Attention Allocation and Managerial Decision Making

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July 1997

Working Paper Series
Stern #IS-97-28

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July, 1997

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Abstract

One of the major problems of managerial behavior is the setting of priorities. Time is a scarce resource and managers have to find ways to deal with the multiple tasks that face them. This paper addresses the issue of priority-setting among tasks by managers by proposing analogies from job-shop scheduling theory. We develop a model that views managers employing a combination of rationality and affective judgments with a limited processing capacity.

ATTENTION ALLOCATION AND MANAGERIAL DECISION MAKING

Several aspects associated with engaging in multiple tasks simultaneously have been discussed in economics, psychology and management. Since dealing simultaneously with a few tasks is often problematic, some priority allocation device is needed. The mechanism which is often discussed in dealing with this problem is attention. This term has been dealt with somewhat differently in the above disciplines. Psychologists are interested, among other things, in the ways attention affects performance (Sarason et. Al. 1996). while economists have discussed the optimal allocation of attention among a few tasks (Radner, 1976). Researchers in management addressed attention as a mechanism that affects choice and decision making (March, 1994, 1997), thus reflecting preferences and priorities and affecting agenda setting (Dutton, 1997).

Interest in attention as a descriptive model of managerial work was instigated by Mintzberg's (1973) study. He observed that managers work at an unrelenting pace on a large number of tasks subject to frequent interruption. In summarizing his findings, Mintzberg argued that,

> "the manager, particularly at senior levels, is overburdened with work. With the increased complexity of modern organizations and their problems he is destined to become more so. He is driven to brevity, fragmentation, and superficiality in his tasks, yet he cannot easily delegate them because of the nature of his information. And he can do little to increase his available time or significantly enhance his power to manage. Furthermore, he is driven to focus on what is current and tangible in his work" (1973: 173).

In the 20 years that passed from the publication of Mintzberg's study it appears that the time constraints managers face may have become even more salient.

To effectively deal with multiple tasks and goals, managers need to develop some ways of setting priorities by some methods such as queuing systems (Simon, 1967). This paper addresses the issue of priority-setting among tasks by managers by proposing analogies from job-shop scheduling theory (Conway, Maxwell, & Miller, 1967; French, 1982). In so doing, this paper is in pursuit of two goals: first, providing a descriptive model of managerial priority setting, and second, proposing some effective ways for managers to deal with this task.

ATTENTION AND PERFORMANCE

In a review of cumulative development of attentional theory, Posner (1982) related to three levels by which attentional theory was approached: (a) The level of performance,(b) The level of subjective experience (e.g., the separation of conscious from unconscious events), and © The relation of conscious attention to neural systems. The level that is most relevant to our discussion is the level of performance. Posner (1982) reviewed early research that attest to the limitations of people in processing information. He also referred to research that showed that at some high level of practice people can some times share two tasks (cf. Alport, 1980). People's ability to monitor more than one channel simultaneously has been the subject of a major debate. The results of many experiments show that while people could monitor two channels simultaneously, the existence of a target on one channel lead to a decrement of monitoring performance on

the other. The issue turned out to be not the mere monitoring of a few channels (that could go on automatically) but the need to note the presence of a target, that led to interference. Perhaps the prototypical example of interference is the famous Stroop (1938) effect where the meaning and colors of printed words lead to clear interference. Such issues are relevant to the design of cockpits, human engineering tasks and to managerial work as well.

In discussions of the relation of attention and performance in the motivational and social psychological literature (Kanfer & Ackerman, 1996, Kuhl, 1981) , a distinction is made between the task and operator dimensions. Attention is examined primarily with respect to the cognitive limitations of the human operator. However, the task characteristics are of utmost importance, and in the case of managerial work the main task characteristic is time. Our main objective is to describe the cognitive limitations of the manager as operator but we start with a brief description of the time constraint that sets the context for our discussion.

