a tool known as a "flat finder" which the operator initially insisted that they needed. There was also a problem with these tools getting lost. When the team was told that the cost for these seemingly simple and inexpensive instruments was $1,500, the operators found that they did not need it as much as before, the loss rate plummeted, and the operators were willing to share.

As a second example, an electronics board that costs $600 used to be routinely thrown out and replaced with a new one. When the team found out about the board's cost, the technicians began to be more diligent about trying to repair the card rather then replacing it with a new one.

In summarizing the reasons for the drop in tool and parts expenditures, they commented that before self-management, team members felt that cost control "wasn't my concern." When the team

became responsible for managing itself, coupled with the offshore
job threat, costs began to be reviewed by the team and curtailed
were possible.

Cost to test. Both the Northern Telecom Rancho Bernardo and
Ottawa plants tested ICs. According to their common director,
both used the same equipment and procedures. There was no
significant difference between them other than that Rancho
Bernardo was self-managed and Ottawa had a traditional management
structure with floor managers and supervisors. However, the cost
to test at Ottawa was 4.5 cents per second, versus 1.3 cents per
second at Rancho Bernardo, a 71% lower cost. Overall, he
estimated that self-management had saved NTRB $3,000,000.

Spending. In 1990, the last full year test was structured
traditionally, test and assembly's spending was approximately
$11.3 million. In 1992, the first full year that test and
assembly was structured as self-managed teams, spending was around
$7 million (Ross, 1992). This constituted a reduction in spending
of 38%.

<u>Productivity</u>

Most people that were in or associated with the testing group thought that the productivity of the teams was greater with self-managing teams. However, almost no one had any sense of what the actual numbers were. This was made most evident when the primary test planner, who tracks the raw productivity data, was indecisive about even a qualitative estimation of whether the group's productivity had increased or not.

Numbers provided by the Director of Test and Assembly showed that in 1990, with 127 test and assembly employees, NTRB had shipped around 12.2 million chips, or 96,100 chips per test and assembly employee. In 1992, with 59 employees, it shipped 17.9 million units, or 303,000 chips per employee (Ross, 1992). This is an increase of 215%.

One of the test planners provided some raw testing data. The actual data is in Appendix F. 5 presents a graph of the average daily units tested during 1991 and 1992, as well as the linear regression line. Since the test floor tested each IC twice, once on a wafer and once it is in a chip, these numbers are approximately twice that of the shipped units.

Some units took much longer to test than other, e.g. hand tested chips versus automated tests. Hence a shift in unit type could cause a dramatic difference in the units tested per day. However, this should have tended to average out over time. Therefore the regression line should provide a general trend of

productivity.

The trend line shows that the estimated daily test output rose from 76,700 units per day on July 1, 1991, to 99,000 per day on December 7, 1992. This is an increase of approximately 26%.

The data, however, does not include the reduction in the testing work force. With 127 employees when the test floor went over to self-managed teams in July 1991, and a July 1, 1991 trend line value of 76,700 units, the estimated average daily output is approximately 604 units per day per person. On December 7, 1992, with 59 employees and a trend line of 99,000 units per day, the output is nearly 1678 units per day. This equates to an increase in productivity of 178%.

Even though there appears to have been a definite increase in productivity, it is unclear how much of it was due to increased worker effort, and how much of it was attributable to increased automation. For example, during 1992, the test engineers were able to upgrade the software to decrease the testing time for the E99 type IC chip by 37%. General estimates by management and engineering was that increased team member efforts amplified testing productivity by about 40%.

CHAPTER VI

DISCUSSION AND CONCLUSION

Discussion

Factors Favoring Contributing Groups

There is fairly conclusive evidence that participation by employees can improve business operations (Barry, 1991; Cordery et al., 1991; Fandt, 1991; Manz et al., 1990; Milliken & Vollrath, 1991). Furthermore, in rapidly changing industries with well-educated workers, as the levels of worker involvement and participation have increased (e.g., quality circles, job enrichment, empowerment) there has been a corresponding improvement in business operations (Donovan, 1986; Lawler, 1986).

Not enough scientific studies have yet been done to conclude if self-managed teams will continue the trend of business improvement through ever greater participation (Goodman et al., 1988). Yet, the evidence collected thus far seems to support this premise, at least in particular situations (Cordery et al., 1991; Fisher, 1993; Goodman et al.; Lawler, 1986; Orsburn et al., 1990; Pearson, 1991; Sims & Lorenzi, 1992; Wellins et al., 1991; Appendix B).

Certainly the case study herein supports the contention that self-managed teams are more productive than simple employee

participation. Before the establishment of self-managed teams, Northern Telecom Rancho Bernardo had participative management as the first of its seven listed values (Northern Telecom Rancho Bernardo, 1985). Yet when the teams went to self-management, their testing employee productivity increased over 170%. While additional automation had played a part in improving the team's productivity, the consensus was that the team members' improved performance alone had accounted for an increase in productivity of 40%. There was no current opposition to the teams, and the vast majority of NTRB employees, both in and outside the teams, spoke very highly of the teams' successes.

