
THREE FACETS OF SATISFACTION AND THEIR INFLUENCE ON THE PERFORMANCE OF INNOVATION TEAMS

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EXECUTIVE SUMMARY

This study investigates and demonstrates the mediating effect of job satisfaction between team deftness and team comprehension and the performance of 168 project teams involved in major innovation projects for their companies.

The study demonstrates that there are at least three independent facets of job satisfaction: instrumental satisfaction with the way the task is progressing, social satisfaction with the way the team members interact with one another and the organization, and egocentric satisfaction with the individuals' perceived benefits to themselves.

Previous studies have shown that innovation team performance is directly correlated with the two antecedents of performance: team deftness, which reflects how effectively the team works to achieve the innovation's purpose and team comprehension, which reflects how the team understands the linkages among key variables driving the innovation outcome. The study argues that these different facets of satisfaction differentially affect the ways in which team performance is affected by deftness and comprehension.

There are three major results:

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1. *Social satisfaction mediates the relation between team deftness and performance—as social dissatisfaction of the team increases, it appears to impede the ability of the team to deploy its deftness in accomplishing the project's purpose.*
2. *Instrumental satisfaction mediates the relation between team comprehension and project performance—as instrumental dissatisfaction increases, it appears to impede the ability of the team to deploy its comprehension to accomplish the project's purpose.*
3. *Egocentric satisfaction does not appear to mediate the relation between team deftness and project performance.*

Some managerial implications of these results are discussed.

INTRODUCTION

Burns and Stalker (1961) were among the first to articulate an important dilemma in the management of innovation. They concluded, in an often-overlooked element of their theory, that whereas innovation may result in many positive consequences for the organization, the consequences for individuals are often ambiguous (see pp. 233–234). Innovation requires more than the creative capacity to invent new ideas; it requires managerial skills and talents to transform the new ideas into practice (Van de Ven and Angle 1989). Whereas the management of innovation has been the focus of many scholars over the years (Robertson, Achilladelis, and Jervis 1972; Van de Ven 1986; Damanpour 1991; Zajac et al. 1991; Ettlle and Reza 1992), this research has focused primarily on the antecedent conditions to successful innovation. Scholars have examined determinants of individual innovative behavior in organizations (Scott and Bruce 1994), political processes of innovation (Frost and Egri 1991), motivational predictors of development of innovative ideas (Monge, Cozens, and Contractor 1992), tensions in the management of innovation (Venkataraman et al. 1993), psychology of innovation (Angle 1989) and organizational culture and innovation (Morris, Avila, and Allen 1993).

We concur with Lewin and Minton (1986) who called for a managerial perspective on innovation that focuses on the key problems and challenges confronting managers initiating and directing the development of an innovation. Notwithstanding this early insight, an underlying assumption in the organization literature is that personal satisfaction and performance at the group level are positively correlated. Indeed, both satisfaction and performance are often treated as dependent variables worthy of equal weight (for example, see Wagner (1994)).

In this study, we offer a model of the satisfaction/performance link, which departs from extant perspectives in two key areas. First, we argue that it is both possible and desirable to disaggregate the “satisfaction” construct. We propose instead three discrete subconstructs, reflecting satisfaction with results, social interactions, and personal rewards, respectively. Our second departure from existing theory is to argue that each subconstruct is associated with performance in distinct and independent ways and that these effects manifest themselves in the manner in which they mediate the influence of deftness and comprehension on performance (McGrath, Venkataraman, and MacMillan 1995).

We begin with a summary of extant treatments of the satisfaction construct, describing various approaches to defining and measuring satisfaction, followed by a discussion of its theorized performance effects. Next, we propose an alternative approach, defining three independent satisfaction-related constructs and offering hypotheses for their performance effects. We then describe our approach to operationalizing these constructs and to testing the hypotheses developed, which is followed by a discussion of results obtained from a sample of 168 innovation project teams. We conclude with the implications of our results for theory

building and managerial practice, focusing particularly on the problem of aligning both individual and organizational outcomes in the innovation process.

SATISFACTION CONSTRUCT

Satisfaction has been the focus of a vast literature. Locke (1976) reported that a search using the key words "job satisfaction" yielded approximately 3350 articles or dissertations. By 1991 a similar computer search conducted on PSYCINFO yielded 6247 articles or dissertations (Jayaratne 1993). Despite the considerable attention satisfaction has received, broad disagreement persists regarding how best to define and measure it.

Two theories have dominated the job satisfaction literature, namely, expectancy theory and the two-factor theory. The two-factor, motivator-hygiene theory was developed by Herzberg, Mausner, and Snyderman (1959). In its simplest form the theory argues that job satisfaction is a result of the presence of motivator factors (elements of work itself), and job dissatisfaction is the result of the lack of hygiene factors (elements of the context of work). So, to increase job satisfaction one must bring about changes in the motivator factors, and to decrease job dissatisfaction one must increase the hygiene factors. Expectancy theory (Vroom 1964; Katzell 1964; Hollenbeck 1989; Locke 1969) in contrast argues that an individual's assessment of job satisfaction is a function of the discrepancy between what an individual expects from the job and what the individual receives. To increase satisfaction in this approach, one can either lower expectations or increase rewards.

The debate over the more appropriate theory remains unresolved but has caused job satisfaction to be defined in very different ways by researchers. For instance, job satisfaction is defined by Porter (1968) as the extent to which rewards actually meet or exceed the perceived equitable level of rewards, whereas it is defined by Locke (1976) as a "pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences."

MEASURES OF SATISFACTION

Differences in approach to satisfaction can also be seen with respect to its measurement. Jayaratne (1993) identifies two major approaches. The first takes a macro perspective, in which the concern is with general feelings about a job (Brayfield and Rothe 1951; Kunitz 1955; Dunham and Herman 1975). Although job satisfaction itself is viewed as a multifaceted or composite phenomenon, the emphasis is on the global assessment or overall evaluation of job satisfaction. In contrast, the second approach emphasizes facets of the job. The extent to which an individual is satisfied with different aspects or facets of the job determines the overall degree of job satisfaction (Herzberg, Mausner, and Snyderman 1959; Smith, Kendall, and Hulin 1969). Jayaratne (1993) concludes that there is in both approaches general acceptance that job satisfaction is multifaceted, although argument persists regarding which facets are most significant (Dunnette, Campbell, and Hakel 1967, p. 143; Ferratt 1981).

Determining which facets of satisfaction matter poses a formidable challenge for researchers. Locke (1976) identified several facets that typically appear in research on job satisfaction, such as quality and quantity of work, satisfaction with pay, promotional opportunity and fairness, recognition and credit for one's work, nature and style of supervision, feelings about self supervisors and co-workers, working conditions, and satisfaction with company and management. Locke proposed that each facet be examined and measured within the context of needs, expectancies, and values. Other researchers have examined work environment; pay, promotion and benefits; and co-workers and supervisors (Quinn and Shepard 1974;

Smith, Kendall, and Hulin 1969; Weiss et al. 1967; Brayfield and Rothe 1951; Hartman et al. 1986; Hackman and Oldham 1980; Dunham and Herman 1975; Kunin 1955; Kornhauser 1965).

