CASE STUDY -- LEAN 94-02

A Case Study of Self-Directed Work Teams at Boeing Defense and Space Group - Corinth

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Multi-skilled employees who rotate across various team work stations have become a critical component of lean production. The concepts of job enlargement and enrichment date back to the 1960s (Hackman & Oldham, 1980). But the current push toward broader job definitions has been fueled by research on lean manufacturing (Womack et al., 1990). Prior to the birth of “lean,” however, a quiet revolution was occurring in plants designed around the principles of sociotechnical work systems (Emery, 1967; Chens, 1978; Weisbord, 1987; Orsbum et al., 1990). Here, the boundaries of job definition are expanded beyond what is commonly considered to be lean, as defined by Japanese management manufacturing practices (Klein, 1994).

Sociotechnical work systems strive to provide both job enlargement and enrichment based on the assumption that if employees are organized into teams and each team is assigned all activities associated with a unit of production (or a portion of the process which has a logical beginning and end), they will feel more responsible for the schedule, cost and quality of their labor because they have greater control over the entire process. Furthermore, by giving team members the necessary skills and information to competently perform their tasks, and then delegating to them the decision making authority associated with the daily operation of the team, it is assumed that team members will be more
committed to their jobs and ultimately more committed to accomplishing their team’s production objectives.

Each sociotechnical work system is designed around an operations’ unique mix of process technology and work force characteristics, but most incorporate a number of common characteristics, such as, organization structured around teams, a minimum number of job classifications and management layers, and production and support employees empowered to manage their daily activities. Over the years, sociotechnical systems have acquired a number of labels, including high commitment systems, high performance teams, sociotechnical work systems, self-managed teams, new work systems, and small business teams. The company described in this case study refers to its teams as self-regulating or self-directed. The latter term will, therefore, be used throughout the case study.

Boeing Defense & Space Group - Corinth (BD&SG-C) is a self-directed team based unionized facility in the defense and commercial aircraft industry. The plant was a greenfield start-up in 1987. Due to the nature of the defense business environment, the facility has weathered a changing product mix and surges and plateaus in its employment. The case illustrates the applicability of self-directed work systems in the defense aircraft industry and will identify lessons learned in the start-up and maintenance of such systems, including how experience in developing a labor-management partnership can be carried over to developing a partnership between DoD contractors and their defense contract administrators.
Boeing Defense & Space Group

In 1986, Boeing's Defense & Space Group decided to establish an electronics manufacturing site in Texas based upon the lessons learned from Boeing’s seven-year-old, low-cost commercial electronics facility in Irving, Texas. Much of the success of the Irving plant was attributed to significant wage differentials between Texas and the Seattle area, lower facilities costs, and a reduced overhead burden stemming from being a independent subsidiary. A site 23 miles north of Irving was selected in Corinth (approximately 30 miles north of Dallas) and Boeing Defense & Space Group, Corinth Company, a wholly owned subsidiary of the Boeing Company, was established in early 1987.

In 1993, the facility was selected to be Boeing’s Center of Excellence for electronics. As such, work was transferred into the plant from operations in Wichita, Philadelphia and Seattle. (In addition, the facility absorbed another Boeing subsidiary, UTL). In total, employment grew from 579 (as of 1/1193) to 936 by year end, an increase of over 60%.

Over 550 of the 936 employees (as of January 1994) were considered on the production payroll and represented by the International Association of Machinists and Aerospace Workers (IAM) Local 776. The remainder of the workforce were support personnel, including engineering, technical, administrative, systems, and finance people. The facility operated on a four day, ten hour a day work week. In March 1993, a second shift was added, which by the end of the year totaled about 150 production associates.
Plant Start-Up

The plant manager and HR manager of the Irving plant were assigned the task of starting up the Corinth operation. Although Boeing’s initial plans for the facility were rather traditional (as evidenced by a large, nicely furnished office complex on the second floor of the building), corporate management approved their request and encouraged them to investigate innovative management methods for the new plant. Their search led them to several innovative work sites, including Tektronix’s self-directed work team plant in Forest Grove, Oregon.

After returning from Oregon, they began the search for a highly qualified staff that could support a team-based culture. Aside from bringing along the quality manager, the safety & security manager and two administrative assistants from the Irving facility, the remainder of the Corinth workforce was recruited from outside Boeing. As a result, employees went through a tremendous learning curve during the early days. The primary selection criteria for the new management team was technical expertise and/or background in alternative work designs, and a desire to try new motivational techniques. In addition, most had some military experience either within the armed services or as an employee of other DoD contractors, such as TI, E-Systems, Motorola, Honeywell, etc.

