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**THE EVOLUTION OF SKILL-BASED PAY
IN AN AMMUNITION ASSEMBLY PLANT**

**CEO PUBLICATION
G 90-14 (176)**

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In 1981, Honeywell Inc. won three contracts to manufacture medium-caliber (25 and 30 millimeter) ammunition for the U.S. Department of Defense. The company leased 1,800 acres of the 23,000 acres at the Joliet Army Ammunition Plant for its facility. Employees refurbished and reequipped several World War II-vintage buildings that had been idle since the Vietnam War. Production began during the second half of 1983.

Top management decided early in the process of designing the organization to use skill-based pay (SBP) for factory employees. The use of SBP in this case is notable in several respects. First, SBP has been used at the site for nearly seven years. No other available case study on SBP covers such a long period of time. The case permits a review of how the plan evolved to meet changing conditions and to overcome initial design problems. Second, the Honeywell facility was perhaps the first in the defense industry to use SBP. The case helps shed light on whether this type of pay system can be used successfully in the defense sector. Finally, the case concerns use of SBP in an assembly technology. Most descriptions of SBP plans consider organizations using continuous process technologies, such as pet food, paint, and chemical plants.

The authors have complementary perspectives and experiences with the SBP plan at the site. The third author was the Human Resource Advisor (manager) for the facility from startup until August 1986. He led the initial SBP design effort. The second author succeeded him as Human Resource Advisor, and led an effort to reformulate the SBP plan. The second author remained at the facility until December 1989. The first author was an action researcher who, along with Tom Cummings of the University of Southern California, assisted with the overall design and development of the organization.

In order to shed light on why top managers felt that SBP addressed organizational needs, we will begin with a discussion of key aspects of the business and the production technology that defined organizational requirements. Then, we will consider the specific design of the pay system. Finally, we will review the effects of the pay system.

Organizational Context

The top management group believed that skill-based pay met several types of organizational needs: business conditions, the work technology, and the overall organization design. It is important to understand these conditions before considering details of the pay system design.

Business Conditions

Competition in the ammunition business was vigorous, especially compared to some capital-intensive, high technology segments of the defense industry. The production technology was familiar to a number of companies. Contracts covered relatively short-term periods of a few years or less, allowing competitors frequent opportunities to reenter the market. Furthermore, long-term production levels were difficult to predict. Even under the best conditions, particular products would come and go depending on the company's success in winning and keeping contracts.

Management hoped to expand greatly the size of the organization. The Reagan administration's defense buildup was in its early stages, and there was room for the facility to expand to several times its original size. (As it happened, conventional ordnance never became a funding priority of the Reagan administration, and production at the facility and in the ammunition industry as a whole never reached the levels management once hoped to see.)

These business conditions placed great pressure on the organization to meet contract performance terms, such as quality standards and production schedules, and to do so at the lowest possible cost. The organization also needed to be very nimble in order to adjust to changes in funding for different programs and to gear up production quickly on new products at the facility.

Production Technology

Ammunition is manufactured using a load, assemble, and pack (LAP) technology. The primary steps in the production process on all three production lines (called Lines 1, 2, and 3 for simplicity) are indicated in Figure 1. In the *Case/Prime* area, employees prepare the shell cases and insert primers into the cases. In the *Charging* area, operators control charger, fuzer, and tracer machines that prepare the projectiles. Because of the danger involved in this step, the operation is performed by remote control. The case and the projectile come together at the *LAP* stage. There, the case is filled with explosive

propellant, the projectile is screwed into the case, and the round is sealed. Finally, in the *Packout* area, an operator loads the output of the LAP area into cases and pallet loads.

Insert Figure 1 about here

The production technology was characterized by high interdependence. Several employees were needed to perform all the machine operation, material handling, maintenance, and quality control tasks essential to keeping the machines in each area running efficiently.

Support operations included a material handling group, a process verification (quality control) facility, and a maintenance group. A number of employees were required in each of these functions.

Variations across Lines. There were minor variations in the production processes across the three assembly lines. Particular machines and some specific steps in the process existed on some lines but not others. However, an employee who knew all steps in the production process on one line knew most of the steps needed to produce ammunition on another line as well.

The major difference between LAP lines was not in the steps of the production process, but in the production volumes on each line. Line 1 was a high volume line, manufacturing over a million rounds per year in a three-shift operation. Twenty-five or more employees worked on the line per shift. Line 3 was a low-volume, batch-oriented operation, in which a crew of 12 to 15 employees to some extent moved through the production stages with the product. Volume on Line 2 was between the other lines in production volume and staffing. The need for flexible employees on Lines 2 and 3 was especially critical, since the employees had to be able to perform needed tasks at various steps in the production process.

Safety. Safety was an overriding concern in the facility. The product was inherently dangerous. One high-explosive round of ammunition, fired by an aircraft or motorized vehicle, could destroy a tank. At any given time, thousands of rounds might be present on or near the production lines in the form of raw materials, work in process, and finished product.

Virtually everything about the facility, from work rules to the physical layout, was designed to reduce the chance of explosions and to contain any blast that might occur. Work rules ranged from the

obvious (a ban on smoking in work areas) to the subtle (a ban on nylon underwear, which could create dangerous static electricity). The production lines were laid out hundreds of feet apart, and each line was divided into smaller work areas stretched out over the length of a football field, in order to limit damage from any explosion. The buildings and the machines were designed to channel the force of any blast upward toward the roof, which lifted to limit the force felt in the work area.

