SWITCHING ON CREATIVITY

Leaders often struggle to structure work routines that nurture creativity. The authors describe a tangible way to help 'switch it on'.

by Jackson G. Lu, Modupe Akinola and Malia F. Mason

IN A WORLD OF HUSTLE AND BUSTLE, switching back and forth between tasks has become the default lifestyle — and work style — for many. Bombarded with emails, phone calls and meetings, employees constantly shift their attention from one task to another. The propensity to 'task-switch' now emerges as early as adolescence: The average 7th to 12th grader estimates spending 60 per cent of the time they set aside for homework switching between homework and other activities such as email and instant messaging.

Not surprisingly, the increasing prevalence of task switching has prompted research into its psychological consequences. To date, research has revealed that switching tasks increases our susceptibility to distraction, facilitates error-making, diminishes learning and heightens social anxiety.

While these studies unveil some of the negative consequences of task switching, they leave open the question of whether there are any *positive* benefits to task switching. In this article, we will summarize our research, which indicates that one benefit of task switching is something every modern organization is seeking: increased creativity.

Creativity at Work

Creativity — defined as 'the production of ideas that are both *novel* and *useful*' — is critical to both individual and organizational success. From an interpersonal perspective, creative employees can inspire 'outside-the-box' thinking among their colleagues to build an inventive environment within the organization. And from an organizational perspective, creativity empowers an organization to thrive in a dynamic world of unforeseen challenges and opportunities.

Although it is clear that creativity influences critical organizational outcomes, many practitioners struggle to design work routines that foster creativity. In response to this 'knowledge gap', scholars have increasingly studied job design factors that enhance or hamper creativity. For example, studies show that job autonomy makes individuals more intrinsically motivated, which in turn enhances creativity. Other job design factors that spur creativity include the spatial configuration of work settings, job complexity, time pressure and contingent rewards.

One under-explored job design factor that may influence creativity is task switching. By forcing individuals to temporarily

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People generate fewer unique ideas when they meet as a group because they fixate on the ideas proposed by other group members.

put tasks aside, a 'continual-switch' approach may elevate creative performance by alleviating the tendency to cognitively 'fixate' on ineffective ideas or problem-solving strategies.

Psychologist **Karl Duncker** was one of the first to research 'functional fixedness' — the inability to think beyond the conventional use of a particular object or concept and repurpose it for a novel task setting. Duncker demonstrated that, when given a candle, a pack of matches and a box of tacks — and challenged to affix the candle to the wall so that the candle burns properly and does not drip wax — a large percentage of individuals fixate on the tack box's function as 'a repository for tacks', failing to realize that it could also be affixed to the wall and converted into a candleholder (see **Figure One**).

Building on this classic demonstration, researchers have established *cognitive fixation* as a primary barrier to two principal forms of creativity: divergent thinking and convergent thinking. Whereas *divergent* thinking involves the generation of multiple ideas in diverse directions (e.g. listing creative uses for a brick), *convergent* thinking involves identifying the best solution to a clearly defined problem (e.g. Duncker's candle problem). Both types of thinking are critical-yet-distinct pathways to creativity, as identifying creative solutions often necessitates both *diverging* from previous approaches and *converging* on an optimal approach.

A wealth of evidence suggests that cognitive fixation impedes both the divergent and convergent aspects of creativity. In the context of divergent thinking, individuals tend to generate fewer and less-novel ideas when the design instruction is accompanied by a pictorial example, because they are apt to generate ideas that conform to the example. Likewise, people generate fewer unique ideas when they are part of a brainstorming group compared to when they brainstorm alone, because they fixate on the ideas proposed by other group members.

In a similar vein, cognitive fixation is considered a barrier to solving problems that require convergent thinking. The classic convergent thinking task, the Remote Associates Test (RAT), presents three 'cue' words and asks the subject to conceive a fourth word that is associated with each (e.g., cue words: cheese, blood, print; solution: blue). The RAT can be challenging because people may first think of and fixate on a non-solution word that is strongly associated with just one of the cues (e.g. cheese — cake; blood — red; print — ink) instead of a word that is commonly associated with all three of them. Likewise, people commonly fail to solve insight problems because they fixate on unwarranted assumptions and strategies that interfere with the requisite insight (e.g. Duncker's candle problem).

An emerging body of research demonstrates that creative performance on both divergent and convergent thinking tasks can be improved if the effects of fixation are mitigated by setting a task aside — through breaks, distractions or interruptions. Breaks can free individuals from their fixated mindset by reducing the 'recency' value of inappropriate strategies. For example, brief breaks during brainstorming sessions can increase the number and variety of ideas generated. Similarly, performance on convergent thinking tasks (e.g. the RAT) improves as the break time between attempts is increased, because cognitive fixation 'wears off' over time.

