

## NOTE

# WORK INTERRUPTED: A CLOSER LOOK AT THE ROLE OF INTERRUPTIONS IN ORGANIZATIONAL LIFE

QUINTUS R. JETT  
JENNIFER M. GEORGE  
Rice University

We discuss four key types of work interruptions—intrusions, breaks, distractions, and discrepancies—having different causes and consequences, and we delineate the principle features of each and specify when each kind of interruption is likely to have positive or negative consequences for the person being interrupted. By discussing in detail the multiple kinds of interruptions and their potential for positive or negative consequences, we provide a means for organizational scholars to treat interruptions and their consequences in more discriminating ways.

Management scholars and practitioners generally define interruptions as incidents or occurrences that impede or delay organizational members as they attempt to make progress on work tasks. Therefore, they typically think of interruptions as disruptive for organizational members. Grove, for example, describes the unexpected visits that managers experience routinely as "the plague of managerial work" (1983: 67). Similarly, Perlow (1999) proposes that the frequent coworker interruptions experienced by software engineers lead to "a time famine" wherein the engineers are plagued by the sense of having more job responsibilities than the time in which to do them. Even the way organization members typically define interruptions (e.g., as something that breaks continuity [Webster's *Ninth New Collegiate Dictionary*]) has negative undertones.

Such negative perceptions notwithstanding, interruptions are ubiquitous in organizational life, and they occur frequently, in a variety of ways and forms. For example, unexpected meetings and conversations throughout the day interrupt the work patterns of managers, thwarting opportunities for extended, isolated periods of reflection (Berger & Merritt, 1998; Grove, 1983;

Mintzberg, 1990; Thomas & Ayres, 1998). Given the fact that many jobs entail multiple and shifting tasks, the onset of an extra activity that requires immediate attention can interrupt a person's work on a current task (Cellier & Eyrolle, 1992; Kirmeyer, 1988). Multiple tasks with widely different time horizons—some that can be completed in single sittings and others involving months-long project spans or years-long strategic spans (Jacques, 1982)—can cause people to interrupt work on one task to attend to another.

Even the physical and psychological work environment can foster interruptions. Informal work climates and open office layouts, designed to promote flexibility and conserve space, bring people close together and increase the likelihood of unplanned physical encounters that interrupt a person's work (Oldham, Kulik, & Stepina, 1991; Perlow, 1999). Background noise or the nearby conversations of others may be a nuisance, interrupting a person's concentration (Oldham et al., 1991).

Moreover, advances in information technology have increased the number of ways that one person or group can interrupt another. For example, e-mail and other forms of electronic communication have joined telephones and pagers as communication media whose pervasive use has increased the possibility of interruptions in a person's work (e.g., Cutrell, Czerwinski, & Hor-

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vitz, 2001; Czerwinski, Cutrell, & Horvitz, 2000; Speier, Valacich, & Vessey, 1999).

Although interruptions occur frequently in organizational life, they have received limited attention in the management and organizational literature. A classic study, which showed that interrupted tasks are recalled more easily (Zeigarnik, 1927), spurred occasional research interest in interruptions (e.g., Gillie & Broadbent, 1989; Kirmeyer, 1988; Schiffman & Greist-Bousquet, 1992), especially in recent years (Edwards & Gronlund, 1998; Fisher, 1998; Flynn et al., 1999; Okhuysen, 2001; Perlow, 1999; Speier et al., 1999; Waller, 1999; Zijlstra, Roe, Leonora, & Krediet, 1999). As yet, however, there is "no systematic body of research on what physical or psychological characteristics make an interrupt" (Moray, 1993: 120). Moreover, meaningful distinctions between different conceptualizations of interruptions have yet to be proposed in the existing literature.

Given that multiple and diverse interpretations of interruptions are relevant to understanding their role in organizational life, in this paper we bring together research from various bodies of literature to develop an integrated perspective on interruptions and their potential consequences. Based on our integrated perspective, we distinguish four interruption types: intrusions, breaks, distractions, and discrepancies. We define and characterize each of these types and propose conditions under which each interruption type is likely to have negative and positive consequences for the person whose work is being interrupted.

Systematically addressing different types of interruptions and their potential consequences provides additional clarity and precision to the study of how organizational members structure their time and manage their work. Our integrated perspective on interruptions is relevant to a number of fields of study, such as time management (Perlow, 1999), the boundaries between work and leisure in organizations (e.g., Ciulla, 2000; Perlow, 1998), and the study of professions and jobs in which individuals regularly perform multiple, complex tasks under conditions of autonomy and time pressure. Discriminating among different types of interruptions and their potential positive and negative consequences also may contribute to our understanding of the determinants of individual and organizational productivity (i.e., the relationship

between the time spent on a task and the magnitude and quality of work output). In work environments where organization members are gaining greater control over when and how they work because of flextime initiatives and the proliferation of computing and communication devices (Ciulla, 2000), it becomes even more vital to understand the nature and consequences of different kinds of interruptions.