So if more employee involvement can lead to improved business operations, with self-managing teams demonstrating both the most employee involvement and the most improved business results, a logical conclusion would be to extrapolate this trend to obtain better results with higher involvement. The contributing group structure is designed to do just that; making everyone in the organization an owner of a business within an organizational umbrella.

The case study also seems to support this extension. The case study team was missing some features and suffering under others, that, if corrected, could be expected to improve its operations. The team did not have the training or education to, among other things, perform cost analysis and facilities management. It did not have a tie-in between group financial performance and rewards. Most members felt that management would

eventually disband the group and that they had no control over the decision; this left them uninterested in improving the team.

The contributing group structure would have directly addressed the last two issues. Furthermore, the direct tie-in between financial performance and rewards would have likely motivated the group to improve performance (Goodman et al., 1988; "Most effective variable pay plan: . . .", 1992) and research ways to reduce costs.

It is true that most team members did not have the training and experience to be actively involved in managing the business side of a contributing group. However, some members (e.g., Hal and Sandra) exhibited abilities to act as temporary business managers while those members who wanted to be involved in the business decisions were improving their appropriate skills. In effect, a contributing group structure, applied to the case study team, would have allowed and forced the team to improve its business performance further.

Factors Against Contributing Groups

The employee involvement-business performance trend suggests that, once in place, a contributing group structure would result in improved business performance in at least some situations. However, the biggest obstacles facing the contributing group structure appear to be establishing them initially.

Management resistance. Middle and front-line management resistance is often a significant problem in establishing self-managing teams in an existing organization (Fisher 1993; Manz et al., 1990; Wellins & George, 1991). Because resistance comes mostly from middle and front-line management, active senior management support and direction can overcome this resistance, as is typically the case in successful self-management implementations.

However, in a contributing group structure, senior management would face the same fears and insecurities that confront lower management when setting up self-managed teams. Instead of controlling the organization, they would serve as the employee of the organization's members and would be subject to dismissal (i.e., non-renewal of their contract) if they failed to serve the needs of those members. Hence, far from proposing a conversion to a contributing group foundation, senior management may resist the establishment of a contributing group structure much as middle and front-line managers sometimes resist the establishment of self-managed teams.

Furthermore, without the guidance and supervision of superiors, senior management may have capabilities to obstruct organizational change efforts that are not available to lower level management. Overt opposition may include directly confronting the organization's owners with vocal opposition to converting to a contributing group structure, either on business

or philosophical grounds. They may also threaten to resign, thereby decapitating the organization, rather than accept their new roles. Covert actions could include delivering misreported or misrepresented performance data once a contributing group structure was established in the hopes of terminating the experiment and reverting to a traditional structure. Although the role of senior managers could be expected to be much more supportive than directive in a contributing group structure, their central role would still afford them many opportunities for informational sabotage.

The case study presented an example of how serious an obstacle this could be to converting to a contributing group structure. Even though the director was a strong supporter of self-managed teams and the abilities of empowered people, it seemed extremely unlikely that the director would have been willing to reverse the superior-subordinate situation.

Overall, in the best cases the potential for senior management resistance to a contributing group structure presents many additional pitfalls beyond those faced when converting to a self-managed team organization. In the worse case, senior management's resistance alone could make the implementation of contributing groups an impossibility.

Investor resistance. A contributing group implementation reduces the investor's influence in the organization to that which the financial liaison group could weld though its uses of the corporate funds. While this is not a problem with self-managed teams, where senior management retains ultimate control, it may prove such a foreign idea to investors that they would force senior management to reject it.

Union resistance. Unions have sometimes strongly resisted attempts to set up self-managed teams (Hoerr, 1989a, 1989b; Lawler, 1986; Orsburn et al., 1990). The role and need of unions in a contributing group organization could be substantially diminished, and therefore could create even more resistance. Unless a significant role was found for the union, it is unlikely that implementing a contributing group structure would be possible in a unionized organization.

Training. The need for training to build and maintain successful self-managed teams is voiced throughout the literature (Allcorn, 1989; Carr, 1991; Manz et al., 1990; Mckee, 1992; Orsburn et al., 1990; Romer, 1987; Wellins et al., 1991; Wellins & George, 1991). This case study supported this premise, where it appeared that training would have significantly benefitted the team in many areas, both technical and social. The literature has also pointed out the high cost of training (Plunkett & Fournier, 1991; Orsburn et al.).

However, it is likely that the training and education that would be adequate for a self-managed team, would be woefully inadequate for contributing group members. Because of the entrepreneurial aspect of each contributing group, for a group to be truly member managed, its members would almost certainly require some business knowledge and the skill to make mature, logical decisions. In fact, to operate more effectively than traditionally structured organizations, this structure would probably require, as a foundation, a well-educated work force that exists only in today's most industrialized countries.

