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Work Organization, Technology, and Performance in Customer Service and Sales

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Abstract

The author analyzes the strengths and weaknesses of Total Quality Management and Self-Managed Teams, as compared to mass production approaches to service delivery, among customer service and sales workers in a large unionized regional Bell operating company. Participation in self-managed teams was associated with a statistically significant improvement in self-reported service quality and a 9.3% increase in sales per employee. When combined with new technology, teams boosted sales an additional 17.4%. These effects persisted over time. Total Quality Management, by contrast, did not affect performance. This study represents a "strong test" of the efficacy of teams because theory predicts weak outcomes for self-managed teams among service and sales employees in establishments where technology and organizational structure limit opportunities for self-regulation, the nature of work and technology do not require interdependence, and downsizing creates pervasive job insecurity – conditions found at the company studied here.

Keywords

Total Quality Management, TQM, self-managed teams, teams, production, service delivery, customer service, sales workers, Bell, unionized, quality, sales, technology, downsizing, job security

Disciplines

Organizational Behavior and Theory

Comments

WORK ORGANIZATION, TECHNOLOGY, AND PERFORMANCE IN CUSTOMER SERVICE AND SALES

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The author analyzes the strengths and weaknesses of Total Quality Management and Self-Managed Teams, as compared to mass production approaches to service delivery, among customer service and sales workers in a large unionized regional Bell operating company. Participation in self-managed teams was associated with a statistically significant improvement in self-reported service quality and a 9.3% increase in sales per employee. When combined with new technology, teams boosted sales an additional 17.4%. These effects persisted over time. Total Quality Management, by contrast, did not affect performance. This study represents a "strong test" of the efficacy of teams because theory predicts weak outcomes for self-managed teams among service and sales employees in establishments where technology and organizational structure limit opportunities for self-regulation, the nature of work and technology do not require interdependence, and downsizing creates pervasive job insecurity—conditions found at the company studied here.

There is considerable support for the idea that "high involvement" or "high performance" work systems lead to better organizational performance in manufacturing.[1] The argument is that work organized under the logic of mass production to minimize costs alone is no longer compatible with current markets, which demand competitiveness on the basis of quality, cost, innovation, and customization (Piore and Sabel 1984; Appelbaum and Batt 1994). High involvement systems, by contrast, produce better quality and efficiency because work is designed to use a higher-skilled work force with broader dis-

[1]See, for example, Levine and Tyson (1990); Cutcher-Gershenfeld (1991); Arthur (1992): Snell and Dean (1992); Adler (1993); MacDuffie (1995); Becker and Gerhart (1996); Berg et al. (1996); Kelley (1996); Ichniowski et al. (1995, 1996); Rubenstein (1998); Appelbaum et al. (2000); Pfeffer (1998).

cretion in operational decision-making; human resource (HR) practices such as training, performance-based pay, and employment security provide complementary incentives for workers to continuously learn and innovate (Lawler 1986; Bailey 1992; Kochan and Osterman 1994; Pfeffer 1998).

At a time when high involvement work systems have gained considerable acceptance in manufacturing, however (for example, Lawler et al. 1995), many service operations are embracing mass production. For example, telemarketers, operators, and customer service and sales representatives in banking, insurance, airlines, telecommunications, and the service centers of manufacturing operations typically work in large call centers. Their work is individualized, repetitive, scripted, and machine-paced by expert systems rather than assembly lines.

In this paper I consider whether the concepts of participation and team work found in high involvement manufacturing systems also produce better performance among production-level workers in call centers—increasingly viewed as the factories of the information economy. Call center work is best conceptualized as "interactive service work" (Leidner 1993). The defining feature is the interaction of a worker with a customer to deliver a service or sell a product. In call centers, however, the interaction is mediated by telephones and computers. In this study, the subjects answer incoming calls for service inquiries (for example, billing, collections) and sales (for example, new orders, transfers, and enhanced features). As in most interactive service work, a tension exists between serving and selling: employees must take enough time with customers to answer their questions fully while simultaneously selling as much as possible and minimizing "call-handling" time. Service and sales appear to involve contradictory demands, and whether they can be "jointly optimized" is a central question in this paper.

Research on interactive service work is important because roughly 42% of the work force is employed in low-productivity service, sales, and clerical occupations (CPS 1996). Call centers have grown dramatically as a result of process reengineering. Heightened global competition in services (McKinsey 1992) and deregulation of national industries (for example, telecommunications, finance, airlines, trucking, and utilities) have led firms to search for higher productivity and quality strategies; and customer service and sales workers increasingly are viewed as critical to competitiveness because they are the face of the company to the customer.

This paper focuses on two questions. First, what is the most effective way to organize work in service and sales operations? Can work be organized to maximize both service quality and sales, or is there an inevitable trade-off? Second, where better performance occurs, what explains it? In addition, I explore what other human resource and industrial relations practices influence individual service and sales performance.

The paper answers these questions through a study of 223 unionized employees in 68 work groups in customer service centers in a large regional Bell operating company organized by the Communications Workers of America (CWA). The telecommunications services industry is an appropriate context for this research because this historically high-skill, high-wage industry achieved annual productivity growth of 6.9% in the three decades prior to 1980, but only 3.4% in the 1980s (Keefe and Boroff 1994). Since 1984, deregulation has led companies to pursue new strategies to cut costs and improve service delivery, and call centers are central to those strategies.

Previous Research

Management theorists have identified two basic strategies for competing in sales and service delivery. The first focuses on maximizing sales and minimizing costs, and adopts a mass production approach as inspired by Scientific Taylorism (Levitt 1972, 1976). The second seeks to maximize sales by providing good service, and is often referred to as "relationship management"

(Gutek 1995; Keltner 1995). Under a relationship management strategy, companies build long-term relationships with customers by providing quality service. Good service is "a bridge to sales" because satisfied, loyal customers buy more and have more inelastic demand curves (Reichheld 1996; Jones and Sasser 1995). Keltner (1995) found that a strategy of relationship banking coupled with highly skilled and trained employees contributed significantly to German banks' outperforming U.S. banks in the 1980s.

For relationship management to succeed, firms need to design work so that employees have the skills and discretion to meet customer demands. Firms typically have accomplished this in one of two ways. The first draws on total quality management (TQM): individual discretion (or what TQM calls "empowerment") is coupled with employee involvement in "off-line" problem-solving groups or quality circles. The second applies the ideas of Socio-Technical Systems (STS) theory: workers organized into self-managed teams decide how to conduct their work and interact with customers. In sum, there are three common forms of work organization in service operations: a mass production approach that maximizes individual efficiency; a total quality approach that seeks to jointly maximize sales and quality by raising individual discretion and worker participation in quality circles, but leaves the supervisory structure in place; and a team approach that maximizes sales and quality through group self-regulation.

Work Organization and Customer Interaction

The mass production approach to service delivery includes a detailed functional division of labor, limited discretion for workers, and the management of customer behavior by limiting service options (Levitt 1972, 1976; Chase 1978; Lovelock 1990). Service quality is likely to suffer because customers have limited options, because employees have limited discretion to meet customer needs, and because the division of labor leads to multiple hand-offs. Individual efficiency is high because workers learn simple tasks through repetition ("practice makes perfect") and because there are few transactions costs associated with switching from one task to another or participating in training or problem-solving meetings (as in total quality or team systems). Customer dissatisfaction and employee boredom, however, lead to high turnover for both parties. High customer turnover creates a vicious cycle in which the firm focuses primarily on new sales to replenish lost customers (Schlesinger and Heskett 1991; Heskett et al. 1997). In sum, under Scientific Taylorism, sales productivity and service quality are inversely related, suggesting the following:

H1a: Workers who have limited discretion in how they conduct their work activities will have higher productivity, but offer lower service quality (compared to workers with greater discretion). Time spent in training or problem-solving meetings will decrease productivity.

In contrast to the engineering efficiency of mass production, work organization in TQM theory is driven by the characteristics and demands of customers. TQM is the source of lean production models in manufacturing, and management theorists have developed a functional equivalent for service operations (for example, Schlesinger and Heskett 1991; Bowen and Schneider 1988). Under TQM, service managers design jobs with grea· r discretion so that workers can meet a wide range of customer demands at any one time, referred to as "universal service" or "one-stop-shopping." Quality service leads to customer retention, and more interesting jobs reduce employee turnover. Customer service workers are viewed as strategically important because they are able to learn from customers and to build an information data base about them. As a result, workers are able both to serve the customer better and to know what sales opportunities exist, maximizing service and sales together. While "learning" under Taylorism is repetitive, "learning" under TQM is a continuous process of using new ideas and informa-

tion as sources of innovation (Deming 1984).[2]

In addition to increased employee discretion, TQM usually includes the systematic use of "off-line" problem-solving or quality improvement teams (QITs): groups of workers who regularly meet with their supervisors (for example, one hour per week away from their work station) to discuss methods to improve work. Off-line teams are "consultative" in nature (Levine and Tyson 1990): that is, workers may influence management decisions, but do not have "substantive" decision-making rights to make operational changes without consulting management. Research has shown that employee involvement in off-line teams has some positive effect on worker attitudes, but does not consistently affect performance (Griffin 1988; Steel et al. 1990; Adam 1991; Cotton 1993). While the use of QITs alone is unlikely to affect performance, the TQM model of greater employee discretion plus participation in QITs should produce better outcomes because workers can apply lessons from off-line teams to their daily work.

H1b: Workers who have more discretion in their work and who participate in off-line quality improvement teams will achieve higher service quality and sales than those who have less discretion and do not participate in QIT.

Team-based systems that draw on Socio-Technical Systems theory differ from the TQM model primarily because they allocate substantive decision-making rights to production-level employees and because the self-managed team (SMT) rather than the "empowered" individual is the unit of operation (Klein 1989; Adler and Cole 1993; Appelbaum and Batt 1994). Self-managed teams are defined as groups of workers who are self-managing, who have significant interdependent relations, who perceive themselves and are perceived by others as a group, and who have significant interdependent relations with other groups in a larger social system (Alderfer 1977). They are not "autonomous" or "self-designing," given that they are embedded in a large organization with hierarchical management structures fully intact (Hackman 1987).

