Stop or not?
How behavioral factors affect decisions related to work interruptions

A Deloitte series on behavioral economics and management
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Work, interrupted

WHEN was the last time you were able to just sit down at your desk and complete an entire task or project start to finish? No emails or texts, no checking of the Internet, no colleagues crashing through the door to report the latest unrelated challenge (or even gossip)?

In academic circles this is referred to as “focused work,” and according to Dave Coplin’s book, The Rise of the Humans: How to Outsmart the Digital Deluge, humans typically only manage about 11 minutes of actual work at a stretch. And after an interruption from someone else, or taking a break to check email or send a quick text, it can take people from 15 to 23 minutes to get back to where they were before.¹ A potentially shocking loss of productivity!

The difficulty of performing sustained, focused work is well understood and has been studied across a variety of settings, including education, health care, and management. Here, we draw on that extensive body of research—focusing on two studies in particular—to examine how distractions and/or interruptions impact the productivity of a broad cross-section of workers, from students to radiologists. Our goal is to summarize findings related to the impact of interruptions of various

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A DELOITTE SERIES ON BEHAVIORAL ECONOMICS AND MANAGEMENT

Behavioral economics is the examination of how psychological, social, and emotional factors often conflict with and override economic incentives when individuals or groups make decisions. The field has its roots in the work of Nobel Prize winner Herbert Simon, who as far back as 1959 questioned the classical economic theory that individuals rationally maximize the outcomes they seek (that is, their “utility”) when making choices.² Ever since, scholars have argued, and demonstrated, that in the face of uncertainty, humans employ all manner of simple, easy-to-use, but often inaccurate cognitive shortcuts. People are not maximizers, but rather muddlers, struggling to cope with a reality that is much less certain, much more complex, and much more variable than they admit. Worse, as has been shown repeatedly by another Nobel Prize-winning behavioral economist, Daniel Kahneman, “We can be blind to the obvious, and we are also blind to our blindness.”³

The implications of cognitive limitation and bias in decision making are as varied as they are vast. Consequences stretch across industries and applications. Managers therefore need to understand something about those aspects of human perception and cognitive processes that can lead us astray. In short, they need to understand something about the psychology of choice.

This paper is one in a series offered by Deloitte that is intended to address this need of managers attempting to improve the performance, growth, and innovative capabilities of their organizations.⁴ Each paper in this series examines the influence and consequences of behavioral principles on the choices people make related to their work. The reader can expect to see some common themes emerge that are related to the framing of choice, the uncertainty of outcomes, the influence of time (and timing), and a general inability to effectively process information. Each paper will provide a set of practical guidelines for recognizing, managing, and/or mitigating the effects of these very natural human limitations and biases in an applied setting.

Collectively, these papers illustrate how an understanding of biases and cognitive limitations is the first step in developing countermeasures that limit their impact on the organization. Alternatively, they may help organizations and individuals identify strategies that ethically exploit these inescapable elements of our humanity to the benefit of a company’s performance, growth, and innovation.
Here, we draw on that extensive body of research to examine how distractions and/or interruptions impact the productivity of a broad cross-section of workers, from students to radiologists.

kinds—from switching among different projects to interruptions of single projects—and to offer insights into effective strategies for combatting the inevitable productivity losses that they impose. From this effort, we distill some key findings and prescriptions for managers to move forward toward achieving higher-performing organizations.

This paper should take about 15 minutes for you to read. Turn off your smartphone, close your door, and see if you can do it in one sitting!
Multitasking among students

Today’s classrooms are filled with students surfing the Internet, posting social media updates, and texting about upcoming weekend plans, all while listening to a lecture on macroeconomics. A recent study found that at any given point during class, 15 percent of students were off-task. Students’ multitasking is not limited to the lecture hall, but can be seen across dorm rooms, libraries, and cafes as students simultaneously process multiple streams of information and entertainment while learning. It’s no wonder that students’ inability to sustain focus is well documented within the literature.