Even assuming an educated work force, the cost of training would probably be much higher than in the self-managing organization. Therefore, although the cost/benefit analysis of training for self-managed teams may be acceptable, this may not be the case for contributing groups.

Size. Another problem with establishing a contributing group structure is that there may be restrictions on the size of the potential organization. Because of the problems listed above, it may be impossible transforming an organization that has grown beyond a certain upper limit. A unionized organization or one publicly traded would be significantly less than a prime candidate.

With each contributing group having an optimum size in the six to eighteen person range (Orsburn et al., 1990; Wellins et al., 1991), a company with less than fifty employees may not yet

have reached a critical mass to benefit from contributing groups. In fact, because of the more personal worker environment in such a small company and the connection between individual performance and company productivity (Hodge & Anthony, 1990), these small companies may already have many of the benefits that are the objectives of a contributing group structure. Unfortunately, by the time a company reaches the critical mass to benefit from contributing groups, its senior management may already be too entrenched and comfortable to willingly submit to a contributing group conversion.

Team maturity. It is unreasonable to expect a work force that is accustom to traditional management to suddenly be team players in a member managed group (Allcorn, 1989; Orsburn et al., 1990). Workers both in a greenfield plant and, more so, in a traditional plant undergoing a transformation, most likely would require considerable training and acculturation to the contributing group philosophy. The members of the case study team would have experienced considerable stress and uncertainty, and certainly a prolonged productivity drop, if they had been asked to become a contributing group without first undergoing extensive maturing as a team. In such cases, it may be necessary to develop the teams into mature self-managed teams (Orsburn et al.), and then, once the teams are comfortable with their self-management and team roles, change the organization over to contributing groups.

Pilot programs. Many self-managed teams are introduced as pilot programs in a plant or even in a section of a plant (Orsburn et al., 1990). However, a central premise of contributing groups is that the front-line groups contract management. This makes it difficult to establish contributing groups as a pilot program, since this implies that management will still ultimately control the contributing groups, thereby undermining the structure and its objectives.

However a pilot program may be possible in a case where the corporation's senior management establishes a physically separate, self-sufficient business unit that sells to external customers, and makes a contract with the pilot site that it will be allowed to continue operating as long as it meets certain performance criteria. This situation would also permit any involved union to have a role by representing the members of this now independent business unit.

The employees in such a plant would divide into groups, who would in turn contract management (coordinating contributing groups) and executive management (Executive coordinating contributing group). Corporate management would then effectively become the sole investor of the contributing group business, with a financial liaison group connecting the two. Because the business unit would be independent, the parent company would likely have to establish the pilot plant as an independent entity to protect itself from financial and legal liability for business

decisions made by the plant. In many ways, the parent company would be selling the business unit to the front-line employees.

Of course this type of pilot program would require that the parent company be willing to give up control of a financially viable portion of its business for an indefinite time. This set up would be far from just putting in a test structure in a section of a plant that could later be shut down if unsatisfactory. For instance, the entire facility where the case study was done would not have been suitably self-sufficient pilot business segment. Even if the entire Northern Telecom Rancho Bernardo facility was converted to a contributing group structure, all its products would only have been salable to other NT customers; therefore management could ultimately shutdown the plant by just ceasing to purchase from them, largely undermining the sense of control that drives the anticipated effectiveness of a contributing group structure.

Not only would the parent business have to give up control of a viable business unit, it would also have to be prepared to compete against the new contributing group facility. For example, while the parent company may set up such a pilot program in one of many similar plants, because of the nature of contributing groups, it would have to be prepared to have its sister plants compete against the now independently minded plant.

Additional problems. An organization attempting to use a
contributing group structure, even if it overcame all the
problems above, may face other external problems. A contributing
group structure is far removed from the top-down image that
American society has of how a business is ran and controlled.
For example, although they are outside the scope of the research
for this thesis, labor laws and taxes may present unintended
obstacles.

Labor laws, for years designed to protect workers against
abuses by management, may conflict with the hours, investments
and efforts a member might wish to contribute in a member managed
group. Tax laws, made for corporations with hundreds or
thousands of employees, may prove disadvantageous to a structure
that is designed to be made up of small teams of member-managers.
 For example, if a contributing group structure, using a
corporation for each contributing group, was set up in
California, each group would be subject to an $800 minimum state
tax. If all these members were employees of one large
corporation, the entire corporation would only be subject to one
$800 minimum tax (California Franchise Tax Board, 1993).

Conclusions

If organization-wide implementations of self-managed teams are more effective than other forms of management, then there is reason to believe that a contributing structure may prove even more effective. However, only further research will conclude whether and where self-managed teams are more effective than other forms of participative management.

Although a contributing group structure may be more effective, there are many obstacles to its implementation. Because of this, a contributing group organization would most likely appear in one of two forms. First, a small firm may start out with the intent of converting to a contributing group structure when it grows sufficiently. To succeed, such a firm would constantly have to be moving in this direction, giving its workers team training as the company grew. Furthermore, the firm may need to spell out in writing the time-line and guidelines for the transfer of responsibility, so that the employees have a clear understanding of what to expect and when.