STS theory predicts better quality and productivity because team members as a group "jointly optimize" the social and technical systems (for example, Trist and Bamforth 1951; Emery 1959; Cummings 1978; Pearce and Ravlin 1987). First, individual autonomy or discretion improves performance by shifting operational decision-making from supervisors to workers with tacit knowledge of the work process (Cummings 1978). Second, apart from individual autonomy or discretion, internal group self-regulation leads to better performance because group members learn from each other and solve problems across an entire process, rather than individually working on a small piece of it (Pearce and Ravlin 1987; Cohen 1994). Group self-regulation under STS is "substantive" rather than consultative (Levine and Tyson 1990). Finally, by reducing or eliminating supervision, teams assume more responsibility for external coordination and direct communication with employees and managers from other departments, and in the process they gain more knowledge and understanding of the broader work process. Most of the research on external coordination or "boundary maintenance" has focused on product development teams (Ancona 1990; Ancona and Caldwell 1992), but the lessons are applicable to production workers. By assuming coordination responsibilities of supervisors, employees learn more and reduce transactions costs associated with third-party (supervisory) intervention.

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[2]The application of TQM to services differs from that of manufacturing because of differences in the nature of the work and technology (Zimmerman and Enell 1988). In manufacturing, workers interact with machines and use TQM tools such as statistical process control (SPC) to improve quality by reducing process variances (unprogrammed deviation from standards or procedures). In services, by contrast, the interaction with customers is the critical point of production. Whereas manufacturing workers "add value" through their knowledge of the production process to *reduce variances*, service workers "add value" through their direct knowledge of customers, and the use of that knowledge to *increase customization*.

The empirical evidence on the performance of employees in self-managed teams is mixed, but stronger than that for individual job autonomy or participation in off-line teams or quality circles.[3] Cohen and Bailey's (1997) review of research between 1990 and 1996 found 24 rigorous studies of work teams in organizations, and concluded that organizing work into self-managed teams or autonomous work groups generally produces positive performance outcomes. Most of the research on self-managed teams, however, has occurred among blue-collar workers in manufacturing. If team effectiveness is contingent on the nature of the task and technology, as STS and group effectiveness theories predict (Cummings 1978; Goodman et al. 1986; Hackman 1987), then findings from manufacturing may not generalize to services. A small number of studies of teams in production-level services have been conducted, and also have shown positive but still mixed results (Gladstein 1984; Yammarino and Dubinsky 1990; Cohen and Ledford 1994; Cohen, Ledford, and Spreitzer 1996);[4] but

only one has found positive effects using objective data (Campion, Medsker, and Higgs 1993). In sum, despite some mixed results, theory and evidence support a positive hypothesized relationship between self-managed teams and performance.

H1c: Employees who work in self-managed teams will provide better-quality service and have higher sales than those who work under traditional supervision.

Work Organization and Information Technology

While the customer-worker interface is one dimension of service work, the use of information technology is a second factor affecting performance. Under mass production in services, the primary role of information technology (IT) is to electronically monitor workers and control operations (for example, Schlesinger and Heskett 1991). Under TQM, by contrast, IT becomes a resource for workers to manipulate (for example, Zuboff 1988). Skilled employees who have discretion in how they use IT systems are likely to come up with process innovations that improve service delivery and sales. One recent study, for example, found that individual autonomy and IT had a positive interactive effect on wages (Hunter and Lafkas 1998). This argument suggests the following:

H2a: The combined use of the TQM model and advanced information technology will have a positive interactive effect on individual service and sales performance.

The argument for a positive interaction between self-managed teams and technology in call centers is less straightforward. STS theory argues that if there is "fit" be-

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[3]Much of the early research lacked independent or objective outcome measures, suffering from single-source or common method bias where correlations between independent and dependent variables are likely to be inflated (Roberts and Glick 1981; Wagner and Gooding 1987). Early studies found strong positive results of SMTs for outcomes for workers (for example, satisfaction, safety), but inconsistent or negative results for firms (absenteeism, turnover, commitment, and various definitions of performance) (Pasmore, Francis, and Haldeman 1982; Wall, Jackson, and Clegg 1986; Pearce and Ravlin 1987; Cordery, Mueller, and Smith 1991). Guzzo, Jette, and Katzell (1985) found modest productivity improvements for 11 STS interventions, but no effect on absenteeism. Beekun's 1989 meta-analysis found some productivity improvements; Cotton (1993), Macy and Izumi (1993), and Cohen and Bailey (1997) reported the most consistent positive results.

[4]Gladstein (1984), in a study of 100 sales teams in telecommunications, found that team processes had a statistically significant positive relationship with self-reported effectiveness, but not with objective sales. Yammarino and Dubinsky (1990) found that group autonomy was positively related to managerial ratings of sales workers in retail sales, but not insurance. Campion, Medsker, and Higgs (1993) found that group autonomy contributed to better performance

among 80 groups of clerical workers in financial services. A study of 100 matched pairs of self-managed and traditionally supervised work groups in telecommunications (Cohen and Ledford 1994; Cohen, Ledford, and Spreitzer 1996) reported that team and manager evaluations (but not supervisor evaluations) of craft and administrative support teams were higher; but those for customer service and sales workers were not.

tween the social and technical systems, the whole is greater than the sum of its parts. This fit argument, however, hinges largely on the type of technology-induced interdependence found in mining and manufacturing. Teams are appropriate in assembly-line operations because "group designs that account for necessary task interdependencies seem more appropriate than individual job designs" (Cummings 1978:627). Service and sales workers who interact individually with customers via telephones and computers do not have such interdependence.

In addition, the empirical evidence of a relationship between teams and technology in the STS literature is weak, although this is primarily because researchers have focused on social organization and have ignored technology (see Emery 1959; Cummings 1978; Goodman et al. 1986; Passmore 1988; Cohen and Bailey 1997). In Passmore's 1988 review of 134 studies of STS interventions, for example, only 16% included any consideration of technological change. The strongest evidence of the interactive effects of computer-aided technology and employee involvement in operational decisions comes from auto assembly (for example, MacDuffie 1995), but even in this context there is debate about what form of participation works best—a more decentralized STS-inspired team approach (Berggren 1994; Rubenstein 1998), or lean production that draws on TQM principles (for example, Adler 1993; Adler and Cole 1993).

Even where interdependence among workers is technically low, however, the three dimensions of team organization discussed above are likely to lead to positive interactive effects of teams and computer technology. As discussed above, compared to "empowered" workers under TQM, workers in self-managed teams have more opportunities to influence how work is done. Second, the group effectiveness literature argues that group work provides an opportunity structure for group goal-setting, learning, and problem-solving (for example, Hackman 1987). On-the-job learning from experienced peers is an important source of tacit knowledge, particularly in an environment where product information and service offerings are rapidly changing. That is, the nature of service and sales work itself does not change under group designs—workers sit at their individual computers and interact with customers—but each member has access to the collective knowledge of the group. Third, the external coordination and communication function is likely to provide team members with additional sources of knowledge for solving technical problems associated with computer-use. These arguments suggest the following:

H2b: The combined use of self-managed teams and advanced information technology will have a positive interactive effect on individual service and sales performance.

Dimensions of Teams and Performance

A final issue to consider is what explains the performance outcomes of teams. If teams have a positive effect on performance, are some dimensions of teams more important than others? Do some dimensions have differential effects on service versus sales performance? For example, group interaction may be a source of learning but may also reduce the amount of time spent with customers, thereby reducing opportunities to sell. Similarly, the external coordination function may be more important for providing good service—for example, consulting with other departments about the status of an order—but may not improve sales. The STS and teams literatures discussed above, however, theorize that all three dimensions contribute to performance outcomes, suggesting the following hypothesized relationship:

H3: Employee participation in self-managed teams leads to better service and sales in three ways: by creating a structure that encourages greater individual discretion at work; by creating a structure of group self-regulation that leads to better learning and problem-solving; and by creating responsibility for external coordination and information gathering across groups and individuals in other departments.

Work, Technology,
and Organizational Context

The site for the study is a large, multi-state regional Bell operating company (RBOC), and the subjects are customer service representatives (CSRs) handling service inquiries and sales requests from residential customers through incoming telephone calls.[5] The organization of work has changed dramatically since the early 1980s, both because of industry deregulation beginning in 1984 and because of new technologies. Like the other former Bell companies, this company adopted a mass production approach to service delivery in response to deregulation, and shifted emphasis from customer service to sales productivity. Prior to deregulation, CSRs (called business office staff) were viewed as providing a public service because telephones were considered a basic necessity. Business office staff provided "universal service" to all customers in small local business offices. Since deregulation, CSRs have been viewed primarily as a sales force. Companies have consolidated operations into large "mega-centers" of several hundred workers, with different centers for functional specialties (for example, service and sales, collections, repair, telemarketing). Process reengineering has routinized and standardized customer interactions.

The CSRs in this study handle service (for example, billing and product information) and sales (basic service, transfers, internet service, upgrades, voice mail, call waiting, and so on). CSRs simultaneously interact with the customer on the telephone and input information directly into computer data bases while the customer is on the line. For complex orders, CSRs do follow-up work on the computer or manually. CSRs receive thirteen weeks of initial training, and reach proficiency in six months to a year, according to manager interviews. The skill requirements for the job include customer interaction skills; keyboard skills; knowledge of procedures, products, services, and legal regulations (which vary by local and state regulation); and technical proficiency in programming language (the traditional AT&T UNIX or Legacy system) plus, on average, eight database programs.

All employees are organized into work groups, with one supervisor for every ten employees. Supervisors have three functions: to handle non-routine calls, customer complaints, and inquiries to managers or subject-matter experts in other departments; to teach or coach employees to improve their performance; and to monitor and discipline. Work is organized to emphasize the vertical relationship between the supervisor and each worker and to minimize co-worker interaction.