Numerous studies on divergent and convergent thinking have found improvements in creative performance when subjects temporarily set aside the focal creative task to work on an unrelated one. For instance, researchers found that, compared to participants who started generating ideas immediately upon receiving a task, those who first engaged in a 'distractor task' generated more novel ideas. The common theme in these studies is that setting a task aside may reduce cognitive fixation and enable individuals to approach the focal task with a fresh mind, thereby enhancing creative performance.

Our Research

The goal of our investigation was twofold. First, we tested our main hypothesis that creative performance may improve when people continually switch between tasks. In particular, we hypothesized that continually switching between tasks may help people abandon initial, unsuccessful problem-solving strategies and approach each task with fresh angles.

To test this, we examined the effects of task switching on both divergent thinking and convergent thinking. Participants attempted two creativity tasks for a fixed amount of time under one of three conditions: continual-switch, discretionary-switch or midpoint-switch. In the continual-switch condition, they were instructed to alternate back and forth between the two creativity tasks (i.e., Task A, Task B, Task A, Task B, etc.); in the discretionary-switch condition, they switched between the two tasks at their discretion; and in the midpoint-switch condition, they dedicated the first half of the allotted time to Task A and the second half to Task B.

We predicted that creative performance would be the highest in the continual-switch condition, as instructing participants to continually switch between two creativity tasks should mitigate cognitive fixation the most. Importantly, evidence that continually switching between tasks improves performance is particularly meaningful if the person involved tends to undervalue the

Duncker's Candle Problem. Left = puzzle, right = solution.

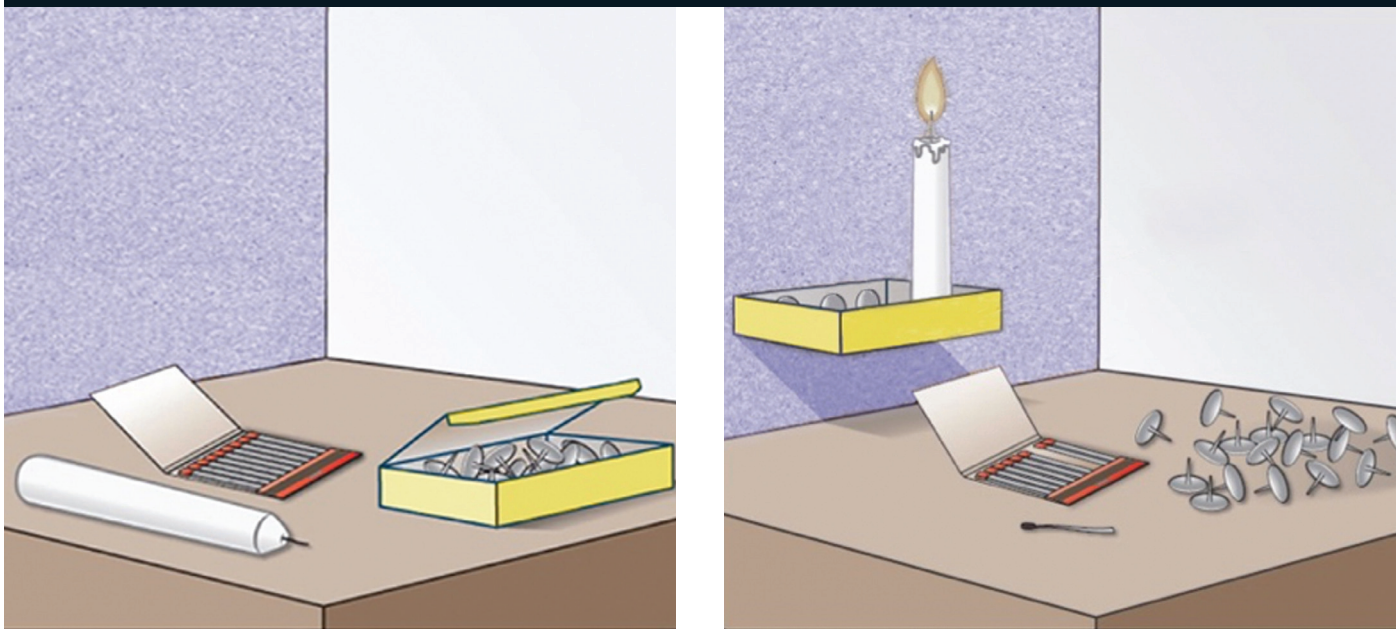

FIGURE ONE

creative benefits afforded by continual task switching. Therefore, in addition to testing whether continually switching between two creativity tasks yields better outcomes, our second goal was to investigate whether people are aware of the creative benefits of this approach. That is, do people choose to switch continually when incentivized to maximize their creative performance?