The initial management team, which later became known as the Strategic Planning Team (SPT), was selected in the spring of 1987 and met at Lake Texoma, Oklahoma in June of 1987 for a week to design the new organization. Under the facilitation of an external
consultant, the SPT used an Organizational Planning Process which began with the development of the plant’s mission, philosophy and vision statements (Exhibit 1). By the end of the week, the SPT had outlined their organizational design objectives which included self-directed work teams with a minimal number of organizational layers and a heavy emphasis on the quality of “people” resources.

<table>
<thead>
<tr>
<th>Exhibit 1: BD&amp;SG-C’s Mission and Philosophy</th>
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<tbody>
<tr>
<td><strong>BD&amp;SG-C’s Mission</strong></td>
</tr>
<tr>
<td>• Create a customer oriented company which produces electronics products that satisfy customer requirements for quality, schedule, and cost.</td>
</tr>
<tr>
<td>• Establish an environment characterized by high ethical standards and highly committed, team-oriented, well trained and enthusiastic employees with common goals dedicated to continuous improvement.</td>
</tr>
<tr>
<td><strong>BD&amp;SG-C’s Philosophy</strong></td>
</tr>
<tr>
<td>• Our way of working together to accomplish goals and our mission is based on the following set of beliefs that we share about people and work.</td>
</tr>
<tr>
<td>• People work best when they are in, and feel part of, a team where they can be trusted, and trust each other, to do their jobs; share leadership and make decisions; be accepted and respected; resolve issues with sensitivity and understanding; have the opportunity to accomplish challenging goals and contribute to continuing improvement.</td>
</tr>
<tr>
<td>• People are committed to work and work best in an environment which provides for creativity, involvement, self-motivation, adequate resources and training, open communications, clear, realistic goals and tasks, feedback on their performance, recognition and praise, honesty, integrity, and high ethical standards.</td>
</tr>
<tr>
<td>• People work best when there is a spirit of freedom, equality, dignity, mutual respect and trust.</td>
</tr>
<tr>
<td><strong>BD&amp;SG-C’s Vision</strong></td>
</tr>
<tr>
<td>Excellence through teamwork, commitment, trust, and respect</td>
</tr>
</tbody>
</table>
Although the plant was initially designed to produce only military products, the plan changed in 1989 with the decline in defense spending. At that time, the commercial side of the company was booming; 1989 was a record year for commercial aircraft sales. With capacity utilization at only 40%, the Corinth plant made a proposal to subcontract work with the commercial division. The proposal was accepted. Work areas were separated and the plant began producing a mix of products for both military and commercial applications. By early 1991, the business mix was 85% commercial, 15% military.

With the 1993 transfer of work from other facilities, the product mix shifted back to 60% military. With the increase of DoD work, the military shop became capacity constrained and the SPT decided to integrate some of the military work into the commercial shops. For example, the team assembling KC-135 and B-2 rotary launcher assembly bundles was transferred into the commercial shop in early January 1994.

Plant Organization

The organization, as initially designed by the SPT, had four levels (see Exhibit 2):

- The **Strategic Planning Team (SPT)**, comprised of Functional Team Leaders (FTLs), focused on long-range planning and the overall operation of the facility. The six functions represented within the plant were Finance, Materials, Human Resources, Manufacturing/Production, Engineering and Quality.

- The **Functional Operating Team**, comprised of Area Team Leaders (ATLs) in each functional area, had general month-to-month leadership responsibilities.
Area Business Teams, comprised of Team Facilitators (TFs), handled week-to-week issues.

Unit Operating Teams on both production and support payrolls handled the technical and day-to-day administrative responsibilities of their assigned units. Team members within these self-directed teams shared leadership responsibilities as part of the Pay for Knowledge System (described below).

Manufacturing/Production was lead by two production ATLs, one with the responsibility for the military operation, the other for the commercial shops. Each of the two production areas was divided into several unit operating (self-directed) teams. To assist in coaching and advising the teams, the ATLs had Area Team Coaches (ATCs). ATCs were assigned to one-to-four teams depending on the maturity and size of the teams. In addition, on-the-job trainers (OJTs), who were non-exempt support (non-bargaining unit) personnel, were assigned to each team to train production associates. Other support resources were provided by the various functional operating teams, such as engineering, quality, materiel, finance and human resources.

Self-Directed Work Teams

The organizational design objectives outlined by the SPT included the following statements:

- People work in self-regulating teams that meet performance requirements.
- People are cross-trained for more than one task in their team.
- Team leaders (i.e., facilitators) rotate with team members selecting team leaders.
- Teams have space and time for planning, problem-solving, and other job
related activities. Teams are continuously improving their ability to identify and solve problems.