Second, a large firm may wish to experiment with the concept by spinning off a relatively small strategic business unit into a contributing group structured business. This implementation too would require years of preparation if the unit was to be successful. The closer the business unit was to being a self-managing organization, the closer the unit would be to undergoing a successful contributing group transformation.

Regardless of how they are introduced, the contributing group structure has the potential to display strong competitive advantages. If it does, in a form of capitalistic Darwinism, firms that use it will tend to triumph over more traditional firms that don't.

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APPENDICES

APPENDIX 1)

SAMPLE COMPANIES USING SELF-MANAGED TEAMS

SAMPLE COMPANIES USING SELF-MANAGED TEAMS

3M	Lawrence Cable
A.O. Smith	LTV Steel Co.
Aetna Life & Casualty	Marlin-Rockwell
Aid Assoc. for Luthrerians	Mary T. Inc.
American Transtech	Master Industries
AT&T	Mayo Clinic
Bell Labs	Mazda
Best Foods	Mead
Blue Cross of California	Mediation & Concil. Srvc.
Boeing	Miller Brewing Company
Borg-Warner	Milliken & Company
Caterpillar Inc.	Mission Manufacturing
Chaparral Steel	Mt Taxi
Centrilift	NCR
Colgate-Palmolive	Newark Quartz
Corning	Northern Telecom
Cummings Engines	Nummi
Dade County Schools	Pepsi-cola
Dana Corporation	Procter & Gamble
DePalma Hotel Corp.	Rio Grande Jewlry Supply
Digital Equipment Corp.	Rohm & Haas
Eaton Corporation	San Diego Zoo
Federal Express	Sara Lee Knit Products
Federal Reserve Bank	Screiber Foods
First Brands	Seattle Metro
FMC	Serwin-Williams
Ford	Shenandoah Life Insurance
Frito-Lay	Specialty Records
Gaines Pet Foods	Standard Meat Company
GE Aircraft	Steelcase Canada
General Dynamics	Suburu-Isuzu
General Foods	Tavistock Coal Mine
General Electric	Tektronix Inc.
General Mills	Tennesse Eastman Company
General Motors	Texas Instruments
Global Metallurgical	Toyota
Goodyear	TRW
Hewlett-Packark	Volvo
Honeywell	Warner Lambert
Howmet	Westinghouse Airdrie
Hotel Okura	Westinghouse Canada
Hughes Tool	Weyerhaeuser
IBM	Windsor, Connecticut
IDS	Xerox
Inter-First Bank	Yaesu Book Company
Johnsonville Foods	Zilog
Johnsonville Sausage Co.	

Sources: Barry, 1991; Donovan, 1987; Donovan, 1989; Dumaine, 1990; Fisher, 1993; Harrington, 1990; Hoerr, 1989, July 10; Manz, Keating, & Donnellon, 1990; McKee, 1992; Orsburn, Moran, Musselwhite, & Zenger, 1990; Peters & Waterman, 1982; Schilder, 1992; Torres & Spiegel, 1990; Wellins & George, 1991

APPENDIX B

SAMPLE QUANTIFIED SELF-MANAGED TEAM BENEFITS

SAMPLE QUANTIFIED SELF-MANAGED TEAM BENEFITS

a) Northern Telecom's Silicon Components Plant in Rancho Bernardo, California reported a 215% increase in testing productivity since changing over to self-managed teams. While much of the increase came from engineering improvements and pre-planned reductions in overstaffing, approximately 40% of this was attributed soley to the changeover to self-managed teams. The per second cost of testing here is 71% less than at an identically equipped plant in Canada.

b) General Mills' Lodi, California plant has increased productivity 40%. At its Carlisle, Pennsylvania plant, teams were able to increase production 5% even though management believed it was running at 100% capacity (Dumaine, 1990). Furthermore, the Lodi plant operates without any managers during the night shift (Orsburn, Moran, Musselwhite, & Zenger, 1990).

c) Aetna Life & Casualty reduced the manager to worker ratio from 1:7 to 1:30 while improving customer service (Dumaine, 1990).

d) Productivity at Johnsonville Foods has risen 50% (Dumaine, 1990).

e) Federal Express cut service problems by 13% between 1988 and 1989, a year after going to self-managed teams. One team saved the company $2.1 million in 1990 by revising its package examination procedure (Dumaine, 1990).

f) Global Metallurgical reported the following benefits from self-managed workteams: 380% increase in productivity in 3 years; returned products dropped from 44 lots to 0 in 2 years; $500,000 net income per employee per year (Harrington, 1990).

g) General Electric's Salisbury, North Carolina plant, through a combination of flexible manufacturing, computerized systems, and self-managed teams, increased productivity by 250% (Schilder, 1992).

