Shiftwork: Factors Impacting Workers' Biological and Family Well-Being

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Abstract

This paper examines shiftwork and the impact on workers' biological and family well-being. The study reviews the literature and synthesizes current findings resulting in suggestions for the human resource planning function. The paper suggests that shiftwork, when not managed properly, can result in poor judgement and lost dollars for the organization. The study also notes that shiftwork can contribute to the breakdown of the family unit. Shiftwork imposes harsh demands on even the most close knit families, forcing shiftworkers to work on a time schedule out of sync with the rest of society. The study examines the impact of shiftwork on dual careers and children. The study encourages human resource planning personnel to be creative in handling shiftwork in the 1990s.

Introduction

Shiftwork involves one-fourth of the labor force in the U.S. and Canada, and is growing at a rate of one percent a year (Jamal, 1981). Historically, little concern has been shown toward the affect shiftwork has on workers' physiological, psychological, and sociological composition, both in and out of the work place. Yet, these combined effects on production and safety are costing companies an estimated \$70 billion a year (Coleman, 1989).

The western world has come to rely on goods and services on a twenty-four hour basis, making shiftwork a necessity worthy of study. According to Coplen (1988), of Synchro Tech, a shiftwork schedule management consulting firm, without working various shifts, we would need to fend for ourselves in the off-hours: lacking police or fire protection, transportation, utilities, medical care, even financial data needed to generate the global economy. Despite this, as many as 20% of the population cannot tolerate shiftwork, and give up the better wage and benefit packages of shiftwork for straight daytime work. Of those who remain, 80% experience medical, social, family, and personal problems that relate to work the shiftwork schedule (Coplen, 1988). Coplen also notes: "the problem isn't with shiftwork itself, the problem is in the way people adapt or more accurately, don't adapt, to the schedule. Most people don't realize that shiftwork affects much more than sleeping patterns. It becomes a way of life, and people must be taught how to live" (Halcrow, 1988, p. 17).

Since shiftwork is a trend unlikely to change, shift scheduling and planning and the associated lifestyle need to be examined by employers, management, human resource units, and even workers themselves. This paper focuses on three aspects of the shiftwork dilemma: 1) why humans have biological problems with shiftwork, 2) how this type of schedule impacts the family, and 3) what steps can be taken to lessen the adverse effect by those involved.

Biological Factors

We now know that constant readjustment of one's time schedule creates problems in a person's ability to synchronize physiological and social cycles (Frost & Jamal, 1979). Sleep is also affected, as shiftworkers average from five to ten hours less per week than straight day shift workers (Staines & Pleck, 1984). Shiftworkers do not get as much deltawave (deep, restful) sleep as non-shiftworkers, and experience greater amount of alpha (toss and turn) sleep (Gould, 1988). EEG studies indicate that microsleeps (sleep lasting from 30 seconds to three minutes) occur, and "at least one fifth of shiftworkers experience sleepiness severe enough to cause the individual to fall asleep (on nights)" (Coplen, 1988, p. 42).

Many shiftworkers continue to work beyond their physical limits to the point of biological breakdown. Typically, older workers are not willing to take unemployment risks to alter the shift-work situation; while younger

workers may be more willing to risk unemployment rather than their health (Frese and Okonek, 1979). The inability to synchronize the body clock, and the irregularity of sleeping and eating habits contribute significantly to the higher medical absentee rates of shiftworkers (Jamal, 1989).

Reinberg (1984) points out that these factors contribute to greater job performance error. This is of significance not only to the worker, but to all of society. Shiftwork includes such occupations as nuclear sub operators, air traffic controllers, power plant operators, emergency room doctors, and intensive care nurses impacting on all our lives. Reinberg (1984) also speculates that stress is a product of an internal struggle to synchronize one's biological rhythms with the structure of a shiftwork schedule. A schedule often out of sync with the rest of society. It is difficult to eat, sleep, or think quickly when either the surrounding society, or one's own body is not ready for it.