## INTERRUPTIONS AS INTRUSIONS

An intrusion is an unexpected encounter initiated by another person that interrupts the flow and continuity of an individual's work and brings that work to a temporary halt. Unscheduled personal visits or phone calls, for example, are intrusions that impose the need to spend time with others on activities that may not be instrumental for completion of the task currently being performed (e.g., Coates, 1990; Vernon, 1990). Consider the example of a faculty member who is attempting to complete a manuscript for submission to a scholarly journal by a certain deadline. As students and colleagues in the office or a spouse and children at home frequently intrude upon the writing of the paper, the professor may be less likely to meet the deadline. Each time work on the paper has to come to a halt because of unplanned personal interactions, the author has fewer available minutes and hours, and ultimately fewer days, to complete the writing.

### Perspectives on Intrusions

Intrusions are normally viewed from a time management perspective. Following a philosophy and practice that addresses the mastery of timing and scheduling in order to increase output, time management proponents advocate that individuals and organizations minimize the occurrence of intrusions (Taylor, 1911). A time management perspective suggests that intrusions are disruptive for a person performing work tasks to the extent that the intrusions occur frequently, are unexpected, and consume long spans of time. Consequently, time management writings prescribe managing the timing of intrusions so that they are more infrequent and predictable and controlling the amount of time that intrusions consume.

An example of a strategy for controlling the predictability of intrusions in organizations is

the institution of "quiet time," whereby members of an organization agree to a standard period of clock time during which coworkers will not intrude on each other and organizational members can concentrate on their solitary work (Coates, 1990; Perlow, 1999). Another strategy is attempting to group similar kinds of intrusions into batches that are handled at pre-established times (e.g., faculty establishing office hours for their students, or checking e-mail and voice-mail only at predetermined times).

When intrusions occur unexpectedly, one could refrain from inviting an unexpected guest to sit down or could limit the conversation of an unanticipated phone call to less than five minutes. One could also create standard responses for the most common intrusions or have files and records well organized so that when managers or coworkers intrude with requests, relevant information is close at hand (Grove, 1983). Thus, time management proponents advocate the use of tactics and strategies that manage intrusions by controlling their timing and length to periods of time when they will have the least deleterious effect on the completion of primary tasks.

The disruption that results for an intrusion is typically thought of in a negative light. However, a more in-depth exploration of intrusions suggests that they can have negative or positive consequences, depending on a variety of factors, including who initiates the intrusion as well as the content and function of the unplanned interaction. For instance, a manager who initiates random encounters with his or her employees to gather real-time information that would likely be lacking in a written report (Kotter, 1982) can be provided with valuable information. Moreover, these manager-initiated intrusions can lead to improved communication and the development of high-quality relations with subordinates. Further, employees who find it disruptive to be interrupted by others can, at the same time, identify many of these same interrupting activities as helpful for their own work (Perlow, 1999: 75). The following analysis of these issues reveals the potential negative and positive consequences of intrusions.

### Intrusions: Consequences for the Person Being Interrupted

The potential negative consequences of intrusions are often recognized, whereas the poten-

tial positive consequences are often overlooked. Negative consequences can occur when available time to work on a critical task is scarce. Unscheduled interactions with others consume time that could be spent on critical tasks, and these intrusions can leave a person with insufficient time to meet a deadline, achieve a goal, or simply complete a task. Perlow (1999) illustrates, in an ethnographic study, how frequent interruptions by managers and coworkers can frustrate an individual's efforts to complete work and can create the sensation of having more responsibilities than the time available in which to meet them.

Additional negative effects related to time pressure may include heightened feelings of stress and anxiety, as the person being interrupted recognizes that less time is available and that he or she may be falling short in reaching task milestones. Such negative consequences of intrusions are most likely to occur when the person being interrupted has a sense of urgency about completing critical tasks. Furthermore, intrusions can hinder an individual's ability to reach a state of total involvement in the task being performed. Such states occur when a person is intrinsically motivated and actively engaged in a task without a sense of time consciousness, and these conditions are generally associated with concepts of "flow" and timelessness (e.g., Csikszentmihalyi, 1975; Csikszentmihalyi & LeFevre, 1989; Mainemelis, 2001). When an intrusion occurs, the disturbance and the subsequent social interaction that may ensue can disrupt the focused attention of a person who is working intently, reinstating time consciousness and a sense of time famine when there are many other activities to perform.

To summarize, intrusions may have negative consequences for the person being interrupted to the extent that they result in insufficient time to perform time-sensitive tasks, stress or anxiety associated with heightened feelings of time pressure, and/or a disturbance in a person's state of total involvement in the task being performed (see Table 1).

Intrusions, however, can also be beneficial for the person being interrupted, and recognition of these benefits is crucial in order to take advantage of them. Otherwise, potentially beneficial intrusions are likely to be curtailed, since they will be perceived in a negative light. Positive consequences occur for the person being interrupted when an intrusion results in the transmission or

