
Computational & Mathematical Organization Theory 7, 207–232, 2001.
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Promotion Systems and Organizational Performance: A Contingency Model

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Abstract

This study explores the organizational impact of a variety of important promotion systems commonly practiced in organizations including up-or-out systems, absolute merit-based systems, relative merit-based systems, and seniority-based systems. Through the computer simulation of organizations in a distributed decision making setting, the results indicate that the effectiveness of any promotion system is dependent on a range of factors including the nature of the task environment, the design of the organizational structure, the frequency of monitoring, the criteria of performance, and the transferability of task knowledge. This study has implications not only for understanding organizational promotion systems from the contingency perspective, but also for bridging the fields of strategic human resource management and computational organization theory.

Keywords: promotion systems, organizational performance, computer simulation, contingency perspective

Promotion Systems and Organizational Performance: A Contingency Model

Promotion systems affect almost all aspects of organizational lives. This is particularly evident from studies of human resource management (HRM) (Fuller and Huber, 1998) and internal labor markets (Baker and Holmstrom, 1995; Barron and Loewenstein, 1985), to name a few. Given the importance of promotion systems in organizations, it is surprising that few studies have attempted to examine the role of various environmental, organizational and job factors on the effectiveness of promotion systems (Allen, 1997; Ferris et al., 1992). This study attempts to fill some of the void and explore the organizational impact of a variety of important promotion systems commonly practiced in organizations including up-or-out systems, absolute merit-based systems, relative merit-based systems, and seniority-based systems. The systems are tested under a wide variety of conditions and the contribution of each promotion system to the performance of an organization on a simulated radar detection task is compared. Factors considered include: the nature of the task environment, individual capabilities, organizational structure, monitoring frequency, performance criteria, and transferability of knowledge. The use of a computational model allows a wide range of contingencies to be systematically examined.

The paper begins with a discussion of previous research on this topic and the theoretical rationale for the study. This is followed by a discussion of the various types of promotion systems and the factors that may mitigate the performance of those systems. Interspersed in this discussion in the generation of hypotheses for the subsequent computational

experiments. The following section of the paper discusses the computational model used in the study and the method of operationalizing the variables discussed in the theory section. The results of the experiments are presented followed by a discussion of the results and conclusion.

Theoretical Background and Hypotheses

Traditionally, students of human resource management (HRM) have placed the study of promotion and recruitment under the rubric of employee selection (Fuller and Huber, 1998). Selection is the process of matching workers to jobs to maximize organizational productivity and performance. Promotion and recruitment are linked because the HR practitioner is supposedly indifferent to whether that candidate is recruited from inside or outside the organization. However, promotion proves to be the more pervasive phenomenon. Empirical studies reveal that around 75% of vacancies are filled by promotions from within the organization (Baker et al., 1994; Chan, 1996; Lazear, 1992; Wholey, 1985).

According to labor economists, internal labor markets are favored because managers typically have better information about an employee's ability, motivation, and performance (Baker and Holmstrom, 1995; Barron and Loewenstein, 1985; Wholey, 1985). Internal candidates may also have developed specific skills not readily available in the external market (Gibbons and Waldman, 1999).

While the reliance on an internal labor market is characteristic of most organizations, there is considerable variation in the mechanisms used to select candidates for promotion. Universities, professional service firms, and the military often use up-or-out models of promotion, where junior employees must make the grade within a specified period of time or exit the organization (O'Flaherty and Siow, 1995; Waldman, 1990). Many other organizations rely on some form of merit or rank-order system, where those receiving the highest performance evaluations in a given cohort are promoted while those missing the cut remain at their current level (Lazear and Rosen, 1981). Seniority has also been widely used as a basis for promotion in many industries (particularly in public administration) but has fallen from favor in recent years (Dobson, 1988; Mills, 1985).

Organizational economists assume that persistent variations in organizational practice must reflect efficient adaptations to local conditions and constraints (Milgrom and Roberts, 1992). Thus, the military and academic use up-or-out promotion systems because they are the most efficient vehicles for the type of environment in which these organizations operate. Economists often seek to justify why one (seemingly inefficient) mode of organization are actually more efficient in a particular context.

The efficiency viewpoint is consistent with *contingency theory* that argues that one best practice does not fit all. Organizations must continually adapt their practices to environmental realities to improve performance (Lawrence and Lorsch, 1967). Contingency theory goes beyond the economist's quest for understanding in seeking to provide normative guidance for managers on how to adjust organizational parameters to cope with changing environmental conditions.

Given the pervasiveness of promotion systems in organizational life, it is disappointing to note that only a few studies have attempted to describe the effect of various environmental,

organizational and job factors on the characteristics of promotion systems (Allen, 1997; Ferris et al., 1992). Ferris et al. (1992) developed a comprehensive model of antecedent and outcomes of promotion systems. Surveys were used to collect data on antecedent factors such as industry type, degree of centralization and formalization, firm size, strategy, and degree of unionization. The survey tool also collected information on outcomes, including factors such as return on investment, turnover, and the perceived fairness of the system. The type of promotion system in a company was determined from four survey responses: whether the company had a) a promotion from within philosophy, b) a time-in-grade requirement, c) a fast track promotion system, and d) a mentoring program.

The limitations of this approach become readily apparent when we consider that Ferris et al. (1992) received only 41 usable responses from 347 mailings to companies in four industries. A follow-up survey by Allen (1997) utilizing the same model received usable data from only 74 of 284 mailings across nine industry groups. Given low statistical power, only a few significant correlations were found and results were frequently not replicated between the two studies. For instance, one interesting result in the Ferris et al. (1992) paper was a reported correlation between return on sales and the use of ability and prior performance as promotion criteria The result was not replicated in the Allen (1997) follow-up study. Neither paper provided descriptive statistics or correlation matrices for review.

The lack of research in this area creates several problems for organizations. First, there is no way of knowing if current practices are the most efficient set of arrangements. Firms may be satisficing rather than maximizing performance but a fear of failure prevents experimentation with alternate promotion systems. Secondly, firms in new industries, or facing new conditions, have little guidance in the selection of a promotion system. Understanding the factors that favor one system over another should lead to better outcomes than the current reliance on tradition, habit, or luck.

The current study uses a computational model to study the relationship between promotion systems and organizational performance. A computational approach allows us to study the dynamic effects of a range of factors while simultaneously controlling for extraneous variables that make real-world comparisons difficult. Studies have shown that such a methodology can be very effective in complementing the contingency perspective (Lin and Carley, 1995; Lin and Carley, 1997).

Types of Promotion Systems

A useful discussion on promotion systems can be found in the organizational economics literature. According to economists, a promotion system serves two fundamental purposes (Baker et al., 1988). First, it selects more able individuals for positions of greater responsibility (the job assignment or matching function of the promotion system) and, secondly, it motivates employees at one level to strive harder to reach the next one (Lazear and Rosen, 1981).