We predicted that people would erroneously expect continual switching to be less conducive to creative performance compared with discretionary and midpoint switching, and therefore overwhelmingly select the latter two approaches over continual switching when structuring their work. We also predicted that differences in switching frequency would translate into differences in the *flexibility* and *novelty* aspects of divergent thinking. Specifically, we expected participants who continually switched to generate a greater number of uses that were categorically unique and novel compared to participants who switched at their discretion and participants who switched at the halfway mark. On the other hand, since usefulness is often inversely related to novelty, we did not expect more frequent task switching to improve the usefulness of ideas generated; thus, we predicted no significant differences in usefulness across the three conditions.

With regard to *fluency*, we predicted that continual task switching would have a negative effect, for two reasons. First, continually switching between two tasks requires participants to cognitively switch gears, which carries 'switching costs' in terms of time and attention. Second, we expected participants in the continual-switch condition to exhibit lower *fluency*, precisely because their idea generation would be characterized by diminished fixation.

We recruited 126 native-English speakers from **Amazon Mechanical Turk**, an online crowdsourcing platform with subjects representative of the U.S. population. Participants were randomly assigned to one of the three experimental conditions and had a total of eight minutes to complete two problems: listing creative uses for a brick; and listing creative uses for a toothpick.

In the continual-switch condition, they were instructed to list uses for the two objects in an alternating manner (i.e. brick, toothpick, brick, toothpick, etc.); and in the discretionary-switch condition, they were instructed to list uses for the two objects in any order they chose. In the midpoint-switch condition,

participants were instructed to spend the first four minutes listing uses for one object and the next four minutes for the other. In all three conditions, the two objects were counterbalanced such that half the participants started with the brick and the other half started with the toothpick.

As predicted, participants in the continual-switch condition switched far more frequently than those in the discretionary-switch condition and those in the midpoint-switch condition (who, by definition, only switched once between the two tasks). Four, independent coders then rated the uses in terms of flexibility, novelty, usefulness and fluency.

RESULTS: Confirming our predictions, the continual-switch condition yielded more ideas that were categorically dissimilar (i.e. displayed higher flexibility) and novel than did the discretionary-switch and midpoint-switch conditions. Critically, the ideas generated in the continual-switch condition were rated as no less useful than those generated in the other two conditions.

Our second study examined whether having people continually switch between *convergent*-thinking tasks would enhance their performance, thereby testing whether the positive effects of continual task switching on divergent thinking would extend to the domain of convergent thinking.

Just as individuals can be less creative because they tend to fixate on preceding responses, they may fail to identify the solution to a convergent-thinking problem (e.g. Dunker's candle problem) because they fixate on strategies that should be abandoned. When faced with multiple convergent thinking tasks, persisting with one task may result in fixation on an ineffective strategy, whereas switching between them may enable the mind

Four Paths to Opportunity Identification by Massimo Garbuio and Andy Dong

In our work teaching innovation and entrepreneurship to students at the University of Sydney Business School and the California College of the Arts, we focus on four cognitive acts that comprise 'design cognition' — the type of thinking that fuels opportunity identification and formation. Understanding and embracing them can help to demystify the genius of the entrepreneur and bring more innovation to organizations.

1. Framing. In entrepreneurship as in design, every situation has a 'problem frame' and a 'solution frame'. Each frame explains your point of view on the situation. For example, is the situation of single-passenger vehicles on congested freeways one of productivity or personal safety? Framing and re-framing aim to establish alternative ways of interpreting situations in accordance with differing perspectives on its various dimensions. In our experience, this can best be achieved by observing situations involving user behaviour or user-generated problem statements.

One exercise that we find effective was inspired by the approach of the **Austin Centre for Design**. Instructors use a toothbrush as the object of design and ask students to consider three new scenarios. First, they ask them to re-frame the toothbrush as it might be used in an atypical environment (e.g., in the kitchen, in an airplane, at a conference). Second, students are asked to re-frame the toothbrush from a different perspective (e.g., for use by a dentist, a hotel housekeeper or on a blind date). And third, students must re-frame the toothbrush as a different type of object entirely. For instance, what if it were a plant, a spray, or a service? These framing exercises prime students to come up with novel frames for their own entrepreneurial aspirations.