**TABLE 1**  
**Each Interruption Type and Its Potential Consequences**

Type of Interruption	Negative Consequences for the Person Being Interrupted	Positive Consequences for the Person Being Interrupted
Intrusion	Insufficient time to perform time-sensitive tasks, stress and anxiety associated with heightened feelings of time pressure, and/or a disruption in a person's state of total involvement in the task being performed	Informal feedback and information sharing unlikely to occur through other, more established means
Break	Procrastination (i.e., excessive delays in starting or continuing work on a task) and/or significant amounts of time spent relearning essential details of the work being performed	Alleviation of fatigue or distress, a rhythm and pace of work enhancing job satisfaction and performance, and/or opportunities for incubation of ideas on creative tasks
Distraction	Mediocre performance when the person's work is complex, demanding, and requires learning and one's full attention and/or when the person has particular traits that make him or her more vulnerable or sensitive to distractions (e.g., lack of stimulus-screening capabilities or a Type A personality)	Enhanced performance when the distraction helps filter out other irritating environmental stimuli and/or increases stimulation levels on routine tasks
Discrepancy	An intense, paralyzing negative emotional reaction or continuous automatic processing of task-related information, if the discrepancy is suppressed or denied	Mindful, effortful, and controlled processing of information and/or the recognition of the need for change and stimulation of action

exchange of information that is critical to the quality or completion of the task at hand. For example, unscheduled interruptions by coworkers, subordinates, or clients can provide individuals with valuable information that might not be forthcoming through more established and formal means, such as client planning sessions (Sutton & Kelley, 1997) or department activity reports (Kotter, 1982). Further, although an intrusion by a subordinate who is performing a delegated task may inconvenience a supervisor, it may help the subordinate performing the delegated work improve his or her understanding of the task and forestall problems and lost time in the future.

Although intrusions, if improperly handled, can destructively consume scarce time and effort, they can also result in the constructive use of time to the extent that they result in increased feedback and information sharing that might not otherwise occur. Carrying on with our example, a professor who is working on a paper can be intruded on by a colleague asking to borrow some journals. While looking for the specific volumes, the professor mentions the topic of the paper, and her colleague then informs her of a new book on the topic written by one of the experts in the field. This kind of spontaneous feedback and information sharing that can arise out of intrusions often does not take place

through other channels, and indiscriminately curtailing intrusions may prove disadvantageous. On the whole, intrusions have positive consequences for the person being interrupted to the extent that they provide informal feedback and promote information sharing that is unlikely to occur through more established means (Table 1).

Because the time management perspective pervades many organizations and work settings, the prevailing inclination among organizational members at all levels is to deal with intrusions as if they were all negative, not realizing that their control or elimination might result in performance shortfalls. We have shown that some intrusions can have positive consequences. In order to handle the diverse consequences of intrusions, organizations must develop ways to manage the tension between the need to sequester individuals to allow them to complete their work and the need to encourage individuals to accept intrusions as a potential source of informal feedback and information sharing (Perlow, 1999).

## INTERRUPTIONS AS BREAKS

Breaks are planned or spontaneous recesses from work on a task that interrupt the task's flow

and continuity. Like an intrusion, a break is a halt in an individual's work on a task, but, unlike an intrusion, it entails anticipated or self-initiated time away from performing work to accommodate personal needs and daily rhythms. Breaks reflect the recognition that organizational members cannot sustain work efforts indefinitely throughout the work day. Work can be naturally punctuated by breaks dictated by work progression, punctuated by prescheduled breaks at set times, or spontaneously punctuated by organizational members as they see fit. In terms of our running example, the professor might take a break after completing work on a major section of the paper, might take a pre-scheduled break to have lunch, or might take a break when she draws a blank and cannot seem to find a way to handle a challenging problem. Within the context of the ebb and flow of the intensity of a person's performance of a task, a break provides a period of idle time (from the perspective of the primary task) to rejuvenate for the resumption of work.

### Perspectives on Breaks

The relatively few studies that directly address breaks indicate that people need occasional changes in the tempo of work or an oscillation between work and recreation, particularly when they are fatigued (Henning, Sauter, Salvendy, & Krieg, 1989) or are working continuously for an extended period (Csikszentmihalyi, 1975). Breaks can occur spontaneously when individuals are bored, frustrated, or just in need of a respite (e.g., individuals take time out to surf the web, make personal calls, balance their checkbooks, or visit the water cooler). They can also be deliberately incorporated into the work-day. Breaks can be formally scheduled by organizational routines (e.g., coffee and lunch breaks) or can be informally instituted by workers themselves (Roy, 1960). Furthermore, work preferences can determine the timing and length of breaks. For instance, some people may schedule breaks at regular intervals throughout the day and strive to make steady progress each day, whereas others may take breaks at random times throughout the day and follow a pattern of seemingly unproductive days punctuated by a highly productive day.

In contrast to intrusions, breaks tend to have a positive connotation, because they may serve a

recreational or rejuvenating function for individuals who have become bored or have grown tired of their work or become fatigued. At the same time, breaks can also potentially be disruptive to the flow of work and the completion of a task. For instance, excessive breaks may result in procrastination that leads to costly delays. Following is an examination of the potential consequences of breaks.

### Breaks: Consequences for the Person Taking Time Off

The potential negative consequences of breaks for the person being interrupted include the loss of available time to complete a task and, perhaps more significant, a temporary disengagement from the task being performed. Although a person may feel inclined to take a break, a break can nevertheless obstruct the person's ability to complete important work responsibilities when the break either consumes excessive amounts of time or disrupts the momentum gained from working continuously on a task.

