

Middle managers score fewer goals and make more fouls: Findings from a computerized top management simulation

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Managerial effectiveness in dealing with ill-structured decision situations is compared across hierarchy levels using a long-duration, multifaceted, and complex computerized simulation. Forty-five managers from a large Indian metal-processing unit employing more than 4,000 managers in 11 levels and 50,000 staff in 9 levels and offering lifelong employment participated in the study. Data of 20 managers were finally analyzed. Results revealed that middle-level managers faced several crises while dealing with the simulated task and ended up with highly unfavorable outcomes, and were significantly less effective as compared to frontline and senior managers. Frontline managers were as effective as the seniors and even better than them with respect to some of the measures employed. Examining the career profile of participant managers, reasons for the observed performance pattern are explored. The article ends with a reflective narration of the author's experiences in conducting a complex computerized simulation study in the Asian-Indian context.

KEYWORDS: *Asian-Indian; complex problem solving; computerized simulation/gaming; ill-structured decisions; MANUTEX; middle managers; top management game*

Consider a round, sloped, multi-goal field on which individuals play soccer. Many different people (but not everyone) can join the game (or leave it) at different times. Some people can throw balls into the game or remove them. While they are in the game, individuals try to kick whatever ball comes near them in the directions of goals they like and away from goals they wish to avoid.

—March and Romelaer (1976, cited in March, 1997, p. 27)

Imagine three teams of managers exclusively drawn from the *frontline*, *middle*, and *senior* levels of an organization playing the above soccer game.¹⁻² Who will win? Maybe it is safe to bet on the frontline team, believing that it consists of young people, new and enthusiastic to learn and be active in the organization. Or will the day belong to the experienced upper level, senior managers? Or will the middle managers who are not as old as the seniors and who are more experienced than the frontline emerge as the

AUTHOR'S NOTE: PD Agarwal Foundation supported data collection and the Indian Institute of Management Calcutta supported preparation of initial drafts of this article with research grants. I thank David Crookall for good encouragement, a *Simulation & Gaming* anonymous reviewer for useful comments, Madhusoodan for assistance in manuscript preparation, and Sanjay Kumar, participant managers, and management of the organization for cooperation.

SIMULATION & GAMING, Vol. 34 No. 3, September 2003 387-408

DOI: 10.1177/1046878103255791

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dark horses to run the victory lap? Maybe we should wait and see, for the game is not just plain soccer, but strange soccer.

March and Romelaer chose this unusual soccer game to illustrate how managers make and execute *complex* (Dearborn & Simon, 1958; Dörner, 1980) or *ill-structured* (Ungson, Braunstein, & Hall, 1981) decisions in organizations. Examples of such decision contexts include technology changeovers, new product design-development introductions, reengineering work processes, resolution of major disputes/conflicts, rectifying major process/equipment breakdowns, and managing large-scale changes like downsizing, organizational turnaround, and transformation. Rapid and radical changes taking place in the work and work contexts increasingly necessitate managers to face such decision situations, and to be successful in their roles they have to effectively deal with them.

This article presents findings from an empirical study that investigated how managers across hierarchy levels deal with ill-structured decision situations or solve complex problems using a multifaceted, long-duration, and complex computerized simulation. In the following sections, I first outline the theoretical underpinnings of the study followed by the research design. Data analysis, results, and discussion follow. The article ends with a reflective narration of my experiences of conducting a complex computerized simulation study in the Asian-Indian context.

Theoretical underpinnings

Conventional wisdom divides organizational hierarchy broadly as *first/frontline*, *middle*, and *senior/top* managerial levels and allocates more of technical, human-technical, and human-conceptual skills and roles respectively to each of them (Stoner, Freeman, & Gilbert, 1995). Thus, while frontline managers execute the organization's work by supervising personnel in the nonmanagerial cadres and senior/top managers formulate policies, provide direction, and steer the department/organization through its internal/external environments, middle managers act as the link between the two.

Early research on the perceptions, attitudes, experiences, and so forth of managers across hierarchy levels suggested a direct, linear relationship. For instance, the higher the position of managers in the organizational hierarchy, the more they were satisfied with work, pay, supervision, coworkers, and personal needs, particularly higher order needs such as self-esteem and self-actualization (e.g., Adams, Laker, & Hulin, 1977; Argyris, 1957; Hulin & Smith, 1965). Furthermore, at higher hierarchy levels, managers perceived more decision autonomy (Blankenship & Miles, 1968), associated higher status and worth for organizational positions (Mahoney, 1979), and engaged more in the interpersonal, informational, and decisional roles specified by Mintzberg (Alexander, 1979).

However, a number of studies also brought to light patterns different from the direct, linear one—patterns that show either negligible or no differences based on organizational job levels (e.g., Grimes & Klein, 1973; Hall, Schneider, & Nygren,

1970), or patterns that reveal striking differences across levels. Notable among the latter set were studies showing managers in the middle levels performing poorly, becoming more frustrated, feeling powerless, being low in motivation, and more being prone to severe job-related stress as compared to managers above and below them (e.g., Frohman & Johnson, 1993; Johnson & Frohman, 1989; Nilakant, 1991).

For instance, Nilakant (1991) found top managers criticizing middle managers as being passive, unable to take charge of change management, and lacking appropriate skills and capabilities, whereas middle managers themselves perceived a lack of adequate opportunities for recognition, growth, and feeling of accomplishment.³ This pattern of deficiencies, ineffectiveness, frustration, resistance, and so forth at the middle-management levels in organizations has been variously referred to as *stuck in the middle*, *middle-management syndrome*, and *gap in the middle* (Frohman & Johnson, 1993; Johnson & Frohman, 1989). However, recent studies show evidence that contradicts the presence of this gap (e.g., Fenton-O'Creevy, 2001; Thomas & Dunkerley 1999), and calls to rejuvenate middle managers by radical role redefinitions are being made (e.g., Floyd & Wooldridge, 1994, 1997; Huy, 2001; King, Fowler, & Zeithaml, 2001).

Although studies on middle managers continue to produce mixed findings and fail to generate any consensus (Currie & Proctor, 2001), there also seems to be a paucity of studies that directly investigate the nature and extent of skills and competencies of managers across hierarchy levels. This research aims to make a contribution in this area by examining the effectiveness with which managers across hierarchy levels deal with ill-structured decision situations in organizations or solve complex organizational problems.