Management has sought to achieve high productivity through the use of advanced information systems that automate routine functions and electronically monitor performance. The information system records the content of customer-employee interactions and the time employees spend in each type of work activity: on-line open to receive a customer, on-line with a customer, on-hold with a customer (for example, checking information or completing an order), closed (completing paper work, going to the restroom or lunch, and so on). Company-developed algorithms provide targets for the time allowed for each type of activity; managers at a central control panel watch for flashing lights of various colors that indicate if an employee has gone beyond the allotted time in any one area. Supervisors then use their discretion to counsel or discipline employees who are at variance from the targeted time allotments (known as "out of adherence"). Average call-handling time (cycle time for the job) is targeted at 300 seconds, and service representatives are expected to complete 90

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[5]This section describes changes in one company, but my field research in several other Bell companies confirmed that the RBOCs have followed similar patterns in their management strategies, use of technology, and HR practices. The RBOCs still employ the overwhelming majority of the work force in telecommunications. For a fuller account of changes in markets, technology, and work organization in the industry, see Batt and Keefe (1999).

calls per day. They complete transactions with customers individually and are discouraged from interacting with fellow employees.

At the time of the study, the company was in the process of upgrading the computer information system, and roughly half of the sample was using the new system. The new system automatically paced work by sending calls directly to "open" employees, rather than having them pick up the phone. Employees had less "closed time" away from the computer to finish up orders or handle non-routine problems. In order to cope with the system, employees had to develop "work arounds," or ways of working with the new technology to make sure that orders were written up or problems taken care of before another customer came on the line. They experienced the new technology as a "speed up" or intensification of the pace of work.

In this context, employees also were evaluated on "quality service." They experienced the twin demands of maximizing sales and service as contradictory because the latter took time away from the former. Employees had to use their own discretion to decide how much time to spend on each. Experienced CSRs often used their expertise to investigate a billing issue or a customer's record when they suspected fraud, to arrange for alternative pay schedules, or to provide what they considered to be good service—even though they risked receiving disciplinary action if they stayed on the line too long. Managers and union representatives alike agree that CSR jobs are the most stressful ones in the industry—higher-stress than telephone operator jobs because of intense pressure to simultaneously sell, provide "quality" service, and turn over calls, all in the context of pervasive electronic monitoring.

Joint Union-Management Work Innovations

In this context, the regional union and corporate management negotiated parameters for joint participation in a TQM program and a self-managed team program in

order to improve service quality and reduce high stress levels among employees. Management also sought to cut staff; and the union viewed the programs as a way to save union jobs by eliminating supervisory positions. Participation in both programs was strictly voluntary, and implementation tended to occur where local union-management relations were cooperative. Pairs of union and management trainers worked with local officials to promote consistent implementation across the company. A joint union-management structure at the corporate, state, and local levels oversaw the programs.

The TQM program consisted of three dimensions: increased discretion or "empowerment" to meet customer demands or make adjustments in customers' bills up to $200 without prior approval; TQM training; and participation in off-line quality improvement teams (QITs). For the self-managed team program, local managers and union leaders developed written agreements specifying what supervisory tasks teams would assume; these included setting daily assignments, writing up reports, covering breaks and schedules, handling non-routine problems, and calling directly on subject matter experts as needed. With the supervisor absent, these teams were responsible for learning and problem-solving. They received additional training, but no additional pay, and remained under the same contractual provisions as other workers. They worked in the same offices and under the same managers as traditionally supervised groups (TSGs). Joining teams was voluntary; volunteers were selected jointly by local managers and union leaders, who said in interviews that they chose a mix of "good and bad" performers to participate in self-managed teams in order to reduce conflicts between them and traditional groups.

Research Methodology

The research strategy was to study total quality and team innovations in one company to help control for organization-level variables such as corporate "culture," busi-

ness strategy, and human resource and industrial relations policies. In this case, the collectively bargained contract also reduced variation in many HR practices (seniority-based job bidding, benefits, compensation, and so on). The research combined observation, interviews at multiple levels of the organization, individual surveys, and archival data on performance matched to the individual surveys. The field work was particularly important for understanding the nature of work and technology in an occupational group that has received relatively little attention.

Sample

The data are from a stratified random sample of residential service and sales representatives located in numerous offices in a five-state area. I first selected all existing self-managed teams; I then randomly selected traditionally supervised work groups (TSGs) from the same offices where teams were located. I oversampled traditional groups to ensure sufficient sample size. To limit the study's intrusiveness, a random subset of employees in these self-managed and traditional work groups received a mail survey in January 1994; 58% responded, for a total of 330 usable surveys. I then matched the individual survey data to company performance data. Of the 330 CSRs in the sample, I matched performance data in 223 cases.[6] Matching was limited because some states were not fully participating in a regional information system. The sample of participants in the total quality program was drawn from employees in SMTs and TSGs because the company did not keep a centralized record of participants in the TQM program. The survey asked employees whether or not they were currently participating in a quality improvement

team. Among SMTs, 23.6% were participating; and among TSGs, 22.7%. Thus, roughly equal numbers of employees in SMTs and TSGs formed the sample of employees in off-line QITs.

Dependent Variables

Definitions of all variables, scales, and coefficient alphas are provided in Appendix 1. Two dependent variables measure performance. Sales productivity is defined as the natural log of individual average monthly sales for the period January 1993–June 1994.[7] I also developed running quarterly averages to consider the sustainability of the effects of work innovations over time. The second dependent variable is self-reported quality measured by two survey questions (alpha = .56), using 1–5 Likert scales. The questions ask employees to rate their work group's service quality and the extent to which the quality has improved over the last two years (the period of heavy implementation of TQM and self-managed teams).

Independent Variables

To create a measure of the TQM model, I used an additive index of individual discretion plus participation in off-line QITs. Discretion is a four-item scale (alpha = .77), which includes control over tasks, tools, procedures, and ability to meet customer needs. Participation in QIT is measured by a dummy variable set equal to 1 if there is current participation, 0 otherwise. Another dummy variable is set equal to 1 for SMT membership, 0 for non-membership. Time associated with participation in meetings is measured by hours and minutes per month

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[6]The full sample included 203 employees in 61 traditional groups and 127 employees in 52 SMTs; the subsample with matched data included 136 employees from 39 TSGs and 87 members of 29 teams. I compared the means of variables used in this study for the total sample and the subsample and found no significant differences.

[7]The company had discontinued the use of other measures because of their unreliability. For example, "sales objectives" and the "percent of objectives met" were discontinued because local managers varied dramatically in how they set objectives and under what conditions they were willing to adjust objectives (for example, for absences, vacations, training time), making comparisons across management units unreliable.

in total quality meetings (TQM time) and self-managed team meetings (SMT time). To measure dimensions of work associated with self-managed teams, I also developed measures of group self-regulation and external coordination based on field observation and focus groups. Each question uses a 5-item Likert scale. Group self-regulation is a 6-item scale that includes the extent to which the work group has control over goal-setting, task allocation, quality, ergonomic safety, and allocation of training, as well as the extent to which members "routinely teach or help one another with short cuts, problem-solving, or ways to improve how you work" (alpha = .71). External coordination is an additive index (0–6) that combines two questions: whether employees have formal authority to interact directly with subject matter experts outside of their department (0 = no authority; 1 = authority), and how frequently they actually interact with these experts (on a 1–5 scale).

Technology is measured by a dummy variable equal to 1 for workers who are using the more automated system and 0 for the status quo. Fifty percent of those in self-managed teams and 62% of those under traditional supervision were using the new system at the time of the survey. For TQM, the interactive term is the product of the TQM model and technology; for SMTs, the term is the product of SMT participation and technology. This strategy follows that of MacDuffie (1995), who used additive indices for work organization and multiplicative terms for work organization and the technological system. In each case, I first transformed the variables of interest by centering their means at zero and then multiplied the two variables to create the interaction term. This allows for direct interpretation of the interaction term in relation to the mean of the interacted variable; it also reduces multicollinearity (Cohen and Cohen 1983:325).

Control Variables

Control variables include measures of human resource practices, employment relations, service market location, and individual characteristics. HR practices include skill level, coaching support, advancement opportunities, job insecurity, and annual earnings. Skill level combines formal and informal learning. It is an additive index of years of education; company-provided formal training in the previous two years (technical, total quality, and team training); and years of tenure, a proxy for informal, on-the-job training. Coaching support is a six-item scale covering supervisory feedback, respect for employees, fairness, provision of resources and time, and support for quality (alpha = .82). Perceived advancement opportunities are measured using a single 1–5 scale question asking how much the employee feels he or she is given a real opportunity to improve skills at the company. The variable for job insecurity is based on a question asking the extent to which the worker feels less secure in his or her job now than several years ago. *Perceptions* of promotion and job security are likely to affect performance regardless of whether they are the result of individual differences in perception or of objective variation (for example, some offices were closing while others were absorbing consolidations). Annual earnings are measured by earnings brackets, and converted to natural logs. Employment relations are measured by three items. Two questions asked workers to describe the relations in their work group (work group relations) and relations between labor and management at work (labor-management relations), using a 5-point scale of very poor to very good. A dummy variable captures union membership.

A series of dummy variables captures variation in state location, which determines sales opportunities. The omitted state is the one in which corporate headquarters is located. In this company, all in-coming calls in a state go to a centralized call distribution system, which automatically and randomly allocates the call to the next worker. A worker in an urban area, therefore, is equally likely to receive calls from rural or suburban customers, so that opportunities to sell are equal. Opportuni-

Table 1. Correlation Matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Ln Sales	1.000													
2. Quality (a = .56)	-0.005	1.000												
3. Discretion (a = .77)	0.033	0.023	1.000											
4. Grp. Self-Reg. (a = .71)	0.061	0.263	0.237	1.000										
5. Ext. Coordination	-0.023	0.050	0.289	0.198	1.000									
6. SMT Time	-0.236	0.151	0.081	0.196	0.161	1.000								
7. TQM Time	0.001	0.022	-0.056	0.006	-0.067	-0.153	1.000							
8. Skill Level	0.120	0.079	0.035	-0.018	0.094	-0.013	0.066	1.000						
9. Coaching (a = .82)	0.113	0.150	0.247	-0.004	0.144	0.004	-0.092	-0.046	1.000					
10. Adv.Opportunities	-0.106	0.216	0.274	0.053	0.148	0.153	-0.029	0.059	0.304	1.000				
11. Job Insecurity	0.167	-0.098	-0.127	0.110	-0.012	0.043	-0.030	0.155	-0.005	-0.160	1.000			
12. Ln Earnings	0.069	-0.023	-0.050	-0.163	-0.154	-0.047	-0.034	-0.087	-0.052	-0.013	0.069	1.000		
13. Wk. Grp Relations	0.005	0.265	0.022	0.075	-0.013	0.099	-0.094	0.066	0.130	0.041	0.052	-0.018	1.000	
14. LM Relations	0.013	0.188	0.184	0.013	0.219	0.053	0.020	0.148	0.411	0.218	0.123	-0.192	0.227	1.000
15. Age	0.081	-0.039	0.004	-0.080	0.073	-0.117	0.035	0.481	0.009	-0.048	0.231	-0.271	0.116	0.250

ties to sell vary across states, however, due to variation in state economies and in state management practices. Given the matched sampling strategy, roughly equal numbers of employees in self-managed teams and traditionally supervised groups are in each state. Variables measuring individual characteristics include age, gender, and race.