Safety considerations had important implications for the way employees were managed. An unusual degree of self-management was desirable simply from the standpoint of the physical distance separating work areas. Even though the total number of employees on any line was relatively small, no single supervisor was able to monitor and control the behavior of all employees spread out over such a distance. All employees needed to know a great deal about safety rules and practices and they needed to be motivated to follow these practices on their own. Also, some support operations, such as material handling, involved an unusually high level of knowledge because of the need to handle explosives safely.

Organization Design

The organization was designed to meet objectives in four areas: safety, quality, schedule, and cost, in that order of priority. The top managers at the facility hoped to do this by avoiding certain conditions they had experienced at other company locations, and by emulating practices they had seen in parts of Honeywell and in other companies.

The conditions top management wanted to avoid included excessive layers of management; instances in which employees idly sat while waiting for skilled tradesmen to fix simple machine problems, due to rigid jurisdictional boundaries; and employment instability that arose because employees lacked the skill to work in other areas when their production line shut down temporarily. All of these problems inflated costs and slowed employee response to production problems. On the other hand, top managers admired several high involvement organizations they visited. These organizations were built around employee work teams which had unusually high levels of authority and responsibility for managing their own performance. Practices common in these organizations included

high levels of employee training, extensive communication of performance and business information, and skill-based pay.

The organization design at the new facility was built around work teams. Each shift on each production line was a team, and each support area (material handling, maintenance, and test facility) also was a team. Each team had responsibilities, but there were no individual job descriptions; employees were expected to work in and understand all tasks in their team. Each team had an "Advisor." The Advisors initially performed functions much like a traditional supervisors, but over time they were expected to encourage their teams to become much more self-managing. There was a conscious effort to minimize status differences between management and employees. All employees were classified as salaried and received the same benefits. From the beginning, management planned to implement a skill-based pay plan to provide incentives for cross-training and to reinforce the functioning of the work teams.

The SBP Design Process

The skill-based pay plan evolved considerably over the years. Some minor changes and updating took place at frequent intervals. However, we can identify three major phases in the history of the pay plan. The design issues faced in each phase, the process used to address these issues, and the outcome of each phase were somewhat different.

- **Phase 1: Adoption** (*March 1984 to July 1985*). The SBP plan was implemented early in 1984, about a year after the first employees were hired at the facility and several months after the start of full-scale production at the facility. Several implementation problems were experienced during this period.

- **Phase 2: Revision** (*July 1985 to January 1988*). The initial SBP plan was revised in light of experience both with the SBP concept and with the technology. As many early problems were ironed out, management and employee acceptance of SBP grew considerably.

- **Phase 3: Reformulation** (*January 1988 to present*). The arrival of a new top management group and introduction of a new weapons system with very different skill requirements led to a review and substantial reformulation of the SBP plan for the entire facility.

We next will consider each phase in greater detail. At this point, we will focus on the overall design and implementation process, rather than the mechanics of the plan.

Phase 1: Adoption

Management was committed to implementing a SBP plan as part of the overall organization design at the facility. However, developing a solid pay plan was a challenge. Joliet was the first SBP plan and the first high involvement plant in Honeywell. Thus, there was no experience in the company to draw on in developing a SBP pay plan, especially one that would complement the high involvement design. Moreover, there were a number of technical problems during the startup period. This made it was difficult to study the work to know exactly what skills were needed and how they could be packaged most effectively.

The goals for the SBP plan established by management were as follows: (1) elimination of jurisdictional boundaries; (2) leveraging of staff and support personnel (that is, using them more effectively); and (3) development of employee problem solving talent. The SBP plan was intended to cover essentially all non-exempt employees except office support. In designing the plan, the Human Resources department played a facilitative and leadership roles in moving the design process forward. The line and support department Advisors played a key role, however. They conducted task analyses that permitted them to determine point value of different skill units (see below). There was relatively little involvement of nonexempt employees at this stage.

A number of problem with the SBP plan arose during Phase 1. Indeed, it quickly became the most contentious issue in the facility. As we will detail below, there were problems with the design of the skill blocks, training, communication, Advisor inconsistency in administration, and other matters. These problems became increasingly obvious in employee complaints to management and the Human Resources group, and as a result of an employee attitude survey conducted in February 1985.

Phase 2: Revision

The problems experienced during Phase 1 led to several changes during Phase 2. The skill blocks were revised based on the Advisors' greater experience with the work technology. For example, points were allocated more heavily to machine operation skills than before. In general, the SBP plan

became more formalized during this period. A thick SBP manual detailing the pay plan was developed and given to all employees at the start of the phase. In general, policies and procedures became much more systematic. Although some differences remained, the Advisors attempted to be more consistent in dealing with issues like training opportunities, job rotation, and evaluation procedures.

The level of business at the facility hit its nadir in the period, and management was forced to lay off about half of the work force in 1986. Layoffs were made partly on the basis of the number of SBP points that had been accumulated at the time. In retrospect, this proved to be an error. Points had been earned in inconsistent ways across teams, and the somewhat arbitrary sequence of job assignments the employee had received influenced how fast they had been able to earn points. This led to considerable resentment of the SBP point system by many employees.