In this study, we deliberately chose to model only the job assignment or matching function of promotion systems. We did this for three reasons:

1. The incentive effect of promotion systems has received little or no coverage in the HRM literature. Promotion is seen as simple job assignment not as a tool for potentially motivating all workers (whether promoted or not).
2. Motivation is extremely difficult to model. Motivation impacts productivity and turnover, waxes and wanes over an employee's tenure, and fluctuates in response to organizational events (such as being passed over for promotion). There is little reliable data concerning the magnitude of these motivational effects. Any attempt to provide a credible model of motivation is likely to be met with howls of derision for some perceived error of omission or commission.
3. Procedural rules for promotion are easy to model. For instance, if seniority is the basis for promotion, it is a simple matter to identify the most senior employee in a given cohort or group. The rules are so transparent and uncontroversial that, in effect, the process is self-validating (Carley, 1996).

Clearly, by controlling (or neglecting) incentive effects across promotion systems we provide only a partial model of the effect of promotion systems on performance. Incentive effects are critical to understanding the full impact of a given promotion system. However, the validity of simplifying reality can really only be assessed in relation to the purpose of the model (Burton and Obel, 1995). We believe the model is still capable of producing useful insights for HR practitioners with this simplification. In particular, the model addresses the question of whether the variations in job assignment performance across different contingencies are large enough to justify changing promotion systems. The transparency of the rules gives us a great deal of confidence in the outcome. We are also confident that the use of empirically validated parameter settings and organizational archetypes can further improve the model's validity (Harrison and Carroll, 1991). Moreover, the existing focus of HR practitioners on job assignment issues suggests motivational issues are already being neglected, and the general paucity of data on these questions begs for a contribution even with these simplifications.

For the purposes of the study, we focus on four commonly practiced promotion systems, plus a random promotion system, which will be used as a baseline for comparison.

Absolute and Relative Merit-Based Systems. The most common form of promotion system is the merit-based system (MBS), which can be further sub-divided into its relative and absolute forms. In an absolute MBS, the candidate must perform above some arbitrary cutoff level in past, current or projected future performance to become eligible for promotion. In a relative MBS, candidates are ranked according to performance and the highest-ranked candidates are promoted regardless of their absolute performance level while those at the bottom tend to face some negative disciplinary actions.

While it may seem that candidates have an incentive to shirk and reduce their performance to a uniformly low level in a relative MBS, the opposite may actually be true. The desire for promotion and uncertainty over the final cutoff point creates an intense competition between candidates that has been likened to a rat-race or sports tournament (Landers et al., 1996; Lazear and Rosen, 1981). However, as we have elected to set aside incentive effects in the current study, the issue becomes the relative ability of each system to select talented candidates for higher-level positions.

Let us assume that performance in a population of promotion candidates for a given level is normally distributed with a mean of zero and a standard deviation of *s*. A candidate scoring below zero will negatively impact organizational performance. Assume further that any given cohort of candidates is sampled from the candidate population distribution.

In a relative MBS, there is always a chance that a cohort will be totally comprised of negative performers. In this case, selecting the best performer for promotion may still result in negative performance outcomes for the organization. This can be contrasted with an absolute MBS that will not promote candidates unless their performance exceeds some minimum threshold level (for example, we may require performance to be greater than zero). An absolute MBS will only select from the best "qualified" performers. Thus, while a relative MBS will always have a candidate to promote, an absolute MBS will always ensure that a negative performer will not be promoted: a classic case of the tradeoff between a sin of commission versus a sin of omission. This leads to the following hypothesis:

Hypothesis 1. An absolute merit-based system will outperform a relative merit-based system in a job-matching function.

Up-or-Out Systems. Up-or-out systems (UOS) are commonly found in universities, professional service firms, and the military (Morris and Pinnington, 1998; O'Flaherty and Siow, 1995). In the traditional UOS, candidates are evaluated after a set period of time. The performers above certain performance criteria in a cohort are promoted while those failing to make the grade are dismissed from the organization. In theory, the system could also include a middle group of candidates that are neither promoted nor dismissed but this is seldom seen in practice.

An up-or-out approach combines the rat-race-like incentive effects of merit-based approaches with the additional threat of job loss for inadequate results. Interestingly, UOS are mainly used for junior employees. Organizations typically revert to a merit-based system after one or two rounds of up-or-out pressure. Universities completely reverse their personnel policy by offering tenure (i.e. lifetime employment) for those making the onerous transition from assistant to associate professor.

As a matching system, UOS combines the benefits of a merit-based system with the ability to drop poor performers from the candidate pool. As a result, an UOS samples more often from the candidate population than a merit-based system. Increased sampling from the candidate population improves the probability that a superior performer will be available for promotion. Over time, this over-sampling may improve the performance of the organization relative to a merit-based system.

Hypothesis 2. An up-or-out system should perform better than a merit-based system in a job-matching function.

Seniority-Based Systems. Seniority based systems promote the candidate (or candidates) in a cohort with either: 1) the most experience in the job, 2) the most experience in the organization, or 3) the most experience in the industry. For this study we focus on the second category, i.e., the experience in the organization as a criterion for seniority. Seniority-based systems offer clear career paths and succession planning, low turnover, and objectivity in

the promotion process (Dobson, 1988). When firm-specific human capital accumulates uniformly over time, and there is little variation in the initial ability of employees, seniority acts as a useful proxy for performance. However, if learning rates and ability are heterogeneous then a seniority system cannot guarantee that the best performer will be promoted. In this situation, seniority is a weak selection device. In the current model the ability of all agents is held constant but differential learning is possible. Accordingly we have the following hypothesis.

Hypothesis 3. Seniority-based systems should not perform better than merit-based or up-or-out systems in a job-matching function.

Random Promotion Systems. In order to compare the relative effectiveness of the promotion systems, we also consider a promotion system that does not use any of the promotion mechanisms mentioned above. This random promotion system will serve as a baseline control and may not find its existence in the real world. In this random promotion system, when there is a vacancy, lower level members are selected based on random chance rather than performance or seniority. We would expect that promotion systems that explicitly seek to promote capable performers into higher-level positions should generally perform better than a random promotion system. Thus, we have the following hypothesis:

Hypothesis 4. Any performance or seniority-based promotion systems should outperform random promotion systems in a job-matching function.

Contingency Factors

A fundamental tenet of contingency theory is that no single organizing principle is optimal for all situations (Lawrence and Lorsch, 1967). The primary goal of this paper is to examine the efficacy of promotion systems under various contingencies. In particular, we propose to test the moderating effects of: task environment, organizational structure, individual capability, frequency of monitoring, performance criteria, and transferability of knowledge on promotion system effectiveness. The rationale for selecting these factors and hypothesized results will be discussed below.

Task Environment. Organizations are open systems and so they can be impacted by the nature of the task environment (Thompson, 1967). Some organizational environments are more routine or concentrated while others are unstructured, novel, and turbulent (Lin, 2000). In dispersed environments, past experience (and hence past performance) may provide little guidance for future action. Three of the four promotion systems under consideration rely extensively on either past performance (up-or-out and merit-based) or experience (seniority-based) to make promotion decisions. Accordingly, these systems will not operate as effectively in a dispersed environment.

Hypothesis 5. All promotion systems should perform better in routine or concentrated task environments than in non-routine or dispersed environments because in routine task environments, past behavior is a more effective guide to future performance.