2. Analogical Reasoning. Research shows that new opportunities can emerge from making novel associations between existing things, and as a result, analogies have figured prominently as inspirations for design. Scholars have identified two types of analogies: within-domain ('near field') and between-domain ('far field'). As an example of between-domain analogies, when you are trying to develop a new business model for your mobility venture, you might want to refer to other platform business models such as those used by **eBay** or **Gillette**. A within-domain analogy occurs when you apply examples from a similar industry or market in order to detail the provision of a new solution.

An intriguing application of analogical reasoning lies in thinking about a new product, service or business model using the 'analogs and antilogs' technique discussed by **Mullins** and **Komisar** in their book, *Getting to Plan B*. Business ideas do not have to be revolutionary; rather, they can be developed by looking at 'analogs' — what has worked in the past — and imitating or building on these exemplars. Ideas can also be developed by looking at 'antilogs' — businesses that have been unsuccessful — and avoiding past mistakes. **Apple**'s iPod helps to explain this concept. In a reverse-engineering exercise, we could say that the **Sony** Walkman is the *analog* that inspired Apple. Because the Walkman proved that millions of people were willing to pay for a device that allows them to listen to music on the go, Apple did not need to validate this hypothesis. The Walkman is only part of the story. We can also obtain insights from looking at *antilogs* such as **Napster** which led to the development of a legitimate platform for downloading music: the iTunes store. The popularity of Napster as a peer-to-peer music-sharing site signified a growing trend toward downloading music. After piracy and illegal downloading led

to approach each task with fresh angles. Thus, Study 2 examined whether instructing individuals to continually switch between two convergent-thinking tasks would reduce fixation and increase the likelihood of solving them.

We randomly assigned participants to complete two convergent-thinking tasks under one of the three conditions (continual-switch, discretionary-switch or midpoint-switch). To test whether the effects of task switching are generalizable across different types of convergent-thinking tasks, we used two Remote Associates Test (RAT) problems to examine the effects of task switching on verbal convergent thinking, and two insight puzzles to examine the effects of task switching on visual convergent thinking. As in Study 1, we hypothesized that participants in the continual-switch condition would switch at a higher frequency and thus perform better on the convergent thinking tasks.

One hundred and four native-English speakers from a large northeastern U.S. university completed our experiment. In the first half of the study, they had a maximum of four minutes to solve two RAT problems of similar in difficulty (RAT1: cheese, blood, print [solution: blue]; RAT2: way, mission, let [solution: sub]).

In the continual-switch condition, the experimenter instructed participants to alternate between the two RATs by uttering 'switch' every 30 seconds. That is, participants spent the first 30 seconds on the first RAT, then the next 30 on the second, the next 30 on the first, and so forth. In the discretionary-switch condition, participants were free to work on the two RATs in whatever order they chose during the four minutes.

After the time allotted to the two RAT problems elapsed, the experimenter administered two insight puzzles to assess visual

to Napster's ultimate failure, Apple created an online store where people could download and save music after paying a small fee to avoid such legal issues.

3. Abductive Reasoning. Unlike deductive and inductive reasoning — which seek to produce logically or empirically-true conclusions — *abductive* reasoning introduces a hypothesis aimed at explaining observations or data. While the hypothesis is plausible, it may or may not be true. This uncertainty generates an experiment, and it is often the experiment itself that leads to the innovation.

Researchers have described two types of abduction: *explanatory* abduction and *innovative* abduction. Explanatory abductions introduce hypotheses to explain surprising observations. The aim is to avoid pattern-recognition bias by explaining observations through recourse to alternative causes and effects. In a typical instance, we ask students to explicitly search for surprising facts and observations that suggest value to users and then propose a testable cause-effect relationship that explains the observation of the value.

Innovative abduction is a form of reasoning in which we hypothesize about what to create and the principle underpinning a class of solutions. In this case, the challenge is not only to understand 'what needs to be true' to support the new value for the user, but also to come up with a new rule that makes the new value come alive, such as a new revenue model.

4. Mental Simulation. Mental simulation involves reassessing past events and imagining future scenarios to evaluate and compare their likelihood and profitability.

Once our students identify a new opportunity, we ask them to mentally simulate in three areas. First, how to make the opportunity work in the marketplace from a business model perspective. Next, we ask them to simulate scaling-up the business, which might include expanding into new occasions of consumption or new geographies. Third, we ask them to mentally simulate competitors' reactions, identifying which competitors are capable of thwarting the new venture to stress-test the opportunity.

We encourage students to consider the following questions: Are these customer needs scalable to other customer segments? Who are we displacing in the value chain? Do we have the capabilities needed to produce the new offering? Do we need partners? In sum, mental simulation helps them identify deficiencies and contradictions within the structure of the 'solution' — and fundamentally improve it.