Ill-structured or complex decision situations such as technology changeovers, new product design-development introductions, and reengineering work processes are characterized by relatively higher doses of novelty, ambiguity, uncertainty, complexity, and dynamism. A predetermined and explicit set of ordered responses do not exist in the organization to effectively deal with them (Mintzberg, Raisinghani, & Theoret, 1976).⁴ They are ambiguous with incomplete problem-related information, have to be continuously defined and redefined by managers, lack a well-defined plan for obtaining desired outcomes, are amenable to multiperson influences, and take a long time to reach solutions (Ungson et al., 1981). Effectively dealing with such decision situations is also a complex and long-drawn-out process involving a continually changing judicious mix of thinking first, seeing first, and doing first approaches (Mintzberg & Westley, 2001).⁵

Many of the ill-structured decision situations that managers face—such as technology changeovers, reengineering work processes, or managing large-scale changes like downsizing, turnaround, and transformation—are usually strategic in nature for the organization. Therefore, dealing with them has been considered the duty as well as the prerogative of senior and top-level managers, whereas dealing with the routine operational problems have been the domain of managers in the lower levels. Hence,

Hypothesis: The higher the position of managers in the organizational hierarchy, the greater is their effectiveness in dealing with ill-structured decision situations or in solving complex problems.

Research design

The players: Sample

Forty-five managers from a large Indian metal-processing unit participated in this study. They came from seven hierarchy levels (assistant manager [E2] to general manager [E8]) and six functional areas (production, materials management, maintenance, marketing, finance, and human resources development), and represented 21 of the 82 departments in the organization, including most of its core shops. The unit was part of a public sector company that offered lifelong employment and, at the time of this study, employed more than 4,000 managers in 11 levels and 50,000 staff (workers) in 9 levels. The unit as well as the parent organization was in the process of reorienting and restructuring to remain successful and effective in the rapidly and drastically changing business environment following extensive liberalization and globalization initiatives of the Indian government. Consequently, managers at all levels were faced with uncertainties and novel and complex issues to deal with in their work and work contexts. The sample size was influenced by the time needed for data collection with each manager (it took about 5 to 6 hours), consequent organizational constraints, and considerations of statistical analysis with allowance for data losses and defects. Data of only 20 managers were finally analyzed. Choice of these managers and finer details of the sample are given later in the data analysis section.

The soccer game: MANUTEX— a computer-simulated top management game

The study was conducted in the administrative office complex of the unit with the author acting as the facilitator. Each participant manager reported at the facilitator's room between 9 a.m. and 11 a.m., depending on the work contingencies he had to deal with in the morning. After initial familiarization, a brief introduction of the study, and some detailed data gathering related to other aspects of the research, the ill-structured decision situation was presented to the manager as a computer-simulated management game—MANUTEX (Schaub, 1988).

Management games have been used for research in group behavior, decision making, leadership, decision support systems, strategic management, and organization studies. They are used to create experiential environments within which learning and behavioral change can occur and can be studied (Keys & Wolfe, 1990). Management games provide a reliable alternative to field experiments with a high degree of control of the context, and at the same time avoid many of the generalization problems of laboratory experiments (Brehmer & Dörner, 1993).

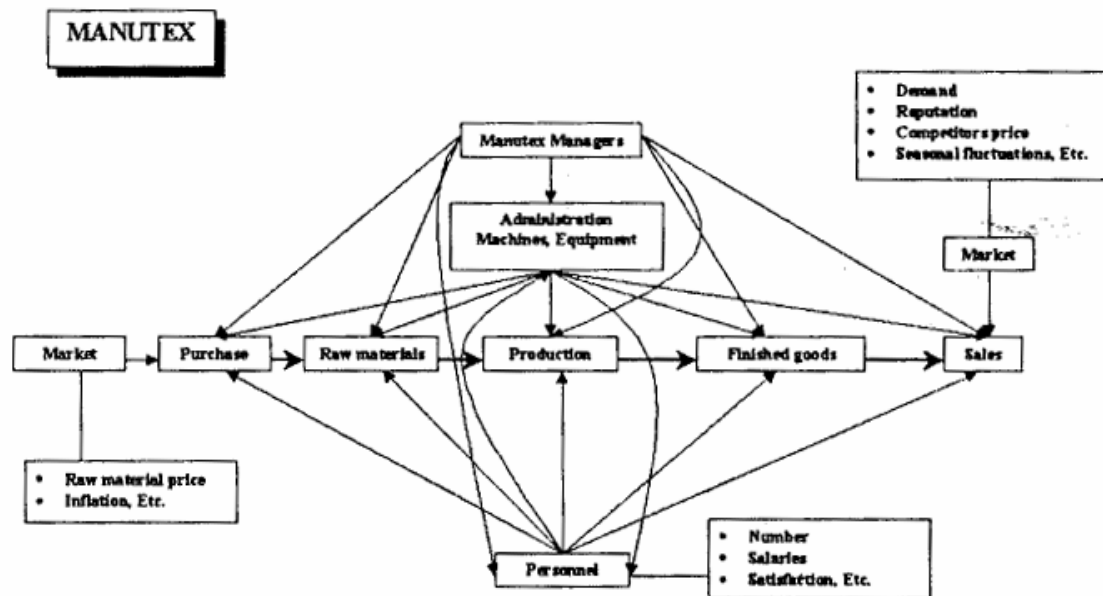


FIGURE 1: Simplified Model of MANUTEX

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The computer-simulated, ill-structured decision situation—MANUTEX—presented in this study was a total enterprise or top management game (Keys & Wolfe, 1990), or a microworld (Brehmer & Dörner, 1993; Senge, 1990). Top management games are simulations of the whole organization incorporating a large number of decision variables from many areas such as marketing, production, personnel, finance, and so forth, and thus require their integration for solving it successfully (Keys & Wolfe, 1990, p. 308). MANUTEX has been used in previous studies on complex problem solving (e.g., Dörner, 1990, 1991; Ramnarayan & Strohschneider, 1997; Ramnarayan, Strohschneider, & Schaub, 1997). A model of MANUTEX is given in Figure 1 (arrows indicate influences among variables, flow of products, etc.).

The simulation process began with the participant manager reading a case description of MANUTEX. It describes MANUTEX as a small-scale, ready-made garments manufacturing unit situated in Malaysia, employing 37 people in three levels and five departments and capable of making seven products using three raw materials. The case also gives a brief history of the unit, prevailing work methods, personnel relations, product-market positions, inventory levels, financial details, and so forth. The participant was instructed to manage the full affairs of MANUTEX firm as its CEO for 2 years (24 simulated months), starting from January of a year, within a real time of 2.5 hours.⁶

MANUTEX simulation is a complex one, with a large range of in-built information. It also allows for a wide range of interventions or decisions to be implemented. For instance, the participant could seek information on as many as 53 aspects of MANUTEX. This information was grouped in seven categories such as *products* (past production, current target, product quality, scheduling priority, stock, raw material

required, etc.), *personnel* (salaries, satisfaction levels, recruitment, etc.), *machine* (working condition, maintenance needs, power, accessories, etc.), and *money* (details of income, expenditure, bank balance, etc.). The participant had to specifically ask for any information to be given. He could also make decisions on many of these aspects in each time interval. I acted as the intermediary between him and the computer for providing information that was asked for, and implementing the decisions taken. The computerized simulation was followed by a feedback discussion lasting 30 to 40 minutes.