- People participate in decisions concerning their work environment. People are provided with the training and resources necessary to accomplish team tasks effectively.

These objectives resulted in employees on the production payroll being hired into one of five job classifications (production associates, quality control associates, material associates, electronics technicians and fabrication technicians) and assigned to three types of teams Production, Quality and Materiel. (There was also a small team of four fabrication technicians who was responsible for design and fabrication of support tooling, modifying hardware and supporting facilities. Facilities maintenance and janitorial services were performed through contract services.)

Teams were organized around whole processes or products based on a sociotechnical analysis (Cherns, 1978). Teams typically ranged in size from twelve to sixteen associates, but occasionally a team was comprised of only three or four associates, as determined by the product requirements. (Teams did not cross shifts.) Because of the nature of the plant’s product mix (i.e., contract manufacturing), teams were formed and disbanded rather frequently. Once a team completed its contract requirements, its members were reassigned to other teams. Typically, reassignments were made through an internal posting system which had been designed by a joint labor/management committee.
Leadership Activities

As noted above, BD&SG-C’s work system was designed to empower team members to handle daily administrative activities. As such, each team member, in addition to being responsible for technical skill tasks that contributed to product output, also assumed a leadership responsibility that contributed to team operations. There were ten leadership tasks which rotated on a 1 80-day or 360-day interval depending on the requirements of the role (see the appendix for a listing of specific duties):

1) Administrative coordinator
2) Schedule coordinator
3) Training coordinator
4) Safety coordinator
5) Quality coordinator
6) TQM coordinator
7) Tooling and Equipment coordinator
8) Productivity coordinator
9) Material/Parts coordinator
10) Customer relations coordinator

It was expected that each team member would ultimately perform all leadership tasks. In addition, each team had a rotating facilitator (i.e., team leader) who was selected by team consensus and paid a ten percent pay premium. The premium applied only for the time spent in the team facilitator role, which was typically six months. Team facilitators (TFs) received 50{;0 hours of training to prepare them to lead team meetings, initiate and lead problem solving, coordinate completion of team action items, and serve as an information source and disseminate necessary information to the teams.
Team Leader Roles

The role of team leaders, as described by the SPT in 1988, was to “Develop team members to manage their business on a daily basis and provide leadership by effectively:

- Taking the time to instruct and train team members.
- Developing, communicating, and ensuring the achievement of the overall business plan.
- Guiding team members in the implementation of the business plan for their team.
- Practicing active listening.
- Concentrating on solving problems and identifying issues rather than assigning blame.
- Encouraging team members to make decisions and take risks.
- Giving and receiving feedback.
- Ensuring that “difficult” decisions are made.
- Creating a positive environment in which all team members are valued.

The above applied to all leadership roles: SPTL, FTLs, ATLs, ATCs and TFs. The boundary between layers, particularly the ATL and ATC role, was often adjusted as required and varied from team to team. ATCs, in general, spent the majority of their time on the floor, facilitating daily communications, while ATL’s spent a large portion of their time in meetings. Initially, disciplinary actions were the responsibility of ATLs, but many ATCs assumed this responsibility with guidance and coaching from the Human Resources group.

The amount of decision making authority delegated to TFs and team coordinators also varied based on the maturity of the team and the amount of control the ATL was willing to delegate. For example, the TF or the team itself (via decisions made at team meetings) would decide on the time and length of team meetings, vacation scheduling, etc. in a
mature team, whereas an ATL or ATC would make more decisions in an immature team. The phrase “shared responsibility” was used to emphasize that management (SPTL, FTLs, ATLs, and ATCs) did not abdicate the responsibility for managing the plant, but, to the extent possible, management shared decision making for daily work related activities with team members.

**Team Norms and Metrics**

About one year after the plant started operation, a joint labor/management committee was commissioned to develop a plant-wide set of team norms or expectations based upon the norms that had been developed by each of the production team. After review and approval by all TFs, the norms (Exhibit 3) were printed on a pocket size card and distributed to all associates. The norms also became an integral part of the plant’s new employee orientation process.

