

Excellence at XEL Communications: Self-directed Work Teams

Employees share the responsibility for competitive improvements.

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The self-directed work team, an alternative to the traditional manufacturing organizational structure, provides a building block in the quest for manufacturing excellence. XEL Communications Inc., a supplier of high-quality electronic components for the telecommunications industry, has experienced significant improvements in cost, quality, and other areas (see Fig. 1) as a result of this organizational philosophy. As process knowledge and autonomy were built within plant teams, overhead support costs also were reduced.

A small, non-union business of about 130 members, XEL transformed its manufacturing systems without adding any overhead — a necessity in a market stressing high quality, short delivery lead-times, and extremely competitive pricing. GTE Telephone Operations is our largest customer; we also serve various Bell operating companies, independent phone companies, and private telecommunications suppliers such as utilities and railroads. The competition in our markets — primarily from domestic companies — has sharply increased in the past two years.

Traditional rigid manufacturing organizations — including the for-

Improvement Indicators (Two Years)

Assembly Defects (PPM)	67% Reduction
Defective Components (PPM)	55% Reduction
Scrap & Rework Cost (\$)	50% Reduction
Leadtime (Days)	75% Reduction (20 Days to 5 Days)
Work-In-Process Inventory (\$)	>50% Reduction

Fig. 1.

mer XEL environment — were designed to relay instructions from the top down to the worker at the end of the command chain (see Fig. 2). Copied from a military chain of command, this system focused on pre-determined standards and heavy supervision of employees. Employees were managed by fear. Management wanted their conformity, rather than their knowledge and expertise.

As customer requirements became tougher and competition increased, senior managers knew that the customary 3-5 percent annual productivity improvements

were not going to be enough to compete effectively in our markets. Reading articles on Just-In-Time/ Total Quality Control (JIT/TQC) and books by consultants Tom Peters and Phil Crosby gave us an idea that dramatic improvements could be experienced even in a small company such as ours by focusing on the JIT/TQC attitude. A major change in attitude is just what we needed, and what we began.

As XEL Communications people have learned during the past three years, however, becoming the “best” in world-class manufac-

turing means change. It presumes a vision of organizational excellence. We've also learned that this change is tough to swallow, particularly if it means eliminating layers of management and releasing the power of the remaining managers to the people they "direct."

Managers must be responsible for teaching and encouraging the team, and training throughout the organization is mandatory.

We began our self-directed work team progression by eliminating one or more layers of management in each plant functional area (see Fig. 3). The remaining managers had to give up much of their directional power, and all of their traditional disciplinary tools (discipline, fear). This "open organization" was a necessity in our transition toward world-class operations.

The underlying principles of XEL's open organization include:

- Take responsibility for your own actions and the entire team (self management).
- The organization must adhere to a value system built on trust, respect, dignity, honesty, and caring.
- The necessity of encouraging risk without fear of retribution must become ingrained.
- The concept of internal customer/supplier relationships is essential.
- Acceptance of the highest quality standards must be the number one motivator.
- Managers must be responsible for teaching and encouraging the team, and training throughout the organization is mandatory.
- Task is always the boss.

Professional Development Team

XEL manufacturing management created a Professional Development Team within manufacturing operations to bring needed training to all employees. Team members included all managers and supervisors plus several individuals from various functions (selected by man-