Measures

Effectiveness of dealing with ill-structured decision situations

It is difficult to find one comprehensive measure to evaluate the effectiveness of individuals in dealing with ill-structured situations, as different persons give varying importance to different aspects and outcomes of the problem and accordingly end up with different solutions that may be satisfying (Simon, 1997) to them. Hence, multiple measures are necessary. Effective handling of MANUTEX simulation involved managing the simulated organization effectively. Two dimensions were identified to define this effectiveness: success and crises, referred to as goals and fouls, respectively (borrowing soccer terms).

The goals: Measures of success. Success refers to the individual's achievement as measured by different favorable/desirable outcomes obtained. Individuals who deal with the situation effectively should show relatively higher levels of achievement as compared to others who are not so effective. Success was measured by the following parameters of MANUTEX: (a) cash balance and net worth of the firm at the end of 1st and 2nd year of operations, and (b) average value of cash balance during the 1st year and during the entire simulation (all measures in Malaysian Dollars: M\$).

The fouls: Measures of crises faced. While dealing with ill-structured situations, individuals and groups tend to deviate from courses of action that are most desirable for effective negotiation. They may do faulty planning and decision making without gathering all relevant information, or with incomplete and insufficient understanding of the complexity of the situation, leading to what are termed *errors* (Dörner, 1990; Frese & Zapf, 1994). Errors result from unplanned actions, inadequate dosage of interventions, inaction, or overlooking of important factors by the problem solver. In MANUTEX simulation, errors result in unanticipated crises for the firm (similar to red and yellow cards in soccer).

Some of the crises that could appear in MANUTEX are the *store* (stock out of raw materials or accessories leading to production halt), *accounts* (cash balance becoming negative necessitating bank borrowing), and *dismissals* (personnel resigning due to low salaries, lack of social benefits, poor performance of the firm, etc.). The more

effectively an individual pursues the ill-structured decision situation, the fewer are the crises that he will face. Low scores on the following two measures indicate a crisis-free nature of dealing with the situation: (a) the number of simulated months during which managers faced crises, and (b) the total number of different crises they actually faced.

Data analysis

The three teams: Final sample

Team size. Although the study began with 45 managers, the computerized simulation could not be conducted with 3 managers due to technical problems. Thirty-seven of the remaining 42 managers completed 1 year (12 simulated months) and 20 of them went ahead to complete 2 years (24 simulated months) within 2.5 hours, as instructed. Data of only these 20 managers were considered for analysis. Six of them belonged to frontline (assistant/deputy manager), 8 to middle (manager/senior manager), and the remaining 6 to senior (assistant/deputy general manager) levels. Further analyses were based on these groupings.

Team profiles. All 20 managers were male, aged 26 to 55 years ($M = 38.9$, $SD = 8.91$). There was significant difference in the age profile of the three teams (eta squared = .911, $F = 86.77$, $p < .000$). Average age of the frontline group was 29.3 years ($SD = 2.34$); middle group, 37.37 years ($SD = 2.45$); and senior group, 50.5 years ($SD = 3.62$). The 20 managers came from 14 departments, including some of the core production and processing shops in the plant. They belonged to different functional areas such as marketing (5%), finance (15%), human resources management (20%), and production and maintenance (40%). Furthermore, there were both line (40%) and staff (60%) personnel in the sample.⁷

All managers in the sample were college graduates, 3 were MBAs, 5 were postgraduates, and 10 had postgraduate diplomas. The frontline group consisted of 5 graduate engineers and a commerce graduate; the middle group had 4 engineers, 1 arts graduate, and 3 science graduates; and the senior group had 5 engineers and 1 science graduate. Furthermore, 9 managers (1 frontline, 5 middle, and 3 senior) had received advanced training from countries like Japan, the United Kingdom, the United States, and Finland on operational and managerial aspects.

Exploratory data analysis and one-way ANOVA

Exploratory data analysis was done with each variable and for each group of managers, specifically testing for normality (using Shapiro-Wilk statistic) and outliers (using box plots), and remedial actions were taken in a few cases. Following this, test of means through one-way ANOVA was done for each goal and foul measure to test the hypothesis that effectiveness of dealing with ill-structured decision situations increases as managers move up in the organizational hierarchy.

TABLE 1: ANOVA Results of Success Measures for the Three Groups of Managers

Effectiveness Measure:	Frontline (n = 6)		Middle (n = 8)		Senior (n = 6)		Eta Squared	F(2, 17)
	M	SD	M	SD	M	SD		
Goals (success)								
Halftime								
CB_12	870,360	410,185	-79,225	451,939	582,245	799,549	.381	5.23**
NW_12	1,933,496	664,023	1,226,488	411,208	1,607,486	547,662	.262	3.03*
AVCB_12	844,281	174,220	457,232	209,806	886,770 ^a	458,487	.372	4.73**
Fulltime								
CB_24	818,554	1,230,242	-1,284,294	696,919	-510,491	1,013,606	.486	8.04****
NW_24	1,722,557	1,165,978	157,942	288,578	1,162,786	1,266,993	.365	4.89**
AVCB_24	889,446	437,257	-111,834	352,079	345,021	490,633	.532	9.66****

NOTE: CB_12 = cash balance at end of Year 1; NW_12 = net worth of the firm at the end of Year 1; AVCB_12 = average cash balance during Year 1; CB_24 = cash balance at end of Year 2; NW_24 = net worth of the firm at the end of Year 2; AVCB_24 = average cash balance during the 2 years. Negative value for success measures indicate that MANUTEX firm is borrowing money from the bank, so the firm is making loss.

a. n = 5, one outlier removed, F(2, 16).

*p < .1. **p < .05. ****p < .005.

TABLE 2: ANOVA Results of Crises for the Three Groups of Managers

Effectiveness Measure:	Frontline (n = 6)		Middle (n = 8)		Senior (n = 6)		Eta Squared	F(2, 17)
	M	SD	M	SD	M	SD		
Fouls (crises)								
Halftime								
CR_12	4.83	1.47	13.5	5.73	5.2 ^a	2.05	.565	10.4†
CR_12M	4.83	1.47	9.5	2.72	6.17	3.54	.395	5.56**
Fulltime								
CR_24	9.33	5.99	37.75	7	22.33	13.22	.668	17.12††
CR_24M	8.67	4.46	21.63	2.88	15.83	5.56	.649	15.68††

NOTE: CR_12 = total number of crises in Year 1; CR_12M = number of time intervals with crises in Year 1; CR_24 = total number of crises in 2 years; CR_24M = number of time intervals with crises in 2 years.

a. n = 5, one outlier removed, F(2, 16).