Winfrey (1982) lists the frequent signs of intolerance to shiftwork such as sleep disorders (60% to 80% more likely), persistent fatigue, excessive mood and behavioral changes (5 to 10 times greater), and digestive troubles like gastritis (3 to 6 times likelier). Research by Tepas (1982) indicated that there was a significant difference in the performance of day and night shiftworkers. Using the Williams-Lubin experimenter paced addition task (before and after sleep during the usual workweek), Tepas concluded, "the differences between groups on polysomnographic total sleep time, pre-sleep performance, and post sleep performance are all statistically significant, indicating poorer performance by night shiftworkers" (Tepas, 1982, p. 188).

Sex differences related to shift work have also been examined. Smith and Miles (1987) found that females had larger nighttime impairment on manual dexterity tasks, but performed working memory tasks better at night than during the day. Males tended to suffer impairment in both measures, and reaction time was impaired for both sexes.

Recent events have supported the notion of poorer early morning work performance. It has been suggested that the Chernobyl disaster (which occurred at 1:35 AM) was in part due to work scheduling and planning problems and human error (Coplen, 1988). Coplen also suggests the Three Mile Island incident (occurring at 4:00 AM) happened for similar reasons. A report of the Presidential Commission on the space shuttle Challenger accident cites sleep loss (due to shiftwork) as a contributing factor toward the poor judgement and mistakes made by those working on the project (Coplen, 1988).

The Impact of Shiftwork on the Family

Due to built in overtime, working holidays, and cover-

age for co-worker vacancies, shiftworkers work on average ten more 40 hour weeks a year than day workers (Coleman, 1989). The time off that shiftworkers do have is frequently of poor quality because of fatigue, which could make one adverse to family demands.

Shiftworkers still have time to spend in their family roles. Staines and Pleck (1984) suggest shiftworkers actually spend more time on housework than other workers. Yet, the scheduling of available family time with other family members who may be on different daytime schedules is a special problem for shiftworkers. The available time shiftworkers have for their family roles comes at the wrong period of the day such that schedules of family members may fail to mesh. According to Staines and Pleck (1984) shiftwork is associated with lower quality of family life, not quantity.

Rosabeth Kanter (1984) writes that when a husband works shiftwork and a wife stays home, the wife becomes the family stabilizer. The non-working wife will often handle family situations as if she were a single parent and make scheduling decisions without consulting her husband. Kanter (1984) also notes that each shift carries its own characteristic family problem. More spousal friction was reported on midnights, resulting from conflicting energy levels and scheduling, while the afternoon shift created father-role troubles, due to the inability of participation in afternoon child-related activities. Hood and Golden's (1984) research found that subjects who went from working days to the afternoon shift reported increased family stress levels within the family. Also, "realignment of family coalitions" and changing patterns of closeness both in and outside of the family occurred (Hood and Golden, 1984, p. 134).

Dual Careers and Shiftwork.

Presser and Cain (1983), in recounting Current Population Survey data, reports that increasing numbers of women (31% of all shiftworkers), married males (68% of all males involved), and married females (48% of all females involved) were working swing shift in 1980. Since married woman represents the fastest growing segment of the labor force, there has been an increase in the number of families where both spouses are employed. In fact, in 1982, 52% of all couples were in "dual-earning" or "dual career" situations, of which approximately 3.3 million couples had incorporated shiftwork, and according to Presser and Cain (1983) it is likely that the spouse of a shiftworker will be on a straight shift.

There is also the danger that spouses will rely too much on each other for the support they need, and too little on other sources, such as friends, relatives, and paid help. Time constraints and tight schedules often make it difficult to seek help. Gilbert (1984, p. 68) claims: "Spouses in dual career marriages should be made aware of the

limitations of individual solutions, and encouraged to develop supportive social networks, and to try to influence social policies (e.g., provision of convenient, quality child care and paternity leaves) that directly affect their lifestyle."