Results

Table 1 provides a correlation matrix of all variables and scales. Appendix 2 includes the means and standard deviations of variables for all employees, those in SMTs, and those in TSGs. There is considerable variation in most of the independent variables of interest but, as expected, not in the HR practices or individual characteristics of the work force. This stems from the effects of the union and the relatively homogeneous nature of the work force. Ninety-one percent of workers are female, and 77% are white; the average age is 40.6 years, average company tenure is 17.9 years, and average education is 13.2 years.

To consider the first set of hypotheses, concerning the individual performance effects of total quality and self-managed teams, I use a hierarchical regression technique. The sampling method (random within work groups), however, violates the OLS assumption that observations are independently and randomly distributed. A

useful control for a "work group" or cluster effect is a Huber (for example, 1967) correction to regression analysis. Where cluster sampling exists, this technique creates more robust standard errors. All of the results reported here use a Huber correction.[8]

Work Organization, Sales, and Service

Table 2 reports the results of the hierarchical regressions in five equations that regress the log of average monthly sales on a series of independent and control variables. The first equation estimates a base line case, considering whether the use of new automated technology and variation in the skill levels of workers affect sales, controlling for other sources of variation. The equation explains 23% of the variance, but none of the variables of interest are statistically significant. Some of the state

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[8] I repeated all analyses using OLS regression and found slight reductions in significance levels in the Huber corrected results, but overall consistency. I also repeated the equations using a group unit of analysis. To do this, I averaged individual responses in each SMT and TSG. In all equations, the results were consistent with those reported here, but because variation was reduced in the group level data, the amount of variation explained by the regressions rose from the range of $R^2 = .23–.32$ to the range of $R^2 = .44–.59$.

Table 2. Determinants of Sales Productivity.
(Standard Errors in Parentheses)

Independent Variable	Dependent Variable: Log Average Monthly Sales				
	Eq. 1	*Eq. 2*	*Eq. 3*	*Eq. 4*	*Eq. 5*
Work Design					
New Technology	0.032 (0.031)	0.036 (0.031)	0.045 (0.030)	0.046 (0.030)	0.053* (0.032)
TQM Model		0.014 (0.015)	0.013 (0.014)	0.008 (0.019)	0.016 (0.020)
Time in TQM Meetings		0.000 (0.000)	0.000* (0.000)	0.000* (0.000)	−0.001** (0.000)
Self-Managed Team			0.076** (0.031)	0.077** (0.032)	0.093*** (0.031)
Time in SMT Meetings			−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)
TQM*Technology				0.009 (0.029)	0.003 (0.030)
SMT*Technology					0.174** (0.075)
Human Resource Practices					
Skill Level	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)
Coaching Support	0.045* (0.024)	0.041* (0.024)	0.031 (0.021)	0.031 (0.022)	0.032 (0.021)
Advancement Opportunity	−0.017 (0.015)	−0.020 (0.017)	−0.013 (0.015)	−0.013 (0.015)	−0.015 (0.015)
Job Insecurity	0.013 (0.015)	0.013 (0.015)	0.016 (0.014)	0.016 (0.014)	0.013 (0.014)
Log Annual Earnings	0.059 (0.068)	0.059 (0.067)	0.048 (0.064)	0.048 (0.064)	0.053 (0.061)
Employment Relations					
Work Group Relations	−0.006 (0.025)	−0.007 (0.028)	−0.006 (0.027)	−0.007 (0.027)	−0.017 (0.026)
Labor-Mgmt. Relations	−0.008 (0.020)	−0.009 (0.020)	−0.005 (0.018)	−0.005 (0.018)	0.001 (0.018)
Union Membership	−0.031 (0.055)	−0.032 (0.056)	−0.034 (0.054)	−0.034 (0.053)	−0.027 (0.052)
Constant	8.372*** (0.661)	8.365*** (0.663)	8.512*** (0.619)	8.524*** (0.617)	8.478*** (0.596)
Sample Size	202	202	202	202	202
F Statistic	5.360	4.710	6.420	6.190	6.860
R^2	0.230	0.235	0.289	0.289	0.316
Change R^2		0.005	0.054	0.000	0.027

*Statistically significantly different at $p < .10$; **at $p < .05$; ***at $p < .01$.

control dummies (not shown) are statistically significant, indicating the importance of variation in market opportunities; these remain statistically significant in all other equations. The second equation estimates whether the TQM model affects sales, and it shows no statistically significant effects (contrary to H1b). The change in R^2 is only 0.008. In models that test the effects of discretion and QIT participation separately,

or the effects of a multiplicative index (discretion * QIT), none of the measures are statistically significant (equations not shown). Finally, time in meetings has no statistically significant effect (contrary to H1a).

Equation (3) adds the effects of self-managed teams. The two variables (SMT membership and time in SMT meetings) increase R^2 by 5.6%. Both variables have the hypothesized effect: self-managed team participation increases sales by a statistically significant amount (H1c), while participation in meetings has a statistically significant negative effect of small magnitude (H1a). Because the dependent variable is in log form, the beta coefficients are directly interpretable as the percentage difference in sales attributable to each variable—7.6% for team participation minus 0.1% for time in meetings, creating a positive net effect of 7.5%.

Work Organization and Technology

The next two equations estimate the interactive effects of work organization and technology. Equation (4) estimates the interactive effects of the TQM model and technology. Contrary to H2a, there is no change in the R^2 and there are no statistically significant effects of the interaction term. In equation (5), by contrast, the interaction of SMTs and technology increases the R^2 by 2.8%. The interaction of teams and technology increases sales by 17.4%, over and above a 9.3% direct effect of team participation. These findings are consistent with hypothesis 2b: despite low levels of technically required interdependence, group interaction improves the use of technology, presumably through learning or problem-solving. Before exploring this set of issues further, I will discuss the results of regressions of service quality using the same set of equations.

Table 3 reports the results of the performance models for perceived service quality. The contrast in findings between the TQM and SMT models remains the same. In equation (2), the TQM model has no effect on perceived quality, and the R^2 re-

mains unchanged. In equation (3), by contrast, self-managed team membership has a statistically significant positive effect on perceived quality and raises the R^2 by 6.3%. In other words, contrary to the predictions of Scientific Taylorism (H1a), teams jointly maximize both service quality and sales. Some of the control variables are also statistically significant in the expected direction, including skill level (positive) and work group and labor management relations (positive). Job insecurity has a negative effect, at a significance level of $p < .06$. In equations (4) and (5), however, neither of the interaction terms (TQM model*technology or SMT*technology) is statistically significant, and the percentage of variance explained remains unaffected.

Dimensions of Teams and Performance

In summary, the evidence from hierarchical regressions suggests that work organized into self-managed teams leads to better service and sales performance. To examine what specific dimensions of teams are related to better service and sales, I use covariance structure modeling, or Lisrel (Bollen 1989; Joreskog and Sorbom 1993). Lisrel is a useful tool because it provides the opportunity to assess multiple relationships between constructs—the direct and indirect effects among the different dimensions of teams and the two performance outcomes of sales and quality. For example, which dimensions of work organization affect quality, which affect sales, and does service quality lead to better sales, or vice versa? The technique consists of the joint estimation of a measurement model (the loadings of indicators on their hypothesized latent variables) and a structural model (the hypothesized relationships among the latent variables) (for example, see Erez, Johnson, and Judge 1995). This approach also produces more precise and unbiased estimates of parameters by correcting for unreliability; the model takes into consideration correlations among indicator variables and error terms.

Fit statistics used in the structural equa-

Table 3. Determinants of Work Quality.
(Standard Errors in Parentheses)

Independent Variable	Dependent Variable: Work Group Quality				
	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5
Work Design					
New Technology	−0.008** (0.110)	−0.012 (0.113)	0.073 (0.105)	0.075 (0.103)	0.075 (0.104)
TQM Model		−0.019 (0.045)	−0.063 (0.051)	−0.080 (0.078)	−0.079 (0.077)
Time in TQM Meetings		0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Self-Managed Team			0.344*** (0.114)	0.346*** (0.113)	0.347*** (0.116)
Time in SMT Meetings			0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
TQM*Technology				0.030 (0.089)	0.029 (0.090)
SMT*Technology					0.008 (0.205)
Human Resource Practices					
Skill Level	0.007 (0.003)	0.007** (0.004)	0.007** (0.003)	0.007** (0.003)	0.007** (0.003)
Coaching Support	0.017 (0.076)	0.021 (0.074)	0.009 (0.077)	0.010 (0.077)	0.010 (0.077)
Advancement Opportunity	0.061* (0.037)	0.065* (0.038)	0.063 (0.043)	0.062 (0.042)	0.062 (0.042)
Job Insecurity	−0.050 (0.038)	−0.051 (0.038)	−0.080* (0.039)	−0.075* (0.040)	−0.075* (0.040)
Log Annual Earnings	−0.036 (0.187)	−0.035 (0.188)	0.044 (0.181)	0.044 (0.181)	0.045 (0.181)
Employment Relations					
Work Group Relations	0.232*** (0.078)	0.231*** (0.078)	0.193*** (0.071)	0.190*** (0.071)	0.190*** (0.072)
Labor-Mgmt. Relations	0.101 (0.063)	0.103 (0.064)	0.143** (0.061)	0.144** (0.060)	0.144** (0.061)
Union Membership	0.076 (0.119)	0.078 (0.121)	0.069 (0.117)	0.070 (0.117)	0.071 (0.119)
Constant	3.235* (1.864)	3.258* (1.882)	2.566 (1.800)	2.610 (1.823)	2.600 (1.828)
Sample Size	202	202	202	202	202
F Statistic	3.740	3.550	6.000	5.750	5.500
R^2	0.197	0.198	0.260	0.261	0.261
Change R^2		0.001	0.062	0.001	0.000