**p < .05. †p < .001. ††p < .0001.

Results of this analysis revealed significant differences across the three groups, with managers at the senior and frontline levels performing better than middle managers (see Tables 1 and 2). Hence, further analyses were conducted to confirm the existence of the gap in the middle, that is, to verify if effectiveness of middle-level managers in dealing with ill-structured decision situations was significantly lower than that of managers above and below them (see Table 3). Finally, because the mean values of goals and fouls were seen to be favorable to frontline managers as compared to the senior group (see Tables 1 and 2), statistical significance of this difference was also tested. Like in soccer, all analyses were done at halftime (completion of 12 simulated months or 1 year of operations of MANUTEX firm) and at fulltime (end of computerized simulation at the end of 2 years of operations).

TABLE 3: ANOVA Results for Middle (n = 8) Group With Senior (n = 6) and Frontline (n = 6) Groups

Effectiveness Measures	Middle With Senior and Frontline		Middle With Senior		Middle With Frontline	
	Eta Squared	F(1, 18)	Eta Squared	F(1, 12)	Eta Squared	F(1, 12)
Goals						
Halftime						
CB_12	.353	9.81***	.245	3.89*	.577	16.34†
NW_12	.214	4.91**	.156	2.23	.336	6.07**
AVCB_12	.207	4.7**	.276	3.81*a	.528	13.4***
Fulltime						
CB_24	.317	8.35***	.383	6.21**a	.58	16.59***
NW_24	.326	8.72***	.287	4.83**	.532	13.65***
AVCB_24	.394	11.73***	.257	4.15*	.653	22.62††
Fouls						
Halftime						
CR_12	.565	22.05††b	.462	9.45**c	.517	12.83***
CR_12M	.37	10.55***	.249	3.98*	.543	14.26***
Fulltime						
CR_24	.548	21.81††	.401	8.04**	.841	63.54††
CR_24M	.475	16.29†	.351	6.49**	.786	43.95††

NOTE: CB_12 = cash balance at end of Year 1; NW_12 = net worth of the firm at the end of Year 1; AVCB_12 = average cash balance during Year 1; CB_24 = cash balance at end of Year 2; NW_24 = net worth of the firm at the end of Year 2; AVCB_24 = average cash balance during the 2 years; CR_12 = total number of crises in Year 1; CR_12M = number of time intervals with crises in Year 1; CR_24 = total number of crises in 2 years; CR_24M = number of time intervals with crises in 2 years.

a. F(1, 10), two outliers removed from senior group.

b. F(1, 17), one outlier removed from senior group.

c. F(1, 11), one outlier removed from senior group.

*p < .1. **p < .05. ***p < .005. †p < .001. ††p < .0001.

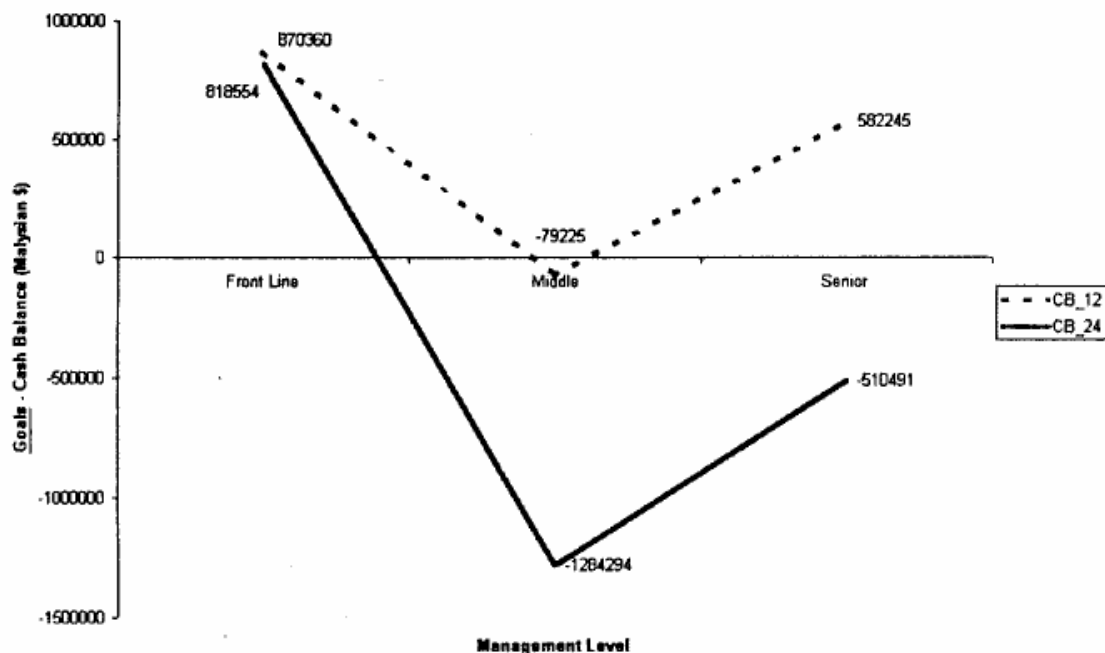


FIGURE 2: Cash Balance at the End of Year 1 (CB_12) and Year 2 (CB_24) of Operations of MANUTEX Firm

Results

The goals: Success measures

Similar to “the more goals the better it is for the team” in soccer, success measures in MANUTEX were such that “the higher the better.” Analysis showed distinctive differences between the three groups of managers on various measures of success while dealing with MANUTEX (see Tables 1 and 3 and Figures 2 and 3).

At halftime. Table 1 reveals that cash balance and net worth of the firm at the end of the 1st year, eta squared = .381, $F(2, 17) = 5.23$, $p < .05$, and eta squared = .262, $F(2, 17) = 3.03$, $p < .1$ (Figures 2 and 3, respectively), and average cash balance during 1st year, eta squared = .372, $F(2, 16) = 4.73$, $p < .05$, show significant differences between the three groups, with middle managers performing poorer than frontline and senior managers. Table 3 reveals that this performance difference is statistically significant. Further, although the mean of cash balance and net worth were higher for frontline managers as compared to the senior group (see Table 1), the differences are not statistically significant.