Individual Capability. Organizations are composed of people who can exhibit different natural abilities (in addition to their on-the-job experiences), which may affect their chances of promotion and ultimately the organizational performance. The field of micro organizational behavior has particularly emphasized such individual differences that may contribute to organizational performance (Barney, 1991). One of the key functions of a promotion system, in a world of heterogeneous capabilities, is to select those individuals with that make, or will make, the greatest contribution to firm performance. To the degree that formal promotion systems successfully accomplish this goal, it makes sense to assume that:

Hypothesis 6. Firm performance will be improved if promotion systems favor selecting more naturally capable individuals for promotion.

Organizational Structure. Organizations use structures to coordinate members' activities and transform external resources into products (Coleman, 1990; Mintzberg, 1983). A hierarchy structure emphasizes a command and control mechanism with the decision power being concentrated at the top of the organization, while a team structure favors a more decentralized mechanism with the decision power being dispersed across a group of members (Hall, 1988; Lin and Hui, 1999). Given the stronger restrictions of a hierarchy structure, we would expect that individual differences tend to make less an impact on the organization. Therefore, promotion systems will also have less impact on organizational performance in a hierarchy than in a team structure.

Hypothesis 7. All promotion systems should have a more positive impact on organizational performance in a team structure than in a hierarchy structure.

Frequency of Monitoring. The frequency of monitoring refers to the time between promotion decisions (measured from the time of hire or last promotion). In general, as performance becomes more difficult to measure or validate, an organization will need more time to review the performance of a promotion candidate. For instance, the lag in creating and publishing academic research requires a university to wait many years before evaluating tenure-track professors for tenure (Siow, 1995). Thus, the longer the monitoring period, the more accurate the evaluation (and subsequent promotion decision) will be, and so the better organizational performance. The seniority-based system, however, may be unaffected because of its reliance on relative experience rather than the absolute time periods.

Hypothesis 8. Shorter monitoring periods will detrimentally affect merit-based and up-or-out systems. Seniority-based and random systems will be unaffected.

Performance Criteria. For absolute merit-based systems or up-or-out systems, performance criteria become important. A higher performance level may cause more performance-related turnovers thus lower organizational performance. Therefore, we may have the following hypothesis:

Hypothesis 9. For absolute merit-based systems and up-or-out systems, higher performance criteria may negatively affect organizational performance. Other promotion systems will be unaffected.

Transferability of Knowledge. Performance-based promotion systems assume that an individual's past experience will be beneficial to his/her future performance. Therefore, knowledge on similar tasks can be transferred across different levels and different organizations. We may thus expect that organizations hiring individuals with similar task knowledge should have a better performance than organizations hiring individuals with no knowledge at all (Lin, 2000).

Seniority systems should be relatively unaffected by the knowledge transferability issue. Although there is an implicit assumption that the most experienced employees will perform better in more senior roles, performance is not explicitly measured, or utilized, in the selection process of seniority systems.

Hypothesis 10. Lack of task knowledge will detrimentally affect merit-based and up-or-out systems. Seniority-based and random systems will be unaffected.

Computational Methods

Organizations are dynamic, complex and open systems (Thompson, 1967). To study the impact of promotion systems on organizations, we must understand the internal dynamic processes and sort out various complex relationships across different levels in organizations. This requires a multi-level approach and an appropriate methodology (House et al., 1995; Rousseau and House, 1994).

To achieve these objectives we use computational modeling, in particular the agent-based method (Weiss, 1999). Agent-based models allow the modeling of not only cognitively intelligent individual members (nodes) and their adaptive interpersonal relationships, but also organizational-level outcomes in a dynamic and controlled setting (Axelrod, 1997). The decision to use this methodology is based not only on the necessity given the nature of this study but also on the fact that computer modeling, as "an extension of human cognition" (Simon, 1973) and "a third symbol language besides natural language and mathematics" (Ostrom, 1988), has its unique advantages over other qualitative case studies, quantitative data analyses, and mathematical modeling (Axelrod, 1997; Taber and Timpone, 1996).

First of all, the problems we attempt to address involve micro-macro processes with complex and adaptive relations that are often mathematically and statistically inexpressible under various organizational contexts, which are impossible to manipulate in the real world (Axelrod, 1997). Secondly, computer modeling can be used to express theory—that is, to build models embedded in programs (Axelrod, 1997; Taber and Timpone, 1996). Through computer modeling, we can enhance accuracy and realism of theories, which are two of the three properties of theory (Weick, 1979). With the use of computer modeling, organizations no longer have to be treated as black boxes, thus providing more realistic insight into the dynamic processes of organizations (Axelrod, 1997; Harrison, 1998). Computer modeling also provides the researchers with high quantitative tools that often go beyond loose conceptual terms, thus greatly increasing the accuracy. Thirdly, computer modeling can provide a more systematic and powerful tool for integrating different perspectives in organization and management studies (Pfeffer, 1993). Finally, researchers have successfully

demonstrated the power of computer modeling in addressing various organizational issues (Axelrod, 1997; Carley and Lin, 1997).

In the following sections, a brief description will be given for the main components of the computer simulation model used in this study. Due to the page limitation, not all details can be included here. Additional technical information can be obtained upon request or from some similar studies using agent-based modeling methods (Glance et al., 1997; Lin and Carley, 1995; Lounamaa and March, 1987; Weiss, 1999).

Overview of the Model

In this study, we take the agent-based modeling approach and model organizations as operating in problem solving tasks. Thus, organizational performance is about the accuracy of decision making. In the agent-based model, the building blocks are individual organizational members. Each agent is modeled with its own memory that allows him/her to communicate information, process information, make decisions, and update past experiences. How members make decisions based on specific decision procedures and promotion policies that will be described below. How members interact depends on decision processes through predefined communication structure, which is a four-tier hierarchy in this study. A typical decision making process starts from the base-level analysts to the top-level manager. After the problem is "over", the top management's final decision is recorded as its organization's decision and feedback is provided to the whole organization. Each individual member's recommendation can be kept in a file and memory updated. A new problem then occurs. Because the organization does not have prior knowledge of the true nature of all the problems nor their distributions of the task environment, and the organization makes the decision through coordination of members who have only partial information, thus the organization can make misjudgments. In addition to organizational structures and their associated communication and decision making procedures, these decision making processes can be further moderated by the various organizational contexts built in the model, such as different promotion policies, environmental conditions, individuals' capabilities, monitoring frequencies, performance criteria, knowledge transferability, etc (figure 1). The model's source code is written in C in a UNIX environment and can be obtained from the authors upon request.

Modeling Promotion Systems (and Associated Decision Making Procedures)

In this study, we model five types of promotion systems, up-or-out, absolute merit-based, relative merit-based, seniority-based, and random systems.

For all the promotion systems, we assume a ten-percent annual natural turnover rate at each position of the organization. This turnover rate is consistent with empirical findings (Baker et al., 1994). Each organization is faced with 200 problem periods and every ten periods is considered one year.