Phase 3: Reformulation

By 1987, the top management team had turned over completely as a result of retirements and transfers. The new senior management team became convinced of the value of SBP, but was not committed to any particulars of the plan that currently existed. There was no shortage of employee suggestions about how to change the SBP plan. The top management group decided to review the entire high involvement organization design for the facility, including the SBP plan, when it became clear that a new weapons system would be produced at the facility.

The new system, called the AT-4, was essentially a disposable bazooka used by NATO infantry troops. Production technology on the new system was far less automated, less interdependent, and lower in skill requirements than LAP technology. Prior to the review, therefore, it was not clear that either SBP or a high involvement design were appropriate for this technology.

A management Review Team was assigned to analyze the pay system thoroughly in light of past problems with SBP and requirements of the new product. The review process included meetings with groups of experienced employees and with new hires; a series of meetings with the Advisors; limited consulting assistance from the first author; an in-depth review of the production requirements of the AT-4; and visits to several plants in other companies that were using SBP.

The Review Team redefined the objectives of SBP. They concluded the system must:

1. Support the production needs and goals of the facility.
2. Train employees in many skills and knowledge to encourage personal development and growth.
3. Enhance the development of a flexible trained work force capable of performing many tasks and skills.
4. Reward employees for learning and performing new skills.
5. Support equal and fair opportunities to all employees.

The Review Team conferred regularly and informally with Advisors and employees on the redesign as the group progressed in its deliberations. It developed a number of changes in the SBP system that were implemented at the beginning of 1988. First, a modified team-based system that included a new SBP plan was adopted for the AT-4. Procedures were developed that allowed employees to transfer from the SBP plan in the LAP area to that in the AT-4 area without any loss of pay. Second, the Review Team removed the few test facility employees who were on SBP from the system. SBP was not seen as an asset in the test facility because the nature of the work did not permit structured job rotation and because the SBP system did not enhance departmental production capabilities. Also, the maintenance team's SBP plan was modified so that it placed greater emphasis on depth of skill in particular trades, as in apprenticeship programs. Ultimately, decision was made to maintain SBP in the LAP areas, but the plan was reformulated.

Next, we consider in detail how the design of the SBP plan evolved through the three phases.

The Skill-Based Pay Plan

Important features of the SBP plan included the design of skill blocks, the way in which the blocks were priced, skill evaluation, training, and communication about the plan. We will consider these issues in turn.

Skill Blocks

Prior to Phase 1, the work of each team was analyzed by the Advisors with help from the Human Resource department. The Advisors identified the major skills required to perform all the work of the group. A written description of each skill unit was developed, and each skill unit was assigned a point value based on complexity, discretionary judgement required, and average time required to learn and perform the skill. These skill units then were organized into skill modules that defined career paths

for team members. There were approximately 240 points, or four skill blocks, in each team including the support groups.

An employee earned a pay increase by accumulating any 60 skill points. Employees could not pick just any collection of positions they wanted to collect enough points for an increase, however, because of the need to fill all positions with employees who had an adequate level of expertise. Some luck was involved in the particular set of positions to which the Advisor assigned an employee; it was possible to spend a long time learning certain difficult skills before earning a pay increase.

The plan called for evaluating an employee after he or she spent three months (called "learning time") learning skills that were worth 60 points. Employees who passed the evaluation then spent six months in "payback time". In this period, the employee continued to practice the skills learned in the block and was responsible for teaching these skills to others. In theory, then, employees could receive a pay increase every nine months (six months of performing time plus three months of learning time on a new skill block). In reality, however, the need to manage job rotation and to balance training needs and production needs slowed movement through the skill blocks.

Employees were told when hired that they would have to learn all the skills within their team as a condition of employment. This meant that all employees on SBP would eventually progress to Level 4. However, no maximum time was set for earning any particular skill level or for progressing through the entire set of four levels.

Several changes in skill blocks were made at the start of Phase 2. First, skill points were recalculated, taking into account a year of experience with the technology. Various machine operation skills, for example, received more points, while material handling on the LAP lines received less. Second, the term "payback time" was changed to the more palatable "performing time." Third, the more realistic expectation was set that the average progression would be about twelve months. Fourth, a team leader skill block was added (Level 5). Only one member of each team was permitted to earn this block at a time, and this position was selected by the Advisor. The team leader's functions were to assist with training, assist with team communication, and to lead problem solving meetings of the team.

In Phase 3, the SBP plan was reformulated by the management Review Team. The most significant change was the abandonment of the point system. Employees had come to resent the point system after layoffs were based partly on points acquired; the Review Team felt that there was too much emphasis on acquiring points, not learning skills; and the system was cumbersome to change, and even made technical changes cumbersome, because a change in any task impacted points and pay rates for all employees in the team. Instead of using points, the skill blocks were reconstituted into a probationary period and entry block; a material handling and basic machine operation block; an inspection block; and an advanced machine operation block. New employees learned the blocks in that order. The new blocks represented general and abstract categories of skills instead of groupings of specific skills associated with each work station. The value of the skill blocks no longer changed in response to minor changes in work procedures or technology. Figure 2 illustrates the different structure of the old and new skill blocks.

Insert Figure 2 about here

Another change in Phase 3 was increased reliance on progression at regular time-based intervals. Over the previous four years, employees had progressed at a rate of approximately 12 months per skill level. Therefore, employees were given a minimum of 12 months under the new system to learn and perform all skills within their block. The formal distinction between learning time and performing time was eliminated. Employees who could not learn all the tasks in the block within 12 months were placed in a special training and certification program. Overall, this system led to much more regular pay increases for employees than had been the case previously.