At fulltime. Table 1 shows that cash balance and net worth of the firm at the end of 2 years, eta squared = .486, $F(2, 17) = 8.04$, $p < .005$, and eta squared = .365, $F(2, 17) = 4.89$, $p < .05$ (Figures 2 and 3, respectively), and average cash balance during the 2 years, eta squared = .532, $F(2, 17) = 9.66$, $p < .005$, show distinctive differences between the three groups. The nature of differences is somewhat similar to the one

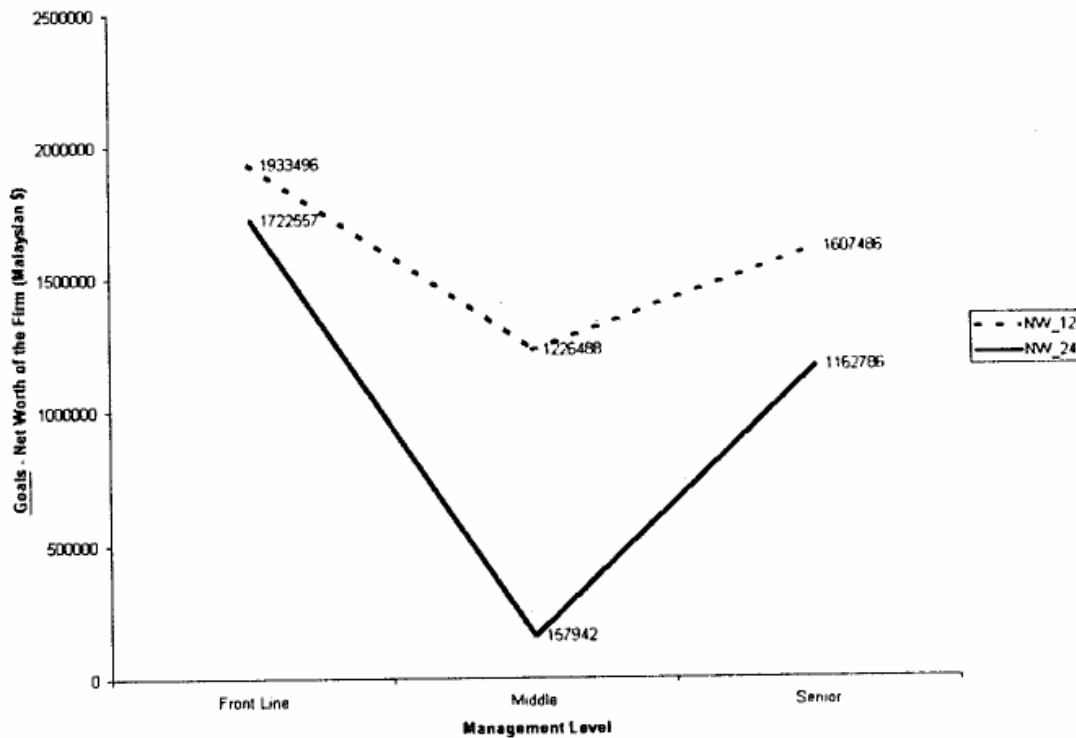


FIGURE 3: Net Worth of MANUTEX Firm at the End of Year 1 (NW_12) and Year 2 (NW_24) of Operations

observed at halftime—middle managers perform poorly, finishing with significantly low cash balance as well as net worth for the firm as compared to frontline and senior managers (see Table 3). However, unlike at halftime, further analysis revealed statistically significant differences between the frontline and senior managers for two of the three goal measures. Frontline performed better than seniors with respect to cash balance, $\eta^2 = .294$, $F(1, 10) = 4.17$, $p < .1$, and average cash balance, $\eta^2 = .292$, $F(1, 10) = 4.12$, $p < .1$.

The fouls: Crises faced

Usually, the fewer the red and yellow cards, the better the prospects for any soccer team. Similarly, the lesser the number of crises in MANUTEX, the better it is in terms of managing the simulated organization, or the higher the effectiveness is of dealing with the simulated ill-structured situation. Analysis showed that on the measures of fouls also, there were distinctive differences between the three groups of managers.⁸

At halftime. Table 2 reveals that during the 1st year of simulation, total number of crises actually faced as well as the number of time intervals when managers faced crises show significant differences across the three groups, $\eta^2 = .565$, $F(2, 16) = 10.4$, $p < .001$, and $\eta^2 = .395$, $F(2, 17) = 5.56$, $p < .05$ (Figures 4 and 5, respectively). The pattern of difference is such that the mean values were lowest for the

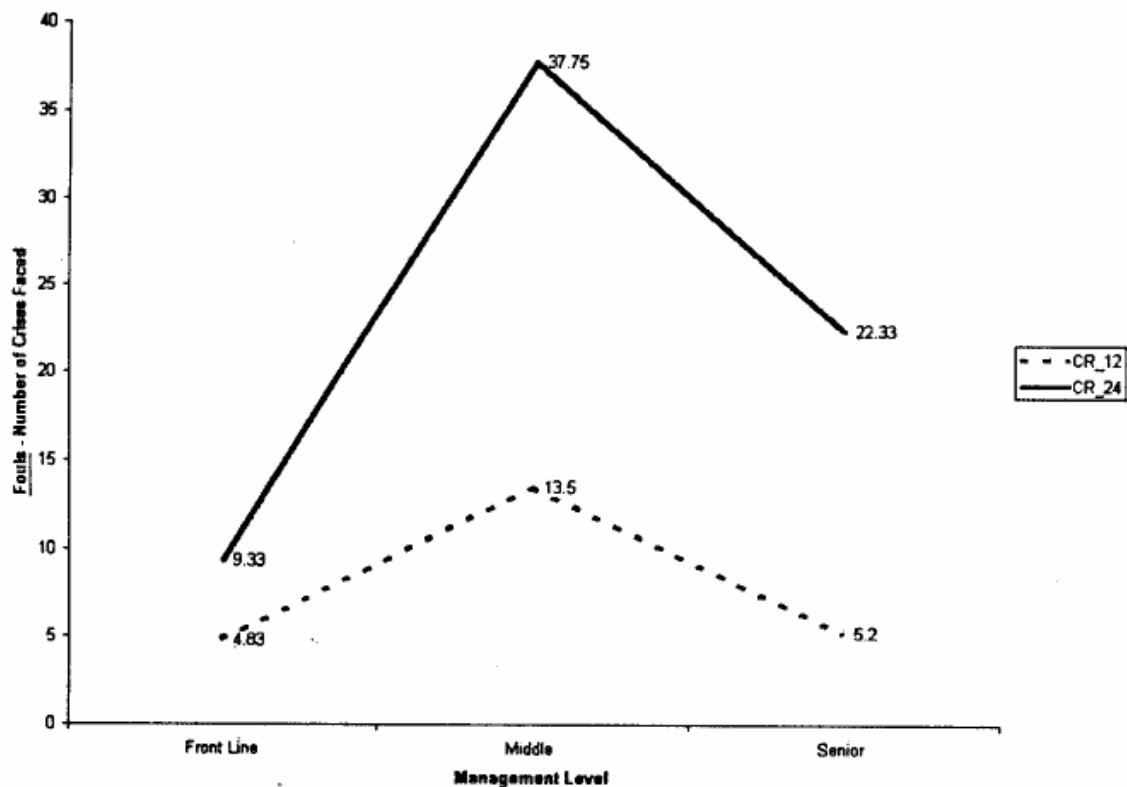


FIGURE 4: Number of Crises Faced in Year 1 (CR_12) and in Year 2 (CR_24) of Operations of MANUTEX Firm

frontline group and highest for the middle group, with the senior managers coming in between. Analysis presented in Table 3 reveals that middle managers faced significantly higher number of crises as well as simulated months with crises, as compared to frontline and senior managers. Further, although the means of both foul measures are more for the senior group as compared to frontline group (Table 2), the differences are not statistically significant.