*Statistically significantly different at $p < .10$; **at $p < .05$; ***at $p < .01$.

tion model include chi-square with corresponding degrees of freedom, the Goodness of Fit Index (GFI), and Adjusted Goodness of Fit (AGFI). Because these statistics are sensitive to sample size (producing misleading results in small samples as in the data here), I also include Bentler's Comparative Fit Index (CFI), Bollen's Incre-

Figure 1. Structural Estimates of Relationships between Work Design, Quality, and Sales.
(Controls Not Shown)
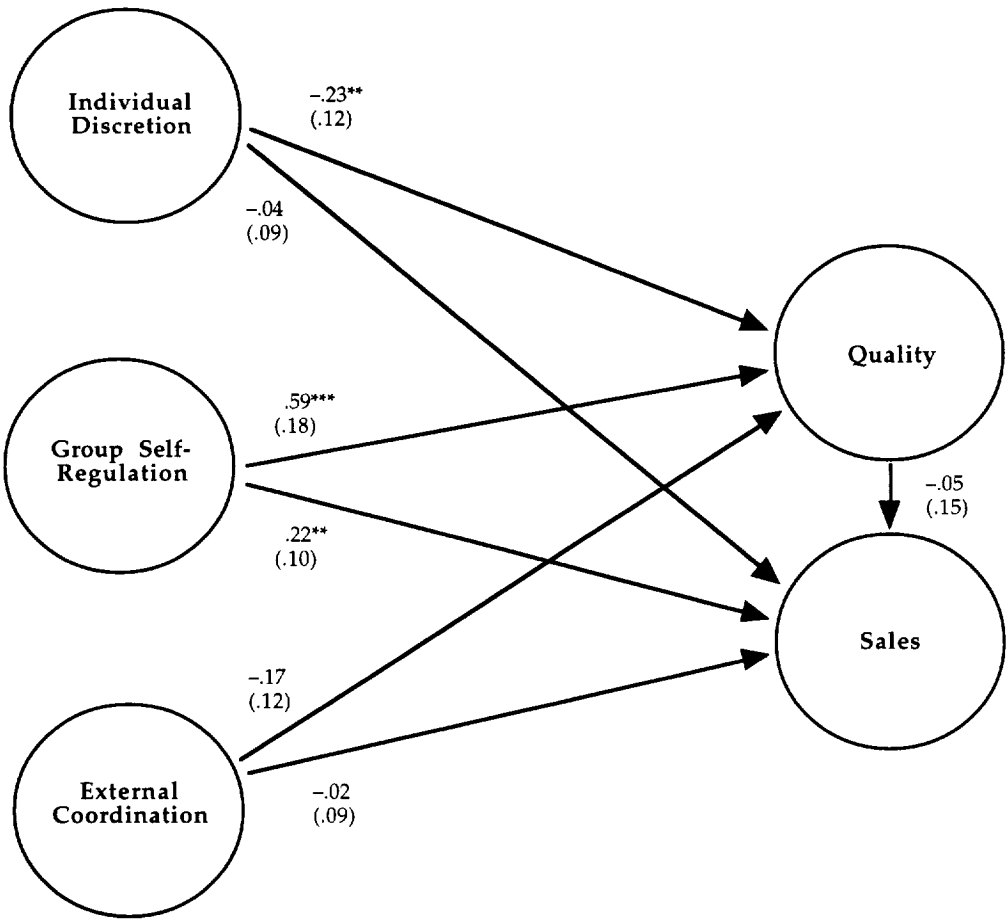
**Statistically significant at the .05 level; ***at the .01 level.

mental Fit Index (IFI), and the Critical N value.[9]

In the third hypothesis, I identified three dimensions of work that are likely to be associated with self-managed teams and lead

to better performance: high individual discretion, internal group self-regulation, and external coordination with other groups and employees. In this data set, simple correlations show that self-managed team membership is significantly correlated with all three, but in varying degrees. Self-managed teams are the most highly correlated with group self-regulation (r = 0.51); they are considerably less correlated with external coordination (r = 0.21) and individual discretion (r = 0.13). In other words,

[9]For the chi-square statistic, the fit of the model improves as the value of p *increases*. The fit of the model improves as the fit indices (GFI, CFI, IFI) approach 1.00; the critical N value should be greater than 200.

while teams appear to create a design structure that encourages workers to assume these responsibilities, teams are not the only source. The team program formalizes what other employees or managers may do informally. Some managers may informally, or formally through the total quality program, encourage employees to assume more individual responsibility or discretion (although individual discretion has no statistically significant correlated with participation in QITs in these data). Experienced workers may simply assume more responsibility on their own, either with customers, with other workers in their group, or across departments. Half of the workers in traditional groups, for example, felt they had the authority to contact managers and experts outside their department as needed, even though only the team program *formally* gave that authority to team members. The structural equation model, therefore, estimates how these dimensions of work organization affect performance, whether they are adopted formally through teams, or informally by employees.

Figure 1 and Table 4 present the results of the structural equation model. In the measurement model (not shown), all loadings of indicator variables on latent variables are statistically significant at the 1% level. The parameter estimates for the structural model are as follows (see Figure 1). Group self-regulation has the most statistically significant effect on quality (.59, p < .01) and on sales (.22, p < .05). However, there is no direct effect of quality on sales; that is, there is no "bridge" from service to sales, as suggested in the literature on relationship management. Contrary to predictions, individual discretion has a statistically significant negative effect on quality (−.23, p<.05) and no effect on sales. Also contrary to expectations, external coordination has no statistically significant effect on quality or sales productivity. The fit statistics are reasonably good: χ^2 = 361 (df = 333, N = 223), p = .14; GFI = .90; AGFI = .84; CFI = 1.00; IFI = 1.00; Critical N = 244.41.

The negative effect of individual discretion on quality is striking in light of

Table 4. Structural Equation Model: Effects of Work Design and Control Variables on Sales and Quality. (Standard Errors in Parentheses)

Independent Variables	Dependent Variables	
	Log Ave. Sales	Quality
Work Design Variables		
Individual Discretion	−0.04	−0.23**
	(0.09)	(0.12)
Group Self-Regulation	0.22**	0.59***
	(0.10)	(0.18)
External Coordination	−0.02	−0.17
	(0.09)	(0.12)
Technology	0.09	0.07
	(0.07)	(0.09)
HR Variables		
Coaching Support	0.14*	0.24**
	(0.08)	(0.11)
Education	0.13*	0.18**
	(0.07)	(0.09)
Training	0.05	0.14*
	(0.07)	(0.08)
Earnings	−0.08	−0.06
	(0.07)	(0.09)
Job Insecurity	0.13*	−0.20**
	(0.07)	(0.09)
Work Group Relations	−0.03	0.23***
	(0.07)	(0.09)
Markets		
Sales Market #1	−0.36***	0.09
	(0.11)	(0.13)
Sales Market #2	−0.34***	0.12
	(0.10)	(0.12)
Sales Market #3	−0.02	0.27**
	(0.10)	(0.13)
Sales Market #4	0.02	−0.13
	(0.09)	(0.11)

Fit indices: P = .14; AGFI = .84; CFI = 1.00; IFI = 1.00; Critical N = 244.

*Statistically significantly different at p < .10; **at p < .05; ***at p < .01.

the work design literature, but not implausible. Without appropriate training and HR practices, for example, increased discretion alone may have negative performance outcomes. In this case, an alternative explanation is that those employees with more discretion developed

higher expectations of providing good service, and were more critical of the constraints they faced in providing good service. The finding is surprising, however, from a methodological standpoint. If anything, one would expect the problem of common source bias to inflate a positive relationship between self-reported discretion and self-reported service quality. The statistically significant negative relationship between discretion and quality lends credibility to the positive relationship found between group self-regulation and perceived quality. The findings do not appear to be artifacts of survey methodology.

Several of the control variables are also statistically significant in expected directions.[10] Coaching support significantly affects quality (.24, p < .01). Education and work group relations positively affect quality. State location variables are again statistically significant. A more interesting finding is the contradictory effects of perceptions of job insecurity on quality and sales. While perceptions of declining job security have a statistically significant negative effect on quality (−.20, p < .05), they have the opposite effect on sales (.13, p < .06). Although this finding is surprising on its face, it is consistent with field interviews with workers who reported a conflict between the desire to provide quality service to customers and the pressure they felt to increase sales in order to maintain competitiveness in an era of growing competition.

A potential confounding factor in a causal link between SMT membership and performance is a Hawthorne effect. If team members view themselves as special or receive special attention, then it may not be the team design but the special attention that produces better performance. In the current case, however, management and the union strongly encouraged and supported both the TQM and the SMT programs, and it is unclear why a Hawthorne effect would be found in only one. A systematic way to assess a Hawthorne effect is to analyze the sustainability of performance outcomes: a Hawthorne effect should erode over time. Some researchers, for example, have found that the benefits of work innovations fade over time (Griffin 1988; Lawler and Mohrman 1987). The novelty wears off.

In this case, the teams were formed over several years, and this variation provides the opportunity to compare employees in early and later-forming teams. About half of the teams began before 1993, and half in early 1993. Given the limited sample size and the availability of data only as of January 1993, it seemed reasonable to compare the workers in established teams (1992 and earlier, N = 44) with those in the newer teams, where the novelty should have been greatest (1993, N = 43).

To consider change over time, I developed three-month running averages of sales and analyzed trends over the 16 periods from January 1993 to June 1994.[11] Using the performance model described above (Table 2, equation 3), I estimated the effects of SMT membership on monthly sales over 16 periods. I estimated three separate equations: one for all teams, one for the pre–1993 teams, and one for the 1993 teams. This analysis not only compares employees in the older and newer teams, but also identifies patterns or trends in the data over a year and a half. The results (Table 5) show quite similar patterns across the three equations. Individuals in teams have higher monthly sales in all periods, but the size

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[10]Because of the greater number of parameters to be estimated in Lisrel models, there are fewer degrees of freedom for added control variables. I estimated the model using various sets of control variables drawn from the regression analysis. The results are robust under several specifications.