Numerous studies show that students consistently choose multitasking—repeatedly turning their attention to something else before returning to and completing the task at hand—over focused work. Even in cases where students are instructed to focus their attention on something important, they routinely succumb to the urge to switch between activities—even unaware of how often they turn their attention elsewhere. For example:

- In one study, third-year college students volunteered to have their laptops monitored during class, and yet still spent 42 percent of their time on non-course-related activities, generating on average 65 open and active windows on their laptop monitor during the lecture—63 percent of those open windows comprised of non-course-related activities (gaming, emails, web surfing, and entertainment). Students were not just distracted with one non-course-related activity, but were frequently switching between multiple activities at any given time.

- This same study found that students on their laptops vastly underestimated their media use during class—underreporting instant messaging by 40 percent and email usage by 7 percent.

- In another study of more than 1,000 college students, 80 percent admitted to texting during class; 15 percent admitted to sending 11 or more text messages during a single class session.

In the context of student learning, it is important to remember that the digital activities in which students most commonly engage—Internet surfing, emails, texting—can compete for the same mental bandwidth that is demanded by learning. While students may vastly overestimate their ability to multitask and underestimate the frequency at which they do so, research demonstrates that individuals of any age have difficulty evaluating how well their own mental processes are operating at any given time, because most of these processes are unconscious. Our minds are simply not wired to simultaneously perform two intricate tasks.
Interruption leads to forgetting

Any interruption, technology-induced or otherwise, can lead to forgetting. Forgetting requires relearning, and relearning harms productivity. Research shows that the longer an interruption lasts, the more information relating to the task at hand will be forgotten. These costs accrue more rapidly where tasks require “significant concentration and attention.” As a result, interruption, forgetting, and the need to relearn can lead to a variety of negative outcomes, including:

- **Work takes longer**, driven by the duration of the distraction and the time spent to re-familiarize oneself with a task when returning to work.

- **The quality of the work suffers** from the increased mental fatigue that results from repeatedly picking up and dropping a mental thread.

- **Retention falls** as information is improperly “encoded” (that is, stored) in memory. Conditions at the time something is first learned are important when it comes to retention. One study found that multitasking during learning led to a whole letter grade drop (10 percent) in recognition and recall assessments.

- **Future application of knowledge is more difficult.** The brain processes and stores information differently when distracted, making it more difficult to extend or extrapolate newly acquired learning to different contexts. Therefore, even if someone can learn something while distracted, they may not be able to flexibly or effectively use that information.

Educational research, therefore, clearly shows us the cost of distractions and other interruptions to learning and educational productivity.
Outside the schoolhouse

Outside the schoolhouse doors. They pervade the workplace as well. We therefore ask the questions:

- Do distractions and interruptions have the same kinds of negative consequences on workers as they do on students? If so, what is a manager to do about it?

- How well do the strategies that workers typically rely on to manage distraction and interruption truly work?

- Can organizations create conditions that allow their workforces to ignore distractions and resist a seemingly reflexive response to an unending barrage of external stimuli?

Fortunately, researchers are grappling with these questions. Studies take at face value the costs of interruption and examine the strategies employed by businesses and other organizations to deal with them. Strategies include such common-sense interventions as setting clear priorities, checking in (both on a schedule and unexpectedly), breaking up projects into smaller tasks, and “sequestering” individuals to get high-priority work done. The results are sometimes surprising. In some cases, common sense prevails, while in others, it does not.

In the remainder of this article, we will focus on two well-crafted research studies that offer strategic insight to managers. We will describe the focus of each study and its findings. Following that, we will distill the managerial implications of both in an effort to offer practical guidance for managers seeking to improve performance across their teams and workplaces.

Priorities, checking in, and switching among tasks

The first study looked at whether project managers could influence project switching behavior (and therefore organizational productivity) through the policies they set. Researchers performed a controlled experiment to evaluate the effects of prioritization and work monitoring on project switching behavior (that is, self-induced interruption in favor of a different task) in a distributed multi-project work environment (see sidebar, “The switching study,” for a more detailed description of the study).
Priorities matter—or do they?