At fulltime. Table 2 reveals that during the entire computerized simulation, the number of crises actually faced as well as the number of time intervals when managers faced crises show significant differences across the three groups, eta squared = .668, $F(2, 17) = 17.12, p < .0001$, and eta squared = .649, $F(2, 17) = 15.68, p < .0001$ (Figures 4 and 5, respectively). Analysis presented in Table 3 reveals that middle managers faced a significantly higher number of crises as well as simulated months with crises as compared to frontline and senior managers. However, unlike at halftime, further analysis revealed statistically significant differences between frontline and senior managers for the number of crises faced, eta squared = .325, $F(1, 10) = 4.82, p < .1$, as well as the number of simulated months with crises, eta squared = .377, $F(1, 10) = 6.06, p < .01$. Frontline managers performed better than the seniors.

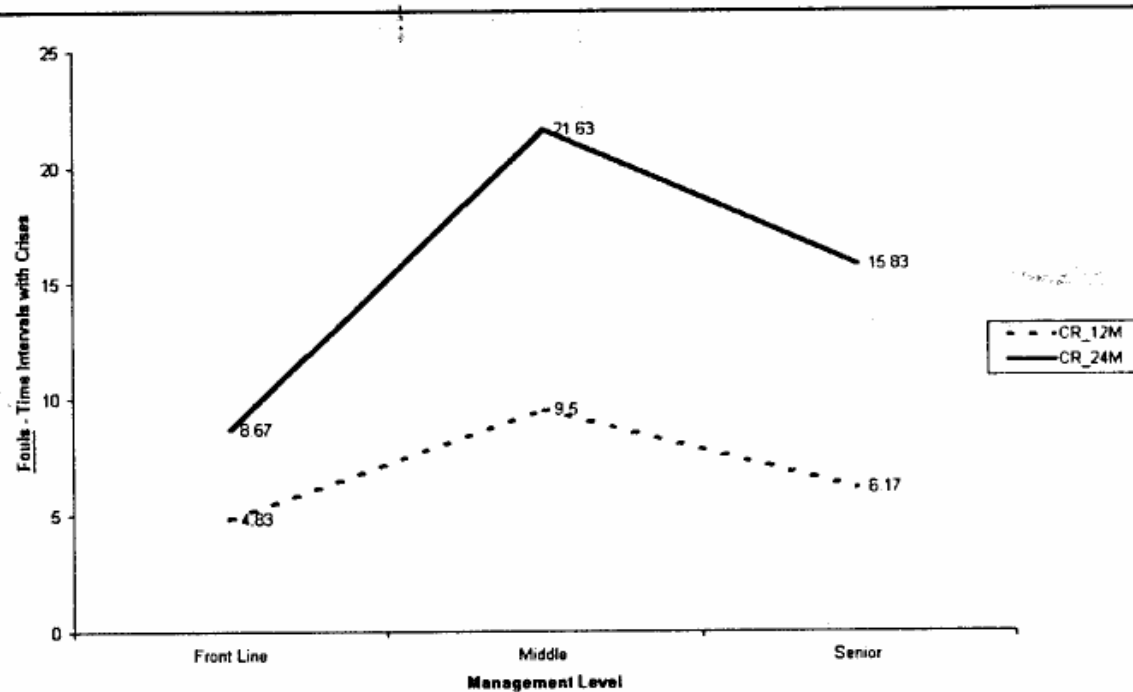


FIGURE 5: Number of Simulated Months When Crises Were Faced in the 1st Year (CR_12M) and in the 2 Years (CR_24M) of Operations of MANUTEX Firm

Conclusion about hypothesis

The above results support the hypothesis only partially. Whereas the senior managers were more effective in dealing with the simulated ill-structured situation as compared to managers in the middle levels, frontline managers were as effective as the seniors and even better than them with respect to some of the measures employed. Analysis revealed that there was a dip in the middle—middle-level managers were significantly less effective as compared to frontline and senior managers. Thus, effectiveness of managers in dealing with the simulated ill-structured decision situation was not seen to increase linearly with their ascent in the organizational hierarchy.

Discussion

This study investigated effectiveness of managers in solving complex problems or dealing with ill-structured decision situations, across hierarchy levels, using a multifaceted, complex, and long-duration computerized simulation. Results show that frontline and senior managers perform significantly better than middle managers.

Existing literature has noted the presence of a gap in the middle. It refers to middle managers performing poorly, becoming more frustrated, feeling powerless and less motivated, showing higher resistance to and lower initiative for change, and experiencing reduced feelings of accomplishment, growth, and so forth as compared to managers above and below them. The findings of this study add to this literature by indicating

the existence of this gap with respect to managerial effectiveness of solving complex problems or dealing with ill-structured decisions as well.⁹

To explain the observed pattern of outcomes, I examined the career profiles of these managers. Fifteen of the 20 managers in the sample had worked only in this organization—the very specific unit where the study was conducted—the breakup being 5 senior, 6 middle, and 4 frontline managers. Three others, 1 in each group, had put in a few months to 3 years in other jobs before joining this unit, and 1 middle manager joined this unit after working in two other units of the parent company in the same function.

A perusal of their job descriptions revealed that in the initial stages of their career, the young managers are new to their organizational and work contexts. They have been well educated and selected directly from reputed graduate schools or through a competitive national-level examination. They exhibit keenness, interest, and initiative to learn the systems, processes, and tasks in the organization and in their jobs.

But as they move to middle-management positions, as reported during feedback discussion, their designations change but the nature of responsibilities essentially remains the same. There is little or no job enrichment associated with the rise to middle levels. Opportunities for learning either reduce or just do not exist. It is possible that these factors reflect in the relatively lowered performance. But as they move to senior and top levels of management, they perform better, probably due to substantial changes in the nature of their tasks and task contexts. At higher levels, their tasks become varied and they are entrusted with general management responsibilities that need a wider and holistic perspective. There is higher task diversity and increased challenges of ill-structured nature. Perhaps these aspects explain better performance at senior levels. Furthermore, the better ones in the middle levels could be getting promoted to senior levels.

Thus, whereas energy and enthusiasm associated with young age as well as novelty of organizational work and work contexts stimulate high performance at frontline levels, a sense of ownership for overall outcomes and the varied general management challenges power up high performance at the senior and top levels. The middle levels seem to be devoid of all these—newness, variety, as well as ownership of tasks and task contexts—leading not only to diminished levels of performance but possibly even to feelings of frustration and discontent.