Up-or-Out Promotion. In this type of promotion, each member in the organization at the time of monitoring will be either promoted or forced to leave the organization, based

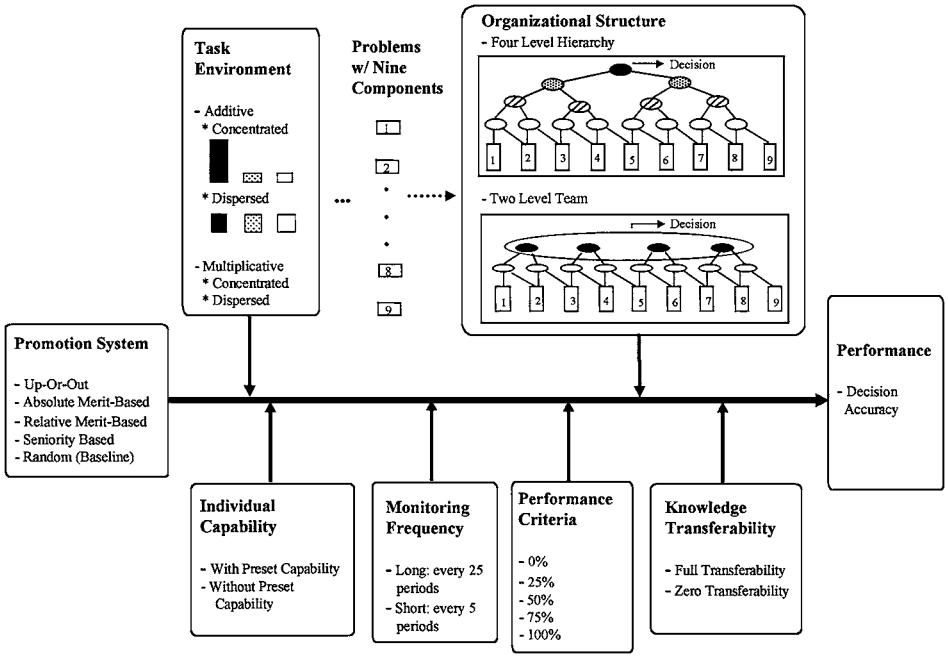

Figure 1. An overview of the model.

on some performance criteria. Under this mechanism, each member's performance at any problem period will be recorded.

$$P_{\mathrm{i}} = 1 - \mathrm{ABS}(D_{\mathrm{i}} - D) \tag{1}$$

where P_{i} is the performance of member i at the current problem period. D_{i} is the decision made by member i at the current problem period and D is the correct decision of the problem at the current problem period. Thus if a member makes a decision as 1 while the correct decision should be 3, his/her performance for that problem will be -1.

Then, performance record of the member up to this problem period will be updated.

$$C_{\mathrm{i}}(t) = C_{\mathrm{i}}(t-1) + F_{\mathrm{i}} \tag{2}$$

where $C_{\mathrm{i}}(t)$ is the accumulated performance credit for member i at period t and F_{i} is the current performance of member i.

Finally, for each member, there is a promotion criterion P to decide whether the member should be up or out when it is time for carrying out the promotion policy.

Given these, if the promotion policy is to be carried out at time t, whether a member should be promoted up or be forced to leave will depend on the comparison between $C_{\mathrm{i}}(t)$ and P. If $C_{\mathrm{i}}(t)$ is less than P, the member will be forced to leave. Otherwise, the member will be promoted.

There are some constraints, however. If a member meets the standard for being promoted, whether the person will actually be promoted to a higher level will also depend on if there are members at the upper level who are to leave the organization. Likewise, if a member does not meet the standard for being promoted and is labeled "out", whether there are qualified lower level members to fill the vacancy will also determine whether the organization will go for external hires. Once a base-level analyst is promoted, a new recruit who has no experience will be hired to fill the position. After a member is promoted to a new position, his/her accumulated performance record, but not the prior memory, will be set to zero (like starting with a new tenure clock).

All members will follow a so-called experiential decision making rule for making individual judgment. Based on this rule, what has occurred the most in the past will have a dominant influence on the member's decision choice. For example, if a member sees the following three pieces of information, 1-2-3, he or she will trace back to the memory to see how such three pieces of information has led to what true decision outcomes in the past. If the frequencies of past true decisions being 1, 2 and 3 with that partial set of information are 10, 35, and 4 respectively, the member will report a decision of 2, as this has occurred the most in the past.

Absolute Merit-Based Promotion. In this type of promotion, an organizational member will only be considered for promotion to a higher level if his/her performance is above a certain criterion and if there is a vacancy in the upper level. At the monitoring period, a member will stay at the current position if his/her performance is below that performance criterion. If there are fewer vacancies in the upper level than qualified members in the lower level, the top performers at the lower level will be promoted. If there are more vacancies in the upper level than qualified members in the lower level, external hiring will happen to fill the vacancies. When vacancies occur at the base level of the organization, new recruits from outside of the organization will be hired. After a member is promoted, his/her accumulated performance record, but not the prior memory, will be set to zero. Again, each member in the organization follows the experiential decision making rule.

Relative Merit-Based Promotion. In this type of promotion, each member in the organization at the time of monitoring will be promoted, fired, or stay based on his/her relative performance among the peers. Like in Eq. (1), each member's performance record will be updated after each problem period. At the time of carrying out the monitoring policy, the best performer among the peers of the same rank will be promoted to the upper level. The worst performer at the rank will be fired. This process goes from the top level to the base level. In the case of the base level, the worst performer's position will be replaced by a new recruit. All other in-between performers will remain at the same position. After a member is promoted to a new position, his/her accumulated performance record, *but not the prior memory*, will be set to zero. Like in the up-or-out promotion situation, each member in the organization follows the experiential decision making rule.

Seniority-Based Promotion. For this study, we focus on the seniority system that promotes the candidate (or candidates) in a cohort with the most experience in the organization. In this type of the promotion system, an organizational member is promoted to the higher level

if he/she has the longest tenure in the organization among the peers at the same level. This process continues from the top level to the base level. For the base level of the organization, a recruit from outside of the organization with no prior experience fills the vacancy.

Random Promotion. In this type of promotion, a randomly selected member from the lower level is promoted to the higher level regardless of performance or seniority. This process goes from the top level to the base level with the base level's vacancy being filled by the new recruit from outside of the organization. This type of promotion can serve as a baseline against which other types of promotion systems can be compared.

Modeling Task Environments

In the computer simulation model, a ternary choice classification task is built for which organizations have to make decisions regarding a series of quasi-repetitive problems, based on multiple indicators (or task components) that can only be partly accessed by different organizational members in a distributed environment (Carley and Lin, 1997; Hollenbeck et al., 1995). This task can find its resemblance in real world settings that involve decision-making by multiple people of different responsibilities or expertise. A few examples can include military radar operation, civilian air-traffic control, and manufacturing planning. For example, in a manufacturing planning setting, the task can be considered as consisting of a series of production proposals that require the organization to decide whether to produce, hold, or reject the production of certain products based on information from nine indicators such as financial status of the company, human resources, technology, customer preference, etc. Because of bounded rationality, each member of the organization naturally can only process a limited number of pieces of information while each one or two single indicators may not provide a complete picture of the situation. Thus, an organization's decision requires coordination among various people who work with different indicators. This task is therefore general enough for us to examine a variety of promotion systems that can be found in those organizational settings.

Organizations operate under environments that can exhibit different characteristics. Organizations retrieve information from the environment and make judgment to respond to the environment. The nature of the task environment and how organizations respond to the environment may impact organizations' outcomes. In the real world, the correctness of the decision can be judged by the reality, if there is one. In the example of manufacturing planning, which will be used to illustrate other points throughout the paper, the correctness of a decision to produce or reject in reality may be judged by the market reaction. This paper uses the advantage of computational modeling and builds the true state of each problem in an independent formula, thus we can know the correct decision for each problem situation.