Having less time to complete tasks is the most obvious potential negative consequence of breaks. Sometimes a break occurs because of a person's blocks or resistance to starting or continuing to work on a task, and such breaks gradually erode the available time to work and create conditions of further distress for the procrastinator. A break can also produce negative consequences when it results in a long time span between a person's efforts on a task. When breaks are frequent or last for an extended period, individuals may become less engaged in the task they were working on, forget essential details of that task, and require a start-up period to become as fully engaged with that task as they were when they stopped it. In sum, breaks can have negative consequences for an individual to the extent that they result in procrastination (i.e., excessive delays in starting or continuing work on a task) or that significant amounts of time are spent relearning essential details of the work being performed (Table 1).

Despite their potential negative effects, breaks can also serve multiple and important positive functions for the person being interrupted. The potential positive consequences of breaks include stimulation for the individual who is performing a job that is routine or boring

(e.g., Fisher, 1993); opportunities to engage in activities that are essential to emotional well-being, job satisfaction, and sustained productivity (Csikszentmihalyi, 1975; Elsbach, 2001); and time for the subconscious to process complex problems that require creativity (Csikszentmihalyi & Sawyer, 1995).

Some studies have focused on breaks as responses to or preventative measures against fatigue and boredom. For instance, studies of data entry and computer operators show that workers who report higher rates of fatigue and boredom take longer breaks (Henning et al., 1989) and that workers who stretch physically during short breaks from data entry tasks perform better than those who take breaks with little physical movement (Henning, Jacques, Kissel, & Sullivan, 1997). Roy's (1960) classic participant observation study of a small group of workers putting in long hours on extremely monotonous and routine tasks also illustrates the benefits of incorporating deliberate breaks into the workday to alleviate boredom. This group of workers initiated regular, frequent, and short interruptions into their workdays, such as "peach time," "banana time," "pickup time," "fish time," and "Coke time," to help them tolerate twelve-hour days of mind-numbing work, to experience a sense of fun and enjoyment, and to have something on which to focus their attention and punctuate the day (Roy, 1960). When the breaks were unintentionally disrupted, workdays became almost intolerable.

Additional research has addressed the importance of recreation, idle time, or periods of non-taxing work in maintaining emotional well-being, job satisfaction, and high levels of work performance in the long run. For instance, Csikszentmihalyi (1975) found that chatting with others about nonwork activities, engaging in daily sports or exercise, daydreaming, reading for fun, watching television, and other activities that might be considered noninstrumental to assigned tasks are essential to emotional well-being and creative output. These seemingly unrelated activities serve as "play" when a person is not currently performing work, and they provide the mental and physical stimulation that satisfies needs that may not be met while working. In an experiment in which subjects were instructed to deprive themselves of activities not directly related to work responsibilities, the subjects reported feeling tense, irritable, and fa-

tigued, and their scores on creativity tests fell dramatically over a period of days (Csikszentmihalyi, 1975: 161).

Rather than focusing on breaks as recreational activities, Elsbach (2001) focuses on breaks as periods of nontaxing work that may be needed in jobs that have a relentless pace and nonstop demands. "Mindless work" that requires limited amounts of concentrated attention and adept social interaction enables a person's mind to drift regularly to non-task-related thoughts. When interspersed with regular activities that are constantly challenging, this mindless work produces a rhythm and pace that support enhanced job satisfaction and creative thinking (Elsbach, 2001).

In the creativity literature, a break from work is also seen as serving another important function: providing time for incubation. Some evidence indicates that when engaged in certain kinds of work, such as coming up with creative ideas or developing original products and processes, people often require time for incubation and time to discuss and elaborate their ideas with others (Csikszentmihalyi & Sawyer, 1995). In developing new ideas, organizational members need to have the autonomy to work in accordance with their own personal rhythms and the pace of their tasks, rather than conform to standards of persistent effort and steady progress.

The concept of incubation explicitly acknowledges that attention can be focused in multiple directions and that while engaged in unrelated activities, workers may glean insights for a focal concern or problem (Leonard & Swap, 1999). Gaining sudden insights in the shower or on the drive to work may be thought of as clichés, but studies of creativity and anecdotal evidence on the creative process suggest that deliberately taking time away from work, engaging in an altogether different activity, or ceasing to think about a task or problem can aid the creative process, since the subconscious continues to operate and make connections between seemingly disparate streams of thought (e.g., Csikszentmihalyi & Sawyer, 1995; Leonard & Swap, 1999; Smith, 1995). During incubation, while the conscious mind is idle, the subconscious mind repeatedly attempts to combine elements of an idea until it becomes stable and coherent enough to emerge back into consciousness (Csikszentmihalyi & Sawyer, 1995). In sum, a

person experiences positive consequences of breaks to the extent that the breaks serve to alleviate fatigue or distress, initiate a rhythm or pace of work that enhances job satisfaction or performance, and/or provide opportunities for the incubation of ideas on creative tasks (Table 1).

Breaks connote the significance of time away from making progress on work activities as a natural and necessary part of performing routine work or preparing for intense engagement in challenging tasks. Breaks are events that may occur spontaneously or may be planned as part of a custom or routine. Although taking breaks from a task does not, on the surface, appear to contribute to a person's immediate progress, breaks can be beneficial to a person's well-being, satisfaction, and effectiveness on the job. This type of interruption emphasizes a holistic view that takes into consideration more diverse factors involved in work performance than actual time spent on a task.