In his meta-analytic study on the relationship between perceived control and variety of outcome variables, Spector (1986) included job satisfaction and noted that many different measures were used—the most popular being the Job Descriptive Index (Smith, Kendall, and Hulin 1969), Minnesota Job Satisfaction Questionnaire (Weiss et al. 1967), and Job Diagnostic Survey (Hackman and Oldham 1980). These all use a “facet-sum” approach to derive an overall measure of satisfaction. Thus, many researchers accepting the above, have adopted a facet-sum approach to measure job satisfaction by assuming that these facets can be summed across to arrive at a measure for job satisfaction.

There are problems with this measurement approach. In his review, Jayaratne (1993) observes that it is not unusual to find facets of job satisfaction being used as independent variables and overall job satisfaction as the dependent variable—thus resulting in a confusing circular logic in the discussion of cause and effect and in selection of independent and dependent variables. A job facet cannot be a predictor of job satisfaction if it is also a dimension of the summative index of job satisfaction.

SATISFACTION AND PERFORMANCE

Despite a considerable body of literature on satisfaction in the organizational and psychology areas (Landy and Becker 1987; Brockhaus and Horwitz 1986), there has been relatively little work that relates group-level performance to individual or group satisfaction, and no study, which we could identify, that examines satisfaction in an innovation context. This is an important gap, because satisfaction is potentially managerially actionable. Given the criticality of innovation to organizational renewal and sustained competitiveness (Guth and Ginsberg 1990), deepening our understanding of such managerially actionable factors is crucial (Lewin and Minton 1986).

At an individual level, job dissatisfaction has been seen to have negative consequences for personal well-being (Quinn, Staines, and McCollough 1974; French and Caplan 1972; Mangione and Quinn 1973; O’Toole 1975; O’Brien and Feather 1990). Similarly, at the organizational level, job dissatisfaction has been associated with work-related fatigue and injury (Quinn and Sheppard 1974); theft and sabotage (Mangione and Quinn 1973); and turnover (Lawler 1973). Studies attempting to take the next step and link job satisfaction causally with productivity have, however, shown no consistent negative or positive associations. This is surprising given the widespread assumption that satisfaction with the job improves organizational performance.

An obvious possible explanation for this lack of association is underspecification of the models used. Most of the literature uses an aggregate measure of job satisfaction to encompass feelings about matters as diverse as workplace environment, personal rewards and incentives, and goal attainment. At the same time, ample theory exists which suggests that such aspects of satisfaction may well be independent of one another. If this is the case, there is no compelling reason to believe that their performance effects should covary. In short, the tendency to represent satisfaction as a unitary construct may render analyses of its effects uninterpretable.

DISAGGREGATING THE SATISFACTION CONSTRUCT

In addition to psychology, three additional streams of literature can be seen to be relevant to the nature of the relationship between group satisfaction and group performance. The first,

drawn from behavioral learning theory, would lead us to consider satisfaction in the context of perceived progress toward achieving organizational goals. The second, drawn from the sociological concept of embeddedness, suggests that satisfaction may also have to do with the nature of interpersonal relations in a group. Utility theory, in contrast, suggests that there is a role for personal rewards and benefits in considering satisfaction. Let us consider each in more depth.

Instrumental Satisfaction

Behavioral learning theory (Cyert and March 1963; Levitt and March 1988) suggests that the link between satisfaction and performance has to do with perceived performance gaps. Performance gaps, in which results fall short of expectations, generate dissatisfaction. This, in turn, prompts either a change in methods or a change in the goals themselves. Narrowing of a performance gap on the other hand generates satisfaction, reinforcing the behavior associated with a narrowing of the gap. We term satisfaction of this kind “instrumental” satisfaction, meaning the extent to which individuals are satisfied with task accomplishment in their teams. This is consistent with Maslow’s (1954) self-actualization needs as well as the motivator factors described by Herzberg et al. (1959) and motivation sources suggested by Kanter (1989) having to do with satisfaction with the elements and progress of the work itself.

Social Satisfaction

Task performance aside, organization members are embedded in a social system (Granovetter 1985). Both sociology and psychology recognize strong group influence on the subjective experience of satisfaction (Heider 1958). To the extent that individuals find their relations and interactions with superiors, subordinates, and co-workers to be difficult or frustrating, the considerable literature on teamwork (see Miller 1992) suggests that performance will be depressed. In addition, social relations in the team shape the norms, vision, and values under which the team operates, which themselves have been shown to have important performance effects (Leonard-Barton 1992). What we call “social” satisfaction thus reflects satisfaction with the working relations and interactions between organizational members and corresponds with the social needs in Maslow’s (1954) hierarchy.

Egocentric Satisfaction

Finally, utility theory tells us that most human behavior can be explained by efforts to maximize utility (Birnbaum 1992). Individuals, governed by norms of rationality, act in such a way as to increase the benefits they receive (March and Simon 1958). Satisfaction is thus related to performance to the extent that by achieving performance objectives, individuals increase the personal benefit they receive. This view of behavior is an important underlying assumption at the heart of many incentive and reward systems (e.g., Kerr 1985). Normally, utility is approximated by individual economic benefit. What we term here “egocentric” satisfaction thus reflects the extent to which individuals perceive that they personally stand to benefit from their participation in an innovation project.

Because they stem from different sources and have different antecedents, there is no a priori reason to assume that the three types of satisfaction we have identified are highly correlated. An individual, for example, might be quite happy with working relations in a team, yet still feel unhappy about the potential economic rewards of engaging in this work with them.

PERFORMANCE, COMPREHENSION, AND DEFTNESS

Having set forth a general perspective on the satisfaction construct, we next turn more specifically to its influence in an innovation context. Team comprehension and team deftness have been empirically demonstrated to have important antecedent effects on the performance of innovation teams (McGrath, Venkataraman, and MacMillan 1995; McGrath et al. forthcoming).

Comprehension

Comprehension, according to Weick and Roberts (1993), reflects the extent to which members of an innovation project team develop an understanding of cause and effect relations in the venture sufficient to permit them to act as if they are able to comprehend relationships of enormous complexity. For an innovation to progress, the set of objectives of the project and the understanding of what must be done to meet them must become sharper, more precise, and better understood among members of the project team. Unless this occurs, such lack of comprehension retards the progress of the innovation project.

Deftness

A second important antecedent reflects the ability of the group to work effectively. McGrath et al. (1995) use the term "deftness" to reflect this quality, which is manifest in mutual confidence, trust, and fluency of task execution. They demonstrate empirically that team deftness represents a second important antecedent for the attainment of project goals.

The emergence of performance in an innovation team, following this logic, occurs through the development first of comprehension, in which the challenges of a specific innovation become clear. As experience and learning lead to improved comprehension, the establishment of deft interactions in a team becomes possible. Together, comprehension and deftness allow a team to increase its level of performance, reflected in the emergence of new competences.

Satisfaction, we suggest, exerts its influence on this process by mediating the effect of the antecedent processes of comprehension and deftness on performance.

MECHANISMS BY WHICH SATISFACTION MEDIATES THE EFFECTS OF COMPREHENSION AND DEFTNESS ON PERFORMANCE

Gladstein (1984) observes that low levels of satisfaction with group relations, which we have termed "social satisfaction," are extremely disruptive to team deftness.

