Motivating & Retaining Technical Employees[1]

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Recent trends in science and engineering are troubling for the future of U.S. technical research and development. Several indicators show that the United States is losing its lead in scientific achievement. Patents granted in United States by country of inventor went from 60.2% for U.S. based inventors in 1982 to 51.8% in 2003. In a similar vein, the number of U.S. doctoral degrees in science and engineering has been declining since 1998, while the number of doctoral degrees in science and engineering has been rising in Europe and even more sharply in Asia. The reality is that we have relied on scientists from Asia and other countries for a lot of our brain power for some time. In 2000 the percentage of engineering Ph.D.'s in the United States who were born elsewhere was 51% and the percentage of physical scientist was 45%. However, the number of graduates from Asia planning to stay in the US has been declining since about 1996 probably due to increased opportunities in their home countries. An even more alarming trend is reflected in technical publications. For example, until 1995 the number of articles published in Physical Review by scientists from the U.S. outpaced articles published by all other countries. Since then the publications by scientists from Europe and other countries have caught up with and surpassed us.

Without the expertise of research and development professionals it will be difficult for US companies to maintain their lead in innovation and technology. R&D is the key to innovation, the rapid development of new products and sustainable company growth. Based on recent studies the demand for technical professionals is exceeding supply, and the situation will probably get worse. For technologically driven companies, the task of retaining experienced and competent R&D professionals faces additional challenges. The access to instant information about jobs and careers via the Internet and other sources has made it easier to seek out alternative opportunities. Factor in the recent his-

tory of downsizing, mergers and outsourcing and traditional company loyalty is weakened, if not a fond memory.

Beginning with the Hawthorne studies in the 1920s, the field of organizational behavior has studied issues related to retention and motivation. I provide a brief overview of this research and then discuss some of the implications for R&D management practices.

Retention

Why do people leave their jobs? One simple explanation is that dissatisfaction leads to turnover. The theory of reasoned action[2], a general model that links attitudes with behavior, can help us understand the process. Simply put, the theory says that attitudes lead to intentions and intentions lead to behavior. In the case of turnover, attitudes are related to job satisfaction. Low satisfaction leads to intention to seek alternatives and this in turn leads to leaving the organization. According to the theory of reasoned action, attitudes have three components: a cognitive component which is what you believe, the evaluative component which is how you feel and a dispositional component which is how you are disposed to act. In the case of job satisfaction there is a cognitive component with respect to what you believe about the organization, and a value component which is at root an emotional reaction to what you believe about the organization. Finally, the behavioral component sets up a disposition to act in a certain way, which may lead to turnover.

According to Steel[3] there are three stages in turnover. First, individuals engage in passive scanning. This includes looking at unemployment or underemployment rates and knowledge is sketchy and impressionistic. In the second stage a more focused search is undertaken where the individual will read employment advertisements and become systematic with respect to searching. Knowledge obtained will be more relevant but data is still processed at an abstract

level. The final stage of job search includes contacting employers to follow-up on leads and engage in interviews. Job satisfaction is the trigger that sets off this search process.

Job Satisfaction

What determines job satisfaction? Work done by Patricia Cain Smith[4] in the 1960s isolated five different factors related to job satisfaction. Decades of research has shown that this Five-Factor Model predicts overall job satisfaction. The five factors include work content, pay, opportunities for promotion, supervision, and coworkers. The first factor, work content, has to do with satisfaction with the work itself and is determined by how interesting and fulfilling the work might be. This factor tends to be most important for technical professionals who place a high value on interesting work. The second factor, pay, tends to be perceived on a relative basis. That is, how satisfied we are with our pay may depend upon how our pay compares to the pay of some significant peer group. Opportunities for promotion are important for some individuals, and since the work done in the 1960s with flatter organizations becoming the norm opportunities for promotion have become less frequent. The final two factors have to do with satisfaction with supervision and coworkers. Both of these factors can vary tremendously between individuals in terms of how important they are, but having compatible coworkers and leaders that we trust and admire can play a big role in our overall satisfaction.

A somewhat different approach to satisfaction is referred to as the two-factor theory[5]. This theory, developed by studying samples of engineers and accountants, distinguishes between "satisfiers and "dissatisfiers". Dissatisfiers, also called hygiene factors, include the quality of supervision, pay, company policies, physical working conditions, relations with others and job security. Satisfiers, also called motivators, include promotion opportunities, opportunities for

personal growth, recognition, responsibility and achievement. According to the two-factor theory these two variables are quite separate in terms of their impacts on individual behavior. The hygiene factors can cause dissatisfaction and lead to turnover but cannot result in increases in motivation. Only the satisfiers, or motivators, can result in greater effort and improved performance.

Several other theories have been used to explain job satisfaction. Value theory posits that the greater the gap is between what you value and what you actually get from your job the more likely you are to be dissatisfied. For example, if you place a high value on individual autonomy and your job offers you little autonomy, you will be dissatisfied and more likely to leave the organization. Social Information theory posits that job satisfaction and job attitudes are strongly influenced by one's coworkers, superiors, subordinates and customers. It also posits that valued coworkers will have the strongest influence and that cohesive groups have more influence than noncohesive groups. The implications are that the leaders' own attitudes and behaviors are important determinant of the attitudes and behavior of followers and that networked groups are major determinants of work-related attitudes including job satisfaction.

The final theory is called the Dispositional Model, which says that dispositions are stable personal individual differences and will tend to produce positive or negative attitudes regardless of the circumstances. The dispositional model received some support on research with identical twins which has shown that identical twins reared apart share approximately 25% of the variance in job satisfaction even though they have never met one another.