### INTERRUPTIONS AS DISTRACTIONS

Distractions are psychological reactions triggered by external stimuli or secondary activities that interrupt focused concentration on a primary task. Distractions are generally instigated by competing activities or environmental stimuli that are irrelevant to the task at hand, and they affect a person's cognitive processes by diverting attention that might otherwise have been directed to that task. Returning to our example, a faculty member attempting to write a paper in her campus office may experience a distraction when students are having a loud conversation in the hall outside her office or when there are other background noises that she finds annoying.

#### Perspectives on Distractions

Studies of cognitive interference, which address the functioning of memory and attention, provide the most definitive statements about how and when distractions may affect a person's concentration while working on a task. Cognitive interference is a concept built on the notion of working memory, which Wickens and Hollands define as "the temporary, attention-demanding store that we use to retain new information (like a new phone number) until we

use it (dial it)" (2000: 241). One form of working memory is phonological—storing linguistic information like words and sounds—and the other form is visuospatial—storing analog and spatial information. Cognitive interference occurs when background stimuli or activities draw on the same types of working memory resources that are being used in the performance of a primary task (Gillie & Broadbent, 1989; Hirst & Kalmar, 1987; Wickens & Hollands, 2000).

Tasks that involve manipulation of words and symbols are especially vulnerable to interference from human speech, because they compete for the same components of working memory. For instance, listening to other people's conversation or to the lyrics of song is likely to interfere with one's concentration when composing the first draft of a lengthy essay or attempting to solve a complex mathematical problem. Alternatively, if the performance of multiple tasks involves different forms of working memory, the tasks might be time shared more efficiently than if they shared a common phonological or visuospatial form. For example, it might be easier to perform visual and auditory tasks at the same time, because they rely on different memory and processing channels.

Another relevant factor pertaining to cognitive interference is whether a focal task that a person is working on involves information that is stored in long-term memory (Edwards & Gronlund, 1998; Wickens & Hollands, 2000). To the extent that a person is well versed in performing an activity, information relevant to the performance of that task may be stored in long-term memory, leaving a greater amount of working memory and attention available to respond to potential distractions. Consequently, given the same objective requirements for a primary task, a more skilled person is less likely to be disrupted by distracting stimuli than a less skilled person. Conversely, when a person is working on a primary task that is new or unfamiliar, performance of that task relies almost exclusively on working (as opposed to long-term) memory, and the person may be especially vulnerable to the effects of distractions. For instance, experimental subjects who are performing unrehearsed word recall tasks are particularly vulnerable to distractions from phonological stimuli that involve similar memory and processing channels as the primary task (Gillie & Broadbent, 1989).

Thus, the same event may be more or less distracting, depending on a person's temperament and circumstances (including the kind of task a person is performing). In research on distractions and their consequences, scholars have explored the extent to which people are distracted by exogenous circumstances. For example, an environment that is noisy because of loud equipment or proximity to others can be disruptive to one person's concentration but not to another's (Oldham et al., 1991). Similarly, music can be a potential source of distraction for some people in certain circumstances but, at the same time, can be beneficial to others, helping to filter out other environmental stimuli and facilitating concentration on a focal task (Oldham, Cummings, Mischel, Schmidtke, & Zhou, 1995). We address these issues as we outline the potential consequences of distractions when a person is working.

### **Distractions: Consequences for the Person Being Interrupted**

Distractions divert attention from ongoing tasks. They can be viewed as either a nuisance or a pleasant diversion, although in the context of an individual who is working on an engaging task or trying to complete a task quickly, they are more likely to be a hindrance. Since a distraction can be observed only indirectly (e.g., signaled through a facial expression or change in the pace of a work activity), the assumption is that people who experience distractions are less able to focus or less interested in focusing on an immediate task (e.g., Fisher, 1998).

Whether a person experiences negative or positive consequences from distractions depends on the characteristics of both the person and the task being performed. Some people, referred to as strong stimulus screeners, are more adept at ignoring low-priority inputs and are less easily aroused by environmental stimuli (Oldham et al., 1991). Moreover, weak stimulus screeners in unshielded environments have relatively low levels of job satisfaction and job performance compared to strong stimulus screeners (Oldham et al., 1991). In a study of police dispatchers who are constantly interrupted with new messages to process, Kirmeyer (1988) found that Type A personalities (i.e., individuals inclined to be impatient and time conscious) are more sensitive to interrupting tasks

and have a lower threshold for reporting overload than do Type B personalities (i.e., individuals inclined to be more patient and easygoing). These studies suggest that there is variance in how individuals respond to potentially interrupting events and that some people may be more sensitive to the negative consequences of potentially distracting events than others.

The degree to which a person experiences disruptive effects from distractions also depends on the characteristics of the task being performed. For example, Speier et al. (1999) found that when a primary task is difficult, the introduction of an interrupting task is likely to distract a person from the primary task and can produce both an increase in decision-making time and a decrease in decision accuracy. In this study the researchers also found that when people were exposed to interrupting activities, they had more negative perceptions about the work experience, regardless of the extent to which these interruptions affected performance.