Following the work by Aldrich (1979), we focus on the predictability/unpredictability (through the distributions of the problems) and the decomposability/non-decomposability (through the interrelationships among the problem components) dimensions of the environment. Specifically, we use "additive/multiplicative" task components to model the decomposability/non-decomposability dimension and "dispersed/concentrated" distribution of problems to model the predictability/unpredictability dimension (Carley and

Lin, 1997; Hollenbeck et al., 1995). We also wish to note that for the multiplicative task environments, prior studies have revealed that the general non-decomposable nature of the task environment will not change with some limited additive components in the equation so long the overall equation is dominated by the multiplicative components (Carley and Lin, 1997). With this mechanism, we can have the baseline against which an organizational system's decision outcomes can be compared. We believe such modeling of task environment can allow us to examine the impact of the nature of the task environment on the effectiveness of a wide variety of promotion systems including the five that we are particularly interested in this study. With these two dimensions, four types of environment can be pre-defined.

Additive Task Environments. The first two types of the task environments are additive with the following formula:

$$\sum = T1 + T2 + T3 + T4 + T5 + T6 + T7 + T8 + T9 \tag{3}$$

In the formula, each T_i refers to one specific indicator that can take an integer value ranging from 1 to 3, with a bigger number representing a more positive indication toward the decision to produce. By varying all possible values of nine indicators, the computer model can create a task environment that has a total of 19,683 different combinations of problems. To make the model more concrete, the task of the model can be to determine whether a particular product has the potential to contribute to the overall growth of the company. Each product has nine attributes that are manipulated by the computer program. These nine attributes can be interpreted as factors that include the strategic match with company, growth rate, total investment, cash flow, available technology, available manpower, customer preference, competition, and profitability. For the concentrated additive task environment we define the true state of the problem in such a way that if $\sum <= 13$ then the true decision should be to reject, if $\sum >= 18$ then the correct decision should be to produce, and if other values then the true decision should be to hold. Following this formula, the task environment contains 625 problems whose true decision should be to "reject" (meaning not pursue), 7,647 problems whose true decisions should be to "hold" (wait before pursuing), and 11,411 problems whose true decisions should be to "produce." With the domination of one type of problems whose true state is to "produce", the organization is facing a more certain environment, and may have less of a chance of making a mistake if it decides to produce.

For the dispersed additive task environment, we use the same formula, but we define the true decision as "reject" if $\sum <= 16$, as "produce" if $\sum >= 20$, and as "hold" if otherwise. With this manipulation, we have an task environment that regards one third of decisions of "reject" as correct, one third of decisions of "hold" as correct, and one third of decisions of "produce" as correct. In this case, the organization may have a tougher time making the correct decisions when faced with a particular problem because of increased uncertainty.

Multiplicative Task Environments. The last two types of the task environments are multiplicative with the following formula:

$$\sum = T1^{*}T2^{*}T3^{*}2 + T4^{*}T5^{*}2 + T6^{*}T7^{*}T9^{*}2 + T8 + T9 \tag{4}$$

In the formula, each T_i again refers to one specific indicator that can take an integer value ranging from 1 to 3, with a number 3 representing a more positive indication towards the decision "3" (produce), and a number 1 representing a more positive indication towards the decision "1" (reject). By varying all possible values of nine indicators, the computer model can create a task environment that has a total of 19,683 different combinations of problems.

The distribution characteristic of the environment can be further predefined to make the environment either concentrated or dispersed by setting the cut-off values for $\sum$ for all problems. For the concentrated multiplicative environment, the true decision "1" (reject) is defined when $\sum$ is no more than 20; "2" (hold) is defined when $\sum$ is between 21 and 22; and "3" (produce) is defined when $\sum$ is greater than or equal to 23. Under this categorization, there are 1,131 problems whose true decisions should be "1" (reject), 3,321 problems whose true decisions should be "2" (hold), and 14,631 problems whose true decision should be "3" (produce). Given this manipulation, organizations under this environment will face most problems of the same nature.

For the dispersed multiplicative task environment the cut-off values for $\sum$ are predefined differently. When $\sum$ is less than or equal to 33, the true decision should be "1" (reject); when $\sum$ is between 34 and 49, the true decision should be "2" (hold); and when $\sum$ is greater than or equal to 50, the true decision should be "3" (produce). Under this manipulation, the environment will be composed of 6,488 problems whose true decisions should be "1" (reject), 6,648 problems whose true decisions should be "2" (hold), and 6,547 problems whose true decision should be "3" (produce). This environment can pose greater uncertainty to organizations because problems of different natures can occur with equally likely probability thus creating higher risk of judgment errors.

The four task environments are modeled independently and are not known to organizations. Because the organization has no knowledge of the task environment, and the organization's final decision is through coordination of individual members' judgments based on their partial knowledge of each problem, there is a chance that a decision made by the organization can be incorrect with regard to the true state of the problem. Because of such manipulations, we will then be able to examine whether such task environment manipulation has an effect on organizations of different designs.

Modeling Organizational Structure

In this study we model two stylized forms of organizational structure, a four-tier hierarchy and a two-tier team. Following other research on organizations, such forms often serve as two opposite extremes for organizational structure (Carley and Lin, 1997; Lin and Hui, 1999), which may yield the most variance for our research purpose.

Hierarchy. In this structure, there are eight base-level analysts, four supervisors, two middle-level managers, and one top-level manager. Each analyst examines two pieces of information from the task environment and makes a recommendation (1, 2, or 3) to his or her immediate supervisor. Because each problem comprises nine individual characteristics, the information an analyst has access to may be partially shared by other analysts. Each supervisor examines the recommendations from two of the base-level analysts and makes

his/her own recommendation (1, 2, or 3) to a middle-level manager. Each middle-level manager examines the recommendations from two of the supervisors and makes his/her recommendations (1, 2, or 3) to the top-level manager. The top-level manager examines the two middle-level managers' recommendations and makes the organizational decision (1, 2, or 3).

Team. In this structure, there are eight base-level analysts and four managers. Each analyst examines two pieces of information from the task environment and makes a recommendation (1, 2, or 3) to his or her immediate manager. Each manager examines the recommendations from two of the base-level analysts. The organization's decision is made by the majority vote (1, 2, or 3) of the four managers. The computer model also takes into consideration cases when there may be a tie among the four managers. If the tie is a polarized situation with two votes for "1" and the other two votes for "3", the computer will choose the middle outcome "2" as the team decision. If the tie is between "2" or "3", the computer will randomly choose either "2" or "3" as the team's final decision, so on so forth. This type of team may be more complex than traditional teams of small groups. In the real world, we can find similar forms in academic institutions and in corporations that have top management teams.