Time as a scarce resource

Time is one of the more salient constraints on managerial behavior. Ask managers what problems they face in their daily activities and they are sure to complain about shortage of time. Many managers end up not completing their daily tasks in their office. Though they work late, they often take with them documents for reading at home or on the way home. Needless to say, after long hours at their office, taking documents home may end up being a ritual rather than an effective manner of dealing with uncompleted tasks. Surprisingly however, not much has been written about it in the management literature save a few exceptions such as Mintzberg's (1973) study. Time as a scarce resource has been examined by economists (e.g. Ghez & Becker, 1975). Their analysis, however, treated the allocation of time as a rational decision. Management researchers, on the other hand, are cognizant of the notion of bounded rationality, which is interpreted as an inherent constraint on one's ability to process information. Bounded rationality coupled with time constraints may lead to serious difficulties, especially if one considers managerial decision making in high velocity environments (Eisenhardt, 1989).

Cognitive limitations and bounded rationality

The pioneering work on bounded rationality in management focused on the deviation of bounded rationality from the classical notion of rationality and is due to Barnard (1938) who coined the term "limited rationality." These ideas were further advanced by Simon's (1947) work. His work along with research by psychologists such as Meehl (1954) eventually led to the development of the area known today as behavioral decision making, where the work of Tversky and Kahneman on heuristics (Tversky & Kahneman, 1974) and framing and choice (Kahneman & Tversky, 1979) has acquired much reputation in the last two decades.

Simon's (1955) work treated bounded rationality as emanating from two sources: the notion that information is often only partially available and that humans have a limited capacity for information processing. These notions imply that utility maximization is not possible hence the suggestion that people satisfice (Simon, 1955). These ideas led to the development of the notion of search as a guide for managerial problem solving further developed by March and Simon (1993) and Cyert and March (1992). In a recent treatise, Radner (1997) distinguishes between two types of bounded rationality: costly rationality

and truly bounded rationality. In the former, the behavior defined as bounded is due to limitations in data availability, data gathering, and time constraints. The latter refers to inherent "hardware" problems in apprehension and calculation. In a sense, behavioral decision theory is more concerned with "hardware" problems whereby the notion of "costly rationality" seems to be relevant to the notion of problemistic search in organizational decision making (March & Simon, 1993).

One of the main analyses of attention as a limited resource was discussed in Kahneman's (1973) seminal work on attention. According to Kahneman (1973) people are assumed to have some pool of attentional capacity from which attentional resources are allocated to different activities. Kanfer and Ackerman (1996) extended Kahneman's model into an integrated resource allocation model of ability-motivation interaction that determines attentional effort in an attempt to explain skill acquisition and task performance.. Recent work in social psychology emerges also from the notion of limited cognitive abilities in an attempt to explain behavior. Gollwitzer and Bargh (in press). suggest that part of the puzzle of observed behavior given such limitations is due to the fact that much of our behavior is exerted automatically rather than consciously.

Recent research extends the ideas about attentional limitations to the determinants and effects of cognitive interference (Sarason, Pierce & Sarason, 1996). Issues that get examined include the negative effects of cognitive interference on thought processes, and the effects of interference and distractibility on performance (e.g. Yee & Vaughan, 1996). Clearly, these issues are relevant to managerial behavior.

Much research in the managerial literature is based on assumptions about cognitive limitations. Managers are "putting out fires" when they allocate their attentions only to those projects or issues that they perceive as pressing problems (Radner, 1976). Managers may put out fires by dealing with the biggest problems first until those situations are under control and then moving on to the next "fires." The putting-out-fires description adds the idea that managers may search for problems that need attention rather than attending to projects before they become problems.

This idea of meeting a minimum acceptable level draws on the notion of satisficing (March & Simon, 1993; Simon, 1955). Satisficing describes reaching a certain level of satisfaction with performance that is at a sufficient level. The manager has met some criteria to a satisfactory degree. However, the manager has not met this criteria at an optimal level. The manager has reached a satisfactory level of performance, though he or she has not reached the aspired level of performance.