The way to view the role of social satisfaction as a mediator is to look at the effect of dissatisfaction. Deftness as envisioned and measured by McGrath, Venkataraman, and MacMillan has to do with the fluidity with which teams work due to mutual knowledge, agreement, and confidence among members of each other's tasks, competences, information needs, and commitment. If members of a deft team begin to experience increasing dissatisfaction with the social relations among one another, this dissatisfaction will begin to inhibit their ability to work together to pursue the objectives of the innovation. As social dissatisfaction increases, no matter how deft the team, dissatisfaction will intervene in the team's ability to deploy their deftness to achieve the innovations purpose. Thus, in a deft team in which members become dissatisfied with the nature of their relationships with one another, conflict, mistrust, suspicion, and argument are likely to inhibit their smoothly flowing interrelations

(Mintzberg, Raisinghani, and Theoret 1976; Guth and MacMillan 1986). This allows us to generate the following hypothesis:

H1: Social satisfaction will mediate the effect of deftness on innovation performance.

A similar argument holds for the role of egocentric satisfaction. No matter how deft the team is, if individuals become increasingly dissatisfied with the personal benefits to them of continuing to operate with others, this dissatisfaction will begin to erode their willingness to continue their contribution to the deftness, which allows the team to smoothly pursue the purpose of the innovation. This is particularly important for innovation projects, in which high levels of commitment are considered essential for the difficult, personally demanding, and intense efforts necessary to achieve goals (Leonard-Barton 1992; Hackman 1990). In short,

H2: Egocentric satisfaction will mediate the effect of team deftness on innovation performance.

In the case of instrumental satisfaction we suggest that dissatisfaction mediates the relation between team comprehension and team performance. No matter how well the team comprehends their innovative tasks, increasing frustration with not being able to accomplish objectives will erode the members' ability to deploy their comprehension to achieve their objectives—frustration with lack of performance erodes their “faith” in their comprehension.

H3: Instrumental satisfaction will mediate the effect of comprehension on innovation performance.

We turn now to the methods used to empirically test these hypotheses.

RESEARCH METHOD

Level of Analysis

As described in the technology, innovation, and corporate venturing literature (for example, Burgelman 1983; Ancona and Caldwell 1988; Gersick 1988; Kogut and Zander 1992; Leonard-Barton 1991), the locus for innovation is at the innovation team level, which is the level of analysis for this study.

Sample

The data for the study were collected from 168 major innovations in 40 different firms—innovations which were identified as important by senior executives of the participating firms. The definition of innovation used here draws directly from Van de Ven (1986) who argued that the distinguishing characteristic of an innovation is its “newness” to the organization in question. We thus defined an innovation project as the development of a new product or service, entry into a new market, or a significant attempt to restructure or improve an internal process (such as the adoption of a new processing technology or design and implementation of a new computer system). Firms were added to the study through personal interactions with research team members.

The sample includes substantial variety in both firms and innovation projects, including wide variation on size, age, performance, industry, objectives, and other potentially important contingent variables, to increase confidence in the generalizability of the results. The industries

represented are presented in Appendix 2. Most of the innovation projects are in U.S.-based firms, although 24% are from firms based in other countries.

The senior executive in charge (usually in conjunction with key project team members) determined the composition of the project team. All individuals who were classified as part of the project team were included in the respondent set for that project. Questionnaires were developed that operationalized and provided measures for each independent and dependent variable. These were administered to each of the individuals in the respondent set. The response rate for each innovation project was 100%.

Constructs and Measures

For each of the central constructs tested in this study, a search of the innovation literature revealed a number of variables related to or thought to measure the construct. Questionnaire items were then created which reflected each of these variables. The questionnaires used are presented in Appendix 1.

Team respondents' scores were averaged for each item. The resulting value was summed for all the items to yield the innovation project's score for the construct. Appendix 1 lists the items with which each construct is measured. Means, standard deviations, Cronbach alphas, and correlation coefficients among variables are listed in Table 1. All measures are reported in Appendix 1 with an extensive list of literature citations used to tap each measure.

Performance

Performance was measured by team responses to 10 items representing their assessment of the degree to which ex post results met or exceeded ex ante expectations for areas considered important for innovation projects (Doty, Glick, and Huber 1993; Van de Ven, Hudson, and Schroeder 1984; Hackman 1990). Specifically, respondents ranked their recent performance in the following areas: budget objectives, staffing objectives, major deadlines, quality objectives, reliability objectives, efficiency objectives, user/client satisfaction objectives, service objectives, and objectives overall.

Comprehension and Deftness

Comprehension and deftness were measured using the scales developed and validated by McGrath et al. (forthcoming). They reflect the team's understanding of cause and effect relations and their assessment of the effectiveness with which they work together, respectively.

Satisfaction

Satisfaction was measured by asking respondents to respond to the question "How satisfied are you with the progress of the project in each of the following areas right now?" where a score of 1 meant "very dissatisfied" and a score of 5 meant "very satisfied." Items relevant to instrumental satisfaction were: current direction of the project, overall performance to date, team's understanding of how to meet project goals, and benefit to the company. Items relevant to social satisfaction were: skill set of the project team, working relationships in the project team, morale in the project team, and project leadership. Items relevant to egocentric satisfaction were pay and compensation, opportunities for promotion, and the nature of the job as currently defined.

TABLE 1 Results of VARIMAX Rotated Factor Analysis

| | Factors | | |
|---|---------|------|------|
| | 1 | 2 | 3 |
| Working relationships in the project team | 0.85 | . | . |
| Skill set of the project team | 0.72 | . | . |
| Morale of the project team | 0.72 | . | . |
| Project leadership | 0.63 | . | . |
| Team's understanding of how to meet project goals | 0.62 | . | . |
| Your opportunities for promotion | . | 0.86 | . |
| Your pay and compensation | . | 0.79 | . |
| Your job as currently defined | . | 0.77 | . |
| Benefit to the company | .. | . | 0.82 |
| Current direction of the project | . | . | 0.77 |
| Overall performance to date | . | . | 0.63 |
| Eigen values | 4.32 | 1.71 | 1.01 |

Note: Values <0.5 have been printed as "."

RESULTS

We suggested that satisfaction comprises at least three independent factors. Therefore, we used factor analysis to separate out the responses to our satisfaction score. Table 1 reports the results of the factor analysis.

Ordinary least-squares regression analyses were used to test the three hypotheses in this study. Table 2 reports the means, standard deviations, and correlation coefficients among the major variables of the study. Tables 3 and 4 report the results for several regression models.

Factor Analysis

The results for the factor analysis reported in Table 1 support our use of the three facets of job satisfaction. The loadings from the rotated factor pattern clearly show that the satisfaction items fall into three facets related to social, instrumental, and egocentric aspects as we argued previously. Each factor has an eigen value of greater than 1, and no item loads greater than 0.5 on any factor other than the one related to its relevant facet of satisfaction.

TABLE 2 Means, Standard Deviations, and Pearson Correlation Coefficients

| Variable | Mean | SD | Cronbach alphas | Social Satisfaction | Instrumental Satisfaction | Egocentric Satisfaction | Performance | Causal Deftness | Understand |
|---------------------------|-------|------|-----------------|---------------------|---------------------------|-------------------------|-------------------|-------------------|------------|
| Social satisfaction | 18.69 | 2.40 | 0.83 | 1.00 | | | | | |
| Instrumental satisfaction | 11.33 | 1.50 | 0.72 | 0.65 ^a | 1.00 | | | | |
| Egocentric satisfaction | 10.31 | 1.32 | 0.76 | 0.30 ^a | 0.27 ^c | 1.00 | | | |
| Degree of performance | 32.01 | 5.38 | 0.87 | 0.42 ^a | 0.43 ^a | 0.06 | 1.00 | | |
| Deftness | 54.56 | 5.82 | 0.90 | 0.70 ^a | 0.47 ^a | 0.27 ^b | 0.32 ^b | 1.00 | |
| Comprehension | 57.02 | 6.71 | 0.89 | 0.41 ^b | 0.44 ^a | 0.22 ^c | 0.30 ^b | 0.43 ^a | 1.00 |

^a p < .0001.