In addition to the plant-wide norms, each newly formed team developed its own set of norms. During the team formation process, a HR facilitator (support resource person) led teams through a series of team development activities, which included getting to know one another, where to go for support, and how the team would function and accomplish its objectives. Team members also learned active listening, group dynamics, problem solving techniques and how to reach consensus.
Exhibit 3: Team Norms

As team members of Corinth, we understand that participation in team activities is not an option and that it is our responsibility to:

| ETHICS: | • Follow the Company Code of Conduct and comply with company procedures and specifications.  
• Be here on time, give 100% effort and stay focused on work objectives.  
• Accurately charge our labor and material. |
| TEAMWORK: | • Put team goals before individual goals and be willing to give and accept help.  
• Treat others as we want to be treated and take responsibility for our own actions. |
| COMMUNICATION: | • Listen to other team members, exercise active listening and respect each other’s ideas and feelings.  
• Ask questions when we don’t understand.  
• Speak up when we have important information or concerns to share. |
| QUALITY: | • Understand and meet our customers’ requirements, recognizing that quality is our number one priority. |
| SCHEDULE: | • Set reasonable schedules, make and meet commitments, and follow up to assure compliance. |
| COST: | • Manage our resources to meet team goals while ensuring maximum utilization to time and materials. |
| SAFETY: | • Help provide and maintain a clean, safe work environment for all team members |

To help the teams track their progress, each team developed an Oregon Productivity Matrix (OPM),\(^1\) which identified the team’s key performance factors (e.g., attendance, late orders, equipment downtime, scrap, safety, rework, etc.). Once the factors had been identified, team objectives were set for each factor and progress against those goals was tracked and posted on a weekly basis by the TF from data supplied by team members in each of the various team leadership roles.

\(^1\) The matrix was developed by the Oregon Productivity Center, Corvallis, OR.
Team Meetings

The frequency and timing of team meetings varied depending on team needs and the maturity of the team. Generally speaking, most teams met daily at the beginning of their shifts for five minutes to discuss production requirements and any new developments. In addition, most teams held a weekly team meeting which lasted for 1 to 11/2 hours. (The meeting could last up to 3 hours if the team were counseling a teammate, resolving a conflict or revising its OPM). Team facilitators typically led these meetings. Topics ranged from status reports from each of the leadership roles within the team to production schedules to team problems (e.g., conflicts between team members or individual team member attendance, dysfunctional behavior or performance).

Pay for Knowledge (PFK)

The heart of the team based system at BD&SG-C was the Pay of Knowledge (PFK) system, the basis for which was formulated by the SPT prior to the plant start-up. There were six steps in BD&SG-C’s PFK structure (Exhibit 4). With the exception of Entry Level Step 1, each step had a required amount of training designed to be completed within 180 day period. Step 1 was divided into two 90 day periods. Assuming new hires passed their training, they were given a pay raise at the end of 90 days. If they mastered the technical skills of the job during their first six months, they earned another raise at 180 days. It was expected that all team members would advance though all six steps and achieve team rate in three years.
Exhibit 4: Pay For Knowledge (PFK) Structure

- **Entry**
  - 90 Days
  - Step 1: Post-hire skills
- **Fabrication**
  - Fab. Module 1: Orientation
  - Fab. Module 2: R.F. Module
  - Fab. Module 3: Analog Module
  - Fab. Module 4: Digital Module
  - Fab. Module 5: Microprocessor
- **Quality Assurance**
  - Team Rate Step 1: Post-hire skills
  - Team Rate Step 2: 12 Points
  - Team Rate Step 3: 12 Points
  - Team Rate Step 4: 12 Points
  - Team Rate Step 5: 12 Points
  - Team Rate Step 6: 12 Points
  - Team Rate Step 7: 12 Points
- **Manufacturing**
  - Production Assocs.
  - Shipping
  - Receiving
  - Stores
  - Receiving Inspec
  - Team Rate
- **Material**
  - Team Rate
- **Fab. Techs**
  - Team Rate
- **Elec. Techs**
  - Team Rate

**Note:**
- 90 Days: Continuous
- 180 Days: 12 Points
- 365 Days: Leadership PFK
In March 1988, the SPT created a PFK Advisory Board comprised of representatives from each of the functional production teams, team leaders, support staff and the IAM. The team was instructed to spend a year “getting smart” about PFK through research, reading, talking with experts and plant visits. As a result of their recommendations, a major redesign of the system was begun in July 1989. (The Advisory Board was then rechartered to monitor and continually look for ways to improve the system.)

Technical review boards, composed of knowledgeable technical professionals, were established for each functional PFK area (i.e., production, quality and material) to guide the process of curriculum development and to recommend modifications, as needed. From August to December 1989, most PFK training was suspended while production associate team members and support team members developed training manuals under the leadership of professional instructors. The technical review boards then checked their work for accuracy and completeness.

An eligibility board, comprised of a peer, a technical support person and an OJT, was also created to oversee performance demonstrations and handle disputes. PFK Facilitators (support personnel) within each functional team were created to administer the plan. In addition, the team leadership responsibility of training coordinator was added to coordinate PFK activities within each team. This included the development of career planners to assist team members in identifying and working their teams’ training needs. At the beginning of step two, team members created a career planner to identify the technical courses they would be taking during the next six months. The training coordinator then worked with their PFK facilitator to schedule the training. The process was repeated every
six months until team members reached step six, which was considered the “team rate.”
(Each step required team members to complete twelve units of training.)