Allocating resources in a multi-project environment is, in theory, facilitated by communicating priorities to the worker in order to help them manage and focus efforts toward specified goals. When conflicts occur or resources are constrained, the highest-priority projects should generally be worked on first, and lower-priority projects should be set aside.\(^{18}\) Switching among tasks is discouraged in favor of focus on the most important task.

Researchers used the concept of “switch loss,” which refers to the time costs of alternating between different types of work—including the cognitive effort required to disconnect from prior work and connect or reconnect with new work—to assess the impact on worker performance and productivity.\(^{19}\) Data showed a 3.5 percent decrease in total productivity for every switch made. In a real-world knowledge work setting, researchers noted that they would expect higher productivity losses, as the cognitive effort to disconnect/reconnect with this type of work would be greater than that required by the project tasks tested.

Comfortingly, common sense seems to prevail when it comes to the setting of priorities.

Three key findings of the study can be summarized as follows:

- Workers who were provided with clear priorities switched tasks less often than those who did not receive priorities.
- Working with clear priorities, workers spent significantly more time on the highest-priority project.
- Given a greater focus on high-priority tasks, and a lower switch incidence, overall worker productivity for those with clear priorities was higher.

The contingent value of monitoring work

In addition to setting priorities, managers also routinely monitor workers in order to check progress on assigned tasks. Researchers considered a variety of monitoring approaches, and their timing, to understand the impact on worker switching incidence and overall productivity. For example, it is common in multi-project work environments to have scheduled progress updates in which workers...
know in advance when they are required to provide project progress updates. In other cases, managers might simply “stop by” for random or unscheduled status updates.

It is reasonable to ask whether one of these approaches is better than the other when it comes to driving worker performance. After all, the researchers reason, in multi-project environments, the “cultural value often associated with being a team player pressures workers to move all their projects along and distribute their efforts regularly.” Hence, the mere act of monitoring might drive project switching behaviors (and therefore reduce overall productivity) as workers attempt to regularly show progress on each project. Then again, managers may be justifiably uncomfortable with foregoing monitoring altogether for fear that project issues may go unaddressed and progress might stall.

The research found that the “how” of monitoring makes a difference. Specifically:

- Scheduled progress updates did not have a significant impact on worker switching incidence or overall productivity.

- Switching incidence was significantly higher when monitoring work progress took the form of unannounced visits, both early on and late in the project timeline.

We speculate from these findings that workers who were able to plan for project switching addressed that need and made switches at natural project breaking points (more on this later), where rework or relearning effort was lessened.

As for the impact of unannounced monitoring, several factors may be in play. Earlier research asserts that when a higher-level manager arrives unannounced during a time when a worker is engaged in another manager’s project, the event can prove awkward. The visiting manager may make comments that may be interpreted as threatening, particularly in cases where the manager is in a position to evaluate the worker. This type of one-to-one interaction between worker and manager involves a stronger social component than the more general interactions required for scheduled progress checks. Therefore, workers may feel more compelled to readily respond to this request from the manager.

Stop or not?

Unannounced progress checks, often referred to as “drive-bys,” can cause costly operational disruptions due to reactive project switching.

Such unannounced progress checks, often referred to as “drive-bys,” can cause costly operational disruptions due to reactive project switching. When a worker feels pressured to switch out of one project and into another, the potential result is an unnatural move or break in the worker’s overall progress plan—one that may result in a rapid return to earlier projects after the manager departs. Further, as these managerial progress checks can occur at any point, workers may feel obliged to frequently switch between projects even in the absence of a managerial progress check because they wish to maintain progress across all projects.