Attention and decision making in organizational settings

In organizational settings, allocations of attention influence the processes by which issues and projects become salient, get selected, and subsequent actions are taken. At this level, structural, political, and cognitive processes blend into organizational agendas, directions, and decisions. Dutton (1986) discusses the allocation of attention to strategic issues as strategic agenda building. Project contexts determine the placement of issues and projects on strategic agendas (Dutton, 1986). In contrast, the garbage can model suggests a process in which decisions unfold differently depending upon the eligible participants present and the interests of the participants (Cohen, March, & Olsen, 1972).

In other organizations research, March and Shapira (1987,1992) look at the implications of managerial risk taking and the focus of managerial attention. They discuss

two focal values for attention in risk-taking decisions: a target level of performance and a survival level. If a manager's performance is above the target level, the focus of attention is normally on avoidance of below target performance, leading to risk aversion. For managers performing below the target level and sufficiently above the survival level, the focus of attention is on opportunities to bring performance up to the target level, leading to risk seeking behavior. Managers whose performance is close to the survival level seek a balance between possible gains and their down-side potentials. As March and Shapira (1987) noted, their framework provides an alternative to preference-based choice theories. They suggested that theories that highlight the sequential consideration of a relatively small number of alternatives (March & Simon, 1993; Simon, 1955) as well as the importance of the order of presentation and agenda effects (Cohen, March & Olsen, 1972; Dutton, 1997) are reminders that understanding action in the face of incomplete information may depend more on ideas about attention than on ideas about decisions.

The work on attention and scheduling suggests a view of managers as cognitively capable of processing complex schedules. Managers can both categorize and prioritize the projects in their task queues. This view does not suggest that managers' schedules achieve some theoretical optimal values or that managers consistently employ their capabilities in allocating their attention. However, managers are capable of dealing with a multiplicity of tasks and developing schemata for juggling and balancing the demands of those tasks.

The Job-shop Analogy

The problems of some managerial attention decisions may be analogous to certain job-shop scheduling problems. Job-shop scheduling comes from scheduling theory (cf. Conway, Maxwell, and Miller, 1967) and the fields of operations research and industrial engineering. In general, scheduling theory seeks optimal orderings. Job-shop scheduling seeks the best way of ordering items that need to have one or more operations performed upon them. The performance criteria or goals chosen defines the best way to order items.

There are some empirical studies in the human factors engineering literature which look at similar issues. Thus, Moray, Dessouky, Kijowski, and Adapathya (1991) look directly at individuals' abilities to schedule tasks in a series of experiments. They compared the performance of subjects who had been instructed previously as to optimal scheduling methods (e.g., French, 1982) with that of control groups. They found that both groups of subjects developed their own scheduling rules that were similar to the optimal rules from scheduling theory. However, both groups of subjects performed substantially below the optimal rules

A manager may be conceived as analogous to a machine. Just as a machine processes one job at a time, a manager can only deal with one problem or task at a time (Simon, 1967). The projects that are managed by a manager are analogous to jobs to be processed by a machine, and the allocations of managerial attention are analogous to the scheduling of operations performed by a machine.

The notion of managers as machines may disturb some, but the purpose is *not* to view managers as mechanical. The process that managers use to make decisions about the content of tasks that they manage may be rational and well considered. However, the process by which they decide what task to focus their attention on may follow a heuristic judgment process (March & Simon, 1993; Simon, 1967). This paper views managers as

employing a combination of rationality and affective judgments with a limited processing capacity (March & Olsen, 1976).

SCHEDULING THEORY

Managers may use several methods to choose what tasks to allocate their attention next. The method chosen for a particular scheduling job depends the objective of the overall schedule. Managers may try to satisfy multiple objectives when allocating their attention to tasks. They may need to satisfy obligations to their supervisors' directives and priorities, obligations to their customers' requirements and standards, and obligations to instruct and supervise their employees. In addition to their obligations to others, managers may have their own agendas and objectives to achieve. Dealing with multiple and sometimes conflicting objectives, managers may require large amounts of processing time to find an acceptable schedule. If managers want to consider all the possible ways of scheduling n projects they may be frustrated with the quantity of comparisons and calculations that need to be performed. Consider that the number of possible permutations of a schedule of n projects is described by $n!$, which is an expression that increases dramatically with n (i.e., $2! = 2$, $3! = 6$, $4! = 24$, $5! = 120$, ..., $10! = 3{,}628{,}800$).