As indicated, opportunity identification does not arise solely from the application of a defined set of activities, but rather through the application of *particular ways of thinking*. Through the continuous acts of framing, making analogies, thinking abductively and doing mental simulations, entrepreneurs — and all innovators — can learn to recognize evolving needs and adapt their offerings accordingly.


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This is an adapted excerpt from their paper "Demystifying the Genius of Entrepreneurship: How Design Cognition Can Help Create the Next Generation of Entrepreneurs," co-written with N. Lin, T. Tschang and D. Lovallo, which appeared in the *Academy of Management Journal*.

The Nine Dot Puzzle

Left = puzzle, right = solution.

Below are nine dots. Your challenge is to draw four straight lines that connect all of the dots without picking your pen off the paper. You can start from any position and draw the lines one after the other, but you can't lift up your pen.

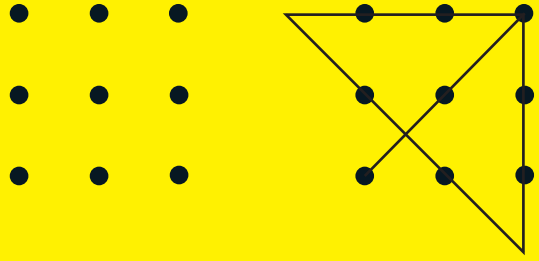
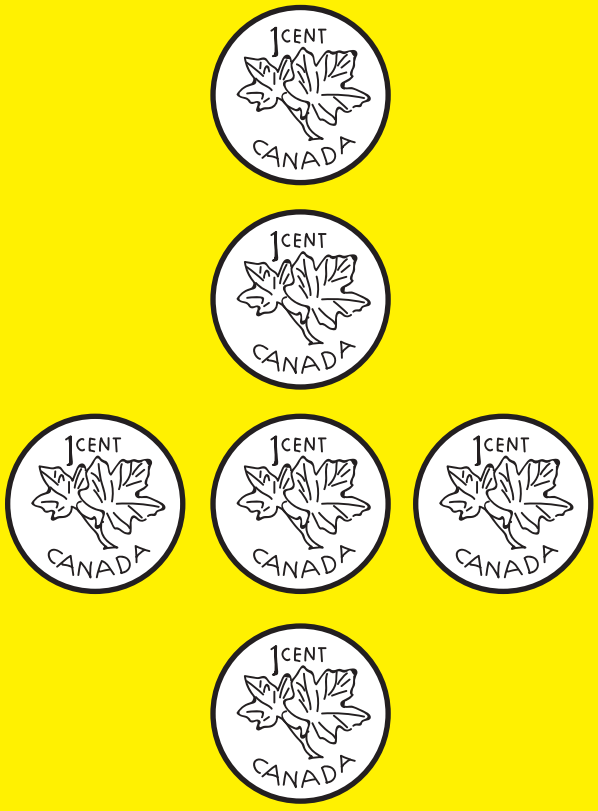


FIGURE 2

The Penny Puzzle

How can you move only one penny to make two rows (in any direction) of four pennies each?



Solution: Place the top coin *on top of* the coin in the middle

FIGURE 3

convergent thinking in the second half of the study. Participants had a maximum of 12 minutes to solve the nine-dot puzzle (see **Figure Two**) and the coin puzzle (see **Figure Three**), which had been pretested to be similar in difficulty.

In the continual-switch condition, the experimenter instructed participants to alternate between the two puzzles by uttering 'switch' every 90 seconds. In the discretionary-switch condition, they were free to work on the two puzzles in whatever order they chose over the 12 minutes, and the experimenter recorded how many times they switched. In the midpoint-switch condition, participants had six consecutive minutes to solve the first puzzle and immediately after, another six consecutive minutes to solve the second puzzle.

RESULTS: As predicted, participants in the continual-switch condition solved more RATs and insight puzzles than their counterparts. These results indicate that just as continually putting one divergent thinking task aside for another enhances performance, so too does putting one convergent thinking task aside for another.

The creative benefits of continual task switching were further corroborated by our finding that, within the discretionary-switch condition, participants who switched more frequently were more successful than those who switched less frequently.

Importantly, participants in the discretionary-switch condition on average switched far less frequently than those in the continual-switch condition, suggesting that individuals tend to 'under-switch' when left to their own discretion. Thus, encouraging individuals to switch tasks more frequently than they would ordinarily may enhance creative performance.

In closing

Despite the premium assigned to creativity in the 21st century workplace, leaders often struggle to structure work routines that nurture creativity among employees. By uncovering a bright side to continual task switching, our research offers a tangible way to help individuals 'switch on' creativity as they navigate multiple tasks. ***RM***



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