A further change was that employee were required to earn only three skill blocks, not four. This reflected management's reassessment of the amount of flexibility that was truly needed.

A second appointed Level 5 position, the Skill-Based Technician, was added to the team. This person's functions were to develop greater technical skill than a person at Level 4, to perform tasks similar to but below the skill level of a mechanic, and to assist with team training.

The SBP plan in the AT-4 area was similar to that described here except in the content of the skill blocks. The blocks in that area were tied more closely to organizational structure and steps in the production process than was the case in the LAP area.

Pricing

The Human Resource group faced the compensation analyst's nightmare at first. The ammunition industry was a low wage industry. However, average wages in the local area were relatively high, due partly to the number of old-line, unionized, industrial plants in the region. This meant that paying wages that were competitive in the local labor market risked making the organization uncompetitive in its business market.

One attraction of SBP to management was that it appeared to offer a way out of this pricing dilemma. The compensation strategy was to peg entry wages at a rate that was low for the area but competitive within the industry. Pay rates rose fairly sharply as employees reached higher SBP levels. Each new skill level was worth a base pay increase of 90 cents per hour. Level 3 was pegged at slightly above the area average and Level 4 was considerably above the area average. By the time they reached Level 4, management believed, employees of the Joliet facility would be so productive that the facility could afford to pay them at a high rate.

Insert Figure 3 about here

For all positions within the facility on the SBP plan, internal equity determined differences in pay. This sometimes conflicted with local practice. For example, material handlers in other organizations usually received higher pay than assembly line workers.

The compensation strategy did not change in Phase 2. However, employees had complained that because each skill level was given an equal pay increase, each level was worth proportionately less money as base pay increased. In response to this concern, the plan was changed so that each skill block was worth a seven percent increase in base pay.

Since 1985, market adjustments have been made to the pay structure approximately annually. The adjustments have kept the same relative spread between blocks, but whole pay structure has migrated upward over the years in line with increases in the area.

In Phase 3, several firms in the local area began negotiating new collective bargaining agreements that collapsed jurisdictional boundaries into broader, more highly skilled jobs in return for pay increases. If this trend continues, it will reduce the Joliet facility's ability to maintain a premium over local wages for those at Levels 3 and 4 of the SBP plan.

Skill Evaluation

During Phases 1 and 2, the Advisors assumed primary responsibility for managing the skill evaluation process. At the end of the learning period, a formal evaluation was conducted by the Advisor, a technical resource (usually, a production engineer or quality engineer), and later the team leader from the employee's team. Until well into Phase 2, there was little direct team input into the evaluations because team members were unwilling to evaluate each other. Eventually, however, employees came to view team input into the evaluation process as a desirable way of influencing the quality of the evaluations. By Phase 3, team input into the evaluations had become routine.

It was impractical to conduct skill evaluations solely on the basis of work samples and on-the-job demonstrations. Many of the critical skills employees needed to learn consisted of safety policies and emergency procedures. Obviously, the testing did not include accidents or explosions merely to test whether employees knew how to react to them. Instead, the evaluation testing included three complementary components. The employee demonstrated skills, where possible; completed some job-related written testing, such as completing inspection tickets; and answered a number of questions orally. An employee who failed the examination had to wait a certain period of time before requesting another examination.

Two other aspect of the evaluation process was added in Phase 3. First, evaluations and pay progressions occurred at twelve month intervals, which was much more regularly than in the past. Second, a recertification program was established. The plan required employees to be retested annually, with the tests focusing on the skills that would be needed especially during the next year. If

an employee failed the examination, he or she was given twelve months to recertify. If he or she still was unable to pass a recertification after an additional 30 to 60 days, the employee's pay was downgraded. The procedure reinforced the message that the purpose of recertification was to maintain skill levels, not to reduce pay.

Third, progression reviews were conducted by the Advisors with all employees at six month intervals. These reviews considered how the employee was progressing against his or her plan. Employees received feedback about any areas of concern at this time. Thus, the progression reviews served the same ends served by performance appraisals of management employees.

The skill evaluation process was the source of much employee unhappiness during the early days of the SBP plan. One early problem was that Advisors were overwhelmed by the demand for evaluations as soon as the plan was implemented. Until production and quality engineers were enlisted to help with the evaluations, there was a logjam in the assessment process. Another problem concerned the fairness or objectivity of the evaluations. Employees often complained that other the evaluations in other teams were fairer or easier than the evaluations in their own team. These complaints abated over time as more and more written materials were developed that defined the skill blocks, the testing criteria, and the testing procedures.

Inconsistency among Advisors in the evaluation procedures created a variety of complications. In particular, although employees were supposed to be tested on all the skills in their current block after the three months of "learning time," some Advisors delayed testing for another six months until completion of the "performing time" period, and still others conducted evaluations after the employee learned each particular skill within a skill block. Employees easily learned of such differences during the movement of employees across teams in response to changing production requirements. When employees perceived that some teams earned pay increases faster or more easily than others, they became very upset. Because differences in evaluation procedures enabled those in some teams to accumulate skill points faster than in other teams, use of the points for layoffs was seen as arbitrary and unfair. The new system greatly reduced this type of problem.