h) Management of Northern Telecom's Morrisville, North Carolina plant expected the telecommunications repair facility to have steady and money losing business. However, after changing over to self managed teams, revenue increased 63%, sales improved 26%, earning improved 46%. Productivity increased 60%, scrap decreased 63%, quality increased 50%, and quality inspectors dropped 40% (Schilder, 1992).

i) Protor & Gamble's 18 self-managed plants operate at 30 to 40%

higher productivity than traditional P&G plants (Orsburn, Moran, Musselwhite, & Zenger, 1990). Their manufacturing costs are also between 30 and 50% lower (Fisher, 1993).

j)Sherwin-Williams' paint cost is 45% lower at its self-managed plant in Richmond, Kentucky than at its sister plant. Productivity is 30% higher and absenteeism 60% lower. Both plants use the same equipment and materials. Since going to self-manged teams, returned products are down 75% (Fisher, 1993).

k)The GM and Toyota joint venture, NUMMI, produces 250,000 cars per year with 2,500 employees arranged as self-managing teams. When this same plant was a traditional GM plant, it had 7,800 workers producing fewer cars (Fisher, 1993).

l)In 1987, a self-managed team of 8 hourly workers at Caterpillar's Decator, Illinois facility reduced costs by nearly $100,000 per year in its first 6 months. Between 1986 and 1989, they were able to reduct thier product's unit cost by 16% (Stephens, Romack, Moore, Rupert, & Morgan, 1989).

m)Dana Corporation's DCS (Dana Computer Services) lowered batch processing errors by 73% in less than a year after implementing self-managed teams (Weis, 1992).

n)Self-managed teams were introduced into a General Foods plant in Topeka, Kansas. This plant reduced costs by 5%, saving $1 million per year (Torres & Spiegel, 1990).

o)Volvo's Kalmar plant reduced the time it spent on each car by 40%, inventory went from 9 times to 21 times per year, and production increased from 96% to 99% (Torres & Spiegel, 1990).

p)Workers at a General Electric plant were able to achieve production schedules 50% faster than management estimates (Torres & Spiegel, 1990).

q)After going to self-managed teams, the Shenandoah Life Insurance Companny's ration of supervisors to employees changed from 1:7 to 1:15 (Torres & Spiegel, 1990). They were also able to process 50% more with 10% fewer people (Orsburn, Moran, Musselwhite, & Zenger, 1990). Case handling time went from 27 days to 2 days (Fisher, 1993).

r)Zilog's wafer fabrication plan in Nampa, Idaho has a yeild of between 90 and 95%. This compares to an industry average of 75%. Moreover, its turnover rate has been as low as 2 to 6%. The same type facilities in california were seeing

turnover rates of 50 to 55% at the same time (Torres & Spiegel, 1990).

s)When General Motor's Livonia, Michigan plant went over to self-managed teams, it was able to eliminate the mid-management layer and reduce foreman by 40% (Torres & Spiegel, 1990).

t)Johnsonville Sausage Company has eliminated formal supervision from its four plants. A team runs each plant (Torres & Spiegel, 1990).

u)Dana Corporation was able to reduce its corporate staff from 475 to 100, and its management layers from fourteen to six, while sales were quadrupling (Torres & Spiegel, 1990).

v)A self-managed team at Tektronix produces as much product in three days as an assembly line use to make in fouteen days (Orsburn, Moran, Musselwhite, & Zenger, 1990).

w)Aid Association for Luterans (AAL) used self-manged teams to increase productivity 20% and decrease processing time 75% (Orsburn, Moran, Musselwhite, & Zenger, 1990).

x)Rohm and Haas' Knoxville facilities has raised productivity 60% since the change to self-managed teams (Fisher, 1993).

y)Self-managed miners at the Tavistock coal mine generated 25% higher output, at lower costs, than on a comparison face. Safety increased 50%, while sickness and absenteeism went down 50% (Fisher, 1993).

z)Westinghouse Airdrie cut cycle time to one week from seventeen (Fisher, 1993).

aa)Compared to its conventional operations, Xerox's self-managed teams are at least 30% more productive (Fisher, 1993).

bb)Weyerhaeuser's Manitowoc plant has increased output 33% and profits 100% with self-managed teams (Fisher, 1993).

cc)The Harrisburg Northern Telecom facility increased profits 100% (Fisher, 1993).

dd)Output increased 280% and quality went from 82% to 99.5% at Honeywell's Chandler facility (Fisher, 1993).

ee)American Transtech cut costs and processing time by 50% (Fisher, 1993).

ff)AT&T, using a structure similar to self-managed teams, was able to beat a PBX hardware development schedule by 2

months, or more than 25% of the time allocated (Glass & Sanders, 1992); something unheard of in the software/hardware development industry.

gg)A team at Northern Telecom's Santa Clara self-managed facility was able to acheive a 214% increase in software quality (Northern Telecom, 1992).