The importance of task completion

A final dimension of the study focused on where workers were in their progress toward completion of a task or project. Two key findings emerged from this angle of inquiry:

- Workers were more resistant to monitoring event-induced switching when the task they were working on was nearing completion. Project completion status did not have the same effect.
Workers were more resistant to switching with each successive monitoring event, particularly when the monitoring event occurred later in the project timeline.

With respect to understanding why task completion turned out to be important, other research has shown that individuals tend to try to finish work close to completion before moving on. According to the concept of psychological ownership, individual workers develop a sense of ownership for projects that they work on. Uncompleted work creates “attention residue” that engages cognitive resources and diminishes the ability to process new work. By completing work, workers are more likely to achieve cognitive closure and be able to take on new tasks.

Workers also seem to build up a tolerance for monitoring, thereby becoming more resistant to switching over time. Researchers believe that workers actually “learned” from project switching. When a worker makes a switch, he or she must inevitably return to the dropped project. Over time, the worker learns that he or she must spend time relearning or reworking steps associated with the dropped project. This learning seemingly emboldens the worker to more firmly resist future switching. Further, resistance was notably greater when the monitoring occurred late in the project timeline. It is reasonable to speculate that when project time is dwindling, workers realize that there is less time available for relearning and rework on a dropped project. Therefore, they will likely be more resistant to switching in response to a managerial progress check.

As this study shows, management behaviors and monitoring can actually motivate workers to frequently switch between projects, negatively impacting worker and organizational productivity. Management policy provides some workers with permission to stay on task and ignore potential interruptions, what would be the impact to productivity? What are the costs of such a strategy? A second study on interruption and forgetting in knowledge-intensive service environments offers some insight.

Handling intrusions and the cost/benefit of sequestering

Where interruptions are costly, it is reasonable to consider strategies for avoiding them. Be they emails and texts pouring in through a smartphone, or colleagues pouring in through the office door, interruptions give rise to the question of whether or not locking oneself away from the world and letting someone else deal with those interruptions makes a difference. A second study looked at how this practice, known as sequestering, can impact productivity across knowledge-intensive service environments. Researchers focused exclusively on intrusions, a form of interruption in which a worker stops work on his or her primary task in order to spend time on unrelated activities. Intrusions are prevalent in knowledge-intensive service environments, and to some degree can be controlled through organizational policy, process design, and the

As this study shows, management behaviors and monitoring can actually motivate workers to frequently switch between projects, negatively impacting worker and organizational productivity. However, a larger fraction of switching, even in this setting, appeared not to be externally triggered, but rather could be deemed purely discretionary (an estimated 60 percent of all switching observed).

But what happens when workers no longer have the choice to switch? If organizational

Handling intrusions and the cost/benefit of sequestering

Where interruptions are costly, it is reasonable to consider strategies for avoidance.
layout of the work environment. The question was, under what conditions do the benefits of sequestering outweigh the costs? Further, if sequestering is an effective strategy for mitigating the impact of intrusions, what are its operational implications within knowledge-intensive service environments?

In “mixed services” environments, workers are tasked with completing their regular work while also attending to incoming customer requests, or intrusions. When these intrusions become too great, organizations sometimes de-couple the work both physically and procedurally. De-coupling allows some workers to focus exclusively on one type of work without customer-induced interruptions. Enabling this type of focused work has been validated as an operations strategy in service organizations, including health care.

The specific context of this second study was the radiology department of a large teaching hospital. Here, the radiologists’ primary responsibility is to read and interpret patient x-rays while also supporting hospital staff with their immediate treatment needs. For the radiologists, most of these interruptions simply delayed their ability to complete the daily flow of exams that needed processing before the end of their shift. However, in some cases, an interruption might be so urgent that if the radiologist delayed handling it, there could be drastic consequences to the patient and hospital (for example, an emergent situation in which a patient’s life depends on timely reading of an x-ray). In this study, researchers assessed how a strategy of partial sequestration, in which one of the two department’s radiologists would be protected from incoming requests, would impact the department’s overall productivity. The study also evaluated the costs associated with a delay in responding to incoming requests.