It may be noted that frontline managers were as effective as the seniors and even better than them with respect to some of the measures employed. One of the reasons for this could be the nature of the simulated task MANUTEX itself that required participants to get into the nitty-gritty, gather information, and make decisions, in addition to formulating successful strategies. Some of the senior managers were uncomfortable doing that, saying they were more at ease dealing with general management and strategic issues rather than getting into operational details, which they preferred to delegate. This opens up the possibility that senior managers could have performed better but were less inclined to engage themselves with the computerized simulation in required details to do that. However, it also leaves a question as to whether this attitude would have gradually robbed some of them of their abilities to deal with operational details

when circumstances required them to do so in their actual work contexts as well, in which case it becomes matter of serious concern.

Furthermore, the senior managers were seen to be concerned about their loss of face if they performed poorly in the computerized simulation. Given their track record of glorious achievements that took them to the senior and top levels in the organization, many of them were more bothered about preserving a sense of competence (Dörner, 1990) than endeavoring to experiment for success. In comparison, the younger, frontline lot had really nothing to lose and probably many things to prove to themselves or others, and hence were seen to be more open to accept setbacks and actively try out alternative strategies to perform better.

Another explanation could be that the stint of senior managers in the middle levels earlier had acted as a cold storage freeze of their high abilities and enthusiastic orientations for high performance exhibited at frontline levels. The intensity of this freeze at the middle could have been so severe that even when contexts changed favorably, they could not unfreeze sufficiently enough to move toward their old levels of abilities and orientations and reach where they once were. Age advancement could also be another reason.

Conclusion

Although this study does have limitations in terms of generalization as the sample size is small and all managers in the sample belonged to the same organization, its findings have some notable implications. In addition to its specific contribution to the literatures on middle managers and on complex problem solving in managerial/organizational contexts, the findings provide directions to improve managerial effectiveness, particularly at the middle and senior levels.

It points toward the need to either create relatively flatter organizations by removing middle layers in the hierarchy that have freezing effects on the capabilities and orientations of managers or to take effective actions to empower managers in the middle. Here, removal of middle layers or delayering is not meant to denote retrenchment but suitable organizational restructuring(s) where middle managers get relatively independent responsibilities and accountability as well as opportunities to continuously learn new roles (however small they may be) that convey a sense of ownership to them. If nothing else, this is at least a humanistic gesture toward preventing dormancy and erosion of capabilities and orientations as individuals rise up in the organizational ladder.

This study also raises another question: Can senior and top managers maintain sustained effectiveness in their roles by focusing on general and strategic aspects only, totally ignoring operational details of organizational decisions, actions, and problem solving, even when that is deemed necessary? Should they not only have the dominant ability and orientation to rise above crowding facts, figures, people, and events and view the forest but also possess the competence and inclination to descend to the ground and merge with the realities of the trees when the situation so demands?

Research into how highly successful senior and top managers balance these two contradicting demands on their competence as well as preferred orientation could shed light for developing highly effective managers at the top.

Reflections on the computerized simulation

This section contains a reflective note on my impressions and experiences of conducting a complex and long-duration computerized simulation study in the Indian-Asian context.

Overall impressions

The dominant impression that I carry from conducting this complex computerized simulation study is of satisfaction—of having generated quality data that suited my research purposes and having presented a meaningful and memorable learning experience to the participant managers. Most managers seemed to value the insights derived and rated their experience as high on self-learning during reflective discussion even when they performed miserably in the simulation.

Initial attitudes, apprehensions, and approaches of participants

Enthusiasm for participating in this study was generated fast in the organization. Within a few days of its initiation, word had spread that someone from the reputed Indian Institute of Management Ahmedabad (IIMA) was conducting an interesting game. Most participants seemed to feel proud and happy that they were chosen for taking part and were keen to grasp the study details. Some of them even questioned the appropriateness of computerized simulation as the research method and suggested alternative approaches, which in their eyes were more pragmatic and close to organizational realities. This feeling of active involvement enabled me to carry out 5 to 6 hours of uninterrupted data gathering, simulation, and discussion with each participant. However, some managers were apprehensive, probably due to anxiety or fear of performance in an unfamiliar context in the presence of an unfamiliar person.

During the computerized simulation

About 35 of the 45 managers, even most of those with high initial apprehensions, settled down fast in the computerized simulation. I observed that each participant either settled down comfortably in the first 45 to 60 minutes (roughly by one third of the total simulation time), or did not settle down at all. About one third of the 45 managers had difficulties, sometimes severe, and mostly in the early phases of the simulation in visualizing actions and consequences in the virtually simulated world of MANUTEX. They complained about the simulation depriving them of the real feel of dealing with machines and people.

Some of the senior and top managers exhibited strong reluctance, which in certain cases came out as their incapability as well, to get into details of the simulated task. Two top managers in the sample declined to engage in the simulation and 2 others left it after initial trials, stating that they preferred to deal with general management and strategic issues rather than plunge into operational details, which they favored to delegate. Unbelievably, one of them strategized on MANUTEX operations and marketing for the entire 2.5 hours of simulation, just completing 3 simulated months, even after consistent persuasion for action from my side. Considering that these managers deal with general management, policy formulation, coordination, and such responsibilities in their jobs, this behavior is comprehensible. Alternatively, it is possible that computerized simulations where participants have to get into many aspects in sufficient detail, like in this study, have limitations as a research method in studying the decisions, actions, and behaviors of general managers.

Assumptions of many kinds ruled

Action in many decision contexts is impossible without making suitable assumptions, and assumptions of various kinds influenced managerial behavior in this simulation as well. Nature of assumptions varied from those about the computer-simulated system to the simulated task and the role of the facilitator.

Researchers do recognize that the computerized simulations they design and use for data collection are machinelike to a large extent. The design is based on certain theoretical foundations and is used to answer specific research questions. Hence, however complex the system design may be, it can still take only certain kinds of defined input and give only certain kinds of output. For individual(s) and group(s) participating in computerized simulations, this could be a limiting as well as a facilitating assumption, eliciting different behaviors and consequences thereof.

Some managers approached MANUTEX simulation with the assumption of limitations about system capabilities, mostly influenced by their previous, however few, exposures to other computer-simulated systems. This assumption prevented them from exploring numerous possible courses of action that existed in MANUTEX, thus leading to ineffective dealing of the situation. They mentioned that although they wanted to pursue many actions, they refrained from them, thinking, "Your computer can't do it." In rare cases, comments like "your system is deceiving" or "is not trustworthy" were also made when their actions did not lead to desired results. Such extreme beliefs resulted in ineffective actions resulting in unfavorable outcomes, which in turn lowered the motivation of these managers to proceed further—they either left the computerized simulation without completion or dragged on talking and taking isolated actions without any seriousness of purpose. On the other hand, a number of managers who knew that any simulated system, computer based or otherwise, does have certain limitations actively sought ways and means to work around them in the best manner possible without fretting, fuming, and getting frustrated.