^b p < .001.

^c p < .05.

TABLE 3 Results of Regression Analyses on Performance

| Hypotheses Tested Variables | H1 | | H3 | | H1 and H3 | | H2 |
|--------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
| Deftness | 0.32 ^a | -0.09 | | | 0.03 | | 0.32 ^a |
| Comprehension | | | 0.30 ^a | 0.13 | | 0.11 | |
| Social satisfaction | | 0.41 ^a | | | 0.22 ^b | 0.23 ^c | |
| Instrumental satisfaction | | | | 0.37 ^a | 0.29 ^b | 0.26 ^b | |
| Egocentric satisfaction | | | | | -0.09 | -0.10 | -0.02 |
| Adjusted R ² | 0.09 | 0.17 | 0.09 | 0.20 | 0.21 | 0.22 | 0.10 |
| F | 18.59 ^a | 13.01 ^b | 16.53 ^a | 20.96 ^a | 11.96 ^a | 12.64 ^a | 9.29 ^a |

Entries represent standardized regression coefficients (*N* = 168).

Note: one-tailed tests were used for hypothesized relationships.

^a *p* < .0001.

^b *p* < .001.

^c *p* < .05.

Regression Analyses

We turn now to the regression results. Standardized beta coefficients and significance levels are reported in Table 3.

Test for H1

Models 1 and 2 test H1 by first testing for the influence of the main effect variable deftness on the dependent variable performance (model 1) and then for the influence of the mediating variable social satisfaction on the dependent variable performance (model 2).

Model 5 repeats the test for the mediating influence of social satisfaction (H1) but also controls for instrumental satisfaction and egocentric satisfaction.

The results support H1. H1 predicted that social satisfaction would mediate the relation

TABLE 4 Results of Regression Analyses on Performance with Controls

| Hypotheses Tested Variables | H1 | | H3 | | H1 and H3 | | H2 |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
| Deftness | 0.36 ^a | 0.11 | | | 0.16 | | 0.35 ^b |
| Comprehension | | | 0.20 ^c | -0.01 | | 0.11 | |
| Social satisfaction | | 0.35 ^b | | | 0.02 | 0.15 | |
| Instrumental satisfaction | | | | 0.53 ^a | 0.44 ^b | 0.43 ^b | |
| Egocentric satisfaction | | | | | -0.03 | -0.02 | 0.02 |
| Project age | 0.02 | 0.02 | 0.01 | 0.05 | 0.05 | 0.05 | 0.10 |
| Project size | 0.10 | 0.11 | 0.05 | 0.06 | 0.06 | 0.07 | 0.01 |
| Firm size | 0.02 | 0.00 | 0.00 | -0.09 | -0.07 | -0.08 | 0.01 |
| Industrial sector | -0.04 | -0.02 | -0.05 | 0.00 | 0.01 | 0.00 | -0.04 |
| Adjusted R ² | 0.10 | 0.16 | 0.01 | 0.23 | 0.24 | 0.22 | 0.09 |
| F | 3.32 ^b | 4.19 ^b | 1.13 | 5.96 ^a | 4.86 ^a | 4.59 ^a | 2.76 ^c |

Entries represent standardized regression coefficients (*N* = 103). (This is different from *N* = 168 due to missing observations with controls.)

Note: one-tailed tests were used for hypothesized relationships.

^a *p* < .0001.

^b *p* < .001.

^c *p* < .05.

between deftness and performance. Models 1 and 2 support this—the main effect of deftness on performance is supported by model 1 ($\beta/\text{gr} = 0.32$ and $p < .0001$), whereas in model 2 the beta coefficient for deftness becomes insignificant ($\beta = -0.09$ and $p < .7$) and instead the coefficient for social satisfaction is now significant ($\beta = 0.41$ and $p < .0001$). This mediating effect is repeated in model 5, which controls for the other facets of job satisfaction ($\beta = 0.03$ and $p < .77$ for deftness, whereas $\beta = 0.22$ and $p < .05$ for social satisfaction).

All of the F-statistics are significant at the $p < .0001$ level, thus showing good fit of the models to the data, whereas the constructs account for a sizable proportion of the variance in performance.

Test of H2

Models 1 and 7 test H2 by checking for the mediating effect of egocentric satisfaction between deftness and the dependent variable performance.

The results do not support H2. The coefficient for deftness in model 7 remains significant ($\beta = 0.32$ and $p < .0001$) as in model 1 ($\beta = 0.32$ and $p < .0001$), whereas the coefficient for egocentric satisfaction is insignificant ($\beta = -0.02$). The overall model, however, shows good fit as indicated by the F-statistic, which is significant at the $p < .0001$ level.

Test for H3

Finally, models 3 and 4 test H3 by checking for the mediating effect of instrumental satisfaction on the relation between comprehension and performance. Similarly, model 6 tests for the mediating effect of instrumental satisfaction between comprehension and performance (H3) while controlling for social and egocentric satisfaction.

The results support H3. H3 predicted that instrumental satisfaction would mediate the relation between comprehension on performance. Models 3 and 4 support this hypothesis—the main effect of comprehension on performance is supported by model 3 ($\beta = 0.30$ and $p < .0001$). However, in model 4 the coefficient for comprehension becomes insignificant ($\beta = 0.13$ and $p < .15$), whereas that of instrumental satisfaction is significant ($\beta = 0.37$ and $p < .0001$). This mediating effect is repeated in model 6, which controls for other facets of satisfaction ($\beta = 0.11$ and $p < .15$ for comprehension, whereas $\beta = 0.26$ and $p < .05$ for instrumental satisfaction).

Again, all of the F-statistics are significant at the $p < .0001$ level, thus showing good fit of the models to the data, whereas the constructs account for a sizable proportion of the variance in performance.

Adequacy of the Measures

Reliability

As noted previously, Cronbach coefficient alphas were above the 0.7 level advocated by Nunnally (1978). Furthermore, Cronbach coefficient alphas calculated for U.S., Finnish, U.K., and Japanese subsets of respondents were greater than 0.7. This reinforces the reliability and external validity of our measures.

Validity

We pursued construct validity by drawing on both previous fieldwork and an extensive review of the literature to develop each of the items, which provided direct linkages and cumulatibility with previous work.

External validity was pursued by sharing the data and results with the managers of the teams that participated in the study shared with practitioners. In responding to the results of this sharing process, the managers have made decisions to completely redirect projects, to terminate them, to accelerate them, and to invest in team-building or strategy formulation consulting. Clearly, the willingness of managers to undertake such actions as a result of the research findings adds to the external validity of the instruments.

Bias

Considerable attention has been paid to problems of bias.

Common method and common response bias. Podsakoff and Organ (1986) suggest Harmon's single-factor test to test common method bias. If significant common method variance is present, then when all the items are run together in a single factor analysis, either a single factor will emerge from the factor analysis or one general factor will account for the majority of the covariance in the independent and dependent variables. Separate factor analyses were run combining items: performance and instrumental satisfaction, performance and social satisfaction, performance and egocentric satisfaction, and then the three facets of satisfaction with deftness and comprehension. In every case, more than one factor with eigen values greater than 1 were obtained. In addition, items from the different constructs separated cleanly—no item from one construct loaded greater than 0.5 onto a factor associated with another construct.