**Sequestering strategies, their benefits, and their costs**

Following this line of inquiry, researchers tested multiple conditions—each unique in terms of the degree of sequestration, amount of forgetting, and frequency of interruption. Findings supported researchers’ primary hypothesis with respect to sequestration:

- Sequestration reduces both “average waiting time” and “average flow time” for the primary task.

Findings supported this outcome in particular when forgetting-induced rework was considered. With knowledge-intensive work...
(for example, reading radiology exams), interruptions extend the time it takes to process the work. The added time includes the duration of the interruption plus the rework/relearning time that is required when workers return to their in-process routine work—in this case, needing to re-familiarize themselves with the patient's history and specifics of the exam in order to develop a reliable diagnosis.

Sequestration allows for some portion of the incoming interruptions to be directed to an unsequestered resource. This frees the sequestered resource to work uninterrupted, or less often interrupted, on routine tasks, and hence reduces rework/relearning time. As a result, routine tasks are processed more quickly.

But sequestration is not without its costs—in particular, to the speed with which interruptions are taken care of. Specifically:

- With sequestration, workers accommodate interruptions less quickly, and the handling of interruptions requires more time.

With sequestration, there is some portion of resources that is dedicated to completing routine jobs. Therefore, it follows that with those resources unavailable to attend to incoming interruptions, the work requested via interruptions waits longer and is processed more slowly. This trade-off between higher throughput for routine work and lower throughput for work requested via interruptions requires a consideration of the overall productivity of the unit, for eventually, all work must be completed. Findings in this regard supported sequestration strategies. Specifically:

- Sequestration led to overall gains in departmental productivity.

The trade-off in processing times (decrease in routine processing time versus increase in interruption processing time) revealed an average 75-second decrease in routine flow and waiting time, as compared to a 30-second increase in interruption flow and waiting time.

That is, the throughput improvement for routine work was 150 percent greater than the throughput loss for interruptions. Interestingly, this trade-off held, and even got better, when the interruption rate increased. For example, the researchers found that when interruptions doubled, the benefit ratio increased to 400 percent (that is, a five-minute flow and wait time savings for routine work versus a 75-second increase in interruption flow and wait times). In summary:

- With increasing amounts of sequestration, the time required to complete all work decreased. All work includes routine tasks and work requested via interruptions.

Sequestering decreased the time required to complete the department's work for two reasons. First, routine work accounts for the majority of the total work. And second, with sequestration, the increase in time required to handle an interruption is far less than the time saved by performing routine work under sequestered or partially sequestered conditions. Interestingly, a higher interruption rate
made the time savings for the total shift even more pronounced.

**An important caveat for sequestering strategy**

Research demonstrates that sequestering can play an important role in improving productivity for knowledge-intensive work. It does so by disproportionately improving throughput for routine work at the expense of work requested via interruptions. However, in some settings, there are metrics more useful than time for determining the value of sequestration. To address this concern, the researchers introduced differentiated costs of delay for routine and interruption types of work. They found that:

- When the costs of delaying an interruption are greater than the costs of delaying routine work, overall system costs increase.

In the study on which we are reporting, the overall system was a hospital, where there are some potential costs that, if incurred, would outweigh any production efficiencies that could be gained through sequestration (for example, the loss of life that can result from delaying care to a critically ill patient). System costs, and whether these are acceptable costs, depend greatly on context. Therefore, management should evaluate any potential costs associated with implementing sequestration that prioritizes routine work over incoming interruptions.
Effective work design strategies for multitasking and interrupted knowledge work environments

WORKPLACE interruptions certainly have their costs. But simply knowing that doesn’t help, since having the ability to deal with workplace interruptions is key to the success of flexible, reactive organizations. Fortunately, there may be intelligent approaches to reducing the worst kinds of interruptions, less disruptively timing necessary interruptions, and matching work assignments to those workers most resilient to lost productivity due to interruptions. Both of the studies on which we focus provide insights that knowledge-intensive service organizations can use to develop policies that can enhance productivity. Based on these insights, we provide recommendations for structuring, assigning, and overseeing projects for companies within knowledge-intensive service industries.