APPENDIX C
DERIVATION OF CONTRIBUTING GROUP FORMULAS

DERIVATION OF CONTRIBUTING GROUP FORMULAS

The corporate income, Y, generated from a particular contributing group is equal to the gross profits, G, times a percentage of the gross profits, Pg, plus the value of external purchases, X, times a percentage of the external purchases, Pe. Expressed as a formula, this is

$$Y = Pg * G + Pe * X. \qquad (A1)$$

The gross profits are revenues minus cost of goods sold, or G = R - C. The costs of goods sold, C, can further be broken down into internal, Ci, and external, Ce, costs of goods sold so that C = Ci + Ce. Furthermore, the value of external purchases, X, is equal to the external cost of goods sold, Ce, plus the external expenditures exclusive of external cost of goods sold, Ee, or X = Ce + Ee. Replacing these identities into equation A1 gives,

$$Y = Pg * (R - Ci - Ce) + Pe * (Ee + Ce). \qquad (A2)$$

Algebraic manipulation of equation A2 gives,

$$Y = Pg * (R - Ci) + Ce * (Pe - Pg) + Pe * Ee, \qquad (1)$$

which is equation 1 in chapter III.

The profitability of an internal contributing group, Ki,

assuming no capitalization of purchases, is equal to their gross profits, G, minus expenditures other than costs of goods sold, E, minus corporate royalty payments, Y. Mathematically this is,

$$Ki = G - E - Y. \qquad (A3)$$

Substituting in the identity for the gross profits gives,

$$Ki = R - C - E - Y. \qquad (A4)$$

Suppose this contributing group customers are entirely composed of other contributing groups within the organization. Further suppose that this group was to leave the organization and supply the same customers at the same net cost to their customers (The price charged would have to be reduced to compensate their customers for the external purchase royalty they would have to pay). As an external supplier, with no royalty payments, its profitability would now be,

$$Ke = R / (1 + Pe) - C - E. \qquad (A5)$$

Therefore the profitability for the contributing group to stay in the organization, Ks, would be,

$$Ks = Ki - Ke. \qquad (A6)$$

Substituting for Ki and Ke, and manipulating leads to

$$Ks = R * \{ 1 - [1 / (1 + Pe)] \} - Y. \quad (A7)$$

and substituting for Y leads to,

$$Ks = R * \{ 1 - [1 / (1 + Pe)] \}$$
$$- Pg * (R - Ci - Ce)$$
$$- Pe * (Ce + Ee). \quad (A8)$$

However, if we assume that Pe is small enough so that
[1 / (1 + Pe)] is approximately equal to (1 - Pe), then
equation A8 quickly reduces to

$$Ks = (R - Ce) * (Pe - Pg) + Pg * Ci - Pe * Ee. \quad (A9)$$

If Ks > 0, it is advantageous for the contributing group to
remain part of the organization, i.e.,

$$(R - Ce) * (Pe - Pg) + Pg * Ci - Pe * Ee > 0 \quad (2),$$

which is equivalent to equation 2 in chapter III.

APPENDIX D

PERSONAL INFORMATION SURVEY

Personal Information Survey

Thank you for allowing me to observer your team and have it be
the basis of my case study in self-managed teams. It would be
very helpful if I could get some basic biographic information to
both assure that I have it right and to help give the reader a
better idea of the people who made up the team. I would
appreciate it if you could please answer the following questions
and return it to me. If you feel uncomfortable with any of these
questions, just leave the appropriate ones blank and I will leave
it out of the report. Please note that if you wish, I will use a
fictitious name in place of your real name in my Thesis. Thank
you for your time, consideration, and helpfulness!

Name: _____   Age: _____

Would you prefer that I use your real name or a fictitious name?
    ◯Real   ◯Fictitious

Years at Northern Telecom: _____

Years in Testing: _____

Education: ◯Some High School   ◯High School Diploma
               ◯Technical/Vocational School Certificate
               ◯Some College
               ◯Associate Degree   ◯College Degree
               ◯Some Graduate Work ◯Graduate Degree

If you have a Technical/Vocational Certificate,
    what was it in?   _____

If you have a College Degree,
    what is it in?   _____

APPENDIX E

PEER EVALUATION ASSESSMENT SHEET

ASSESSMENT STATEMENTS

Read each statement and circle the number which best describes
the person you are assessing using the following set of
guidelines.

    1. Not characteristic of the person
    2. Slightly characteristic of the person
    3. Moderately characteristic of the person
    4. Very characteristic of the person

hh)Admits mistakes openly and learns from mistakes.

        1   2   3   4

ii)Asks for help when necessary

        1   2   3   4

jj)Demonstrates openness and friendliness to others. (is
    approachable).

        1   2   3   4

kk)Candidly expresses what she/he thinks and feels when
    interacting with others.

        1   2   3   4

ll)Listens to others' ideas and opinions and is willing to change
    own position about an issue based on other inputs.

        1   2   3   4

mm)Deals with conflict in a positive manner (as presented in
    "Communication with Impact").

        1   2   3   4

nn)Expresses ideas clearly.