To further address issues of common method/common response bias, correlation coefficients among project leaders scores and team members' scores were calculated. The project leader's scores correlated with team scores at the .05 level or better. Thus, the team's perceptions correspond with the perceptions of the team leader, who is most exposed to organizational perceptions of project performance (Ancona 1990).

Perceptual Measures

Measures of the constructs were obtained from several knowledgeable insiders, not merely from a single source, so individual biases and distortions tended to be subsumed in the averaging process. Although there is still a danger that the team as a whole might bias their performance ratings upward, we concur with Crampton and Wagner (1994). They concluded from a meta-analysis of 42,934 correlation coefficients published in 581 articles that what the scholarly community must do instead of blanket condemnations of perceptual measures is to specifically address whether percept-percept effects are likely to *materially* influence the conclusions drawn.

In this study, the danger should be modest. First, the survey process was typically initiated as part of a collaborative arrangement, in which teams sought to use the data as feedback for enhancing their effectiveness, so the team had an interest in providing accurate data. Second, the respondents are all individuals of some skill, judgment, and talent, otherwise why they would be allocated significant responsibilities in important innovation projects? Finally, confidentiality was assured for individual responses, reducing the members' incentive to artificially inflate or disguise their responses.

Potential Confounds and Controls

We formally controlled for four important variables that might alternatively explain the variability in performance of the projects. This was done by rerunning the regression models, but now including the four variables as controls. These results are reported in Table 4.

Industry. Industrial sector is thought to affect performance (Tushman and Anderson 1986; Mills and Moberg 1982). Forty percent of the projects in this sample were from service firms and 35 % from manufacturing firms. The remainder were from category checked as “other” (25 %). A sector dummy (service sector or not) was included in regressions as a control variable.

Firm size. Firm size is commonly found to have important effects on such variables as degree of innovativeness (Evans 1987; Mansfield 1963; Mohr 1969). Actual size (measured in terms of number of employees) was included as a control variable.

Project age. It is possible that older projects have the benefits of team experience, so that our measures of comprehension and deftness are simply surrogates of the experience effect (Arrow 1962; Henderson 1980). Therefore the age of the project in months was included as a control.

Project size. Team size has been found to influence communication modes and frequency and the formality of coordination structures (Ancona and Caldwell 1992, p. 329; Hull and Hage 1982). Projects with 12 or fewer team members were included. The median project size was six individuals, inclusive of the leader.

As Table 4 indicates, the control variables did not change the results—social satisfaction continued to mediate between deftness and performance, whereas instrumental satisfaction continued to mediate between comprehension and performance. Egocentric satisfaction still does not mediate.

DISCUSSION AND IMPLICATIONS

Limitations

The reader should bear in mind a number of limitations:

Possible Multicollinearity

There is a possible multicollinearity problem caused by the high correlation between social satisfaction and deftness. We suggest that this expected strong relationship between social satisfaction and effectiveness does not pose major problems of multicollinearity for the following reasons:

1. The item scales for both the constructs are based on different theoretical concepts, and the wording of the items in the two measures are totally dissimilar.
2. We systematically dropped items in each of the measures and then reran the correlations. This did not substantially change the correlation coefficients.

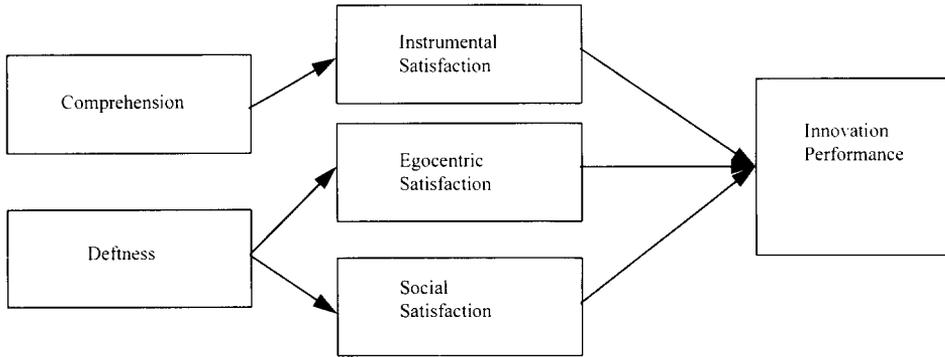


FIGURE 1 Effects of comprehension and deftness on performance as mediated by satisfaction.

Cross-Sectionality of Study

The study is not longitudinal, and thus it is improper to assume that the results demonstrate causality among the variables. Our position is that if the above correlated results were not obtained there would be no point in pursuing the longitudinal study which is planned as the next major stage of the research program. In addition we have to some extent addressed the cross-sectionality limitations by including innovation projects at various stages of evolution. Project leaders were asked to categorize their innovation project in terms of their stage of development. For those cases where the project leaders provided the necessary information, their stage of development is reported in Appendix 2.

Implications: The Role of the Satisfaction in Performance of Innovation Projects

The original framework depicted in Figure 1 appears, for the most part, to be supported by our results. The effects of deftness and comprehension on performance appear to be mediated differentially and by different facets of job satisfaction. Social satisfaction mediates between deftness and performance, and instrumental satisfaction mediates between comprehension and performance. However, our results do not support the widely held assumption that egocentric satisfaction, namely satisfaction with the personal benefits team members receive, has a significant mediating effect between deftness and performance, at least not in the innovation projects in this study.

The results we have obtained in this study have four major implications.

Three Facets of Satisfaction

This analysis suggests that there are at least three underlying and independent dimensions to the satisfaction construct, which stem from different antecedents, two of which have distinct mediating effects on performance. This suggests that efforts to link satisfaction with organizational performance will be best served by separate measurement and consideration of these underlying dimensions. Conflating these dimensions, as is frequently done, may lead to inconclusive or misleading results.

Mediating Effect of Social Satisfaction

Since social satisfaction appears to significantly mediate the effects of deftness on performance, and deftness is a key antecedent to the development of new competences (McGrath et al.

forthcoming), social satisfaction becomes critical to the innovation process. The results suggest that the recent emphasis in the teamwork literature on social satisfaction (e.g., Katzenbach and Smith 1993) is definitely appropriate and warrants significant management attention to orchestrating the processes by which innovation occurs, rather than focusing primarily on the content. Though such attention to process is frequently advocated in the organizational behavior literature, it is seldom given the same emphasis by management that is given to the technical and market-oriented challenges of innovation projects (Peace 1991; Block and MacMillan 1993). In fact, one project manager in the study remarked that although he would have little problem in securing permission to spend tens of thousands of dollars on technical or market studies, he would be looked at with astonishment if he proposed even a 10 thousand dollar expenditure on process consultants to do project team development. Our results suggest that managers would be well advised to attend much more deeply to the processes by which innovation teams work.