Consistent with this reasoning are theories and research that suggest that motivational interventions (e.g., assigned goals) designed to promote self-regulatory activities can become distractions that hinder learning and performance. For example, when a task requires all of one's current attentional resources, self-regulation will divert attentional resources away from the task at hand (Kanfer & Ackerman, 1989). For instance, when individuals are learning complex tasks that require all of their attention, assigning them a difficult goal is likely to interfere with learning, since some of their attention is diverted away from learning about the task and toward thinking about how to achieve the goal. In sum, distractions result in negative consequences for the person being interrupted when the work is complex, demanding, and requires learning and one's full attention and/or when the person has particular traits that make him or her more vulnerable or sensitive to distractions (e.g., lack of stimulus-screening capabilities or a Type A personality; see Table 1).

Distractions also may have less widely recognized positive consequences, such as filtering environmental nuisances and increasing stimulation levels on routine tasks. For instance, aircraft engine noise, while potentially disruptive to an airline passenger, can dampen other, more disruptive noises, such as loud conversations and the movement of heavy meal carts down the

aisles. An interrupting task or background noise can also be welcome rather than disruptive when a task is tedious or boring (Oldham et al., 1995; Zijlstra et al., 1999). For example, some studies suggest that while the introduction of an interrupting activity can degrade performance of a primary task when that task is complex, the introduction of an interrupting activity can quicken a person's work pace and information processing on primary tasks that are simple and require limited attention (Speier et al., 1999; Zijlstra et al., 1999).

The same experiments that have documented the negative consequences of interrupting activities when subjects are performing difficult tasks have also illustrated that interrupting activities can reduce decision-making time for simple tasks without a loss of decision accuracy (Speier et al., 1999). Furthermore, Zijlstra et al. (1999) found, in a simulated office environment, that when skilled subjects are performing work they find unchallenging, an interruption can accelerate the processing of that task without necessarily affecting the quality of the individuals' task-related concentration and output. In sum, a person may experience positive consequences from distractions when the distractions filter nuisance stimuli, thus fostering increased concentration, or when the distractions provide stimulation for tasks that are routine and unchallenging (Table 1).

Distractions are typically considered dysfunctional for organizational members, and prescriptions associated with handling potential distractions normally include sequestering oneself from external stimuli and avoiding unrelated activities and thoughts. When a person has responsibilities that entail cognitive activities that require all the individual's attention, distractions can produce disruptive effects by interfering with focused concentration (Flynn et al., 1999). In a sense, the disruptive qualities of distractions and intrusions are linked, because the potential psychological interference of a distraction sometimes results in an unplanned halt in work and lost time typically associated with intrusions.

Although organizational researchers have studied distractions, usually in lab experiments, they know relatively more about distractions' potential negative consequences than their potential positive consequences. Distractions also may have beneficial effects, which have been

shown to exist in very specific circumstances that researchers are only recently beginning to address (Speier et al., 1999; Zijlstra et al., 1999).

## INTERRUPTIONS AS DISCREPANCIES

Discrepancies are perceived inconsistencies between one's knowledge and expectations and one's immediate observations that are perceived to be relevant to both the task at hand and personal well-being. Essentially, discrepancies occur when an individual perceives significant inconsistencies between his or her expectations and what is happening in the external environment. Discrepancies interrupt the automatic processing of task-related information and redirect attention to the source of the inconsistency.

In our extended example, a discrepancy might occur when a colleague tells the faculty member that a recently published article covers much of the same ground she is focusing on in the paper she is writing. At the moment this information is received, the faculty member initially feels shocked and dismayed and begins to process the meaning and significance of the discrepancy. In this case the discrepancy arises from the perceived inconsistency between the faculty member's perception that she is working on an original and significant set of ideas and the recently obtained knowledge that some of these ideas might just have been published by another researcher. The interrupting nature of the perceived discrepancy will have positive consequences for the professor to the extent that she actively and deliberately assesses how her working paper overlaps with, and is distinct from, the published article and where there are areas of differentiation, contradiction, or extension. An alternative response might be to downplay the significance of the discrepancy or deny its existence altogether (George & Jones, 2001). Although this alternative response may coincide with minimal interruption of ongoing work, it is likely to be ineffective, since an essentially unpublizable paper may result.

Discrepancies occur because the environment produces "demands and situations which are different from what the individual expects" (Mandler, 1990: 28). The environment may trigger such interruptions, but they are interpreted through one's own experience. Discrepancies are, by definition, unexpected, and their per-

sonal relevance produces arousal and emotional reactions (Frijda, 1988; Mandler, 1984, 1990). Emotional reactions to discrepancies can be positive or negative (Mandler, 1990), depending on the implications of the discrepancies for personal well-being. Discrepancies underscore the fact that while people are inclined to interpret information in ways that are consistent with their expectations or views of the world, sometimes contradictory information or events are encountered, causing people to question their expectations and world views and to actively process the meaning of the contradictory stimulus. The shift to the more active and mindful thinking prompted by perceived discrepancies results in the interruption of automatic or less reflective modes of information processing.

Discrepancies can arise spontaneously as incoming information is perceived and processed. For example, a manager may experience a discrepancy when he reads a quarterly sales report that indicates a previously best-selling product has had a rapid decline in sales; this discrepancy engages the manager's attention as he searches for potential explanations for the sales shortfall. Discrepancies also can be introduced intentionally. For example, a mentor might actively challenge the behavior and expectations of a mentee to direct the mentee's attention to areas needing personal growth and development (Langer, 1997; Okhuysen, 2001). Discrepancies might also be initiated by a recognized incongruity between one's expectations and one's behavior (Argyris & Schön, 1974). When viewing discrepancies in the context of work interruptions, we focus on the perceived inconsistencies between a person's expectations and his or her task-related observations.