Iterating through all of the permutations or sets of project sequences to find one that achieves the maximum number of objectives or minimizes the total effort expended in achieving the objectives may take a large amount to processing time. So, in scheduling 4 items the number of possible schedules that must be compared is 24 and in scheduling 10 items 3,628,800 possible schedules must be compared. Given the shear number of comparisons that need to be made to schedule a small number of items, several scheduling heuristics have been developed to cope with this computationally intensive process of scheduling tasks or projects. These scheduling heuristics achieve very good approximations of optimal schedules using a very small amount of comparing or processing time. Therefore, if a manager only deals with 4 projects, the number of permutations (24) would certainly discourage her or him from looking at all the possible scheduling arrangements. In such cases scheduling practices resort to the use of heuristics to achieve near optimal schedules using a fraction of the managerial processing resources.

Drawing from job-shop scheduling (cf. French, 1982), there are many ways for managers to allocate their attention to projects using scheduling heuristics. Scheduling heuristics use one or more job characteristics to order the jobs. Examples of job characteristics are the time it will take to process the job, the date the job is due or required to finished, and the priority or relative importance of the job or job class. Heuristic scheduling models can achieve one or more of the objectives that managers seek by using each of these characteristics. Further, it is often possible to meet multiple objectives by combining simple heuristics.

Scheduling Assumptions

Priority Class Order. Priority ordering of jobs is the ranking of jobs based on an objective criterion. Managers may categorize tasks by both priority and priority class. Priority class ranks may be assigned through dynamic, evolutionary, learning-based, or other processes. Examples of priority classes are projects for business expansion, projects for the boss, administrative tasks, and customer lead development (cf. March & Olsen, 1976; Gardner

et al., 1989). Each project or task within a priority class may have a different priority. So, under the 'projects for the boss' class, the priority of a report for a board of directors' meeting may rank higher than a project to inventory the office equipment used by each department in the firm. Formally, each project, task, or issue that a manager oversees may fall into a different priority class j, where priority class j has a higher priority (i.e., will be attended to by the manager before lower priority classes) than priority class j+1, where j = {1, 2, 3}.

Interruptions. Manager working days are filling with interruptions, "quick" questions from bosses and employees, and ad hoc meetings. Through this daily obstacle course of the business environment, managers may deal with "putting out fires" or high priority tasks that are unscheduled that require immediate attention. When a manager decides to allocate his or her attention to a high priority job, the manager must stop working on the current job to attend to the important job at hand. The manager resumes attending to the interrupted job with a small loss of time to become re-acquainted with the task. This system for dealing with interruptions is a modified version of what the scheduling literature called pre-emptive resume, priority scheduling.[1]

Scheduling Heuristics

Shortest Processing Time (SPT). Using job processing times to order jobs, SPT minimizes the mean flow time or mean waiting time of a job sequence. The sum of the processing times for a given set of jobs is the same regardless of the sequence of the job. The waiting time for job *i*, w_i, is the sum of the processing times of the jobs processed before job *i* (see Appendix A for an example).

This type of scheduling objective may be an important objective for managers, as the time the average project waits for attention is minimized. Supervisors, subordinates, and others may perceive that the manager is working faster or customers are being served faster with a minimized wait time.

Though the SPT heuristic relies on knowing information about the processing time of a job, it is not necessary to know the exact run time of a job. The relative time requirements of jobs or approximate run times will yield usable schedules using the SPT method. Of course, the method may lose efficacy if the information available is circumspect.

Earliest Due Date (EDD). Scheduling jobs using the due date characteristic can minimize the maximum lateness of a set of jobs. Processing the job with the earliest due date (EDD) first and processing the job with the second earliest due date next until processing of all jobs finishes minimizes the maximum lateness of the sequence. A job completed after its due date is late. A negative lateness indicates the completion of a job before its due date. Each job will have a lateness associated with it, L, that can be positive (late), zero (on time), or negative (early). Minimizing the maximum lateness tries to reduce the largest lateness of a set of jobs (see Appendix A for an example).