In general, the evaluation process became much simplified and much more regular over time, and in the process employee concerns about the process were greatly reduced.

Training

Most of the training that employees needed to progress under the SBP system was on-the-job training. Employees rotated into a new area or work station to get the opportunity to learn new skills. Incumbents conducted training for employees who rotated to their position. Employees also had some opportunities to become familiar with new skills without being rotated to a particular area. For example, if their area went down due to machine repair or because production needs had been met, they often could move to a new area to begin learning new skills.

Job rotation and on-the-job training were managed primarily by the team Advisors, although team coordinators and team members took increasing responsibility for training in Phase 2 and Phase 3. Indeed, the teams grew by confronting the training issue. Spontaneously taking full advantage of training opportunities, such as machine downtime or employees' encounters with unusual production problems, required frequent movement of personnel along the line. Relying only on the Advisor to make manpower adjustments for twenty or more employees spread over a great distance was cumbersome. In addition, some Advisors tended to keep the best machine operators on one job, rather than allowing them to rotate and progress under the pay system. By confronting the Advisors about these patterns, some teams assumed a much greater role in managing their own training process.

During Phase 1, a variety of classroom training programs were developed for employees. The company received state and federal funding to conduct the training. Most of the courses covered topics that were important regardless of work area, such as safety practices, quality techniques, material identification, and group problem solving skills. Some of these were conducted at the local community college. The courses were not closely tied to particular skill units and skill blocks.

For about two years prior to Phase 3, less classroom training was conducted. The management Review Team concluded that there had to be a renewed focus on knowledge requirements that went beyond immediate job skills. Employees receive formal classroom training or retraining each year in safety; inspection procedures; labor reporting; material identification; performance standards (i.e., how

and why production rates are established); statistical process control; team skills; and security rules. Employees now are required to receive this training in order to be eligible to progress to the next pay level. Although the level of classroom training clearly has increased, there sometimes remain problems in maintaining management commitment to the formal training effort.

On-the-job training became more formal as well in Phase 3. The use of incumbents to train other employees was a mixed success. Some employees were better than others at training, and some were less interested in training fellow employees than in their own advancement to the next position. The design team addressed this tendency by requiring the team coordinator and skill-based technician to assume more responsibility for training, with the operator playing a secondary role. This assured greater consistency in on-the-job training.

Communication

In every phase, team meetings were a key means of communicating the details of the pay system. Line management took the lead in holding these meetings. Especially in Phase 1, this created some problems as some Advisors added their own twist on the plan as it was explained to employees. This laid the groundwork for later problems around consistency across the facility on issues such how points were earned, how job rotation would be handled, and so on.

A critical means of communication was one inch-thick, bound SBP manual that was given to all employees at the start of Phase 2. This was the first comprehensive document that employees had received about the pay plan. It described the philosophy and mechanics of the pay plan, and listed the specific skills that were included in each team's SBP progression. Months of effort were required to compile the manual, but it was an extremely important document from the standpoint of providing a clear explanation of the pay system that all employees could review.

Additional written materials were provided in Phase 3 to describe to all employees how the reformulated pay system would work. These included a twelve-page packet explaining the new system, and later a revised skill-based pay manual that listed all the questions that might potentially be asked on a certification examination. This, then, provided a very detailed SBP study guide for employees.

These materials now are routinely given to all new employees. An Advisor manual also was developed, which provided the required answers to the certification question.

Effects of the SBP Plan

It is difficult to identify the impact of SBP on performance and employee quality of work life at the Joliet facility, independent of the effects of all of the other business, technological, and work system factors that also influenced performance. This is true for the Joliet facility as it is for almost any greenfield startup. We can, however, report on the performance record and quality of work life at the site. Where there appears to be a strong link between these outcomes and the SBP plan, we will indicate this and explain why we see a link.

Effects on Organizational Performance

Safety. Safety was the performance objective that facility management gave the first priority from the earliest days of startup. Thus, managers and employees are justifiably proud of the outstanding safety record at the facility. Inevitably, there have been some explosions that have damaged equipment. However, there has never been a fatality in these potentially dangerous operations, and there have been very few lost-time accidents. On two occasions, the facility went several years at a time with no lost-time accidents--an enviable record in any industry. The emphasis on knowledge of safety regulations and safety procedures in the SBP evaluations certainly has contributed to this record.

Productivity. Productivity, measured in labor costs as a percentage of production costs, is superior to that of other company facilities in similar businesses. The primary reason for the productivity advantage at Joliet is not lower average wages per hour. The advantage is based primarily on the effective use of people, which is made possible partly by the employee flexibility resulting from the SBP system. Employees, especially those in support positions, are far less likely to sit idly, waiting for something to happen that needs their attention. They know enough to do something useful at all times. Also, there are several fewer hierarchical layers at Joliet because employees have the knowledge and skill needed to manage themselves.

Interestingly, productivity has shown continuous improvement at the facility. This has been due primarily to improvements in the technology and a maturing of the work system, but the high level of employee skill and flexibility encouraged by the SBP plan has also been a factor. This is best seen in the high volume ammunition production line, where currently seven or eight employees do the work that once was done 25 to 30.