Hiring Process

Candidates were qualified through a national contract temporary service. Once candidates passed a validated aptitude test, trained team members interviewed and observed candidate behavior in group problem solving settings and rated their findings against desired attributes. Successful candidates were drug tested and their employment applications were verified. Those that passed were then hired as contract employees for 45 days. Successful candidates then went through an additional four-to-six week training period intended to certify candidates to government contract requirements. This training represented the core level courses in the PFK technical skills plan. During this time, they went through an extensive skills training program to assess their capability to learn a technical skill and demonstrate good team behaviors. Unsuccessful candidates were released to the contract temporary service.

IAM/BD&SG-C Partnership

Shortly after the first production associates were hired, IAM Local 2317 was certified as the

\(^2\)This section draws heavily from Shenberger (1990).
bargaining agent for the production payroll. (Local 2317 belonged to the same IAM District covering the Boeing facility at Irving, Texas.) Although the labor contract was fairly traditional, the contract book was prefaced with a partnership statement (Exhibit 5).

**Exhibit 5: Partners in Excellence: BD&SG-C and the IAM Purpose Statement**

To develop and maintain a high level of trust and respect between the company and the Union so we can: provide a desirable team environment; meet quality, cost and schedule performance goals.

One aspect of the partnership was a monthly meeting where the local union leaders and stewards met with the SPT to discuss general business issues and other non-contract related concerns. It became known as the “5x5 Meeting” because its membership comprised five management and five union representatives; the basis for the meeting was laid out in a 1991 letter of understanding (Exhibit 6). Examples of topics discussed included the transfer of surplussed employees for the Irving facility, implementation issues.

**Exhibit 6: Letter of Understanding on Union/Company Team**

The Company and the Union will plan and implement a consensus decision making team. The team will emphasize communication and teamwork, welcome participation from all disciplines and provide a workplace with the most effective technical tools available. The team will develop its own mission statement and operating procedures. This team’s composition will be fifty (50) percent bargaining unit employees selected by the Union and fifty (50) percent support and management payroll employees. The team’s purpose will be to make decisions or recommendations and resolve disputes between the Union and the Company on issues not covered by the labor agreement between the Union and the Company.

This letter of understanding is not a part of the labor agreement between the Union and the Company. The Union/Company team cannot make decisions on issues that are part of the labor agreement between the parties. This letter of understanding does not supersede the labor agreement between the parties.
concerning the establishment of a second shift and how to handle speeding in the parking lot. The 5x5 meeting was held in the morning of the same day that the local held its monthly union meeting to enable the local leaders to quickly discuss issues and provide feedback to the SPT on potential member concerns. A frequent outcome of the 5x5 meeting was the establishment of joint labor/management committees, such as the PFK Advisory Board.

Dallas-DCMAO/BD&SG-C Partnership

Although the plant strove to develop a new relationship with the IAM and within the operation between management and the production workforce, its initial relationship with its defense contract administrators was rather traditional. (The Defense Contract Management Area Office (DCMAO) was assigned the contract administration of military contracts at BD&SG-C; the assignment was primarily for quality assurance functions.) Although the plant’s philosophy was that of partnership, when it came to dealing with DCMAO, plant management altered their approach to fit into what they assumed were DCMAO’s expectations. As a result, the BD&SG-C quality group members were the only plant personnel to interact with the government quality people.

Shortly after a change in plant leadership in mid 1988, a cross-functional off-site team building meeting was held where the new SPTL learned of a great deal of frustration among the management team toward the contracting auditors. In response, the SPTL approached the plant’s contracting representative with a proposal to improve their relationship and begin to develop a partnership. The initial reaction to the proposal on the
part of the Dallas division of the Defense Logistics Agency (DLA) was suspicion.

Despite suspicions, an off-site meeting was held to explore areas where there might be common objectives between BD&SG-C and DCMAO. In attendance were the SPT and key staff of the Dallas Division for Quality of the DCMAO (Division Chief, Assistant Division Chief, Branch Chief, Section Supervisor, and Boeing’s Quality Assurance Representative). Under the guidance of both an internal and external facilitator, the group discovered that both parties had many common objectives and could help one another meet respective goals. For example, DLA was initiating its TQM efforts and developing In Plant Quality Evaluation (IQUE) guidelines which aimed to develop better relations between contracting administrators and their respective contractors.