[11]Three month averages reduce inaccuracies and missing data due to vacations, absences, or unusual external circumstances. In fact, the pattern of statistical significance using monthly data only is almost identical to that using the rolling averages, but the smaller sample sizes slightly reduce significance levels. For this reason, I use the rolling averages.

Table 5. Determinants of Sales over Time:
All Teams, Pre–1993 Teams, and 1993-Teams Compared.[a]

Period[b]	All SMTs vs. All TSGs			Pre-1993 SMTs vs. All TSGs			1993 SMTs vs. All TSGs		
	Monthly Sales	P =	Sig. Level	Monthly Sales	P =	Sig. Level	Monthly Sales	P =	Sig. Level
1	$535	0.076	*	$442	0.296		$581	0.152	
2	466	0.100	*	304	0.459		568	0.129	
3	454	0.120		313	0.396		585	0.133	
4	298	0.310		521	0.150		277	0.521	
5	336	0.250		652	0.111		139	0.714	
6	595	0.110		812	0.114		473	0.343	
7	643	0.080	*	603	0.224		613	0.245	
8	596	0.110		423	0.327		761	0.210	
9	1,207	0.000	***	869	0.022	**	1,834	0.000	***
10	1,230	0.000	***	992	0.018	**	1,849	0.000	***
11	1,393	0.000	***	1,463	0.005	***	1,601	0.002	***
12	1,655	0.000	***	1,721	0.008	***	1,581	0.004	***
13	797	0.047	**	1,131	0.025	**	560	0.245	
14	466	0.104	*	304	0.459		568	0.129	
15	454	0.117		313	0.396		585	0.133	
16	504	0.472		331	0.670		618	0.524	
18-Mo. Average	724	0.023	**	951	0.029	**	672	0.181	
Log 18-Mo. Ave.	0.056	0.183	*	0.0828	0.033	**	0.043	0.405	
Quality	0.368	0.000	***	0.2459	0.015	**	0.475	0.004	***
Sample Size	223			159			157		

[a]Results of regression using Huber selection correction; replicates model 3 in Table 2, controls not shown.
[b]Three-month rolling averages (period 1 = 1/93–3/93, period 2 = 2/93–4/93, etc.).
*Statistically significantly different at p < .10; **at p < .05; ***at p < .01.

and significance level of the beta coefficient rise over the year, are highest in the fall and early winter, and then fall off in the following spring. This suggests a seasonal pattern. The evidence is contrary to a Hawthorne argument and suggests that the effects of participation in self-managed teams are sustainable over time.

Another possible explanation for the positive performance of individuals in teams is selection bias. As indicated earlier, however, although joining teams was voluntary, managers and union leaders said that they purposefully put employees with different performance levels together in teams so as to avoid the charge that self-managed teams were being favored. For example, only 4% of surveyed managers said that performance was used as a criterion for selection.

Another way to examine whether members of self-managed teams are systemati-cally biased is to analyze whether there are differences between employees currently in traditional groups who say they would volunteer for self-managed teams and those who say they would not. While it is not possible to go back in time, we can compare current volunteers and non-volunteers. A survey question asked employees if they would volunteer for self-managed teams if given the opportunity. Using this question, I substituted SMT volunteers for SMT members in the performance models discussed above. Doing so had no statistically significant effect on quality or sales (results not shown).

Discussion

In summary, this research compares the effectiveness of three approaches to organizing work in call centers: mass production, total quality management, and self-

managed teams. I found that compared to mass production, TQM had no statistically significant positive effects on performance; and there were no interactive effects associated with TQM and technology. By contrast, participation in self-managed teams raised objective sales by 9.3%. Time spent in SMT meetings, often a concern of management, had a statistically significant negative effect on sales of .1%, so that the net effect of teams was 9.2%. The interactive effect of team participation and use of new technology raised sales by an additional 17.4%. Participation in teams also significantly raised self-reported service quality. In addition, the effects associated with teams did not erode over time.

Perceptions of job insecurity were associated with decreased service quality and higher sales. A reasonable interpretation is that job insecurity led workers to reduce the time and attention (quality of interactions) they gave to each customer in order to increase the number of calls they handled and, hence, sales volume. They probably did this because their performance evaluations were weighted more heavily toward maximizing sales and minimizing call handling time than toward providing high-quality service.

It is important to interpret these findings in context. The level of decentralized decision-making was minimal compared to the classic model of self-managed teams in the literature. The team model, for example, did not challenge the extensive process standardization in the call centers. The large and statistically significant performance advantages of teams are surprising given the context of this study. Four organizational factors would argue against the successful implementation of teams in this context: the nature of work and technology did not require interdependence; process standardization and organizational structure limited opportunities for self-regulation; setting boundaries around a small team's work in the context of a large office setting (considered critical for group effectiveness) (for example, Cummings and Huse 1989) was not possible; and human resource practices such as group-based pay and job security were not in place.

This raises the question of what dimensions of teams are really important as drivers of better service and sales, and the structural equation analysis points to the importance of group self-regulation, rather than individual discretion or external coordination. What does group "self-regulation" mean, however, in this highly routinized environment?

The results from qualitative field research suggest that the real value of teams centered around group goal-setting, problem-solving, and learning. Workers in teams emphasized that the program "got the supervisor off our backs and allowed us to work together." They said that they established group sales goals, rather than individual ones, and then helped each other with developing sales strategies, handling problem customers, and keeping up with rapid changes in product information, work procedures, and legal regulations. They explicitly noted the contradiction of "going self-managed" in the context of increasingly automated technology, but said that the benefits of teams were even more important in that context. Both the automated technology and management efforts to maximize call volume created a work environment in which social interactions in traditionally supervised groups were minimized. Employees were not supposed to talk to one another because that meant time away from call-handling and sales opportunities. The rapidity of change in both product and legal information and software technology, however, meant that both selling and good service required on-going learning and problem-solving that was more effectively accomplished in groups.

Conclusion

One reason the institutional context of this case is important is that the historic HR practices of the Bell System had created a highly skilled work force with tremendous tacit knowledge of the customers, the telecommunications infrastructure, and the use of information systems. In addition, a long

history of mature collective bargaining created a climate of trust, and union support for the program provided employees with confidence to fully participate in ways that might otherwise not have occurred. Thus, arguably, the industrial relations system provided the kind of support viewed as necessary for successful implementation of high involvement work systems. The missing incentives were group-based pay and job security, and as indicated earlier, employees viewed self-managed teams as a vehicle to enhance security.

Not long after the experimental implementation of total quality and team management, the company let both programs dissolve, and union-management relations deteriorated in the face of on-going downsizing and reengineering. Management reasoning was that small teams are not consistent with reengineering, where the gains from automation and process standardization are significant; and participatory meetings are a waste of time. The company, like others, has moved in the direction of a mass production model of individualized work, faster cycle times, and stricter adherence to schedules. It has created training modules on-line to reduce initial training, and has shifted much of subsequent training to on-line, self-paced modules. Virtually all training and work-related information (work procedures, system capabilities, product information, legal regulations) are on-line; employees receive eight to ten e-mail messages per day advising them of any updates in any of their systems. Employees are discouraged from asking questions or talking with one another because doing so reduces productive work time. The company has also introduced individual sales commissions as an incentive plan. The evidence in this case, however, argues against this type of mass production model, even on the basis of sales efficiency, because effective sales as well as service quality depend on continuous learning, processing of information, and tacit knowledge that group collaboration appears to foster.

<div align="center">

Appendix 1
Variable Definitions

</div>

Dependent Variables

Sales
Average monthly sales, January 1993 to June 1994
Log of average monthly sales, January 1993 to June 1994

Work Group Quality
A scale formed by the following 2 items (a = .56):
   • In your opinion, what is the quality of services provided by your work group? (1 = very poor to 5 = excellent)
   • How does the current service quality provided by your work group compare to that of 2 years ago? (1 = much worse to 5 = much better)

Independent Variables

Technology
Have you begun using the regional negotiations system in your daily work? (no = 0, yes = 1)

Discretion
A scale formed from the following 4 items (a = .77):
Please tell us how much *personal influence* you have over the following things:
   • Deciding what tasks or work assignments you do. (1 = none to 5 = complete)
   • Deciding what tools or procedures you use. (1 = none to 5 = complete)
   • Controlling the pace or speed at which you work. (1 = none to 5 = complete)
How often is the authority you have adequate to change things to meet customer needs? (1 = never to 5 = almost always)

TQ Team Participation
Are you currently participating in a total quality or problem-solving team? (no = 0; yes = 1)

Appendix 1 *(Continued)*

TQM Model

Additive index that combines discretion and TQ team participation.

SMT Membership

Is your work group a self-directed team? (no = 0, yes = 1)

Group Self-Regulation

A scale formed by the following 6 items (a = .71):
In your daily activities, who is primarily responsible for handling the following tasks?
(1 = primarily higher management; 2 = primarily the supervisor or coach; 3 = the responsibility is shared by both the supervisor/coach and the work group; 4 = primarily the work group).
  • Set work group goals
  • Assign daily tasks to group members
  • Perform quality inspections and reports
  • Perform safety inspections and reports
  • Decide the training that group members receive
  How often do members of your group routinely teach or help one another with short cuts, problem-solving, or ways to improve how you work? (1 = never to 5 = almost always)

External Coordination

Additive index formed by the following 2 items:
  • Do you have the authority to solve problems by directly contacting supervisors or managers outside your group or in other departments? (0 = no, 1 = yes)
  • How often do you interact directly with supervisors or managers *outside of your department* to solve problems or get your work done? (1 = rarely to 4 = daily)

Human Resource Practices

Skill Level

Additive index formed by three variables: education, tenure, and training.

Education

What was the highest level of schooling you completed?
  1 = some high school (recoded to 10 years)
  2 = high school diploma or equivalent (recoded to 12 years)
  3 = post–high school vocational or technical training institute (recoded to 13 years)
  4 = some college (recoded to 13 years)
  5 = 2-year college degree (recoded to 14 years)
  6 = 4-year college degree (recoded to 16 years)
  7 = some post-college or graduate training (recoded to 17 years)
  8 = masters degree or higher (recoded to 18 years)

Tenure

What is your length of company service (tenure)?
  1 = Less than 1 year (recoded to .5 years)
  2 = 1–5 years (recoded to 3 years)
  3 = 6–10 years (recoded to 8 years)
  4 = 11–15 years (recoded to 13 years)
  5 = 16–20 years (recoded to 18 years)
  6 = 21–25 years (recoded to 23 years)
  7 = over 25 years (recoded to 28 years)

Training

Please consider the following types of training and indicate how much off-the-job training provided by this company you have received in the last 2 years.
  1. Technical training
  2. Basic skills training (math, reading, etc.)
  3. Quality training
  4. Self-directed team training
For each category, 0 = no training; 1 = 1–2 days (recoded to 1.5); 2 = 3–5 days (recoded to 4); 3 = 6–10 days (recoded to 8); 4 = 11–20 days (recoded to 15); 5 = 20 days or more (recoded to 22).