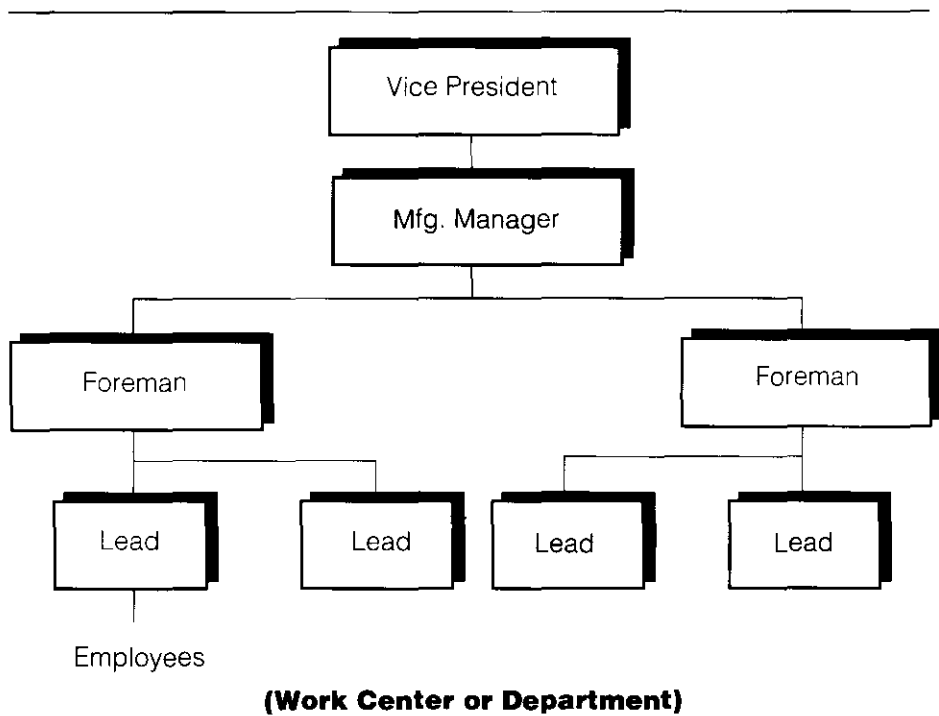


Fig. 2. Traditional top-down manufacturing organization.

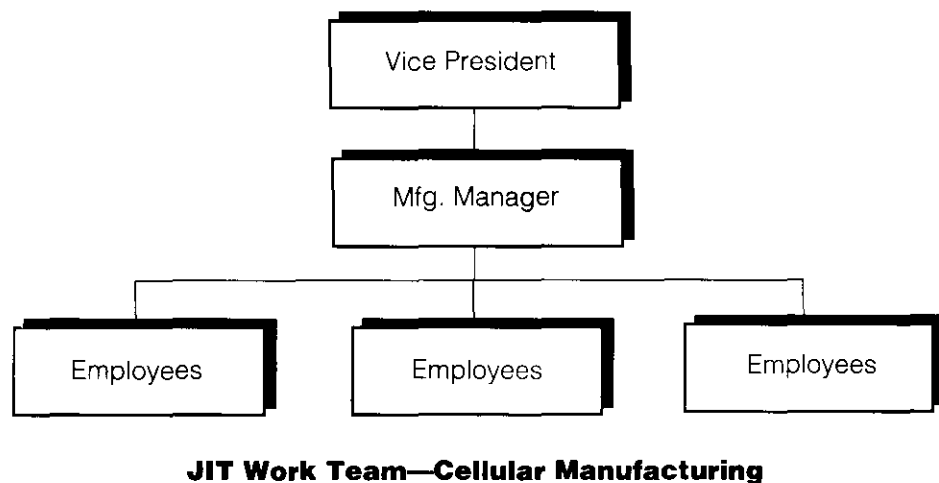


Fig. 3. XEL's organization using self-directed work teams.

Chronology of Transition

Professional Development Team Training	3Q'87-1Q'89
Pilot Team Formation	1Q'88
Full Factory Team Conversion	3Q'88
Production Supervisor Position Removed	1Q'89
Former Supervisors Removed From Teams	3Q'89

Fig. 4.

agement). With the help of a consultant specializing in open organizations and team building, an 18-month "transformation training" process began. Managers and other trainers learned the concepts and skills to be included in the XEL "manufacturing vision" of an open organization. They studied group dynamics, team building, organizational values, motivation, and behavior modification principles.

The Professional Development Team continues to evolve. Several members have left the company to pursue other interests. In our flatter organization, these managers have not been replaced. New team members are selected from various manufacturing departments. Volunteers are screened by remaining team members. Unanimous approval is needed for new members. The team, renamed The Manufacturing Advisory Council (MAC TEAM), advises management in communication, operations, and strategic manufacturing issues.