Joint mission and philosophy statements (Exhibit 7) were developed and it was agreed that the two organizations would begin to fix problems together as opposed to waging a paperwork battle, particularly relative to Quality Deficiency Reports (QDRs). In addition, it was decided that Corinth would become an informal test site for the new IQUE guidelines.

BD&SG-C also became a model for DCMAO-Dallas as they began to introduce self-directed work teams (SDWTs) within their own agency. Although the facility did not justify a full-time QAR due to the decline in the production output, DCMAO retained an office within the facility to observe and learn about SDWTs. BD&SG-C advised DCMAO on their training needs and BD&SG-C facilitators were used to facilitate several DCMAO meetings.
Exhibit 7: Dallas-DCMAO/BD&SG-C Partnership Mission and Philosophy

Dallas-DCMAO/BD&SG-C Partnership Mission

The Dallas-DCMAO/BD&SG-C partnership will establish a Total Quality Management process that promotes continuous improvement and provides products and services which meet or exceed our customer’s expectations.

Dallas-DCMAO/BD&SG-C Partnership

Our way of working to accomplish our goals and our mission is based on the following set of beliefs:

People work best when they serve as partners in establishing goals toward satisfying customer requirements for quality, schedule and cost.

As partners, people are committed to the accomplishment of their mission and goals recognizing that participative practices are essential to success.

People at the juncture where government and industry meet are most productive in an atmosphere that provides for mutual respect, trust and development of innovative methods to assure a strong national defense in an environment of global economic competition.

People work best when there is a sense of unity based on honesty and high ethical standards and focused on meeting the expectations of our customers.

As a result of these efforts, the DCMAO/BD&SG-C partnership received acclaim and recognition by the DoD, including a “GovernmentlContractor Partnership” display at the Pentagon.

With the consolidation of work from other facilities in late 1993, QAR support increased with the addition of three new people. This created a strain on the improved relationship because there was insufficient time to explain the partnership and conduct team building between the SPT and the new QARs. To rejuvenate the partnership, a second off-site session was held in July 1993 where strategic partnership goals focusing on world-class competitiveness were developed (Exhibit 8).
**Exhibit 8: DCMAO-Dallas/BD&SG-C Partnership Goals**

1. DCMAO-Dallas/BD&SG-C will review our strategic goals quarterly beginning in October 1993.

2. By December 1993 a story board of the DCMAO-Dallas/BD&SG-C partnership will have been created so all our TMs understand it.

3. We will have developed a more effective working relationship among BD&SG-C, ArgoS and DCMAO-Dallas by December 1993.

4. The Contractor/Government partnership will be presented as a model to be emulated by others.

5. Relationships with The Boeing Company and outplant organizations will be improved by August 1994.
   - Mandatory inspections will be reduced.
   - The number of reviews and audits will be reduced.

6. By August 1994 the cycle time of the key processes will have been improved at least 15%.

7. By September 1994 we will have jointly developed a plan that reflects steps and requirements for Boeing self-governance and DCMAO activity in support and evaluation of our plan.

8. Corinth will reach Level 5 IQE maturity by December 1994.
   - Disengagement of non-mandatory GSIs will be completed by January 1996.

9. BD&SG-C will have reached the 6-sigma defect level by March 1995.
   - Process variations will be reduced by 30% by August 1994.
   - Ten innovations (CIOs) in the key processes will be developed and implemented by August 1994.

10. BD&S-C will discontinue reliance on inspection to ensure product quality; quality will be inherent in the build process by June 1995.

11. Corinth will be recognized as a World Class Manufacturer by December 1995

**WCC/TQM Activities**

In 1992, Corinth management recognized that the concepts of World Class Competitiveness (WCC) and Total Quality Management (TQM) provided an avenue to push plant performance to a new plateau. Within the commercial area, a task team
(comprised of production associates (PAs), Quality, IAM reps, manufacturing engineering and quality engineering) met to recommend ways to more effectively handle quality issues at individual work stations. In conjunction with this effort, a side team, consisting of OJTs, quality engineers and SPC engineers, met to establish guidelines for PA self-inspection. The outcome was a Shop Responsibility Stamp (SRS) Plan, which was initiated in December 1992. PAs, once qualified, became Inspector/Builders. By the end of December 1993, 150 PAs had been certified. It was estimated that the impact of SRS was a 10% increase in throughput and a 10-20% savings in hours/bundle. During the first year, however, there was also a 10% increase in training costs and the need to have dedicated OJTs and a team (comprised of a quality engineer, manufacturing engineer, process engineer and production control specialist) devoting a significant portion of their time to the implementation process.