Coaching Support

A scale formed by the following 6 items (a = .82):

Continued

Appendix 1 *(Continued)*

To what extent does your immediate supervisor or coach provide your work group with the support it needs in the following areas (1 = almost never to 5 = almost always):
- Encourages me to participate in solving problems which affect my work
- Provides adequate time for us to meet and discuss work-related issues
- Knows enough about my work to accurately evaluate my performance
- Gives me feedback frequently enough so that I know how I am performing
- Treats employees with respect
- Puts quality above other objectives such as budgets or schedules.

Advancement Opportunity

I am given a real opportunity to improve my skills in this company.
(1 = strongly disagree to 5 = strongly agree)

Job Insecurity

To what extent do you agree or disagree with this statement: "I feel less secure in my job now than I did several years ago." (1 = strongly disagree to 5 = strongly agree)

Earnings

What are your annual earnings (including overtime)?
  1 = under 20,000 (recoded to 15,000)
  2 = 20,000–29,999 (recoded to 25,000)
  3 = 30,000–39,999 (recoded to 35,000)
  4 = 40,000–49,999 (recoded to 45,000)
  5 = 50,000–59,999 (recoded to 55,000)
  6 = 60,000–79,999 (recoded to 70,000)
  7 = 80,000–99,999 (recoded to 90,000)
  8 = over 100,000 (recoded to 110,000)

Employment Relations

Work Group Relations

In general, how would you describe relations between co-workers in your work group?
(1 = very poor to 5 = excellent)

Labor-Management Relations

In general, how would you describe relations in your workplace between management and craft employees? (1 = very poor to 5 = very good)

Union Affiliation

Are you a member of the union? (0 = no; 1 = yes)

Service Markets

Markets

What state do you work in? (series of dummy variables for 5 states)

Individual Characteristics

Gender

What is your gender? (0 = male, 1 = female)

Race

What is your race/ethnicity?
(recoded to 1 = white, non-Hispanic; 0 = other race or ethnic group)

Age

What is your age?
  1 = Under 25 (recoded to 21.5)
  2 = 26–30 years old (recoded to 28)
  3 = 31–35 years (recoded to 33)
  4 = 36–40 years (recoded to 38)
  5 = 41–45 years (recoded to 43)
  6 = 46–50 years (recoded to 48)
  7 = 51–55 years (recoded to 53)
  8 = 56 years or older (recoded to 58)

Appendix 2

Means of Variables: All Workers, Self-Managed Teams, and Traditional Work Groups

Variable	All Workers		SMTs	TSGs
	Mean	Std. Dev.	Mean	Mean
Dependent Variables				
Ave. Monthly Sales	5,313	2,289	5,753	5,033**
Log Ave. Monthly Sales	9.120	0.220	9.155	9.107
Work Group Quality	4.022	0.646	4.213	3.900***
Independent Variables				
Technology	0.568	0.496	0.500	0.614*
Skill Level	39.38	11.80	39.41	39.36
Self-Managed Team	0.390	0.488		
TQM Model	3.016	.949	3.155	2.926*
TQM Team	.224	.418	.218	.228
Individual Discretion	2.791	0.882	2.937	2.699**
Group Self-Regulation	2.258	0.591	2.639	2.014***
External Coordination	2.282	1.419	2.655	2.044***
Coaching Support	3.737	0.804	3.772	3.715
Training	8.816	10.199	7.770	9.485
Advancement Opportunities	3.128	1.242	3.139	3.120
Job Insecurity	4.373	0.988	4.459	4.319
Earnings (Annual)	32,590	4,789	33,045	32,293
Log Annual Earnings	9.539	.298	9.518	9.553
Employment Relations				
Work Group Relations	4.452	.635	4.534	4.400
Labor-Mgmt. Relations	3.158	0.918	3.139	3.170
Union Membership	0.837	0.369	0.851	0.830
Service Markets				
State1	0.139	0.346	0.241	0.074***
State2	0.336	0.473	0.288	0.368
State3	0.174	0.380	0.161	0.184
State4	0.197	0.398	0.184	0.206
State5	0.152	0.360	0.126	0.169
Individual Characteristics				
Age (yrs.)	40.60	0.582	40.453	40.707
Gender (% female)	0.908	0.289	0.930	0.894
Race (% white)	0.768	0.422	0.765	0.771
Education (yrs.)	13.209	1.338	13.068	13.301
Company Tenure (yrs.)	17.873	7.936	18.574	17.422

*Statistically significantly different at the .10 level; **at the .05 level; ***at the .01 level.

REFERENCES

Adam, Everett E. 1991. "Quality Circle Performance." *Journal of Management,* Vol. 17, No. 1 (March), pp. 25–39.

Adler, Paul. 1993. "The 'Learning Bureaucracy': New United Motor Manufacturing, Inc." In Barry Staw and Larry Cummings, eds., *Research in Organizational Behavior,* Vol. 15. Greenwich, Conn.: JAI Press, pp. 111–94.

Adler, Paul, and Robert Cole. 1993. "Designed for Learning: A Tale of Two Auto Plants." *Sloan Management Review,* Vol. 34, No. 3 (Fall), pp. 85–94.

Alderfer, Clayton P. 1977. "An Intergroup Perspective on Group Dynamics." In J. W. Lorsch, ed., *Handbook of Organizational Behavior.* Englewood Cliffs, N.J.: Prentice-Hall, pp. 190–222.

Ancona, Deborah G. 1990. "Outward Bound: Strategies for Team Survival in an Organization." *Academy of Management Journal,* Vol. 33, No. 2, pp. 334–65.

Ancona, Deborah G., and David F. Caldwell. 1992. "Demography and Design: Predictors of New Product Team Performance." *Organization Science,* Vol. 3, No. 3 (August), pp. 321–41.

Appelbaum, Eileen, Thomas Bailey, Peter Berg, and Arne Kalleberg. 2000. *Manufacturing Competitive Advantage: The Effects of High Performance Work Systems on Plant Performance and Worker Outcomes.* Ithaca, N.Y.: Cornell University Press, forthcoming.

Appelbaum, Eileen, and Rosemary Batt. 1994. *The New American Workplace: Transforming Work Systems in the United States.* Ithaca, N.Y.: ILR Press (an imprint of Cornell University Press).

Arthur, Jeffrey. 1992. "The Link between Business Strategy and Industrial Relations Systems in American Steel Minimills." *Industrial and Labor Relations Review,* Vol. 45, No. 3 (April), pp. 488–506.

Bailey, Thomas. 1992. "Discretionary Effort and the Organization of Work: Employee Participation and Work Reform since Hawthorne." Manuscript prepared for the Alfred P. Sloan Foundation, August.

Batt, Rosemary, and Jeffrey Keefe. 1999. "Human Resource and Employment Practices in Telecommunications Services." In Peter Cappelli, ed., *Employment Strategies: Why Similar Employers Manage Differently.* Oxford: Oxford University Press, forthcoming.

Becker, Brian, and Barry Gerhart. 1996. "Special Research Forum: Human Resource Management and Organizational Performance." *Academy of Management Journal,* Vol. 39, No. 4, pp. 777–985.

Beekun, Rafik I. 1989. "Assessing the Effectiveness of Sociotechnical Interventions: Antidote or Fad?" *Human Relations,* Vol. 42, No. 10, pp. 877–97.

Berg, Peter, Eileen Appelbaum, Thomas Bailey, and Arne Kalleberg. 1996. "The Performance Effects of Modular Production in the Apparel Industry." *Industrial Relations,* Vol. 35, No. 3, pp. 356–73.

Berggren, Christian. 1992. *Alternatives to Lean Production: Work Organization in the Swedish Auto Industry.* Ithaca, N.Y.: ILR Press (an imprint of Cornell University Press).

Bollen, Kenneth. 1989. *Structural Equations with Latent Variables.* New York: John Wiley & Sons.

Bowen, David E., and Benjamin Schneider. 1988. "Services Marketing and Management: Implications for Organizational Behavior." In B. M. Staw and L. L. Cummings, eds., *Research in Organizational Behavior,* Vol. 10. Greenwich, Conn.: JAI Press, pp. 43–80.

Campion, Michael A., Gina J. Medsker, and A. Catherine Higgs. 1993. "Relations between Work Group Characteristics and Effectiveness: Implications for Designing Effective Work Groups." *Personnel Psychology,* Vol. 46, No. 3, pp. 823–50.

Chase, Richard B. 1978. "Where Does the Customer Fit in a Service Operation?" *Harvard Business Review,* Vol. 56, No. 6, pp. 137–42.

Cohen, Jacob, and Patricia Cohen. 1983. *Applied Multiple Regression/Correlation Analysis in Behavioral Sciences,* 2nd ed. Hillsdale, N.J.: Lawrence Erlbaum.

Cohen, Susan G. 1994. "Designing Effective Self-Managing Work Teams." In M. Beyerlein and D. Johnson, eds., *Advances in Interdisciplinary Studies of Work Teams,* Vol. 1. Greenwich, Conn.: JAI Press, pp. 67–102.

Cohen, Susan, and Diane Bailey. 1997. "What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite." *Journal of Management,* Vol. 23, No. 3 (June), pp. 239–90.

Cohen, Susan, and Gerald Ledford. 1994. "The Effectiveness of Self-Managing Teams: A Quasi-Experiment." *Human Relations,* Vol. 47, No. 1, pp. 13–43.

Cohen, Susan, Gerald Ledford, and Gretchen Spreitzer. 1996. "A Predictive Model of Self-Managing Work Team Effectiveness." *Human Relations,* Vol. 49, No. 5 (May), pp. 643–76.