Mediating Effect of Instrumental Satisfaction

Our results suggest that instrumental dissatisfaction appears to obstruct the ability of the team to deploy its comprehension to pursue progress on the project. This suggests that when objectives of the project are not being accomplished there is a real need for a methodology that allows the team to systematically unfold the underlying reasons why progress is not being made. If this methodology is not in place, increasing frustration with the lack of progress will start to become dysfunctional and will begin to distract the team from focusing on the reasons for lack of progress. Inevitably in an innovative program the amount of knowledge with which the team has to work is extremely low compared with the amount of assumptions that it must make and the more innovative and the earlier in the project, the lower the knowledge to assumption ratio. If the team, or equally important their senior management, has not recognized the attendant problems of this low assumption to knowledge ratio as a fact of life, and has no way of systematically recognizing that assumptions will not match the unfolding reality, nor has a way of testing these assumptions and converting them into revised knowledge, it will inevitably lose confidence and faith in what little understanding it has developed. Therefore, our results suggest that the arguments of Block and MacMillan (1985) and McGrath and MacMillan (1995) that innovation initiatives require very different planning, monitoring, and control systems than those of an ongoing business. Such planning methodologies recognize *ex ante* that assumptions can not be treated as facts, that innovation teams cannot be held accountable for untestable assumptions, that learning and hence redirection of the innovation is inevitable as the experience of the team unfolds, and that the final outcome will often be very different from the outcome originally planned. To mitigate the obstructive effects of instrumental dissatisfaction, these authors' call for milestone or "discovery driven" planning, which may well be worth heeding.

Lack of Egocentric Satisfaction Effect

A surprising result from our study was the unexpected lack of any mediating effect from the egocentric satisfaction construct. Because the projects in the study were all regarded by the firm as important innovations for the company, it may be that the participants were willing to tolerate depressed short-term benefits, in anticipation of the prestige and/or sense of self fulfillment that the success of such a project might bring them in the long-term. This suggests that firms may well find it less necessary to motivate team members with short term incentives, focusing the promise of significant rewards on longer term outcomes. If the results prove

valid in a longitudinal study, this would mean that organizations can be more aggressive in aligning the time horizons of their incentive systems with the long-time horizons of typical innovation projects.

Future Research

Clearly there is a need for these cross-sectional results to be reinforced via a longitudinal study so that we can begin to increase our confidence that the correlational results we have obtained have some causal underpinnings.

Second it would be important to expand the sample in such a way that we can begin to identify whether the patterns we have found fit with different cultures. In this study, more than one-half of the respondents were from U.S. companies and unfortunately there were not sufficiently large subsamples from other countries to carry out the regression analyses of this study.

CONCLUSION

In the introduction we argued that it is both possible and desirable to disaggregate the satisfaction construct into several subconstructs and that each subconstruct is associated with innovation project performance in distinct and independent ways. We suggested that these constructs manifest themselves in the manner in which they mediate the influence of deftness and comprehension on performance. Whereas the empirical results are based on a cross-sectional sample, the cross-sectional results do provide support to the central theses of the study.

In conclusion, we have made a beginning, albeit an exploratory one, in the fascinating problem of understanding team processes and their correlates in a highly complex, uncertain situation such as a major innovation. The results of the study are encouraging and suggest that this is a fruitful area for further inquiry.

REFERENCES

- Alchian, A.A. and Demsetz, H. 1972. Production, information costs and economic organization. *American Economic Review* 62:777-794.
- Ancona, Deborah Gladstein. 1990. Outward bound: Strategies for team survival in an organization. *Academy of Management Journal* 33(2):334-365.
- Ancona, Deborah G., and Caldwell, David F. 1992. Demography and design: Predictors of new product team performance. *Organization Science* 3(3):321-341.
- Angle, Harold L. 1989. Psychology and organizational innovation. In Andrew Van de Ven, Harold Angle, and Marshall Scott Poole, eds., *Research on the Management of Innovation: The Minnesota Studies*. New York: Harper & Row.
- Arrow, K.J. 1962. The economic implications of learning by doing. *Review of Economic Studies* 29: 155-173.
- Barney, Jay. 1986. Strategic factor markets: Expectation, luck and business strategy. *Management Science* 32(10):1231-1241.
- Birnbaum, Michael H. 1992. Issues in utility measurement. *Organizational Behavior and Human Decision Processes* 52(3):319-330.
- Block, Z., and MacMillan, Ian C. 1993. *Corporate Venturing*. Cambridge, MA: Harvard Business School Press.
- Block, Zenas. 1989. Damage control for new corporate ventures. *Journal of Business Strategy* March/April:22-28.

- Block, Z., and MacMillan, I.C. 1985. Milestones for successful venture planning. *Harvard Business Review* Sept-Oct:4-8.
- Brayfield, A.H., and Rothe, H.F. 1951. An index of job satisfaction. *Journal of Applied Psychology* 35:307-311.
- Brockhaus, R.H., and Horwitz, P.S. 1986. The psychology of the entrepreneur. In D.L. Sexton and W.R. Smilor, Eds., *The Art and Science of Entrepreneurship*. Cambridge, MA: Ballinger, pp 25-48.
- Burgelman, R.A. 1983. A process model of internal corporate venturing in the major diversified firm. *Administrative Science Quarterly* 28:223-44.
- Burns, T., and Stalker, G. 1961. *The Management Of Innovation*. London: Tavistock.
- Castaneda, Maria, and Nahavandi, Afsaneh. 1991. Link of manager behavior to supervisor performance rating and subordinate satisfaction. *Group & Organization Studies* 16(4):357-366.
- Cook, J.D., Hepworth, S.J., Wall, T.D., and Warr, P.B. 1981. *The Experience of Work*. London: Academic Press.
- Crampton, Suzanne M., and Wagner, John A., III. 1994. Precept-percept inflation in micro-organizational research: An investigation of prevalence and effect. *Journal of Applied Psychology* 79(1):67-76.
- Cyert, R.M., and March, J.G. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs, NJ: Prentice-Hall.
- Damanpour, Fariborz. 1991. Organizational innovation : A meta-analysis of effects of determinants and moderators. *Academy of Management Journal* 34(3):555-590.
- Doty, D. Harold, Glick, William H., and Huber, George P. 1993. Fit, equifinality and organizational effectiveness: A test of two configurational theories. *Academy of Management Journal* 36(6): 1196-1250.
- Dunham, R., and Herman, J. 1975. Development of a female faces scale for measuring job satisfaction. *Journal of Applied Psychology* 60:629-631.
- Dunnette, M.D., Campbell, J.P., and Hakel, M.D. 1967. Factors contributing to job satisfaction and job dissatisfaction in six occupational groups. *Organizational Behavior and Human Performance* 2:143-174.
- Ettlie, John E., Reza, and Ernesto, M. 1992. Organizational integration and process innovation. *Academy of Management Journal* 35(4):795-827.
- Ferratt, T.W. 1981. Overall job satisfaction: Is it a linear function of facet satisfaction? *Human Relations* 34:463-473.
- Frost, P.J. and Egri, C.P. 1991. The political process of innovation. In *Research in Organizational Behavior*, vol. 13. Greenwich, CT: JAI Press, pp. 229-295.
- French, J.R.P., and Caplan, R.D. 1972. Organizational stress and individual strain. In A.J. Marrow, ed., *The Failure of Success*. New York: AMACOM.
- Gersick, Connie J.G. 1988. Time and transition in work teams : Toward a new model of group development. *Academy of Management Journal* 31(1):9-41.
- Gladstein, D.L. 1984. Groups in context: A model of task group effectiveness. *Administrative Science Quarterly* 29:499-517.
- Granovetter, Mark. 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91:481-510.
- Gresov, Christopher; Drazin, Robert, and Van de Ven, Andrew H. 1989. Work-Unit task uncertainty, design and morale. *Organization Studies* 10(1):45-62.
- Guth, W.D., and Ginsberg, A. 1990. Guest editors' introduction: Corporate entrepreneurship. *Strategic Management Journal* 11:5-15.
- Guth, William D., and MacMillan, Ian C. 1986. Strategy implementation versus middle management self-interest. *Strategic Management Journal* 7(4):313-327.
- Hackman, J.R. 1990. *Groups That Work (and Those That Don't)*. San Francisco, CA: Jossey-Bass.
- Hackman, J.R., and Oldham, G.R. 1980. *Work Redesign*. Reading, MA: Addison-Wesley