The EDD heuristic can be used to schedule tasks that have due dates associated with them or where approximate due date information is available. Like the SPT heuristic, the EDD heuristic relies on supplied information about the processing time of a job.

TOWARDS A MODEL OF MANAGERIAL ALLOCATION OF ATTENTION

[1] Classical pre-emptive resume priority scheduling assumes that tasks are resumed without penalty or delay upon completion of the interrupting task (French, 1982).

The following model is a derivative of the basic SPT heuristic. Adding priority classes and allowing interruptions to the schedule helps to deal with more realistic work situations. Though deadlines are a part of managerial attention allocation, we chose not to present a model using scheduling theory based heuristics for due dates.

We have chosen to base our model on the SPT heuristic instead of the EDD heuristic or some combination of the two in order to present a simple model that does not describe complexities beyond the cognitive processing abilities of humans. Moray, et al. (1991) found that graduate students trained in these scheduling heuristics could only perform the simplest of them without significant errors in real-time scheduling experiments. Scheduling models as simple as the EDD model presented above require a complex set of data, assumptions, and calculations. Modeling managers as performing these manipulations is inconsistent with the notion of individuals as having limited abilities to calculate and evaluate tradeoffs (Simon, 1955, 1967, 1972; Padgett, 1980).

This model attempts to balance realistic assumptions of priorities and interruption in managers' work schedules without forcing a calculatingly rational view of them. Managers have some abilities to identify projects with performance problems. Also, managers may choose to pay attention to those projects with performance problems. They combine two basic rules in allocating their attention to these tasks: (1) work on the highest priority tasks first, and (2) work on the tasks that can be completed in the shortest amount of time first. The model does not specify that the managers' priority rankings must follow an economically rational model. Managers may apply a boundedly-rational choice model when selecting their next tasks.

SPT with Priority Classes and Interruptions

Often, managers must deal with more than one project to manage at any given time. Using a hypothetical account of the morning of a manager, Ms. Smith from a large manufacturing firm, we formulate a schedule for her using the model, SPT with priority classes and interruptions. This account attempts to describe the basic features of the model in a more realistic context than possible with a mathematical formulation.

Ms. Smith manages the research and development (R&D) department of a large manufacturing firm. She has three research teams of three engineers each under her supervision. She reports directly to the director of R&D and informally to the director of manufacturing.

This morning, Ms. Smith has several tasks to complete. For her subordinates, she has expense reports to approve, project milestones to review for two teams, and a project summary report to read. She knows that her staff will draw her into several ad hoc meetings during the day. These brief ad hoc meetings are important since they give her good information on the department's status, issues, and problems. However, she also needs to spend some time preparing next year's budget and should have ad hoc meetings with both her direct and indirect superiors.

In her mind she makes a game plan for the day. She tends to lump tasks into three priority classes: (1) immediate attention, (2) very important, and (3) important. First, immediate attention items tend to be impromptu meetings and calls from her supervisor. Second, very important items are things that must be attended to today. Finally, important class items is a catch all for other tasks she needs to pay attention to this week. In other words, each task that Ms. Smith attends to may fall into a different priority class j, where

priority class j has a higher priority (i.e., will be attended to before lower priority classes) than priority class j+1, where j = {1, 2, 3}.

Ms. Smith attempts to attend to higher priority tasks before beginning lower priority items. However, sometimes a high priority task such as an impromptu meeting will interrupt a lower priority task. In these cases, the meeting is allowed to interrupt the lower priority item and the lower priority task is resumed after the meeting is completed. For example, a meeting with one of her engineers may interrupt her review of project milestones or reading a project summary report and she will continue the reviewing or reading after the meeting.