Modeling Individual Capability

We model two types of individual members in organizations. In the first situation, each member in the organization is randomly assigned a natural capability ranging from 1 to 50. At every decision period, when that member's capability is greater than a randomly generated number between 1 to 100, the member will always make the correct decision. Otherwise, the member will rely on his/her memory and go through the normal decision making procedure. For example, if a member is pre-assigned a capability of 30, at each decision period, the computer program will generate a random number. If this random number is 25, the member is assumed to make a correct decision. If the random number is 40, the member's natural capability will not be considered enough. Instead, the member will rely on normal decision making procedure based on past experiences embedded in his/her memory. With this manipulation, we are then able to create members of different "natural capabilities" while still consider the role of knowledge embedded in memory. Once a member is promoted, the capability will also be transferred to the new position. If a new member with a blank memory is hired, a new individual capability will be randomly generated for that new member. Under the second situation, or the no capability situation, each individual is considered having equivalent capability and all decisions are made purely based on the reliance of past memories and the decision-making procedure.

Modeling Frequency of Monitoring

We set two monitoring frequencies. One is every five periods, or every half a year in real time. The other is every 25 periods, or every two and a half years in real time. Promotion will not be carried out until it is the monitoring period.

Modeling Performance Criteria

For each promotion system, we allow the performance criteria to be set at 0%, 25%, 50%, 75%, and 100% levels respectively. Each such level represents the degree of accuracy required by the organization for decision-making tasks.

Modeling Transferability of Knowledge

We study the transferability of knowledge by allowing the memory of each individual member to be either carried to the new position or not. Under the perfect knowledge transfer situation, each member will carry his/her memory to the new position after promotion. Under the no knowledge transfer situation, each member will be assigned a blank memory after being promoted, which will serve as another baseline for us to examine the importance of transferred memory/knowledge on performance.

Virtual Experiments

For this study, we run a series of virtual experiments for the five promotion systems (5) under situations where dimensions of task environment (4), organizational structure (2), individual capability (2), monitoring frequency (2), performance criteria (5), and transferability of knowledge (2) can vary. As a result, we have an experiment design composed of $5 \times 4 \times 2 \times 2 \times 2 \times 5 \times 2$ (=1,600) virtual experiments. In each virtual experiment, we let the organization process 200 randomly generated problems from the selected task environment. We assume that each virtual "year" consists of 10 problem periods. Therefore, every organization will go through an equivalent of 20 years in each virtual experiment. To allow the examination of variances and enhance the statistical rigor of analysis, we run 30 times for each of the 1,600 virtual experiments, thus generating a total of 48,000 performance points (each based on 200 problem periods) for the whole study. Throughout the processes, performance at various individual and the organizational levels is recorded and feedback is provided to the organizations, whenever called for.

Results

We start analyzing the result by looking first at the overall impact of promotion systems, then the moderating effects of contingency factors.

Overall Impact of Promotion Systems

The performance of the entire sample of 48,000 runs is presented in Table 1. Approximately 65% of problems were correctly identified by the simulated organizations. The percentage of correct decisions, however, was quite wide, ranging from around 20% to a high of 99%. It is difficult to have 100% of decisions made correctly because each member is modeled

Table 1. Performance of the entire sample.

Mean	Median	SD	*N*	Max	Min
65.1	68.0	22.6	48,000	99	19.9

Table 2. Performance by promotion system.

Promotion system	Mean	Median	SD	*N*	Max	Min
Random	65.1	67.3	19.6	9,600	97.5	25.0
Up or Out	65.2	68.0	20.3	9,600	99.0	23.0
Absolute	67.0	71.4	19.7	9,600	98.0	22.6
Relative	63.4	65.5	20.0	9,600	97.5	24.2
Seniority	65.0	67.0	19.7	9,600	97.5	23.9

to have only limited rationality and because some learning (i.e. mistakes) must occur in the early rounds even with the most capable organization.

The central research question concerned the relative performance of various promotion systems. Descriptive statistics for each promotion system are presented in Table 2. The first hypothesis, that an absolute merit-based system will consistently outperform a relative merit system, is confirmed by the aggregate results. The absolute merit system outperformed the relative merit system on mean, median, and maximum performance. This supports Hypothesis 1. However, due to the large sample size, *any* difference that is less than 1/50th of the standard error of performance will result in a statistically significant difference at the $p = 0.05$ level. For instance, the standard error of our results in Table 2 is approximately 0.20 (=standard deviation/square root of N) so a difference of as little as $.20/50 = 0.004$ will be statistically significant. As a result, it is the practical relevance of performance differentials rather than their statistical significance that should be assessed. In many real world situations, including radar detection, we would argue that about 2–3% increase in accuracy could be very meaningful indeed.

The second hypothesis predicted that an up-or-out system should outperform a merit-based system. In our results, the up-or-out system performed better than the relative merit system but failed to match the performance of the absolute performance system (although the maximum performance of the up-or-out system exceeded that of other systems). Thus, only partial support for Hypothesis 2 is provided in these aggregate results. The picture, however, becomes more complicated when contingency factors are considered later in this section.

The third hypothesis predicted that seniority systems should not perform as well as merit or up-or-out systems. In fact, the seniority system was only clearly beaten by the absolute merit system. It performed better than the relative merit system and is on par with the up-or-out system. Even more surprising was the performance of the random promotion system. Although Hypothesis 4 predicted random promotion should be the worst performer,

it actually performed better than the relative merit system and was roughly equivalent to the up-or-out and seniority systems. Only the absolute promotion system was appreciably higher. Thus, Hypotheses 3 and 4 were not supported.

Contingency Factors

We now look into the role of various contingency factors.

Task Environment. The study considered two problem classes—additive and multiplicative—further divided into simple (concentrated) and complex (dispersed), in terms of their possible distributions. The relative performance of each promotion system across the four task environments is presented in Table 3. Hypothesis 5 stated that performance should be greater on simple tasks and this prediction was supported by the results of the study. In both additive and multiplicative environments, performance was always greater on simple tasks. While the difference averages around 10% for additive problems, the gap grew to over 30% in the multiplicative case. In the latter case (simple multiplicative), most of the stimuli resulted in the same identification. Agents simply had to discover the correct identification and success rate soared. For the other environments, similar radar patterns could result in widely divergent identification solutions.

The difference between simple and complex tasks was also remarkably uniform across promotion systems. There was little or no interaction between promotion system and task environment (see figure 2).

Individual Capability, Organizational Structure, Monitoring Period, and Knowledge Transferability. The results for contingency factors including individual capability, organizational structure, monitoring period, and knowledge transferability are pooled in Table 4 and the gains from one level of the factor to the next are summarized in Table 5. At the aggregate level, each of the contingency factors had a significant effect on performance.

Table 3. Performance by promotion system and task environment.

	Additive environment		Multiplicative environment	
	Simple (Concentrated) Mean (SD)	Complex (Dispersed) Mean (SD)	Simple (Concentrated) Mean (SD)	Complex (Dispersed) Mean (SD)
Random	64.5 (13.4)	55.1 (17.0)	86.6 (9.9)	54.2 (17.2)
Up-or-Out	65.0 (14.8)	55.3 (18.3)	85.7 (10.9)	54.6 (18.4)
Absolute	66.5 (13.1)	56.8 (18.1)	88.4 (6.4)	56.1 (18.2)
Relative	63.1 (13.4)	53.2 (17.1)	84.9 (12.5)	52.5 (17.2)
Seniority	64.4 (13.6)	55.1 (17.1)	86.3 (10.4)	54.1 (17.2)
Total	64.7 (13.7)	55.1 (17.6)	86.4 (10.3)	54.3 (17.6)

$N = 2{,}400$ for each cell and $N = 12{,}000$ totals.