- Hartman, S., Grigsby, D.W., Crino, M.D., and Chhokar, J.S. 1986. The measurement of job satisfaction by action tendencies. *Educational and Psychological Measurement* 46:317-329.
- Heider, Fritz. 1958. *The Psychology of Interpersonal Relations*. New York: Wiley.
- Henderson, B.D. 1980. *The Experience Curve Revisited*. Boston, MA: The Boston Consulting Group, Perspective No. 229
- Herzberg, F., Mausner B., and Snyderman, B. 1959. *The Motivation at Work*. New York: Wiley.
- Hollenback, J.R. 1989. Control theory and the perception of work environments: The effect of focus of attention on affective and behavioral reactions to work. *Organizational Behavior and Human Decision Processes* 43:406-430.
- Hull, F., and Hage, J. 1982. Organizing for innovation: Beyond Burns and Stalker's organic type. *Sociology* 16:564-577.
- Jayarathne, S. 1993. The antecedents, consequences, and correlates of job satisfaction. In R. Golembiewski, ed., *Handbook of Organizational Behavior*, Chap. 6. New York: Martin Dekker, pp. 111-140.
- Kanter, R.M. 1989. The new managerial work. *Harvard Business Review* 67(6):85-92.
- Katzell, R.A. 1964. Personal values, job satisfaction and job behavior. In H. Borow, ed., *Man in a World of Work*. Boston, MA: Houghton-Mifflin.
- Katzenbach, J.R., and Smith, D.K. 1993. *The Wisdom of Teams: Creating the High Performance Organization*. Boston, MA: Harvard Business School Press.
- Keller, Robert T. 1986. Predictors of the performance of project groups in R&D organizations. *Academy of Management Journal* 29(4):715-726.
- Kerr, Jeffrey L. 1985. Diversification strategies and managerial rewards. An empirical study. *Academy of Management Journal* 28(1):155-179.
- Kerzner, Harold. 1987. In search of excellence in project management. *Journal of Systems Management* 38(2):30-39.
- Kogut, Bruce; Zander, Udo. 1992. Knowledge of the firm and the speed of transfer and imitation of technologies. Working paper, Philadelphia, PA: The Wharton School, University of Pennsylvania.
- Kornhauser, A. 1965. *Mental Health of the Industrial Worker: A Detroit Study*. New York: John Wiley.
- Kunin, T. 1955. The construction of a new type of attitude measure. *Personnel Psychology* 8.
- Landy, F.J., and Becker, W.S. 1987. Motivation theory reconsidered. In L.L. Cummings and B.M. Staw, Eds., *Research in Organizational Behavior* 9:1-38.
- Lawler, E.L. 1973. *Motivation in Work Organizations*. Monterey, CA: Brooks/Cole Publishers.
- Leonard-Barton, Dorothy. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal* 13(special issue/summer):111-125.
- Leonard-Barton, Dorothy. 1991. Corporate culture and the dual nature of core capabilities in new product development. Paper prepared for the conference on the evolution of firm capabilities, Reginald Jones Center for Corporate Strategy, Management, and Organization. Philadelphia, PA: The Wharton School, University of Pennsylvania.
- Levitt, Barbara, and March, J.G. 1988. Organizational learning. *Annual Review of Sociology* 14:319-340.
- Lewin, A.Y., and Minton, J.W. 1986. Organizational effectiveness: Another look and an agenda for research. *Management Science* 32:514-538.
- Locke, E.A. 1969. What is job satisfaction? *Organizational Behavior and Human Performance* 4:336-409.
- Locke, E.A. 1976. The nature and causes of job satisfaction. In M.D. Dunnette, ed., *Handbook of Industrial and Organizational Psychology*. Chicago: Rand McNally.
- Mangione, T.W., and Quinn, R.P. 1973. *Job Satisfaction, Counterproductive Behavior and Self-Narcotizing Withdrawal from Work*. Ann Arbor, MI: Institute for Social Research.
- Mansfield, E. 1963. Size of firm, market structure and innovation. *Journal of Political Economy* 71: 556-576.
- March, J.G., and Simon, H.A. 1958. *Organizations*. New York: Wiley.

- March, J.G. 1991. Exploration and exploitation in organizational learning. *Organization Science* 2: 71-87
- Maslow, Abraham. 1954. *Motivation and Personality*. New York: Harper.
- McGrath, Rita Gunther, and MacMillan, Ian C. 1995. Discovery driven planning. *Harvard Business Review* 73(4):44-54.
- McGrath, Rita Gunther, MacMillan, Ian C., and Venkataraman, S. 1995. Defining and developing competence: A strategic process paradigm. *Strategic Management Journal* 16(4):251-275.
- McGrath, R.G, Tsai, Ming Hone, Venkataraman, S., and MacMillan, Ian C. 1996. Innovation, competitive advantage and rent: A model and test. *Management Science* (forthcoming).
- Miller, J.A. 1992. Book reviews: Whose team are you on? *Human Resource Planning* 15(2):83-95.
- Miller, D. 1983. The correlates of entrepreneurship in three types of firms. *Management Science* 29: 770-791.
- Mills, P.K., and Moberg, D.J. 1982. Perspectives on the technology of service operations. *Academy of Management Review* 17:467-478.
- Mintzberg, H., Raisinghani, D., and Theoret, A. 1976. The structure of "unstructured" decision processes. *Administrative Science Quarterly* 21:246-275.
- Mohr, L.B. 1969. Determinants of innovation in organizations. *American Political Science Review* 63: 111-126.
- Monge, Peter R., Cozzens, Michael D., and Contractor, Noshir S. 1992. Communication and Motivational predictors of the dynamics of organizational innovation. *Organization Science* 3: 250-274.
- Morris, Michael H., Avila, Ramon A., and Allen, Jeffrey. 1993. Individualism and the modern corporation: Implications for innovation and entrepreneurship. *Journal of Management* 19(3): 595-612.
- Nunnally, J. 1978. *Psychometric Theory*, 2nd ed. New York: McGraw-Hill.
- O'Brien, J.E., and Feather, N.T. 1990. The relative effects of unemployment and quality of employment on the affect, work values and personal control of adolescents. *Journal of Occupational Psychology* 63:151-165.
- O'Toole, J. 1975. *Work in America*. Cambridge, MA: MIT Press.
- Peace, William H. 1991. The hard work of being a soft manager. *Harvard Business Review* 69(6):40-47.
- Pettigrew, A.M. 1973. *The Politics of Organizational Decision Making*. London: Tavistock.
- Pinto, J.K., and Prescott, J.E. 1990. Planning and tactical factors in the project implementation process. *Journal of Management Studies* 27(3):305-327.
- Podsakoff, P.M, and Organ, Dennis W. 1986. Self-reports in organizational research: Problems and prospects. *Journal of Management* 12(4):531-544.
- Porter, M. 1980. *Competitive Strategy*. New York: The Free Press.
- Porter, L.W. 1961. A study of perceived need satisfaction in bottom and middle management jobs. *Journal of Applied Psychology* 45:1-10.
- Quinn, R.P., and Sheppard, L.J. 1974. *The 1972-73 Quality of Employment Survey*. Ann Arbor, MI: Institute for Social Research.
- Quinn, R.P., Staines, G.L., and McCollough, M.R. 1974. A longitudinal study of a valence model approach for the prediction of job satisfaction of new employees. *Journal of Applied Psychology* 68:307-312.
- Robertson, A.B, Achilladelis, B.G., and Jervis, P. 1972. Success and failure in industrial innovation. *Report on Project Sappho*. London: Center for the Study of Industrial Innovation, Science Policy Research Unit.
- Scott, Susanne G., and Bruce, Reginald A. 1994. Determinants of innovative behavior : A path model of individual innovation in the workplace. *Academy of Management Journal* 37(3):580-607.
- Smith, P.C., Kendall, L.M., and Hulin, C.L. 1969. *The Measurement of Satisfaction in Work and Retirement: A Strategy for the Study of Attitudes*. Chicago: Rand McNally.