Another outcome of the WCC/TQM effort was the transfer of quality control associates (QCs) into production teams in December 1992. As members of the teams, QCs assumed team leadership roles on a rotating basis with PAs, where appropriate. (For example, in one team interviewed for this case study, the team facilitator was one of the team’s QCs.) As a result of the integration of QCs into the production teams, traditional barriers between quality and manufacturing were reduced and there was an increased ownership on the part of those building the product to produce a quality product. Overall results, however, have been mixed. In retrospect, the transfer of QCs should have been based on team performance rather than on an instantaneous, across-the-board plant-wide basis.
Performance Results

BD&SG-C has been successful along both hard and soft measures. The fact that the plant was chosen as Boeing’s Center of Excellence for electronics is an indicator of its low cost, high quality, on-time performance. In January 1993, BD&SG-C was recognized by the Vice President and General Manager of the Everett Division of Boeing’s Commercial Airplane Group for 100,000 on schedule wire bundle deliveries with a reject rate of .00029 (.029%).

As of January 1994, the plant had received only five written grievances in six years (none of which occurred in 1993, a year of unprecedented growth), and the annual attrition rate has been 54%. In the last attitude survey in which subsidiary’s results were broken out, the Corinth facility scored extremely well in relation to the corporation as a whole. (Exhibit 9 provides a sample of the 1989 survey results.)

### Exhibit 9: Employee Attitude Comparison

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<tr>
<th>Boeing</th>
<th>Corinth</th>
<th>Summary Category</th>
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<tbody>
<tr>
<td>89%</td>
<td>94%</td>
<td>Agreed they are personally committed to quality improvement</td>
</tr>
<tr>
<td>54%</td>
<td>74%</td>
<td>Agreed team leaders are committed to quality improvement</td>
</tr>
<tr>
<td>46%</td>
<td>67%</td>
<td>Agreed team leaders are personally committed to teamwork/involvement</td>
</tr>
<tr>
<td>45%</td>
<td>56%</td>
<td>Agreed they are involved in the quality improvement process</td>
</tr>
<tr>
<td>32%</td>
<td>41%</td>
<td>Agreed face to face communications is effective</td>
</tr>
<tr>
<td>31%</td>
<td>44%</td>
<td>Are satisfied with the fairness of personnel practices</td>
</tr>
</tbody>
</table>
Lessons Learned

This case provides a look at one company’s application of self-directed work teams in the defense aircraft industry. The case illustrates that the concept is viable within the industry and a vehicle to provide needed workplace flexibility to meet DoD requirements. BD&SG-C’s partnership with DCMAO also shows how the principles can be useful in enhancing the relationship between DoD contractors and their audit agencies.

The case highlights a number of lessons applicable to any organization (commercial or DoD contractor) who may be contemplating the introduction of self-directed work team systems:

The Empowerment Process - BD&SG-C found that the same principles apply for empowering teams to perform leadership roles or quality activities. Most importantly, teams must earn as opposed to being given responsibility and authority. Three critical steps are necessary to make this happen: 1) Motives must be sound and goals clearly expressed. For example, reducing costs through the elimination of quality inspectors or supervisory personnel may be a short-term side benefit but lacks strategic focus for employees to rally around. In contrast, most everyone can buy into incorporating quality responsibility into manufacturing teams to assure quality in the product. Likewise, the objective for empowering the workforce should be to better utilize the skills and knowledge of the people building the product, as opposed to reducing overhead costs.
(In fact, some overhead costs, such as training, may increase.) 2) Empowerment once earned, can be lost. If problems occur, such as consistently missed metrics, managers and appropriate support personnel (e.g., quality or HR) may have to step in to help resolve problems. The “help” must be viewed as temporary assistance, not discipline, if empowerment is to survive over the long haul. 3) There must be an ability to obtain real data to predict and design systems to minimize problems in the first place. SPC provides a mechanism to correct such data and also set boundaries for determining when assistance is needed.

**Partnerships:** As with empowerment, partnerships must have perceived value and continually nurtured by the partners. Inattention can lead to a retrenchment to old patterns of behavior, as evidenced by the temporary setback in the BD&SG-C/DCMAO partnership with new entrants who did not have the opportunity to participate in the design of the partnership and the development of behavioral norms. As a result, organizations must periodically revisit the initial partnership objectives and involve current organizational members in reshaping those objectives to fit ever-changing business situations.

**PFK System:** At first glance, BD&SG-C’s PFK system does not fit the mold of paying for the acquisition of additional skills in that every PA or QA receives the same rate of pay after three years regardless of their particular skills or knowledge. Furthermore, top rate does not assume that an associate knows every task within the team. A skeptic could also argue that the compensation system looks more like a traditional seniority based
job progression scheme, except for the shared leadership element, and that an associate could have a free ride after reaching team rate. No doubt, the latter occasionally occurs, but the dynamic nature of the business and technology makes it extremely difficult to retain employment without continually updating one’s skills. In addition, the fact that most every associate reaches team rate may be more a reflection of the facility’s stringent hiring criteria than a sign of a lax progression system.