Organizational Adaptation. One of the key business reasons for adopting skill-based pay was to promote organizational adaptability in response to the expected changes over time in production schedules and product mix. In this regard, the SBP plan has been very successful. The SBP plan made it possible to move employees from one LAP line to another and to use them effectively as production schedules shifted. A much more difficult and important test of adaptability occurred when the facility won a contract to produce a completely new product, the AT-4. There was not much direct overlap in the production technology used to manufacture the AT-4 and that used to manufacture medium-caliber ammunition. Nevertheless, startup on the new operation was greatly facilitated because employees from the ammunition lines transferred to the new AT-4 operation. Employees' knowledge of safety procedures, material handling procedures, explosives storage requirements, security arrangements, and other matters was a valuable asset, even if some of the particulars (such as the specific explosives used) were different in the new operations.

Other Performance Measures. On other indicators of performance, including quality, history of meeting production schedules, and history of keeping costs within budget, performance has been adequate but not spectacular. The record was spotty during the first few years at the facility, due to a number of business, technological, and management conditions that were unrelated to the pay system. As the facility matured as an organization, performance on quality, schedule, and cost improved significantly.

We certainly could suggest ways in which the SBP system may have contributed to the improvement. For example, virtually all employees, rather than a few inspectors, were trained to detect and correct quality defects. However, the net contribution of SBP to performance improvements in these areas was less clear than its contribution to safety, productivity, and adaptability. On quality,

schedule, and cost, the SBP plan certainly had less impact at Joliet than other factors, some of which (such as DoD funding for the industry) were beyond the control of the facility.

Effects on Employees

Pay level. A clear benefit of the SBP system for employees is that they made higher wages, on average, because of skill-based pay. As we have indicated, the skill-based pay system actually allowed employees who had progressed several steps in the pay system to earn wages higher than the local area average. The wage advantage to employees of working in the ammunition facility compared to other local employers decreased over time, due to changes in the wage plans elsewhere. Even so, the average pay rate was several dollars per hour higher than it would have been under a traditional job-based system.

Employment Stability. The ability to move employees across production lines and use them in constructive ways was very important to employment stability during periods when production demand was low or nonexistent on a particular line. In a traditional organization, short-term layoffs would have been much more frequent and severe than was the case at Joliet. SBP insulated employees from business conditions only to a degree, but it helped prevent lost wages, turnover, production disruptions, and other problems.

Employee Attitudes. Systematic attitude data, from two employee surveys conducted by the first author, are available only for the early stages of the SBP plan. The first survey was conducted in February 1984, just prior to the adoption of the SBP plan. At that point, employees had attended presentations about how the new system would work, but it had not yet affected any employee's pay or changed behavior at the facility. The second survey was conducted in February 1985, in the middle of Phase 1. At that point, most employees had earned at least one pay increase and a number had earned two increases. At this time, the full extent of the problems with SBP that were experienced in Phase 1 was just becoming known to top management.

Data from these surveys are reported in Table 1. The data reported here are from a matched sample of employees paid on the SBP plan. (A matched sample includes only those employees who

took both surveys and left confidential identification numbers on the survey both times. Use of a matched sample permits strong statistical inferences about changes in employee attitudes.)

The data indicate that employees had fairly negative feelings about SBP and the pay system in general during the early days of SBP. On most indicators, the average employee rating is on the negative side of the scale. It is notable that there were some statistically significant changes between Time 1 and Time 2, however. As employees began to receive more money under the SBP system, there were increases in reward satisfaction and feelings that their pay was fair compared to that of other local firms. On the other hand, employees felt less good about the explanations of SBP they had received from management.

Insert Table 1 about here

The changes of Phase 2 were stimulated partly by these results. Unfortunately, no comparable attitude data were collected during Phase 2 or Phase 3. It is the strong impression of all three authors, however, that employees became much more favorable about the SBP plan over time. Not only did the average employee receive pay increases of several dollars per hour, but many of the problems that had created dissatisfaction during the early phases disappeared or became much less serious.

The evidence that attitudes improved after 1985 is mostly anecdotal. The first author interviewed several employees in the fall of 1987 who he had known since the startup period. He was struck by the reversal in attitudes toward SBP. Visitors to the plant also frequently commented on employee support of the SBP plan in particular. Indeed, the employee support for SBP expressed during these visits was a factor in the diffusion of SBP elsewhere in the company (see below). The second author estimates, based on his experience, that perhaps 60 percent of employees favored the SBP system by the end of 1989, which represented a marked improvement over the years.

The SBP Plan as a Corporate Pilot

A final outcome of the SBP plan was important. The Joliet organization was the first in Honeywell to adopt a SBP plan. Subsequently, SBP has been adopted at a number of other locations in

Honeywell. There is little doubt that the endorsement of SBP by managers and employees to visitors from other company locations played an important role in diffusion of this pay innovation.

Conclusions

This case suggests a number of lessons about skill-based pay. These include the following.

1. *Continuous evolution of the SBP plan may reflect organizational learning, not design failure.*

The SBP plan in this case underwent a more or less continuous evolution over seven years, with two periods of major revision. The plan probably will change again in the future. Traditional pay systems rarely undergo such frequent changes. Is this degree of change a sign of a poor pay design? We argue, to the contrary, that the changes are a positive indicator of organizational learning.

It is difficult to design a complex innovation like SBP, especially when it is the first such plan in the company and when it is being designed for a new business. We expect that other organizations in similar situations also will need to learn from their own experiences and that they will need to revise their own SBP plans periodically.