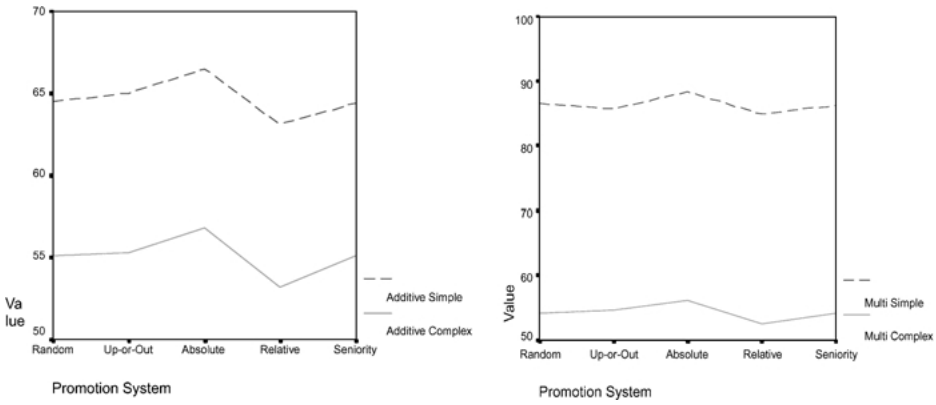

Figure 2. Performance by promotion system and task environment.

Introducing ability had the effect of raising the performance 22.5% with the greatest gains in the up-or-out and absolute merit systems followed by the relative merit system. Surprisingly, random and seniority systems also received large performance increases. This supports Hypothesis 6.

An average performance increase of 7% was also observed when moving from hierarchical to team-based structures. Once again, however, the effect was unevenly distributed with random and seniority systems registering the greatest gains. This supports Hypothesis 7. Similarly, while skill transferability and monitoring period led to an average performance

Table 4. Performance by promotion system and other contingency factors.

	Ability		Structure		Transferability		Monitoring period	
	Off Mean (SD)	On Mean (SD)	Hierarchy Mean (SD)	Team Mean (SD)	Off Mean (SD)	On Mean (SD)	Short Mean (SD)	Long Mean (SD)
Random	54.4 (20.1)	75.8 (11.7)	60.3 (20.1)	69.9 (18.0)	62.4 (19.5)	67.8 (19.4)	63.1 (19.5)	67.0 (19.6)
Up-or-Out	53.4 (20.0)	77.0 (11.9)	63.0 (21.8)	67.4 (18.3)	60.3 (19.5)	70.0 (19.9)	63.1 (20.2)	67.2 (20.1)
Absolute	55.4 (20.0)	78.6 (10.3)	65.4 (21.3)	68.5 (17.8)	65.2 (19.3)	68.8 (19.9)	66.1 (19.7)	67.8 (19.7)
Relative	52.2 (20.5)	74.7 (11.4)	59.5 (20.1)	67.3 (19.2)	60.3 (19.5)	66.5 (20.1)	60.5 (19.9)	66.3 (19.7)
Seniority	54.2 (20.1)	75.7 (11.8)	60.2 (20.2)	69.7 (18.0)	62.1 (19.5)	67.8 (19.5)	63.0 (19.6)	66.9 (19.5)
Total	53.9 (20.2)	76.4 (11.5)	61.7 (20.8)	68.6 (18.3)	62.1 (19.5)	68.2 (19.8)	63.2 (19.9)	67.1 (19.7)

$N = 4{,}800$ for each cell and $N = 24{,}000$ for totals.

Table 5. Average gains for contingency factors.

	Ability	Structure	Transfer	M Period
Random	21.5	9.5	5.3	3.9
Up-or-Out	23.6	4.4	9.7	4.1
Absolute	23.2	3.1	3.6	1.7
Relative	22.5	7.8	6.2	5.8
Seniority	21.5	9.5	5.7	4.0
Total	22.5	6.9	6.1	3.9

Table 6. Mean performance by promotion system and cutoff criterion.

	Cutoff				
	0 Mean (SD)	0.25 Mean (SD)	0.5 Mean (SD)	0.75 Mean (SD)	1 Mean (SD)
Random	65.0 (19.7)	65.1 (19.6)	65.1 (19.6)	65.0 (19.7)	65.2 (19.7)
Up-or-Out	68.5 (20.3)	64.3 (20.3)	64.0 (20.0)	64.5 (20.3)	64.6 (20.2)
Absolute	60.8 (19.0)	66.1 (19.0)	68.2 (19.2)	69.7 (19.7)	70.1 (20.0)
Relative	63.4 (20.0)	63.5 (20.1)	63.4 (19.9)	63.5 (20.1)	63.3 (20.1)
Seniority	64.8 (19.6)	65.1 (19.7)	65.0 (19.7)	65.0 (19.7)	65.0 (19.8)
Total	64.5 (19.9)	64.8 (19.8)	65.2 (19.8)	65.5 (20.0)	65.6 (20.1)

$N = 1{,}920$ for each cell and $N = 9{,}600$ for totals.

benefit of 6% and 4% respectively, up-or-out systems enjoyed an almost 10% gain with transferability while absolute merit systems received less than 4% in transferability and less than 2% from increasing the monitoring period (see Table 5). Based on these results, Hypotheses 8 and 10 are also supported.

Performance Criteria. One area that a clear interaction effect was observed was between promotion system and performance criterion (or cutoff score). Hypothesis 9 argued that moderate performance targets should improve performance in absolute merit and up-or-out systems while performance should decline at higher cutoff levels. The performance of an organization using different promotion systems and cutoff levels is presented in Table 6 and figure 3.

It is evident from figure 3 that performance increases with increasing cutoff levels in the absolute merit system albeit at a decreasing rate. There is no evidence that higher cutoffs lead to poorer performance. In the up-or-out system, performance starts above that of the random and seniority systems and then falls below the two systems before recovering slightly. The relative merit system continues to linger below the random and seniority systems but all three show the predicted insensitivity to cutoff levels.

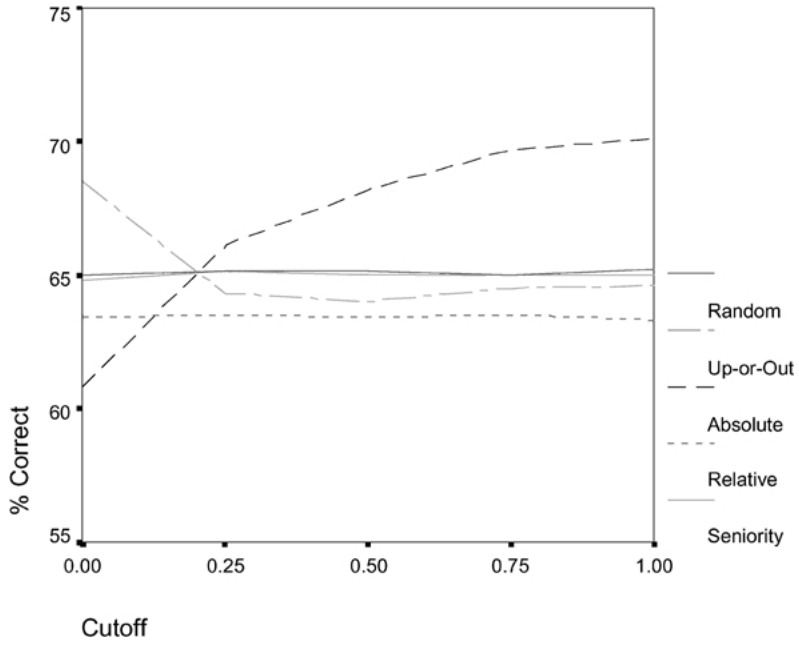

Figure 3. Performance by promotion system and performance cutoff.