Studying job satisfaction is worthwhile not only because it is related to turnover. Job satisfaction, has a low but significant correlation with job performance, and is also related to a variety of other behaviors. For example, low job satisfaction can lead to disruptive behaviors in the workplace or even sabotage. High job satisfaction, on the other hand, can produce increases in organizational citizenship and higher organizational commitment. Organizational citizenship includes behaviors such as mentoring, helping behavior, sportsmanship, and other behaviors in which individuals go beyond their prescribed roles to voluntarily help the organization and other individuals be successful.

The role of pay in job satisfaction and turnover is an interesting one. Pay is generally accorded less importance than the nature of the work and satisfaction with coworkers but pay can still have an influence on retention. For example, a recent study showed that pay for knowledge increased retention but that awarding group pay decreased retention.

Organizational commitment is closely related to job satisfaction and is strongly linked to retention. Three different types of commitment have been identified. These include continuance commitment, normative commitment and affective commitment. Continuance commitment means that an individual will continue working for an organization because he or she cannot afford to leave. Normative commitment means that an individual will continue working for an organization because they face pressure from others (e.g., coworkers) to remain. Affective commitment means that an individual will continue working for an organization because they agree with the values of that organization and desire to remain there. Affective commitment tends to engender organizational citizenship behavior and increases the likelihood of retention.

Motivation

Several theories of motivation have been proposed including Needs Theories, Goal Setting, Equity Theory, Expectancy Theory and the Jobs Characteristics Model. Needs theories of motivation began with Abraham Maslow who first posited a hierarchical theory of needs which begin with physiological needs, then move to safety needs. Once these needs were satisfied individuals are motivated by social needs. Finally, needs for self-esteem and self-actualization are triggered when social needs are met. Later researchers simplified Maslow's hierarchy into existence needs, relatedness needs and growth needs.

There is a tremendous amount of research that shows the motivating effects of goalsetting. Briefly, the theory of goal setting says that once a goal is set motivation begins with the recognition of the challenge of a higher goal level. The individual must accept the goal as his or her own which leads to goal commitment. Goal commitment is also related to the desire to attain the goal and the perceived chance of attaining the goal.

Implications for Management Practice

Employee Recruiting and Selection
Recruiting and selection usually focuses on relevant experience and competencies necessary for the job. While these factors are clearly critical the research tells us that unless we select individuals whose values and personal styles are compatible with the values and culture of the organization, dissatisfaction, lowered commitment and turnover is the likely outcome. Organizations should incorporate an assessment of values and personal style into their recruiting and selection methods. Job candidates should be given realistic previews of the job and organization, including its values and culture.

Work Design Research on the Jobs Characteristics Model, Goal Setting Theory and Expectancy Theory tells us that work should be designed so that there is sufficient opportunity for employees to utilize a variety of skills and abilities. Employees should understand that their work is significant to the organization, should be given clear goals, control over their work, and should be provided with meaningful feedback.

Organizational Structures Organizational structures should be designed to provide for cultures that are compatible with the values of technical professionals; these include cultures that are open, value learning, growth and autonomy. Structures should provide opportunities for the social needs of individuals to be met, especially with the increase in virtual work.

Pay Organizations can take steps to ensure that pay is equitable relative to the peer groups that matter most to R&D professionals: co-workers and others within their professional discipline. The research seems clear on variable or "at-risk" pay. If pay is variable, it should be linked as closely as possible to individual performance.

Supervision and Leadership R&D leaders should be involved in taking some of the steps outlined to ensure retention and motivation. Training in leadership can be helpful in teaching supervisors how to engage in a more transformational style of leadership. Not everyone can be a true transformational leader but many of the associated can be learned and will result in higher commitment and motivation.

Ultimately, goal setting leads to higher performance, especially when goals are specific, clear and moderately difficult.

A third theory of motivation is related to rewards and is called Equity Theory. Equity theory, briefly, says that individuals make an assessment of their rewards vs. their inputs

(effort, skill and ability). Their personal ratio of rewards/inputs is then compared with the same ratio for others. The theory states that if the ratio for others is perceived as higher the result will be anger and decreased motivation. On the other hand, if the ratio of others is perceived as lower the employee will feel guilty and will work harder. Equitable outcomes which result in a balance between inputs and outputs relative to perceived others will lead to job satisfaction

Expectancy Theory incorporates several major factors: Expectancies or the belief that one's efforts will result in performance; Instrumentality, or the belief that performance will be rewarded; and Valence, or the value of the rewards. According to Expectancy Theory motivation will be a function of one's expectancies, instrumentality and the belief that performance will lead to valued rewards.

The Job Characteristics Model focuses on enhancing three psychological states: meaningfulness of work, responsibility for outcomes of the work, and knowledge of the actual results of work activities. Improvement in these three states will lead to increased motivation, better performance, higher job satisfaction and lower turnover.

A final theory of motivation distinguishes two different factors called Intrinsic and Extrinsic motivation. Intrinsic motivation can be characterized as "a labor of love" or motivation based on interesting, engaging and satisfying work. Extrinsic motivation is motivation that depends solely on rewards or recognition. Research has shown that scientists are typically driven by intrinsic motivation and intrinsic motivation, has been related to creativity and innovation. There is some evidence that extrinsic motivation is negatively related to creative behavior.

Implications for Management Practice

This review of research and theory can be used as the basis for a better understanding of the factors that satisfy and motivate R&D professionals. There are clear implications for R&D management practices (see table, previous page).

References:

[1] This article is based on the keynote presentation made at the 15th Annual SATM Conference, May 11th, 2004.

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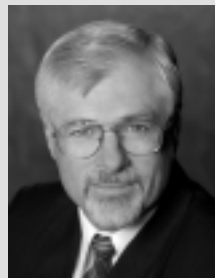
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