Strain on the dual-earning male and on his marriage also results from the greater degree of power that his wife feels in the marriage because of her employment. Consequently, couples may be more likely to have increased conflict. In concordance with the concept of androgyny, Gilbert (1984) suggests that less role conflict for both men and women is associated with higher self esteem and liberal attitudes toward gender roles. In this way, the sexes can match their behavior to the situation, rather than being limited by what is culturally defined as male or female. Unfortunately, shiftwork adds a confounding variable to this re-socialization process (Gilbert, 1984).

Shiftwork and Children.

Presser and Cain (1983) also indicate that over half of the dual-earning couples involved in shiftwork have children. Statistically, shiftworkers are young, implying that their children are also young (one-third of these couples have children less than 5 years of age). The high role conflict and stress often reported by married professional women with young children apparently arises from an internal value system that these women may no longer agree with cognitively, but still react to emotionally. Gilbert (1984, p. 68) notes:

"Women who guiltlessly leave their young in order to pursue a career may think they are suspect in the eyes of society and put undue pressures on themselves as mothers."

Easterlin's (1982) research concerns child care changes that have occurred due to hours of employment changes and dual spousal work. Easterlin (1982) concludes that there has been a decrease in the amount of time of parental presence in the home, reflecting a drop in fertility of the last two decades, and a widening of the age gap between siblings. He also noted that child care in the home for children under the age of 3 was significantly less in the late 70's than it was in the mid 60's. The major care of these children has shifted from a relative to a non-relative.

A high percentage of shiftworking women have employed husbands who are the primary caretakers of the children. This accounts for a stronger psychological involvement that fathers have with their children (Presser, 1983). Skinner's (1984) research suggests that males in a dual-earning situation felt restrictions in attempting to find free time. Stress increased because they were partly responsible for house-keeping (designated as women's work in our culture), and because they lost part of their "active support system", their wife's working (Moore &

Sawhill, 1984, p. 158).

Couples may share child care when on different shifts, but the strain on the parents due to scheduling difficulties produced by their jobs may not be in the child's best interest (Presser & Cain, 1983). According to data provided by the AFL-CIO-CLC, about 3,000 of the nation's six million employers provide childcare support of any kind. Parents needing child care pay on the average \$3,000 annually for even inadequate care. And, federal child care programs have been cut relentlessly since 1981 (Steelabor, 1988).

Summary Solutions

The problems resulting from a shiftwork schedule need to be recognized and acted upon by policy makers and strategists in business. The various studies of human endeavor--politics, religion, economics, science, and law--invariably point to the concept of striving for, establishing, and maintaining equilibrium. Successfully balancing the needs of a company with the needs of the employees will likely be regarded as the best possible solution to a wide variety of production considerations. Any imbalance will ultimately cost one, or both sides something.

The employer's concern is in having to pay the built-in hidden costs of shiftwork, such as: poor quality product and reduced productivity, reduced safety and safety violations, poor morale, replacing personnel turnover and bid outs, decreased motivation, and operator error leading to unscheduled downtime (Coleman, 1989). In attempting to improve shiftwork for both the employer and the employee, the human resource planning function should strive to improve three areas that can balance the employer-employee shiftwork dilemma: appropriate environment both at home and at work, shift scheduling, and training and education.

Appropriate Environment.

According to Gould (1988), a work environment can promote alertness by using yellow, red, and orange room colors, along with good lighting. Gould (1988) also suggests that adequate ventilation is needed to keep carbon dioxide (which produces drowsiness) from building up. Room temperature should be kept between 73 to 77 degrees.

Additionally, the employee needs to create a good daytime sleeping environment at home. The sleeping room temperature should be cool (65-68 degrees), and free from noise and distractions. Often it is necessary to insulate the room from the normal household activities. This can be achieved by using ear plugs, or using a continuous "non-involving" noise, like a fan, air conditioner (Coplen, 1988, p. 45).