### Perspectives on Discrepancies

Researchers have addressed discrepancies most systematically in the literature on cognitive schemas. Schemas are abstract knowledge structures that contain organized information about a kind of stimulus, concept, person, or event; its attributes; and relationships between its attributes (Fiske & Linville, 1980; Fiske & Taylor, 1991; Taylor & Crocker, 1981). Individuals develop schemas for concepts or stimuli they encounter repeatedly, and they use these schemas to facilitate information processing. Use of schemas results in a relatively top-down,

theory-driven, and low-effort type of processing, in which new information is dealt with using pre-existing knowledge and associations, rather than in a careful bottom-up consideration of the actual details and facts surrounding a situation (Abelson, 1981; Bobrow & Norman, 1975; Fiske & Taylor, 1991; Rumelhart & Ortony, 1977).

Essentially, once an individual has developed a schema for a type of stimulus, whenever he or she encounters something that appears to fit the concept or be related to it, the individual relies on that schema to make sense of and interpret the new, incoming information. Schemas can be thought of as people's simplified theories about the way things are and the way the world works that they use habitually to make sense of incoming information and ongoing observations (Fiske & Taylor, 1991).

Schemas tend to be resistant to change (Fiske & Taylor, 1991). Senge warns that "very often, we are not consciously aware of our mental models or the effects that they have on our behavior" (1990: 174). Existing schemas are tacit, they limit people to familiar ways of thinking and acting (Senge, 1990), and people are often unlikely to reflect on their schemas unless they encounter the unexpected (Schön, 1982). Particularly for often repeated, well-learned tasks, people become less likely to reflect on information (Schön, 1982) and tend to process information automatically (Langer, 1997; Louis & Sutton, 1991; Waller, 1999), falling into a state of "mindlessness" (Langer, 1989a,b, 1997). In a state of mindlessness, people are more likely to process information in ways that are consistent with familiar interpretations, rather than to revisit and actively examine pre-existing assumptions. A significant discrepancy may be needed to interrupt the familiar structures and interpretations of experience (Langer, 1989a; Louis & Sutton, 1991; Meyer, 1982; Tyre & Orlikowski, 1994).

Perceived discrepancies and their accompanying emotional reactions (Mandler, 1990) disrupt normal routines by interrupting ongoing cognitive processes and behavior and by providing an impetus to move from a state of minimal reflection to a state of mindful attention and engagement (Langer 1989b, 1997). According to Langer (1989a,b), mindfulness is characterized by a high level of awareness and alertness, active and controlled information processing, and cognitive delineation. This attentive state provides a window of psychological experience in which active engage-

ment is triggered and in which reexamination and possible change in existing schemas can take place. We examine this process as we describe the potential negative and positive consequences of discrepancies.

### Discrepancies: Consequences for the Person Being Interrupted

The consequences of a discrepancy for the person being interrupted depend on the nature and the timing of his or her response to the discrepancy (e.g., Waller, 1999). Potential negative consequences might occur when the discrepancy triggers either an extreme and prolonged reaction or very little reaction at all. Emotional reactions accompany perceived discrepancies (Mandler, 1990), serving a vital role in alerting individuals to the need to reexamine their pre-existing expectations and schemas. A person experiencing a discrepancy may be overcome with intense emotions that may delay necessary action in response to the discrepancy. The person experiencing a discrepancy may also suppress or ignore it, delaying a response to the discrepancy indefinitely.

Hesitation or mindful reflection is a natural reaction to the recognition of discrepancies (Schön, 1982). Sometimes organizational members have hours, days, or weeks to process information in response to discrepancies (Senge, 1990). Other times, however, individuals or groups are required to respond to discrepancies in minutes or seconds, because a rapid response is needed for a nonroutine event (Waller, 1999). When organizational members do not respond quickly enough to unprecedented events or situations that produce discrepancies, negative consequences are likely to occur. In extreme cases, when people are slow to respond or fail to recognize discrepancies between unfolding events and their own experience, a catastrophic event or loss of life can sometimes occur (Perrow, 1984; Weick, 1993). Such hesitation can result from intense emotions and the inability of people to control these emotions and switch to mindful and active information processing. To summarize, perceived discrepancies result in negative consequences for the person being interrupted to the extent that he or she has an intense, paralyzing, negative emotional reaction, or if he or she suppresses or denies the discrepancy and continues to automatically process task-related information (Table 1).