Conversion to Cellular Manufacturing Teams

Once the transformation process within the Professional Development Team was well underway, the conversion of the XEL production area began. The first step changed the entire factory to Just-In-Time (JIT), cellular manufacturing teams. We converted our traditional factory work center-based layout (Fig. 5) to one that divided all products into four teams and arranged all necessary people and equipment into each of the work cells (Fig. 6). For the entire chronology, see Fig. 4.

Three teams were dedicated to the production of printed circuit board assemblies and one team was dedicated to the production of various mechanical assemblies. Within each cell, each work team of "X Perts" (Fig. 7) received complete production responsibility for a product line or group of products — manual assembly, production testing, packaging, and labeling for shipment to finished goods.

The process was scheduled by our MRP II (Manufacturing Resources Planning) system. Since

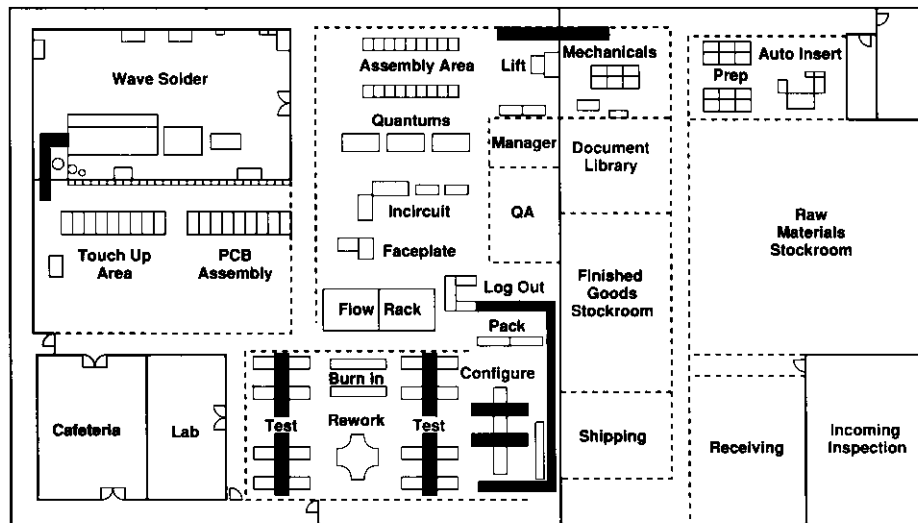


Fig. 5. Traditional manufacturing work centers.

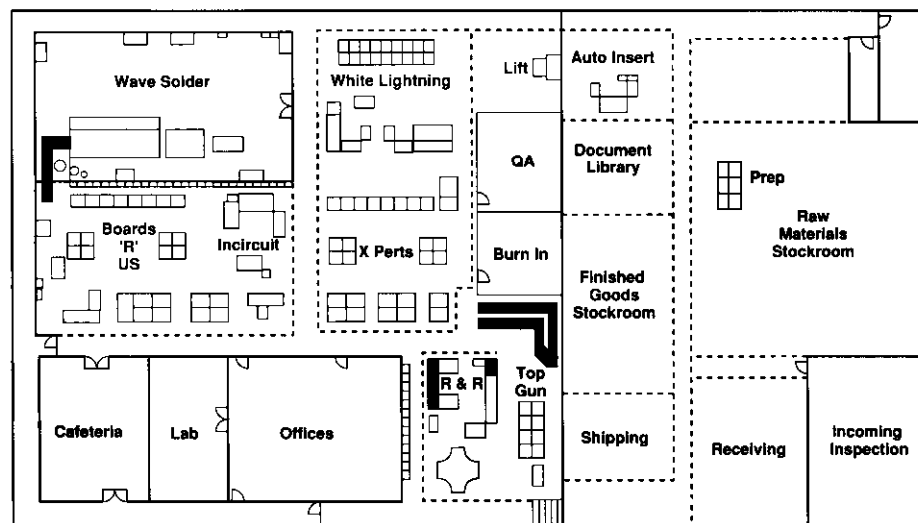


Fig. 6. JIT cellular manufacturing.