Cordery, John L., Walter S. Mueller, and Leigh M. Smith. 1991. "Attitudinal and Behavioral Effects of Autonomous Group Working: A Longitudinal Field Study." *Academy of Management Journal,* Vol. 34, No. 2, pp. 464–76.

Cotton, John L. 1993. *Employee Involvement: Methods for Improving Performance and Work Attitudes.* Newbury Park, Calif.: Sage.

Cummings, Thomas G. 1978. "Self-Regulating Work Groups: A Socio-Technical Synthesis." *Academy of Management Review,* Vol. 3, No. 4 (July), pp. 625–34.

Cummings, Thomas G., and E. F. Huse. 1989. *Organizational Development and Change.* St. Paul, Minn.: West.

Current Population Survey (CPS). 1996. Merged Annual Earnings Files. Washington, D.C.

Cutcher-Gershenfeld, Joel. 1991. "The Impact on Economic Performance of a Transformation in Workplace Relations." *Industrial and Labor Relations Review,* Vol. 44, No. 2 (January), pp. 241–60.

Deming, Edward. 1984. *Out of the Crisis.* Cambridge, Mass.: MIT Press.

Emery, F. 1959. *Characteristics of Socio-Technical Systems.* Document No. 527. London: Tavistock Institute.

Erez, Amir, Diane Johnson, and Timothy Judge. 1995. "Self-Deception as a Mediator of the Relationship between Dispositions and Subjective Well-Being." *Person. Individual Differences,* Vol. 19, No. 5, pp. 597–612.

Gladstein, Deborah L. 1984. "Groups in Context: A Model of Task Group Effectiveness." *Administrative Science Quarterly,* Vol. 29, No. 4 (December), pp. 499–517.

Griffin, Ricky W. 1988. "Consequences of Quality Circles in an Industrial Setting: A Longitudinal Assessment." *Academy of Management Journal,* Vol. 31, No. 2, pp. 338–58.

Goodman, Paul S., Elizabeth C. Ravlin, and Linda Argote. 1986. "Current Thinking about Groups: Setting the Stage." In P. S. Goodman, ed., *Designing Effective Work Groups.* San Francisco: Jossey-Bass, pp. 1–33.

Gutek, Barbara. 1995. *The Dynamics of Service: Reflections on the Changing Nature of Customer/Provider Interactions.* San Francisco: Jossey-Bass.

Guzzo, Richard A., Richard D. Jette, and Raymond A. Katzell. 1985. "The Effects of Psychologically Based Intervention Programs on Worker Productivity: A Meta-Analysis." *Personnel Psychology,* Vol. 38, No. 3, pp. 275–91.

Hackman, J. Richard. 1987. "The Design of Work Teams." In J. W. Lorsch, ed., *Handbook of Organizational Behavior.* Englewood Cliffs, N.J.: Prentice-Hall, pp. 315–42.

Heskett, James, W. Earl Sasser, Jr., and Christopher Hart. 1990. *Service Breakthroughs: Changing the Rules of the Game.* New York: Free Press.

Heskett, James, W. Earl Sasser, Jr., Leonard A. Schlesinger. 1997. *The Service Profit Chain: How Leading Companies Link Profit and Growth to Loyalty, Satisfaction, and Value.* New York: Free Press.

Huber, P. J. 1967. "The Behavior of Maximum Likelihood Estimates under Non-Standard Conditions." *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability,* Vol. 1, pp. 221–33.

Hunter, Larry W., and John J. Lafkas. 1998. "Information Technology, Work Practices, and Wages." *Proceedings of the 50th Annual Meeting of the Industrial Relations Research Association.* Madison, Wisc: IRRA.

Ichniowski, Casey, Thomas Kochan, David Levine, Craig Olson, and George Strauss. 1996. "What Works at Work: Overview and Assessment." *Industrial Relations,* Vol. 35, No. 3, pp. 299–334.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi. 1995. "The Effects of Human Resource Management Practices on Productivity." Working Paper No. 5333, National Bureau of Economic Research.

Jones, Thomas O., and W. Earl Sasser, Jr. 1995. "Why Satisfied Customers Defect." *Harvard Business Review* (Nov.–Dec.), pp. 88–99.

Joreskog, Karl G., and Dag Sorbom. 1993. *Lisrel 8 User's Reference Guide.* Chicago: Scientific Software International.

Keefe, Jeffrey, and Karen Boroff. 1994. "Telecommunications Labor Management Relations after Dives-

titure." In Paula Voos, ed., *Contemporary Collective Bargaining in the Private Sector.* Madison, Wis.: Industrial Relations Research Association.

Kelley, Maryellen R. 1996. "Participative Bureaucracy and Productivity in Machined Products." *Industrial Relations,* Vol. 35, No. 3, pp. 374–99.

Keltner, Brent. 1995. "Relationship Banking and Competitive Advantage: Evidence from the U.S. and Germany." *California Management Review,* Vol. 37, No. 4 (Summer), pp. 45–73.

Klein, Janice. 1989. "A Reexamination of Autonomy in Light of New Manufacturing Practices." *Human Relations,* Vol. 44, No. 1, pp. 21–38.

Kochan, Thomas, and Paul Osterman. 1994. *The Mutual Gains Enterprise.* Boston: Harvard Business School Press.

Lawler, Edward E. III. 1986. *High-Involvement Management: Participative Strategies for Improving Organizational Performance.* San Francisco: Jossey-Bass.

Lawler, Edward E. III, and Susan A. Mohrman. 1987. "Quality Circles: After the Honeymoon." *Organizational Dynamics,* Vol. 15 (Spring), pp. 42–54.

Lawler, Edward E. III, Susan Mohrman, and Gerald Ledford. 1995. *Creating High Performance Organizations: Practices and Results of Employee Involvement and Total Quality Management in Fortune 1000 Companies.* San Francisco: Jossey-Bass.

Leidner, Robin. 1993. *Fast Food, Fast Talk: Service Work and the Routinization of Everyday Life.* Berkeley: University of California Press.

Levitt, Theodore. 1972. "Production Line Approach to Services." *Harvard Business Review,* Vol. 50 (September–October), pp. 41–52.

____. 1976. "The Industrialization of Service." *Harvard Business Review,* Vol. 54 (September–October), pp. 63–74.

Lovelock, Christopher. 1990. "Managing Interactions between Operations and Marketing and Their Impact on Customers." In David Bowen, Richard B. Chase, and Thomas Cummings, eds., *Service Management Effectiveness: Balancing Strategy, Organization and Human Resources, Operations, and Marketing.* Oxford: Jossey-Bass, pp. 343–68.

MacDuffie, John Paul. 1995. "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry." *Industrial and Labor Relations Review,* Vol. 48, No. 2 (January), pp. 197–221.

Macy, Barry A., and Hiroaki Izumi. 1993. "Organizational Change, Design, and Work Innovation: A Meta-Analysis of 131 North American Field Studies, 1961–1991." *Research in Organizational Change and Development,* Vol. 7, pp. 235–313.

McKinsey, G. I. 1992. *Service Sector Productivity.* Washington, D.C.: McKinsey.

Pasmore, William A. 1988. *Designing Effective Organizations: The Sociotechnical Systems Perspective.* New York: Wiley.

Pasmore, William A., C. Francis, and J. Haldeman. 1982. "Sociotechnical Systems: A North American Reflection on Empirical Studies of the Seventies." *Human Relations,* Vol. 35, No. 12, pp. 1179–1204.

Pearce, John A., and Elizabeth C. Ravlin. 1987. "The Design and Activation of Self-Regulating Work Groups." *Human Relations,* Vol. 40, No. 11, pp. 751–81.

Pfeffer, Jeffrey. 1998. *The Human Equation: Building Profits through People.* Cambridge, Mass.: Harvard Business School Press.

Piore, Michael, and Charles Sabel. 1984. *The Second Industrial Divide.* New York: Basic Books.

Reichheld, Frederick F. 1996. *The Loyalty Effect.* Boston: Harvard Business School Press.

Roberts, Karlene H., and William Glick. 1981. "The Job Characteristics Approach to Task Design: A Critical Review." *Journal of Applied Psychology,* Vol. 66, No. 2, pp. 193–217.

Rubenstein, Saul. 1999. "The Impact of Co-Management on Quality Performance: The Case of the Saturn Corporation." Forthcoming, *Industrial and Labor Relations Review.*

Schlesinger, Leonard, and James Heskett. 1991. "Breaking the Cycle of Failure in Services." *Sloan Management Review,* Vol. 32 (Spring), pp. 17–28.

Snell, Scott, and James Dean. 1992. "Integrated Manufacturing and Human Resource Management: A Human Capital Perspective." *Academy of Management Journal,* Vol. 35, No. 3, pp. 467–503.

Steel, Robert P., Kenneth R. Jennings, and James T. Lindsey. 1990. "Quality Circle Problem Solving and Common Cents: Evaluation Study Findings from a United States Mint." *Journal of Applied Behavioral Science,* Vol. 26, No. 3, pp. 365–82.

Trist, Eric L. and K. W. Bamforth. 1951. "Some Social and Psychological Consequences of the Long Wall Method of Coal-Getting." *Human Relations,* Vol. 4, pp. 3–38.

Wagner, John A., and Richard Z. Gooding. 1987. "Shared Influence and Organizational Behavior: A Meta-Analysis of Situational Variables Expected to Moderate Participation Outcome Relationships." *Academy of Management Journal,* Vol. 30, No. 3, pp. 524–41.

Wall, Toby, Nigel Kemp, Paul Jackson, and Chris Clegg. 1986. "Outcomes of Autonomous Work Groups: A Long-Term Field Experiment." *Academy of Management Journal,* Vol. 29, No. 2, pp. 280–304.

Yammarino, Francis J., and Alan J. Dubinsky. 1990. "Salesperson Performance and Managerially Controllable Factors: An Investigation of Individual and Work Group Effects." *Journal of Management,* Vol. 16, No. 1 (Spring), pp. 87–106.

Zimmerman, Charles, and John Enell. 1988. "Service Industries." In J. M. Duran and Frank Gryna, eds., *Juran's Quality Control Handbook,* 4th ed. New York: McGraw Hill, pp. 33.1–72.

Zuboff, Shoshana. 1988. *In the Age of the Smart Machine.* New York: Basic Books.