A lesson from this case is that organizations adopting SBP need to embrace the idea that the plan will change. Indeed, they need to plan for change, not avoid it. The revisions in the plan at Joliet made it more effective and increased its acceptance among employees over the years. Avoiding the issues could have been fatal to the plan; addressing them strengthened it.

2. *Employee dissatisfaction with SBP can be an extremely positive force.*

This lesson sounds paradoxical. However, the case shows that employee dissatisfaction with SBP need not be fatal to the plan. Instead, employee dissatisfaction can be a stimulus to learning and organizational improvement.

In this case, the underlying cause of employee discontent was the gap between management's aspirations for the organization and the reality. Management wanted an organization in which strong, effective work teams managed themselves to a large degree, received extensive training, rotated to whatever jobs needed to be done, and so on. At Joliet, the pay system gave employees a stake in seeing that management lived up to its ideals. Employees did not quietly accept organizational problems that affected employee pay. Working through issues that affected the pay system forced management to

come much closer to its aspirations for the organization. Moreover, the teams grew as they took increased responsibility for such things as scheduling job rotation, cross-training, and peer evaluation in order for team members to advance more quickly through the pay system.

This suggests that SBP is not for managers who want a docile work force. Employees are unlikely to be silent about problems with pay in the same way they will be silent about the gap between management ideals and reality on other issues. If managers cannot tolerate such criticisms and channel them constructively, SBP is the wrong pay system for the organization.

3. There were distinct advantages to adopting SBP in a new organization.

The case suggests that new organizations have distinct advantages in adopting SBP. The spread between the bottom and top of the SBP system was several dollars per hour, which provided a strong incentive for learning. Existing organizations often cannot afford to build that much incentive on top of an established pay structure. In addition, no past history at the site constrained design choices. Finally, the site had the luxury of being able to select potential employees who fit the culture that the organization wished to build. The selection system did not work perfectly, but the average employee at the facility was highly motivated, achievement-oriented, and willing to speak up. Also, most employees were at approximately the same seniority level. This work force was an asset to SBP.

4. There also were distinct problems with adopting SBP in a new organization.

Although newness was an advantage in some respects, it also created a great many problems for the SBP plan at Joliet. It was difficult to design the initial pay plan because of early problems with the technology. It was difficult to determine the appropriate skill blocks and to develop needed training and certification materials when little work was being done that could be studied. The intense pressures and stress of startup also sapped energy for developing the pay plan and making it work. Employee involvement ultimately contributed to the solution of many SBP problems, but it took several years for employee involvement to evolve to that point. Existing organizations that convert from traditional pay systems to SBP may avoid these problems, especially if they have a history of successful employee involvement activity.

5. Ownership by line management is critical but can be a mixed blessing.

There was a great deal of ownership over the SBP concept by line management at the site. The Human Resource department did not have to sell the SBP concept to line management. Line ownership proved to be very important in maintaining commitment to the pay system, despite early troubles with the plan. At every major milestone in the evolution of the plan, line management was the key to moving forward on SBP. The Human Resource staff played an important facilitative role, for example by making sure that the right issues were surfaced.

On the other hand, many of the key problems with the plan were the result of line management's behavior. Of particular importance was inconsistency between Advisors in implementing the plan. These discrepancies ultimately helped kill the points-based version of SBP. Ironically, the inconsistencies arose partly because of the ownership the Advisors felt over SBP; they put their own spins on the plan. The problems were such that greater central control, perhaps by the Human Resource department, over administration of the pay plan may have been desirable.

Line 1

Case Prime	Charging
LAP	
Packout	

Line 2

Case Prime	Charging
LAP	
Packout	

Line 3

Case Prime	Charging
LAP	
Packout	

Figure 1
Parallel Production Lines for
Ammunition Assembly

FIGURE 2

SKILL-BASE PAY PROGRESSION: PHASE 1-2 VERSUS PHASE 3

LEVEL 5: 300 POINTS ACHIEVED (APPOINTIVE POSITION)
LEVEL 4: 240 POINTS ACHIEVED
LEVEL 3: 180 POINTS ACHIEVED
LEVEL 2: 120 POINTS ACHIEVED
LEVEL 1: 60 POINTS ACHIEVED
ENTRY

**PHASE 1-2
PROGRESSION
SYSTEM**

LEVEL 5: 60 MONTHS (APPOINTIVE POSITIONS)
LEVEL 4: 48 MONTHS ADVANCED MACHINE OPERATION
LEVEL 3: 36 MONTHS INSPECTION
LEVEL 2: 24 MONTHS BASIC MACHINE OPERATION/ MATERIAL HANDLING
LEVEL 1: 9 MONTHS GENERAL ORIENTATION
PROBATION: 3 MONTHS ENTRY