When Ms. Smith has several tasks to complete that are from the same priority class, she attempts to rank order the tasks from lowest to highest by the amount of time each will take to complete. She tries to complete the tasks that she estimates will take the least amount of time first. This heuristic allows her to finish several items on her list in a relatively short amount of time and show progress rapidly. It is not necessary for Ms. Smith to know exactly how long each task will take, but to estimate the relative length of the tasks. For example, Ms. Smith estimates that approving the expense reports will take about ten minutes. Reviewing the project milestones for two teams, reports will take longer than the expense reports task of each set of milestones to review. Reading a project summary report will take longer than the review tasks. From this rank order she selects the shortest task, approving the expense reports to attend to first. When that task is complete she will review the list of tasks yet to be completed and select the shortest task again.

Let S_{ji} represent the time to complete task i of priority class j, where i = {1, 2, 3...}. So, if $S_{ji} = \min \{S_{jx}\}$, where x = {1, 2, 3...}, then the task is the shortest of priority class j and Ms. Smith will allocate her attention to task S_{ji}. If $S_{ji} \geq \min \{S_{jx}\}$, the task is not the shortest of priority class j and she will not allocate attention to this task next.

Using her own time estimates, Ms. Smith may select the tasks that she can complete most quickly before tasks that will take larger amounts of time to complete. With the SPT heuristic, she will first process the task that she can complete in the least amount of time. So, if $S_{jy} < S_{jx}$, where $x \neq y$ and $\{x, y\} \in i$, then S_{jy} will be processed first. If $S_{jy} = S_{jx}$, where $x \neq y$ and $\{x, y\} \in i$, then the tie will be broken arbitrarily.

When a higher priority level task S_{ji} falls below its minimum acceptable performance level and a lower level task $S_{(j+1)i}$ falls below its minimum acceptable performance level at the same time; Ms. Smith will attend to the higher priority task S_{ji} first. If a lower priority level task is being processed by the manager, she will interrupt it when a higher priority level task is encountered that needs managerial attention using the pre-emptive resume method. Table 1 gives an example of a queue of tasks waiting for managerial attention and the order of processing.

Insert Table 1 about here

The first task to be processed by Ms. Smith is S_{13}. This task is first because it will take the least amount of time to complete (i.e., three time units, $S_{13}=3$) of the tasks that need processing in priority class j=1. The SPT heuristic determines the processing order for tasks within each priority class. So, those tasks with shorter times to completion are processed first. When all of the tasks in priority class j=1 finish, Ms. Smith may turn her

attention to priority class j=2. Table 2 represents the queue from Table 1 after processing of all the tasks from priority class j=1.

Insert Table 2 about here

Table 2 shows that first two tasks requiring managerial attention S_{22} and S_{24} have the same required time for completion, and accordingly, the tie for which task should be processed first is broken arbitrarily. Ms. Smith works on task S_{22} first and task S_{24} second. She follows the same procedure for priority class j=2 and j=3 tasks until no tasks remain.

If Ms. Smith is in the middle of processing a priority class j+1 task (i.e., $S_{(j+1)i}$) and a task in priority class j (i.e., S_{ji}) develops, she will interrupt the class j+1 task to work on the class j task. Work will not resume on the priority class j+1 task until there are no more priority class j tasks that require processing. When Ms. Smith continues processing the class j+1 task, the work will resume in the place where it left off without a loss of the work completed prior to the interruption. For example, if task S_{16} develops while she is in the middle of processing task S_{22}, she will stop working on task S_{22} and start on task S_{16}. When Ms. Smith completes working on task S_{16}, she will continue processing task S_{22} at the point where the interruption occurred. Table 3 indicates the new processing order.

Insert Table 3 about here

The above description may appear too mechanistic and too orderly. It also reflects the difficulty of describing complex human behavior by formal models. Yet, the major idea is that what may govern managerial behavior are scheduling heuristics such as SPT. On the one hand that may look too simple for operation researchers although it may look too complex for organizational theorists. In fact, the behavior may be even more complicated in organizational settings rather than under controlled experimental conditions. Life in organizations actually lead to priorities and interruptions that form the basis for such models. Given the critical effect of the organizational context on priority setting (Dutton, 1986, 1996; March, 1994), it appears that the problem of interruptions and the need for priority setting is higher at higher echelons.