Structuring work

- **Structure projects as many short tasks.** A modular approach to project design can provide workers with convenient switching points. A series of independent activities that require little information transfer between tasks offers more instances of “near task completion” that may prompt workers to be more resistant to switching tasks in response to unanticipated managerial progress checks.

- **Assign workers with a high rate of forgetting to routine project work.** When the costs of delaying interruptions are acceptable, free resources who are susceptible to forgetting from interruptions and encourage them to adopt a closed-door policy focused on routine work.

- **Assign workers who suffer less from forgetting to handle incoming interruptions.** Also consider shifting these workers to cover routine work that is detail-intensive and less conducive to modular design (that is, short tasks). These workers can work in less sequestered contexts to handle more interruptions.

- **Determine appropriate sequestration policy (zero, partial, complete) by department.** Study both routine work and interruptions to determine the cost of delay for both (include costs for all downstream resources that could be rendered idle by virtue of a delay, and/or non-cost factors such as quality or safety). In high-interruption
environments, or during periods where interruptions increase, consider strategies to dedicate resources to handling them, leaving others to stay focused on routine tasks.

Supervising work

- **Create incentives for higher-priority projects.** Savvy managers may realize that they can influence workers to switch projects and that they can use this influence to their advantage, getting their lower-priority projects greater focus. To counter this behavior, structure incentives for both managers and workers to resist switching to low-priority tasks and to focus on high-priority organizational efforts.

- **Encourage a predictable approach to project monitoring.** Reward disciplined project managers capable of resisting the urge to perform unannounced progress checks. Workers will be less likely to unnecessarily switch projects if they work with project leaders who refrain from (intentionally or not) intimidating and exerting pressure to influence progress across projects with varying priority levels.

- **Communicate and intervene as necessary so workers understand when sequestration is important to maintain.** Workers are more likely to resist sequestration when interruptions are occurring in rapid succession (ironically, when sequestration may be most valuable). It is at this time that they will most need to be reassured by leaders to stay the course with routine work and let interruptions wait. Messaging should reinforce learning about how sequestration benefits the overall productivity of the collective department or organization.

For your 15-minute investment of sequestered time, you have gained greater insight into the pervasiveness of interruptions, their costs, and the effectiveness of some common strategies for dealing with them. These insights serve as a starting point for management to begin evaluating the nature of project work and the resources employed to tackle it. As was exhibited by the radiology department referenced in the sequestration study, the effective use of these insights is highly dependent on context. Therefore, the derived value of these insights can only be realized when they are successfully integrated into a specific knowledge-intensive operating environment.

While the potential benefits suggest this is a worthwhile pursuit, even here we recommend caution. Efforts to restructure work using the guidance presented here should take place in the context of a well-structured process, be appropriately prioritized, and involve focused personnel subjected to regular, yet planned check-ins with higher-level managers. Therein lies the path to efficient execution of the organization’s work effort.
Endnotes


10. Ibid.


14. The type of thinking required by the tasks that a person is switching to and from will also impact quality degradation. For example, switching from writing a comparative literature essay, which requires precise grammar and formal language, to sending a casual text message requires a significant change in cognitive demands that will likely result in greater “switching costs,” in this case mistakes in the essay.


24. For the purposes of this study, a “task” is defined as a discrete work-step in an overall “project.” Therefore, a project contains many distinguishable tasks that are completed over time.


30. Ibid.


34. Waiting time is the total time a job spends in the system not being actively processed; waiting time is a subset of flow time, but only for those jobs that experience waiting. Duration is the time a job takes from the moment it enters the system to when it is completed and exits the system.

35. Froehle and White, “Interruptions and forgetting in services.”
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