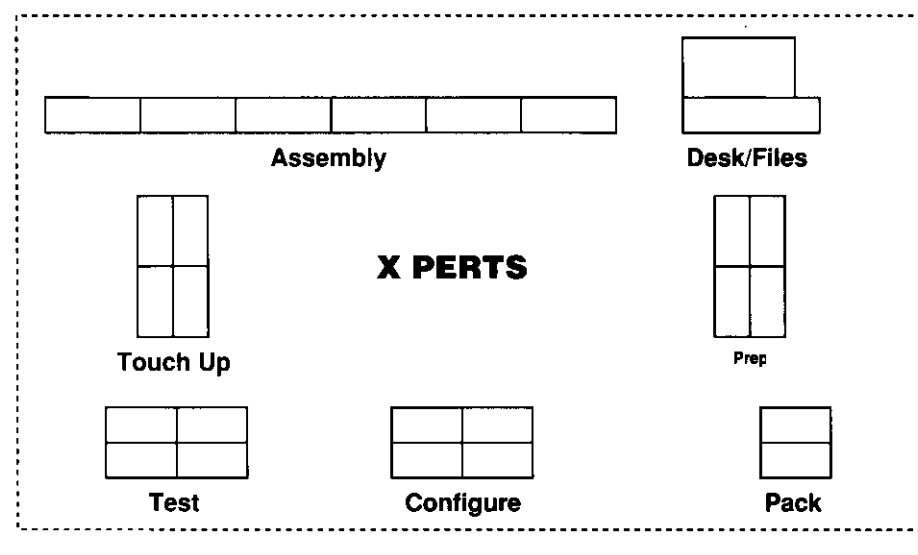


Fig. 7. JIT cell.

we make to stock, the finished goods forecast became the customer. The raw material stockroom became the supplier. JIT manufacturing involving true customer orders and JIT suppliers will be developed later. However, the JIT concept of "pull-systems" was instituted at the beginning, using "kanbans" to trigger prior operations. This conversion was done while retaining the traditional production supervisor positions. Each team selected a team name and designed a large banner to hang in their area.

The Planning Team, composed of several production employees from different production areas, determined that certain common equipment could not be located within each cell. "Feeder kanbans" were created, to handle these special processes. The first of these external "kanbans" was the automated component insertion, since one piece of equipment was sufficient for the requirements of all teams. This special work cell had to serve the other three teams. The Planning Team decided to use three incoming and three outgoing "kanbans" controlled by the requirements of each of the separate teams. The wave solder area was handled in much the same way as the auto-insertion team.

Training Gets Off the Ground

At this point, JIT and TQC (Total Quality Control) training of all production team members started. Top management began coaching employees in the concepts of self-management, preparing for the eventual conversion to self-directed teams through the elimination of supervisors. Prior to this training, led by the vice president of manufacturing, several people from the manufacturing support staff had been sent to formal off-site JIT training so they could train the rest of the organization. The supervisors involved in the transformation also were counseled and trained with regard to their changing roles.

We chose to begin training for the majority of the organization after the conversion to cellular manu-

facturing, to relate the concepts to real-world conditions. Our feeling was, and continues to be, that it is better to hold off detailed training until the opportunity to use the concepts is available, rather than train people ahead of time and lose retention prior to implementation. The risk of production mistakes is outweighed by the educational and training benefits from correcting the errors in the production environment.

While preparing the teams to operate in a self-directed mode, we provided extensive training to all team members in team interaction, systematic problem solving, and Statistical Process Control. Because production requirements in our factory fluctuate, we make extensive use of temporary personnel. As part of the team development process, the team members were taught how to interview and select new members for their teams. Now the teams define their own labor needs based on the schedule requirements and select additional temporary personnel to hire; they also identify surplus temporary employees to terminate.

Measuring Performance

The final step in the transformation process was to establish expectations and accountability for the performance of each team. The training for this phase began by teaching all team members the composition of product cost, and how to identify the portions of the cost structure in which they had ownership and the portions they could influence. The cost accounting structure was modified and simplified to show each team the material, labor, and expense components of their product lines.

The quality indicators were also modified so each team could track its own quality performance. Each printed circuit board team is measured on its assembly defect rate, component replacement rate (both measured in ppm), and final audit defect rate (measured in percent defective). Measures established for solder process and auto-insertion teams consisted of solder defects (ppm) and insertion defects (ppm).