**PHASE 3
PROGRESSION
SYSTEM**

FIGURE 3
SKILL-BASE PAY PRICING STRATEGY

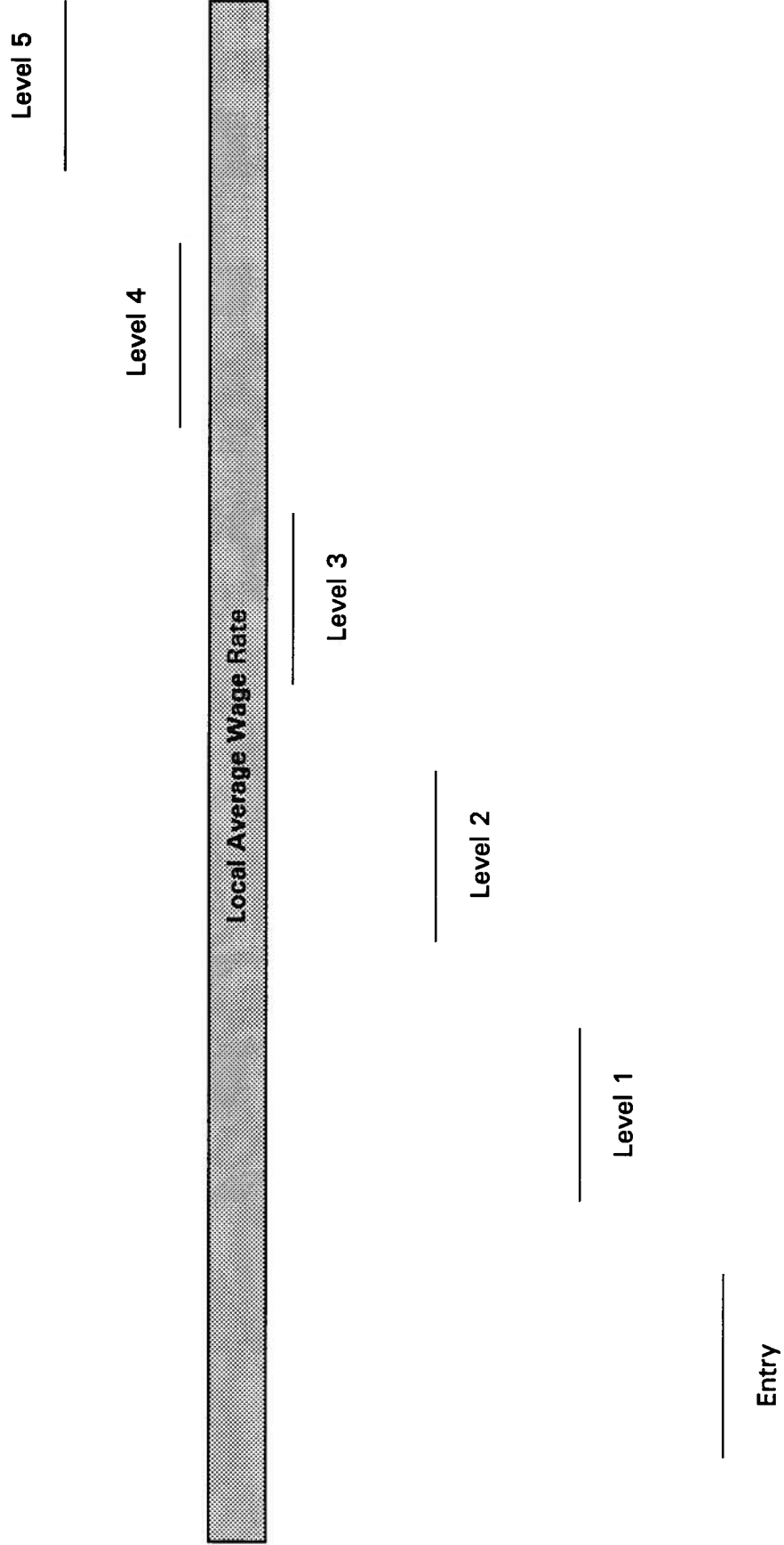


TABLE 1
EMPLOYEE ATTITUDES TOWARD SKILL-BASED PAY
AND RELATED ISSUES¹

SURVEY MEASURE	FEBRUARY 1984 MEAN	FEBRUARY 1985 MEAN	SIGNIFI- CANCE OF T-TEST
<u>ATTITUDES TOWARD PAY</u>			
Reward Satisfaction	3.2	3.7	*
Satisfaction w/ Pay Administration	2.4	2.5	ns
Overall Pay Equity	2.9	3.3	ns
Equity versus Co-Workers	3.2	3.4	ns
Equity versus Local Area	2.2	2.9	***
Equity versus Industry	N.A.	2.7	N.A.
<u>ATTITUDES TOWARD SKILL- BASED PAY</u>			
Preference for SBP	2.8	2.8	ns
Understanding of SBP	4.5	4.5	ns
Management Explains SBP Well	5.0	4.4	*
Equity of SBP	2.9	2.6	ns
Fit of SBP w/ Organization Design ²	N.A.	2.7	N.A.
Participation in SBP System ²	N.A.	2.8	N.A.
<u>ATTITUDINAL OUTCOMES</u>			
Job Satisfaction	5.3	5.1	ns
Satisfaction of Growth Needs	5.0	4.8	ns
Satisfaction of Social Needs	5.4	5.2	ns
Organizational Commitment	4.8	4.6	ns

NOTES

1. Data were from a matched sample of 55 respondents who completed both questionnaires and left a label with their confidential identification number on both surveys.
2. All measures used seven-point response scales except Participation in the SBP System and Fit of SBP with Organization Design, which used five-point response scales. On all measures, higher means are more favorable.
3. Some measures were asked only at Time 2. "N.A." means not applicable because measure was not used at Time 1.
4. T-Test result indicates whether the two means are significantly different (i.e., the observed difference is unlikely to be the result of random measurement error). Significance levels: * < .05; *** < .001