- Spector, Paul E. 1986. Perceived control by employees: A meta-analysis of studies concerning autonomy and participation at work. *Human Relations* 39(11):1005–1016.
- Stokes, Stewart L., Jr. 1990. Building effective project teams. *Journal of Information Systems Management* 7(3):38–45.
- Tushman, M.L. 1977. A political approach to organizations: A review and rationale. *Academy of Management Review* 2:206–216.
- Tushman, M.L., and Anderson, Phillip. 1986. Technological discontinuities and organizational environment. *Administrative Science Quarterly* 31(3):439–465.
- Van de Ven, Andrew. 1986. Central problems in the management of innovation. *Management Science* 32(5):590–607.
- Van de Ven, Andrew, and Angle, Harold L. 1989. An introduction to the Minnesota Innovation Research program in Chapter 1. In Andrew Van de Ven, Harold Angle, and Marshall Scott Poole, eds., *Research on the Management of Innovation: The Minnesota Studies*. New York: Harper & Row.
- Van de Ven, Andrew, Hudson, R., and Schroeder, D.M. 1984. Designing new business startups: Entrepreneurial, organizational and ecological considerations. *Journal of Management* 10(1): 87–107.
- Venkataraman, S., Shane, Scott, McGrath, R.G., and MacMillan, I.C. 1993. Some central tensions in the management of corporate venturing. In S. Birley and I.C. MacMillan, eds., *Entrepreneurship Research: Global Perspectives*. Amsterdam: Elsevier Science Publishers B.V.
- Vesper, K.H. 1990. *New Venture Strategies*. Englewood Cliffs, NJ: Prentice-Hall.
- Vroom, V.H. 1964. *Work and Motivation*. New York: Wiley.
- Wagner, J.A. 1994. Participation's effect on performance and satisfaction: A reconsideration of research evidence. *Academy of Management Review* 19(2):312–330.
- Weick, Karl E., and Roberts, Karlene H. 1993. Collective mind in organizations: Heedful interrelating on flight decks. *Administrative Science Quarterly* 38(3):357–381.
- Weiss, D.J., Dawis, R. V., and England, G. W. 1967. Manual for the Minnesota satisfaction questionnaire. *Minnesota Studies in Vocational Rehabilitation* 22:120.
- Wernerfelt, B. 1989. From critical resources to corporate strategy. *Journal of General Management* 14(3):4–12.
- Zajac, Edward J., Golden, Brian R., and Shortell, Stephen M. 1991. New organizational forms for enhancing innovation: The case of internal corporate joint ventures. *Management Science* 37(2): 170–184.
- Zirger, B.J., and Maidique, M.A. 1990. A model of new product development: An empirical test. *Management Science* 36(7):867–883.

APPENDIX 1 Construct Operationalization

| Construct and main sources | Items | Alpha |
|--|---|-------|
| <p>Construct: Performance</p> <p>Sources: Gresov, Drazin and Van de Ven (1989); Ancona and Caldwell (1992); Van de Ven, Hudson & Schroeder (1984); Block and MacMillan (1985)</p> | <p>Performance with respect to:</p> <p>Quality objectives; Reliability objectives; Cost objectives; Efficiency objectives; User/Client satisfaction objectives; Service Objectives</p> <p>Overall objectives</p> | .87 |
| <p>Construct: Comprehension</p> <p>Sources: March (1991); Barney (1986); Alchian and Demsetz (1972); Hackman (1990); Block and MacMillan (1985); Vesper (1990); Zirger and Maudique (1990); Porter (1980).</p> | <p>Team's understanding of:</p> <p>Key sources of revenues or funds; Identity of key customers or clients; Customer needs; Competition faced; Usage patterns; Risks to customers; Pricing issues; Legal and regulatory issues; Risks to the firm; Support services required; Costs of resources; Key operational requirements; Threats to reliability; Threats to quality; Costs; Bottlenecks.</p> | .89 |
| <p>Construct: Deftness</p> <p>Sources: Hackman (1990); Wernerfelt (1989); Pettigrew (1973); Guth and MacMillan (1986); Tushman (1977); Alchian and Demsetz (1972); Gersick (1988)</p> | <p>Evaluation of these dimensions:</p> <p>Others know what to do; Others are competent; People can depend on one another; People know what information is important to others; Evidence of "hidden agendas"; Information is held up or withheld; Information gets distorted; New people are easily assimilated; People understand one another; People will implement decisions; Information is not available; The team is short of key skills; People resist challenging one another.</p> | .90 |
| <p>Construct: Instrumental satisfaction</p> <p>Sources: Kerzner (1987), Morton (1983), Pinto and Prescott (1990), Vesper (1990), Larkman (1987)</p> | <p>Assessment of extent to which the team member is satisfied with:</p> <p>Current direction of the project; overall performance to date; benefit to your company.</p> | .72 |
| <p>Construct: Social Satisfaction</p> <p>Sources: Kerzner (1987), Pinto and Prescott (1990), Vesper (1990), Larkman (1987), Stokes (1990), Castaneda and Nahavandi (1991)</p> | <p>Assessment of extent to which the team member is satisfied with:</p> <p>Skill set of the project team; working relationships in the project team; morale in the project team.</p> | .83 |
| <p>Construct: Egocentric satisfaction</p> <p>Sources: Smith, Kendall and Hulin (1969), Cook et al (1981), Weiss et al (1967), Locke (1976)</p> | <p>Assessment of extent to which the team member is satisfied with:</p> <p>Pay and compensation; opportunities for promotion; current job definition.</p> | .76 |

APPENDIX 2 Industrial Base of Firms That Provided Data on Innovation Projects

| Industry | % |
|--------------------------|------|
| Airlines | 2.5 |
| Automobiles | 2.5 |
| Banking | 7.5 |
| Chemicals | 7.5 |
| Distribution services | 5.0 |
| Environmental services | 5.0 |
| Farming/Agriculture | 2.5 |
| Financial services | 7.5 |
| Glass and ceramics | 2.5 |
| Insurance | 2.5 |
| Medical/Hospital | 2.5 |
| Mining | 2.5 |
| Oil | 2.5 |
| Pharmaceuticals/Consumer | 7.5 |
| Retailing | 2.5 |
| Shipping | 2.5 |
| Small manufacturing | 7.5 |
| Software | 2.5 |
| Steel | 2.5 |
| Telecommunications | 17.5 |
| Transportation | 2.5 |
| Travel | 2.5 |