        1   2   3   4

oo)Changes priorities to meet changing build plan.

        1   2   3   4

pp)Acts appropriately for the good of the team.

        1   2   3   4

qq)Treats others with respect, fairness and empathy.

     1   2   3   4

rr)Uses existing or creates new systems to increase effectiveness (Excellence tools, Continuous Improvement, SPC etc..).

     1   2   3   4

ss)Encourages "possibility thinking" and "intelligent risk-taking".

     1   2   3   4

tt)Concentrates effort(s) on areas which have impact for long-term Divisional success "Continuous Improvement Team" (Excellence!).

     1   2   3   4

uu)Uses time and energy to maximum benefit.

     1   2   3   4

vv)Identifies potential problems and opportunities and assists with resolutions or implementations.

     1   2   3   4

ww)Follow operation procedures (Specifications, standard practices).

     1   2   3   4

xx)Accomplishes work within timeframes agreed to with others (Doing what we say we will do, on time).

     1   2   3   4

yy)Takes charge of a project or task which fits with his/her talents and team goals.

     1   2   3   4

zz)Works customer satisfaction issues with the customer, demonstrating trust and open communications.

     1   2   3   4

aaa) Acknowledges individuals and teams for taking charge of projects or tasks which fit with their talents and team goals.

    1   2   3   4

bbb) Gives recognition to individuals and teams for accomplishing goals within the agreed timeframe.

    1   2   3   4

ccc) Plans and follows through on action(s) to correct deviations from expected performance. (i.e. training, spec review, personal effort).

    1   2   3   4

ddd) Demonstrates competence in his/her specialty area within the team.

    1   2   3   4

eee) Contributes to team meetings.

    1   2   3   4

fff) Helpful in answering questions or solving problems.

    1   2   3   4

ggg) Willingly moves to other job assignments or assists in other work areas when needed.

    1   2   3   4

hhh) Provides oncoming shift with system information and any changes in priorities.

    1   2   3   4

iii) Ensures maintenance of a safe and healthy oriented work environment.

    1   2   3   4

jjj) Exercises sound judgment.

    1   2   3   4

kkk) Places quality as a first priority.

      1   2   3   4

lll)Can be depended upon to "do the right thing".

      1   2   3   4

Suggest one (1) item that would improve this individuals
contribution to TEAM SUCCESS.
_____
_____

APPENDIX F

WEEKLY IC TEST DATA

Table 5 - Weekly IC Test Data

Northern Telecom Production Week	Date	Total Weekly Units Tested	Run Days	Average Daily Units Tested	Trend
1	12/31/90	173.8	5.0	34.8	68.9
2	01/07/91	338.2	7.0	48.3	69.2
3	01/14/91	435.3	7.0	62.2	69.5
4	01/21/91	385.7	7.0	55.1	69.8
5	01/28/91	564.1	7.0	80.6	70.1
6	02/04/91	489.8	7.0	70.0	70.4
7	02/11/91	529.0	7.0	75.6	70.7
8	02/18/91	474.9	7.0	67.8	71.0
9	02/25/91	530.0	7.0	75.7	71.3
10	03/04/91	524.8	7.0	75.0	71.6
11	03/11/91	613.2	7.0	87.6	71.9
12	03/18/91	516.4	7.0	73.8	72.2
13	03/25/91	500.3	7.0	71.5	72.5
14	04/01/91	574.8	7.0	82.1	72.8
15	04/08/91	647.2	7.0	92.5	73.1
16	04/15/91	592.8	7.0	84.7	73.4
17	04/22/91	686.9	7.0	98.1	73.7
18	04/29/91	532.0	7.0	76.0	74.0
19	05/06/91	598.7	7.0	85.5	74.3
20	05/13/91	639.1	7.0	91.3	74.6
21	05/20/91	669.3	7.0	95.6	74.9
22	05/27/91	459.9	6.0	76.7	75.2
23	06/03/91	592.4	7.0	84.6	75.5
24	06/10/91	522.7	7.0	74.7	75.8
25	06/17/91	542.6	7.0	77.5	76.1
26	06/24/91	511.1	7.0	73.0	76.4
27	07/01/91	393.8	6.0	65.6	76.7