Discussion and Conclusion

To date, most of the research on promotion systems in organizations has been focused on the individual experience of promotion: the fairness of promotion decisions and the promotion making decision itself (Ferris et al., 1992). Much of the research relates to gender or racial discrimination issues. Related literature relates to how external forces, such as the degree of unionization affect the choice of promotion system. To our knowledge, there is no study that even purports to report the frequency of usage of various promotion systems, frequency by industry or country, and changes in frequencies over time. Instead we are left to make broad-brush observations that seniority systems are losing ground, up-or-out systems persist in professional organizations, and merit-based systems are dominant. In general, hypotheses were developed within a Darwinian natural selection framework but, in many cases, the level of theoretical support is often missing in the background literature. Part of the contribution of this paper to the HR literature is to draw attention to this lack of rigor in theoretical pronouncements and to encourage more development.

This study contributes to a systematic understanding of promotion systems and their impact on organizational performance from a contingency perspective. Through the computational modeling of organizations in distributed decision making settings, the study indicates that the effectiveness of any promotion system is dependent on a range of factors including the nature of the task environment, the design of the organizational structure, the individual capability difference, the frequency of monitoring, the criteria of performance for promotion decisions, and the transferability of task knowledge.

There are several interesting findings that are worth further discussion. First of all, random promotion systems (supposedly a baseline condition) outperformed up-or-out and relative merit-based systems on a number of occasions. While this needs to be further investigated in our future studies, we think two possible causes may have partly contributed to this phenomenon. The first is related to the task used in this study. With the current task, each position of the same level basically is faced with identical distribution of problems, though the order of these problems can differ. Same-level individuals' performance in the long run should be similar, in particular when working under the same operating condition. As a result, up-or-out systems and relative-merit-based may sometimes force the shortsighted promotions of the wrong personnel due to shorter monitoring periods. The second cause may be related to the memory-building process. While promoting the best performers may help organizational performance, there is a tradeoff. The newly promoted may actually suffer from poorer performance in their new positions due to outdated memories and knowledge building processes. Thus, there is this irony: promotion of best performers may actually degrade the overall organizational performance, when compared with just promoting a random member of the group.

Secondly, we have consistently found that the impact of promotion systems is greatly diminished when organizations are under dispersed (complex) rather than concentrated (simple) task environment. This is important in that it suggests that to enhance the predictive power of current theories of human resource management, there is a need for more research that can go beyond stable and simple environments. The finding also reveals that whether a task environment is composed of additive or multiplicative problems are not of the same importance. This seems to confirm the original work by Aldrich (1979) that heavily emphasized the dispersion/concentration dimension of the environment. While the results have shown the significantly role of the nature of the environment, we must also be aware that there can be different dimensions of the environment that are not captured in this model. As a result, future generalizations should be cautious.

Thirdly, we have noticed the significant impact due to the consideration of individuals' natural capability in promotions. Individuals of higher ability were able to perform better and thus were selected for promotion more often (at least in promotion systems that selected members on the basis of past performance). These systems therefore indirectly selected individuals based on ability. Of course, the meaningfulness of this result is dependent on the assumption that "ability" is good and transferable across organizational levels. We believe this assumption is warranted if ability (as operationalized in our model) can be assumed to represent a generalized trait such as intelligence or learning acumen that can be readily transferred from one level of an organization to another. It should be noted, however, that in our model the reliance of individual decision-making based on memory is modeled as some sort of a residual effort after the application of ability. That is, only a person with low ability will have a higher use of memory, and vice versa. This may partly explain the fact that enabling the transferability of *memory* from one level to another had a relatively weak effect on performance in our model. Clearly, the effectiveness of various promotion systems is ineradicably tied to the particular nature of the job task and the fungibility of knowledge between levels in an organization. In the case of our model, task memory was not particularly fungible while ability had an enduring effect on performance.

Finally, we have found the moderating role of organizational structure in the impact of promotion systems on organizational performance. In particular, hierarchy structures have been found to exert more restrictive control on organizational promotions and thus tend to reduce the impact of promotion systems. This result has again echoed the view by organization theorists (Pfeffer and Cohen, 1984) with regard to the purpose of organizational structures. We have to be cautious though before we jump to the conclusion that a team structure is always more beneficial to organizational performance. We need to understand the specific nature of the environment, the member capability, the internal operating condition, and other organizational characteristics because they may alter the value of a team structure (Lin and Hui, 1999).

This study has again demonstrated the usefulness of computer modeling. Like any other research method, however, the computer simulation method has its own limitations. As a special form of laboratory study, it has to confront the question of generalizability from a specifically defined setting. Our purpose is not to present a model that is generalizable to all organizations, but to organizations with certain characteristics as stylized in this paper. We believe the results from this study will at least provide some new insights and directions for future research, both empirically and theoretically, which can greatly expand our thinking and advance the field of organization science. The benefit of using computer modeling thus far outweighs the opportunity loss if the current research is left in a segmented state.

The study has some other boundary conditions and limitations. For example, this study only focused on a limited number of stylized features in each aspect of the environment, structure, and procedure and so the generalization of the results will have its constraints. While this may be necessary at this stage, we will need to further improve the model to encompass broader aspects related to organizational decision making. This study has only examined decision making in a distributed setting. We believe that with the changing nature of the decision type, new relationships between environmental uncertainty and performance may emerge. That should also be worth studying in our future study. It will also be beneficial to use information from more selected case studies of real world organizations to provide further empirical support and insight, which can in turn empower the theoretical strength of the computer model. Clearly, it would also be desirable to attempt to model the motivational effects of each promotion system in future research.

Notwithstanding the previous discussion on performance, the current study raises the uncomfortable suggestion that all the time and effort put into promotion and selection by HR practitioners doesn't really matter that much. After all, even though performance went up and down in response to contingency factors, the average difference between promotion systems at a given level could be measured in single digits on a hundred point scale (even random promotion wasn't that much different from the rest). Could it be that the particular method used for job assignment really has little effect on an organization's bottom line? This is directly relevant to HR practitioners because they typically spend a lot of time on the job assignment task and such time might be allocated elsewhere if the effort in unproductive or inefficient. Of course, the current study has not ruled out the possibility that the small differences between the various promotion systems are an artifact of the task used in the model. Further research is underway to test if the differences between promotion systems remain small even under optimal conditions for observing strong job assignment effects.

Despite these limitations, we believe the study can make significant contributions in that it has not only explored the relationships between promotion systems and organizational performance but also successfully bridged the field of strategic human resource management with that of organization theory. This study has again demonstrated that computer modeling can be a natural and effective method for studying complex issues in dynamic organizations (Carley and Prietula, 1994; Lant, 1994; Weiss, 1999). We hope findings from this study can direct us to new frontiers of management research, both empirically and theoretically.

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