Proposition 1. The higher the manager's job in the organization's hierarchy, the more prone the manager is to interruptions and the stronger the need for priority setting to achieve stability at work.

Although many managers state that they set priorities and carry their work accordingly, the situation in fact may resemble more Mintzberg's description of managers as fire fighters rather than planners. There are observations that overload inhibits managerial performance and given that managers are worried about falling below their performance targets (March & Shapira, 1992) they may engage in certain behaviors to try to make sure that their behavior is in line with their targets.

Proposition 2. When a set of priorities exists, managers behave in line with the EDD heuristic, trying to accomplish their tasks in line with the priorities.

Proposition 3. In the absence of priorities, managers behave in line with the SPT heuristic since by completing more tasks a manager can get reinforced by a sense of accomplishment.

It should be noted that we do not mean to treat SPT and EDD in their literal sense but as general heuristics, thus SPT may mean doing simpler tasks first while EDD means doing the more important tasks first.

Preliminary tests.

The above hypotheses were examined in a preliminary study employing two samples. Both samples responded to a semi structured questionnaire that requested them to describe their work patterns, the number of times they get interrupted in a typical work day, the ways they set priorities and they ways they deal with interruptions.

The first sample included some 22 middle level managers who were enrolled in an Executive Development Program. The second sample included 26 MBA students. Subjects in both samples responded in a way that provides general support to the above hypotheses. About half of the subjects reported that their planned activities were interrupted, on average, 50% of their work days., and a little over 50% reported that they have managed in general, to deal with these interruptions. However, subjects reported that they were unable to complete their scheduled activities in about a third of their work days.

About 80% in both samples used due dates in allocating their attention to project work., and about half of the subjects reported that they actually try to estimate the time a task will take when they attempt to decide what task to do next.

Subjects also described all kinds of factors that determine the setting of priorities. These included goals set by superiors as well as requests emerging through the work days coming from external clients. It appears that most of our respondents were cognizant of the source of a request as an indicator of importance and noted that such requests often led them to shift their existing priorities in an attempt to fulfill the new demand or request. Finally, while most of the subjects noted that they were trying to organize their work by some priority order that emanates from the above factors, some said that if it is left for them to determine the priority order they tend to arrange their tasks so that they finish the simple tasks first and leave time for the more demanding task

DISCUSSION

Scheduling tasks through a job-shop has long been of interest to operations researchers and industrial engineers. This paper develops initial ideas of a model of managerial attention allocation using an analogy from scheduling theory. From this analogy, this paper explores the ways managers decide the order in which they attend to different tasks. Though the model portrays managers as processing information in a rational manner, the priorities and decision criteria that go into this process may be boundedly rational. Managers depend on a combination of calculation and intuition to make attention allocation decisions. These priority evaluations may be products of combinations of both bounded rationality and economic rationality. Mintzberg's (1973) study appeared to suggest that managers do not make decisions in an analytical rational way. Such a view was challenged by Simon who argued that "It is a fallacy to contrast "analytic" and "intuitive" styles in management. Intuition and judgment - at least good judgment - are simply analyses frozen into habit and into the capacity for rapid response through recognition" (1987, p. 63).

Traditional description of individual decision behavior came under attack in the late 1960s and the heuristics and biases paradigm (Tversky & Kahneman, 1974) became the accepted framework in behavioral analyses of decision making. The heuristics proposed above are consistent with that approach by suggesting that managers use shortcuts and employ heuristics to cope with conflicting demands on their attention. This approach is different from other attempts to describe attention allocation as a pure rational

process (Becker, 1965). The SPT and EDD heuristics can be used in a descriptive manner to try to untangle attempt to examine whether managers process information in a sequential or parallel manner as well as the role of automaticity in their information processing behavior In their seminal work on organization theory March and Simon (1958, 1993) discussed at length the idea of programs and programmed decision making. A major implication of their discussion is that programmed decision making is necessary to free resources for innovation. Our approach follow the same line of thought in suggesting that by pointing at the need to develop practices such as automation and the delegation of authority as potential ways to deal with managerial attention allocation dilemmas. These issues should be examined in future research.

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