Northern Telecom Production Week	Date	Total Weekly Units Tested	Run Days	Average Daily Units Tested	Trend
28	07/08/91	526.2	7.0	75.2	77.0
29	07/15/91	584.9	7.0	83.6	77.3
30	07/22/91	562.8	7.0	80.4	77.6
31	07/29/91	557.6	7.0	79.7	77.9
32	08/05/91	591.9	7.0	84.6	78.2
33	08/12/91	560.9	7.0	80.1	78.5
34	08/19/91	631.9	7.0	90.3	78.8
35	08/26/91	554.8	7.0	79.3	79.1
36	09/02/91	419.5	6.0	69.9	79.4
37	09/09/91	679.7	7.0	97.1	79.7
38	09/16/91	648.6	7.0	92.7	79.9
39	09/23/91	785.3	7.0	112.2	80.2
40	09/30/91	541.1	7.0	77.3	80.5
41	10/07/91	602.8	7.0	86.1	80.8
42	10/14/91	570.6	7.0	81.5	81.1
43	10/21/91	533.8	7.0	76.3	81.4
44	10/28/91	505.4	7.0	72.2	81.7
45	11/04/91	600.9	7.0	85.8	82.0
46	11/11/91	550.4	7.0	78.6	82.3
47	11/18/91	650.5	7.0	92.9	82.6
48	11/25/91	393.0	5.0	78.6	82.9
49	12/02/91	358.7	7.0	51.2	83.2
50	12/09/91	506.3	7.0	72.3	83.5
51	12/16/91	393.4	7.0	56.2	83.8
52	12/23/91	201.7	3.0	67.2	84.1
1	12/30/91	306.9	4.0	76.7	84.4
2	01/06/92	648.8	7.0	92.7	84.7
3	01/13/92	534.5	7.0	76.4	85.0

Northern Telecom Production Week	Date	Total Weekly Units Tested	Run Days	Average Daily Units Tested	Trend
4	01/20/92	558.1	7.0	79.7	85.3
5	01/27/92	558.1	7.0	79.7	85.6
6	02/03/92	487.7	7.0	69.7	85.9
7	02/10/92	626.4	7.0	89.5	86.2
8	02/17/92	596.6	7.0	85.2	86.5
9	02/24/92	645.1	7.0	92.2	86.8
10	03/02/92	567.0	7.0	81.0	87.1
11	03/09/92	523.8	7.0	74.8	87.4
12	03/16/92	522.4	7.0	74.6	87.7
13	03/23/92	541.0	7.0	77.3	88.0
14	03/30/92	549.6	7.0	78.5	88.3
15	04/06/92	518.4	7.0	74.1	88.6
16	04/13/92	547.5	7.0	78.2	88.9
17	04/20/92	585.0	7.0	83.6	89.2
18	04/27/92	717.0	7.0	102.4	89.5
19	05/04/92	557.1	7.0	79.6	89.8
20	05/11/92	575.2	7.0	82.2	90.1
21	05/18/92	518.1	7.0	74.0	90.4
22	05/25/92	542.5	6.0	90.4	90.7
23	06/01/92	575.3	7.0	82.2	91.0
24	06/08/92	556.8	7.0	79.5	91.3
25	06/15/92	558.5	7.0	79.8	91.6
26	06/22/92	716.8	7.0	102.4	91.9
27	06/29/92	582.6	6.0	97.1	92.2
28	07/06/92	643.1	7.0	91.9	92.5
29	07/13/92	459.2	7.0	65.6	92.8
30	07/20/92	572.9	7.0	81.8	93.1
31	07/27/92	720.7	7.0	103.0	93.4

Northern Telecom Production Week	Date	Total Weekly Units Tested	Run Days	Average Daily Units Tested	Trend
32	08/03/92	513.4	7.0	73.3	93.7
33	08/10/92	807.5	7.0	115.4	94.0
34	08/17/92	706.5	7.0	100.9	94.3
35	08/24/92	721.9	7.0	103.1	94.6
36	08/31/92	612.8	7.0	87.5	94.9
37	09/07/92	525.9	7.0	75.1	95.2
38	09/14/92	585.0	7.0	83.6	95.4
39	09/21/92	614.1	7.0	87.7	95.7
40	09/28/92	769.9	7.0	110.0	96.0
41	10/05/92	880.5	7.0	125.8	96.3
42	10/12/92	794.8	7.0	113.5	96.6
43	10/19/92	779.5	7.0	111.4	96.9
44	10/26/92	747.7	7.0	106.8	97.2
45	11/02/92	728.0	7.0	104.0	97.5
46	11/09/92	778.0	7.0	111.1	97.8
47	11/16/92	833.1	7.0	119.0	98.1
48	11/23/92	564.0	5.0	112.8	98.4
49	11/30/92	738.1	7.0	105.4	98.7
50	12/07/92	741.0	7.0	105.9	99.0

ABSTRACT

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The proposed contributing groups are small groups of workers who
would work together on an identifiable piece of work that could
be sold to customers or other contributing groups. Each
contributing group would be a separate, financially self-
sufficient entity. All members of the group would typically
share in managing the group. Collectively, these groups would
contract management to administer the organization. Contributing
groups are in many ways an extension of self-managed teams. An
organization formed into a contributing group structure would
have many similarities to an organizational implementation of
self-managed teams. This thesis investigates the contributing
group proposal by investigating self-managed teams through a
literature review and a case study done on a self-managed team at
Northern Telecom, Rancho Bernardo. The case study's results are
reported, including the team's 178% productivity increase since
going to self-management. The literature and case study results
are then used to evaluate the plausibility of a contributing
group structure. The structure is concluded to be plausible, but
extremely difficult to implement.