The real benefit of BD&SG-C’s PFK system is the flexibility it provides. The nature of the facility’s business, i.e., contract manufacturing, requires the ability to reassign associates from one team (or business area) to another on a fairly regular basis. Having all associates at one team rate allows for more flexibility and eliminates any job rate barriers.

**Training:** BD&SG-C’s work system, especially PFK, demands a great deal of time, not only to design, develop, and administer, but also to deliver. The overall cost of designing and developing (not including delivery) training for the first four years was estimated to exceed one million dollars. As of 1994, approximately 4% of labor time was allocated for training.

The original design was to train employees for any tasks they might be called upon to perform; this meant that people were often trained in tasks they did not perform. One of the PFK Advisory Team’s recommendations was to more closely align training to the daily operational needs of the business. The use and review of career planners helps to
assure that the training fits the needs of particular teams as well as the plant in general.

Transfer of Knowledge: To a certain extent, BD&SG-C has been a learning laboratory and Boeing has leveraged many of the plant’s learnings in the redesign and start-up of other facilities. For example, one Corinth’s FTLs participated on a panel of team managers from various companies who spoke to the management team prior to the design of the Auburn Fabrication Plant.

Greenfield vs. Retrofit: There is no doubt that BD&SG-C has had the benefit of starting anew. The plant went to great lengths to break old patterns by hiring its workforce (both management and non-management) externally. In fact, the difficulty of transferring employees in from traditional sites surfaced even after a careful screening of transfers from the Irving plant. The conclusion should not be that such a system is only applicable to greenfield sites, but that the work system is “systemic,” i.e., all the pieces are interdependent. For example, BD&SG-C’s PFK system relies on a hiring process that selects associates who are comfortable with one pay rate for all (after three years of training). This highlights the fact that each sociotechnical work system, be it a greenfield or a retrofit), must tailor its HRM policies and practices (including hiring/selection processes, compensation systems, types of leadership tasks, and the definition of team leader roles) to its unique workforce, technology and business environment.
References


Emery, F. E., The Next Thirty Years: Concepts, Methods, and Anticipations, Human Relations, Volume 20, Number 3, 1967


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Appendix: Leadership Roles

Administrative coordinator

- Daily time transaction corrections into TMS
- Weekly time transaction approval
- Weekly and monthly attendance reporting
- Trend analysis of problem attendance
- Paycheck distribution and problem resolution
- Office supply budgeting and distribution
- Overtime tracking and overtime request report
- Report team attendance and overtime on OPM

Schedule coordinator

- Communicate status/priorities
- Product movement
- Determine priorities
- Manage boundaries
- Process paperwork
- Determine status
- Delegate
- Distribute work

Training coordinator

- Explain PFK system to new and existing team members
- Discuss how system works
- Show new team members where training rooms are
- Communicate responsibility of completing training
- Generate and maintain career planners for all team members
- Provide assistance in selecting courses
- Receive quarterly course offerings and schedule team members into PFK courses
- Assist team members needing to reschedule PFK or certification classes

Safety coordinator

- First aid and CPR
- Chemical awareness
- Emergency response
- Safety inspections
- Housekeeping
- Record keeping
- Ergonomics

Quality coordinator

- Statistical process control
- Yield problem identification and resolution
- Communicate with quality inspector
- Monitor certification logs
- Update OPM chart
– Static meter and larostat

TQM Coordinator
– Educate team members on TQM
– Lead meetings on current project
– Work TQM projects
– Problem solving
– Process improvements

Tooling and Equipment coordinator
– Identify team area facilities problems
– Complete required paperwork to initiate corrective actions for facility-related problems
– Work with facilities personnel to attain approval for movement of furniture or equipment
– Initiate replacement of lost equipment
– Assist team members in establishing need for new or different types of equipment/tools

Productivity coordinator
– Compute realization, distributive direct and rework percent
– Standard development/application
– Performance analysis
– TMS braining for VAR follow-up
– Run BFL charts/pie charts
– Maintain standards/work with engineering if incorrect
– Project BFL
– Report data to team
– Help project needed overtime

Material/Parts coordinator
– Furnish supplies
– Stock supply cabinets
– Coordinate with Program Support on shortages
– Shop order splits
– Maintain rotobin
– Fill shop order shortages
– Receive and report scrap to team
– Assist team members on ordering parts

Customer relations coordinator
– Communicate concerns or problems for your team
– Lead tours through your area for our customers