Discrepancies can have positive consequences when the emotional reactions to them activate mindful or controlled information processing, learning, and adaptation. As relatively intense feelings or affective states that have a significant impact on ongoing cognitive processes and behaviors (Simon, 1982), emotions are functional and adaptive signals that focus people's attention on stimuli relevant to their well-being, that direct attention to interpreting the cause of the discrepancy, and that help energize actions (Frijda, 1988). In terms of Smith and DeCoster's (2000) dual-process model of social cognition and memory, discrepancies require people to shift from relatively effortless interpretations based on prior associations in schemas to an effortful process of trying to make sense of incoming information, to understand its implications, and to figure out how to proceed (Argyris, Putnam, & Smith, 1985; Argyris & Schön, 1974; Schön, 1982; Senge, 1990). The information-processing activities that emotional reactions produce can ultimately lead to a change in pre-existing schemas and, hence, changes in individual perceptions, interpretations, and behavior (George & Jones, 2001). When an individual responds promptly to discrepancies, he or she is interrupting automatic, or mindless, information processing (Langer, 1989a,b; Louis & Sutton, 1991) and initiating active thinking that contributes to adaptation and learning (Okhuysen, 2001). In summary, perceived discrepancies result in positive consequences for the person being interrupted to the extent that they lead to mindful, effortful, and controlled processing of information; recognition of the need for change; and stimulation of action (Table 1).

A perceived discrepancy—a form of interruption not widely recognized—has the potential to trigger a shift from automatic to mindful processing of information that results in task engagement (Langer, 1997). It also may trigger a change in perceptions of task-related activities that enlivens a fatigued mind (Langer, 1989a). Whether the potential consequences of discrepancies are negative or positive depends on the particular characteristics and reactions of the individual being interrupted. Factors such as adeptness at handling unforeseen events, openness to new experiences, the personal relevance of events, the stage of personal development, and flexibility/rigidity can affect an individual's response to a perceived discrepancy. Addition-

ally, characteristics of the task at hand can play an important role in this process. For example, when an individual is performing a complex and time-dependent task, he or she may have insufficient resources to manage heightened emotional reactions, process information mindfully, and take appropriate action. Under these circumstances, negative consequences may be likely, despite the individual's active engagement as a result of the perceived discrepancy.

## CONCLUSION

Interruptions occur frequently in organizations, in a variety of forms, and they are generally perceived as detracting from individual effectiveness. To date, relevant theorizing and research on interruptions have been piecemeal and lack a unified framework for understanding different kinds of interruptions, their etiology, and their potential negative and positive consequences. Based on reviews of diverse literature, in this paper we have proposed four key types of interruptions: intrusions, breaks, distractions, and discrepancies. Each of the four types raises distinct issues and results in different consequences.

Research that distinguishes among different types of interruptions has the potential to provide multiple benefits for both theorists and practitioners. For example, empirical studies of the causes and consequences of different kinds of interruptions under varying contextual conditions can provide organizational scholars with valuable insights on how people work and manage their time and productivity. Given the fact that knowledge work is on the rise and knowledge workers often have discretion in terms of when, where, and how they work, it is vital to understand the role that interruptions play in work activities.

Studying the four types of interruptions and their consequences in different contexts may also guide organizational scholars in conducting research on multitasking and how people simultaneously manage a variety of work-related and personal responsibilities and concerns. Moreover, an appreciation of the different interruption types and their potential consequences may help members of some occupations, such as academic researchers who must balance research with teaching and professional service, alleviate unnecessary stress when they experience interruptions (Cartwright & Cooper, 1997). Clearly, the interruption con-

struct provides researchers with fertile ground for exploring a multitude of important research questions that address how people behave and make decisions in work environments.

There are a number of important topics for future theorizing and research. For example, we have deliberately focused on the potential consequences of a single interruption, given the dearth of theorizing on this subject. It is likely that complex dynamics arise when one kind of interruption occurs simultaneously, or in close succession, with another type of interruption. For example, an intrusion by a coworker might lead to a perceived discrepancy if the coworker's queries challenge one's own expectations and assumptions about the work being performed. The frequency and intensity with which different kinds of interruptions are experienced can also be important factors in predicting consequences. Furthermore, we have focused the paper on the effects of interruptions at the individual level of analysis. While the effects of interruptions at the individual level are important, an interesting topic for future research is the consequences of interruptions at higher levels of analysis, such as the group and organizational levels.

We suggest that managing interruptions and their effects is not simply a matter of exercising control over their occurrence; organizational members must also understand the meaning and function of different kinds of interruptions. For example, individuals need to think mindfully about when intrusions can and should be dealt with (Grove, 1983; Perlow, 1999), to be sensitive to their own idiosyncratic needs for breaks (Csikszentmihalyi, 1975; Roy, 1960) and incubation time (e.g., Leonard & Swap, 1999), to manage circumstances that can distract concentration during peak engagement (Speier et al., 1999; Zijlstra et al., 1999), and to welcome discrepancies that can prevent the unreflective processing of information and can promote adaptation (Langer, 1989a; Louis & Sutton, 1991; Okhuysen, 2001).

While we identify four key types of interruptions in this paper, there may be additional kinds of interruptions, and this, too, is an important topic for future theorizing and research. As organizational members and scholarly researchers acknowledge and appreciate more fully the multiple kinds of interruptions and their potential positive or negative consequences, it is our hope that they will treat interruptions in more discriminating and creative ways.

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**Quintus R. Jett** is an assistant professor of management in the Jones Graduate School of Management at Rice University. He received his Ph.D. from Stanford University. His research interests include innovation, organizational change, and strategy processes in uncertain environments.

**Jennifer M. George** is the Mary Gibbs Jones Professor of Management and Professor of Psychology in the Jones Graduate School of Management at Rice University. She received her Ph.D. in management from New York University. Her research interests include affect, mood, and emotion; personality; teams; stress and well-being; and creativity.