The final measures involve schedule performance: on-time delivery of product to our customer and production linearity. The measure of linearity was based on variance to the established daily production rate as established by the team.

Performance charts track each of the indicators for both the full factory operation and for each team. Improvement targets were established by each team. The individual teams identify and attack the problem they consider most appropriate to meeting their expected improvement objectives using various SPC methods.

Because continuous improvement remains the primary objective, the task is never finished. As each team identifies and solves one problem, they move on to the next. All of the necessary controls have been given to the individual teams. At this point, management leadership consists of encouraging and maintaining the proper environment for risk taking, and keeping the organization focused on the overall requirements and expectations.

As the improvements began to mount, the planning leadtime shortened considerably. Consequently constant communication of changes in requirements and expectations became a critical management objective. Rapid reaction to changes in the marketplace is a real asset to the corporation. Reduced leadtimes, reduced waste, increased ownership in the process, and positive financial returns resulted from the concept of self-directed work teams.

As teamwork developed, many examples of the self-management attitude emerged (see Fig. 9). For example, one team decided to take a day off in the middle of the week and work the following Saturday due to a part shortage. This decision prevented them from building with a part shortage which would have required additional cost to finish once the part was received. It was made by the team, with the production manager's courtesy approval.

QUARTER 2 1989	TQC	PROD	FACT	AUTO	BOX	BRAD	BURN	COM	CONF	DIL	FLR	LOG	MAP	MH	PRTO	REW	SOD	SPEC	WRK	
	TRA	FLOW	FORM	TEST	LAB	MARK	IN	TRA	ITRA	TRA	STK	OUT	SYS	TRA	TRA	TRA	TRA	PREP	TRA	
BOLDEN, JUDITH	A																			
DANG, CHRISTINE	A																			
HAN, HONG	A																			
MITAMURA, MITSUKO	A																			
PARK, IN JA	A																			
PROM, PHIRITH	A																			
TYNDALL, SUSIE	A																			
WASHINGTON, MICHELL	A																			
CURRY, PATTY	C																			
FOSKETT, JACQUE	C																			
SULLY, BETTY	C																			
OAKES, ADDIE	M																			
SMITH, JUDY	M																			
SOK, SENG	M																			
FIELDS, MARY	S																			
LOOMIS, MARY ANN	S																			
LUECK, BECKY	S																			
MILLS, NANCY	S																			
BRIDGMAN, TWANA	T																			
YAFT, NABILA	T																			
YURKO, DIANE	T																			
CLASS LIMITS		8	8	10		4	3	2	8	8	3	2	8	8	8	2	2	4	4	4
CLASSES/COURSE																				
CLASS HRS/QTR																				
TRAINING COURSES																				
ASSEMBLY	COMPONENT PREP	CONFIGURATION		MATERIAL HANDLING/KIT		SOLDERING		TESTING												
REQUIREMENTS:	REQUIREMENTS:	REQUIREMENTS:		REQUIREMENTS:		REQUIREMENTS:		REQUIREMENTS:												
Product Flow	Product Flow	Product Flow		Factory Forms		Product Flow		Factory Forms												
Factory Forms	Factory Forms	Factory Forms		TQC		Factory Forms		TQC												
TQC	TQC	TQC		Map Course		TQC		Product Flow												
Component Course	Component Course	Map System		Floor Stockroom		Map Course		Automated Test												
Prototype Course	Special Prep Training	Log Out to Stock		Product Flow		Solder Skills Course														
	Drop in Line Training	Brady/Markem		Burn-in Course		Workmanship Standards														
		Boxing/Labeling		Component Training		Rework from Processes														
		Configuration Assembly		Material Handling Course																

Fig. 8. All plant employees at XEL can participate in training sessions for skills ranging from assembly to materials handling and component prep. Each labor grade has a set of required performance skills to carry out assigned tasks. For each of six basic skill groups, courses are taught by fellow employees. In each course, participants are tested to qualify for a one-time

bonus; several courses are included in each skill area. For example, in the "testing" area, qualification must be demonstrated in factory forms, TQC (Total Quality Control), product flow, and automated test. This pay-for-skill program builds employee flexibility and helps employees learn the basics for added problem-solving activities.