A second set of assumptions was based on previous knowledge/experience of organizing, organizations, decisions, and actions and the replicability of the same in

MANUTEX. In an extreme case, a manager persisted with a solution strategy that was consistently leading to serious setbacks and disastrous outcomes. Asked about this during reflective discussion, he said that his approach was guided by the successful strategy pursued by his previous employer in a very similar situation. This was a unique case of repeating a learned routine from a successful previous similar experience but with disastrous outcomes in the new context. Interestingly, he never regretted it and reiterated that he still held his beliefs and behavior highly valid, and that he would do just the same again in similar contexts. On the other hand, many managers appropriately used their prior knowledge to decide on advertisement, production target setting, human resources management, and so on in the new situation.

Participants revealed a third set of assumptions on the role of the facilitator. Some of them said that when I as the facilitator was conveying information to them that did not match with their expectations, they tended to doubt my integrity. They thought that I was deliberately playing mischief with them to elicit certain kinds of behaviors, some of them even saying, "We know such things do happen in research." But in the next breath, they also stated that they did not persist with such doubts for long as a stronger counterbelief of "he is from IIM Ahmedabad, so he will not play any mischief or deceive us" took over. This trust of the participants in me as the facilitator based on legitimacy obtained from my institutional affiliation played a very significant role in successfully carrying out the computerized simulation study that spanned nearly 3 months in this organization.

Experiences as the facilitator

Because I acted as the intermediary between the simulated system and the participant for giving the information sought and implementing the decisions made, my role was very crucial. Beyond the trust factor mentioned above, I had to be extremely careful about the words and tone I used as well as in maintaining emotional neutrality. Even the movement of my facial muscles became crucial, particularly when the participants were doing miserably bad in the simulated task. They seemed to seek cues of approval (or otherwise) of their decisions (actions) from the look/glare in my eyes and movements of eyebrows and facial muscles in addition to gestures, nods, and body postures. Although I adopted a neutral and poised approach throughout, still, there were numerous occasions when I realized that I had to be extraconscious to remain calm, poised, and neutral not only in words and tone but also in every movement I made, however minor or insignificant they were otherwise. A number of participants mentioned this aspect during the reflective discussion and appreciated my conduct.

On closing the computerized simulation: Reflective discussion (debriefing)

Many researchers attempt to give something back to their respondents, participants, or subjects. Among other aspects, the nature and effectiveness of this feedback is influenced by the research design followed. For instance, in survey research, the feedback

is sent to the respondents in the form of a final report, working paper, article, or thesis that usually contains aggregated/summarized data and analysis. In this regard, simulations—behavioral as well as computer based—enable the researcher to give individual, group, problem, and/or context specific feedback. If the feedback and/or the process of conveying it does make the participant feel that the person has undergone a meaningful experience, then it could be a first-level humanistic outcome of the research conducted.

In this research, reflective discussion between the participant and myself at the end of the computerized simulation stands out as a very memorable part of the whole process. On average, I spent 40 minutes with each manager immediately after the 2.5 hours of simulation, and in an extreme case the discussion went on for more than 2 hours. It began with a few general questions from me on his thoughts and feelings while dealing with the simulation, goals he was pursuing, logic or lack of it behind his actions, if he felt he should have done differently, and so on. Appropriately, during this narration, I pointed out specific actions or omissions he committed as leads to explore his thoughts and feelings further.

At a suitable point, usually about 15 to 20 minutes into the discussion, I took over and explained the complex nature of the situation that was simulated, its theoretical underpinnings, and informative details of MANUTEX. Following this, I commented on his approach to the computerized simulation, the ways in which he dealt with it, and pointed out alternative actions and strategies that were possible. Likely implications of his approach in MANUTEX manifesting in his work context were also discussed. Finally, he was invited to comment on any aspect of the simulation, study design, or any other matter that he felt like expressing.

In short, the reflective discussion had elements of constructive self-review by the participant, appreciation of what he had done, learning from mistakes, and a reasonably well-informed and considered feedback from the facilitator. There was also learning for me as a facilitator as well as a researcher. At the end, when each manager left the simulation room, I could sense that most of them felt good about their overall experience, even when they performed miserably in the simulation.

Notes

1. In tune with the introductory quote from March and Romelaer, terms borrowed from soccer are used in this article.

2. Masculine gender is used throughout, as all the 20 managers whose data were finally analyzed were male.

3. Frohman and Johnson (1993) define middle managers as those who occupy roles "beginning at first-level supervisor and ending just below the level of executives who have company-wide responsibilities" (pp. xii). Nilakant (1991) places them between a functional/divisional head with profit/cost responsibility and a first-level supervisor. For Huy (2001), they are two levels below the chief executive officer (CEO) and one level above line workers and professionals. The classification of middle managers in this study is close to the definition by Nilakant.

4. Mintzberg, Raisinghani, and Theoret (1976) actually use the term *unstructured* instead of *ill-structured*. Researchers have also used terms such as *ill-defined* (Newell & Simon, 1972), *wicked* or *ill-*

behaved (Mason & Mitroff, 1972, 1981), messy (Ackoff, 1979), and nonprogrammed (Simon, 1997) to denote this type of problems. I use *complex* (Dearborn & Simon, 1958; Dörner, 1980) and *ill-structured* (Ungson, Braunstein, & Hall, 1981) interchangeably in this article.

5. The *thinking-first* approach is preferable when the issue(s) are clear, data is reliable, and the context is structured, where a disciplined approach of planning and programming can yield desired results. *Seeing first* involves visioning, imagining, and playing with ideas or alternatives, and is preferable when many elements have to be combined into creative solutions. *Doing first* involves venturing, experiencing, and learning, and is best suited for situations that are novel, confusing, and complicated.

6. In MANUTEX, 24 simulated months mean 24 decision cycles. In each simulated month, the individual has to gather information and make all decisions that he thinks are necessary to effectively run the firm. However, he has the option of sticking to and repeating exactly the same set of decisions over any number of subsequent months, or changing the decision cycle to 2 or more months.

7. Managers involved in production and maintenance of equipment in the plant (blue collar) have been considered as line managers, and those in supporting functions such as personnel, finance, value engineering, training, and so on have been counted as staff managers (white collar). It may, however, be noted that some of the managers currently in staff positions were earlier holding line responsibilities in the plant.

8. In the computerized simulation MANUTEX, crises come only in integers, like no crisis, one crisis, two crises, and so on per simulated month. Because the mean and standard deviation are reported for comparison across groups, they appear with decimals in Table 2.

9. At this point, it should be mentioned that originally this study was designed to investigate the influence of certain cognitive variables of managers on their effectiveness of solving complex problems (Nair, 2001; Nair & Ramnarayan, 2000), and not to check the performance differences among them based on hierarchy levels. Hence, it is significant to note that even this set of data, collected with drastically different research objectives, revealed striking performance differences among managers based on their position in the organizational hierarchy, with middle managers performing poorer than managers in the frontline and senior levels.

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