Moderation in exercise, alcohol, nicotine, and caffeine usage will help to improve sleep quality. Gould (1988) also suggests to use moderate amounts of carbohydrates as sedatives, rather than sleeping pills (e.g. a half a candy bar). Carbohydrates produce tryptophan, a precursor for serotonin, which signals the body to go to sleep. Gould (1988) also recommends the use of proteins for alertness (as opposed to stimulates). A few ounces produces an alertness effect 30 minutes after consumption (Gould, 1988).

Scheduling.

According to Gould (1988) a forward or clockwise drift is critical when designing shift schedules--she suggests that one that moves from days, to afternoons, to evenings is more compatible with the natural drift of the human body clock. Gould (1988) also claims a medium (weekly) rotation is preferable. She notes that body fluctuation patterns should be taken into account when scheduling work detail. On the afternoon shift, difficult mental and physical tasks should be scheduled during the first half of the shift when one's body temperature is rising, and at the end of the midnight shift when the body temperature begins to rise. Gould (1988) suggests employees should bring extra clothing to wear after 8 p.m. when the body temperature begins to drop.

Psychological research regarding sleep suggests that humans seem to be genetically programmed to sleep longer at night (Webb, 1974). As a result, the Japanese are allowing naps to be scheduled into the night shift, claiming that this reduces fatigue, and enhances productivity (Reese, 1988). At the very least, providing adequate breaks is a must.

According to Coleman (1988) companies are moving away from the crew concept, toward the team concept. In a crew concept, each shift runs the operation their own way, with little if any interaction with the subsequent crew. The team concept attempts to motivate employees on the different shifts to work toward a common goal. A system like this operates with crews so lean, that if one employee were absent, the operation could not run. Employees must have a strong incentive to cover their shifts, so the company will trade time off for lower cost, reliable sick and vacation coverage. Employees will be able to make their own scheduling decisions, and operate more independently of management. These are job enrichment factors that attempt to make shiftwork more attractive. Coleman (1988, p. 15) comments that as in sports, shiftworker teams need to know the score, they need clear results and quick rewards.

As Coleman (1988) warns, the human resource practitioner needs to be aware of some key elements before implementing a new schedule. In particular, attention must

be paid to defining new scheduling goals and keeping employees informed. Also, managers must recognize the impact of shift changes, and ultimate disruption of employees lives.

Training of Management and Employees.

A large percentage of management does not know how to analyze the variety of costs and staffing factors in shiftwork (Coplen, 1988). Training management to use algorithms, like the models provided by Burns and Koop (Koop, 1988) would be useful, as this type of model reduces the amount of calculations needed in figuring efficient staffing numbers and scheduling cycles.

Policies and procedures are often written for the 9 to 5 personnel, but this type of policy is not necessarily good for evening or night shifts. In order to develop an adequate policy for shiftwork, knowledge of proportional staffing allocations, shift and daily relief factors, duty cycles, shift change properties, team integrity, and bio-compatibilities are just a few of what is needed to help to balance the concerns.

Orientation programs for new employees that focus on the aspects discussed need to be routinely implemented. Making this information available at an early time in the process may aid the employee in adjusting their lifestyle, before a fatigued indifference sets in. At that point, workers may forget that shiftwork undermines their life, and they may lose the realization that they could be much more comfortable than they are. Likewise, their family and social life would be better if they could learn to manage time better.

Conclusion

The information conveyed in this paper needs to be taken seriously. The repercussions could well be lost dollars to the production process, loss of revenue to the GNP, and decreased family well-being. Stress plays a role in the family's loss of stability and cohesiveness. Shiftwork, as shown by this paper, produces stress and should be considered as yet another underlying cause in the changing, and possibly decaying family unit.

The balancing of concerns embodied in shiftwork presents a challenge to the human resource planning function. It is up to inter-disciplinarians to explore the possible solutions that can balance the concerns of employees with the goals of the organization. Because of the numbers working on shiftwork, the job importance of those employed in it, and the provisions and contributions the employees make to our 24 hour a day society, shiftwork should be a major concern of human resource planning in the 1990s.

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