Another team confronted a temporary team member about behavior the team felt was inconsistent with the value systems in place. At first they were going to release the person. However, on their own initiative, they decided to confront the individual and give him the opportunity to respond. He was so impressed with the openness and honesty of the team, he willingly elected to change in order to remain a part of the team. These are only two of many examples demonstrating the strong commitment to this process of individual responsibility and accountability.

We're achieving cost reductions in support operations, besides the improvements as shown in Fig. 1. Many non-value-added

tasks were eliminated. They include complex labor reporting, maintenance of precise labor standards, and a host of unnecessary reports and files.

Skills Expansion and Fewer Labor Grades

Another benefit of this approach: We reduced the number of labor grades. We learned from cross training within our teams that we could reduce our labor grades from seven to three.

A skill-based bonus program was developed by production team members and the production manager. A skills expansion program filled employees' need for job enrichment. In the past, employees could vertically progress through a posting and bidding process — when openings for a particular job

grade were posted, employees in these slots would apply for training needed to qualify for the next grade. Now, we have defined a set of performance skills for each labor grade. In this program, an employee could participate in a training program for soldering or other skills, and then receive a one-time performance bonus after successfully completing a qualification test. All XEL employees are salaried.

Six skill categories were set up within the production assembler grade. Basic skills to carry out assigned tasks are required for each grade. Assembly, component prep, configuration, material handling, soldering, and testing are specific training areas. For each skill level,

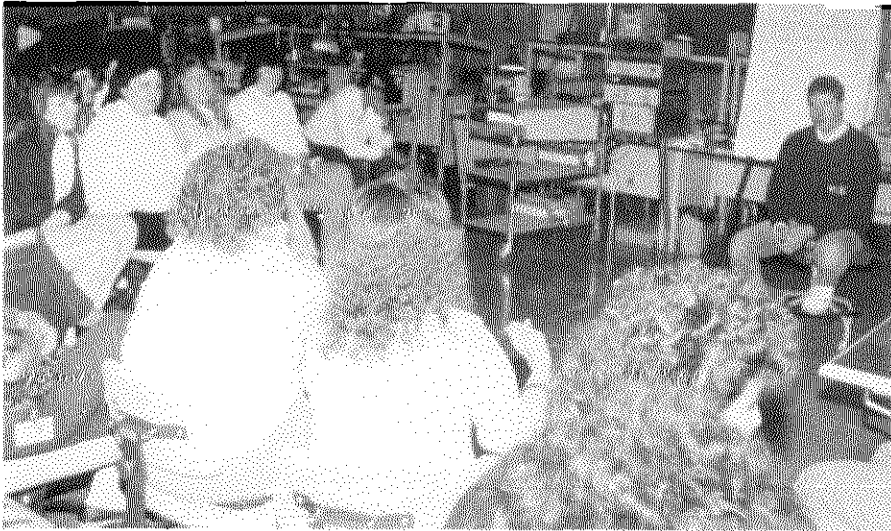


Fig. 9. *Informal discussions lead to problem solutions for self-directed teams. Team members identify corrective actions, using flip charts or other rough data collection and analysis tools.*

there are as many as eight classes and qualification tests.

In our voluntary training schedule, everyone who wishes to participate can learn skills in the areas for which they are not certified. Fellow employees in production management and from various teams train others. This sharing process provides an opportunity for building teamwork and leadership skills among trainers and "students."

Our Journey Has Just Begun

XEL has come a long way in the past three years. Our self-directed work teams are providing dramatic performance improvements, though we realize our continuous improvement journey has just begun. Hearing about employee involvement and cultural change means little until you actually do something about it. We have made the process of change work for us despite difficulties along the way.

Suggestions from the lessons we've learned:

- You cannot win the race or even compete if you do not start.
- Remain fixed in your commitment no matter what the change in business conditions.
- Things will get worse before they get better. Hang in there!
- Demonstrate commitment and enthusiasm. They cannot be delegated.
- Some people will not respond to cultural change. Be prepared to remove them, no matter who they are.
- Find someone you can confide in, especially when you feel you are losing it.
- Celebrate every little success. Positive reinforcement breeds more success.
- You cannot over-communicate.

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