

has the right to make a recommendation to a client on a path to purchase? Does a customer qualify for a promotional offer? What were a client's last three NPS ratings? Effective KPI data governance means these questions aren't hypothetical; they are essential to meaningfully measuring success. The ability to reliably answer these kinds of questions is the surest signal of transformation success.

#### 4. Commit to Continuous KPI Improvement

Because digital transformation is a process, not a destination, KPIs are waypoints, not endpoints. Culturally and operationally, leaders must accept that KPIs have to continuously evolve in order to continue to drive value creation.

For example, a telecom company embraced customer churn as a strategic KPI. Its marketing and finance teams collaboratively created a CLV metric to identify, segment, and score customers at risk of canceling their service. More-valuable customers would be targeted with promotional offers or upgrades to increase retention. Analytics subsequently identified some previously undervalued customers as social media influencers who deserved higher scores. Incorporating that data into decisions on whom to target with special offers reduced churn rates among high-value customers at very low cost.

KPIs continuously improve when linked to better data, better analytics and machine learning, and better experimentation. Leaders and teams that own transformational KPIs should always seek to make them more valuable by searching out additional data held by the company or third parties. If NPS and customer satisfaction are critical, then ever more granular data on on-time delivery, returns, and customer service queries provides useful leading indicators. If a perfect order rate is paramount, then data sets providing better visibility into suppliers' reliability are key. Digitally integrating dynamic analytics into a strategic KPI is what transformation is all about.

Digital platforms transform the economics of rapid and scalable experimentation; advanced organizations typically run thousands of digital A/B experiments a week. They're keen to learn more about customer, prospect, and lead behaviors. For example, digital marketers increasingly run

experiments to refine messages, segment customers, and build loyalty. Such experiments might determine when or whether better segmenting customers is more valuable in reducing churn or increasing sales than better personalizing offers for them. For some companies, better segmentation will boost retention and CLV; at others, personalization represents the better digital investment.

Some practitioners may also clone real-time data sets, data flows, and the analytics composing them in order to simulate different scenarios and experiment with options for improvement. They might test whether more granular data might lead to better performance or how changes in one KPI might affect or influence the performance of another.

**TAKEN TOGETHER**, this framework's four components enable a virtuous cycle. Better data and analytics improve and enhance KPIs; better data orchestration encourages the discovery of and access to new data sources that strengthen strategic metrics; seeing KPIs as dynamically evolving encourages leaders to look for new KPIs to track new kinds of value the company can create; and ongoing improvement and growth is baked in, so digital transformation is ongoing.

Too many organizations fail to see transformation as an opportunity to rethink strategic priorities and operations. Our most important insight about transformation is that successful leaders privilege performance and capability improvements over cost and head count reductions. These leaders champion KPIs as a way of holding themselves and their employees accountable against strategic goals. They look to metrics and measures that inspire new thinking, new customer insights, and new growth opportunities. Their KPIs are as innovative and empowering as the products, services, and user experiences they sell. These are the transformations that win.

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# How Well-Designed Work Makes Us Smarter

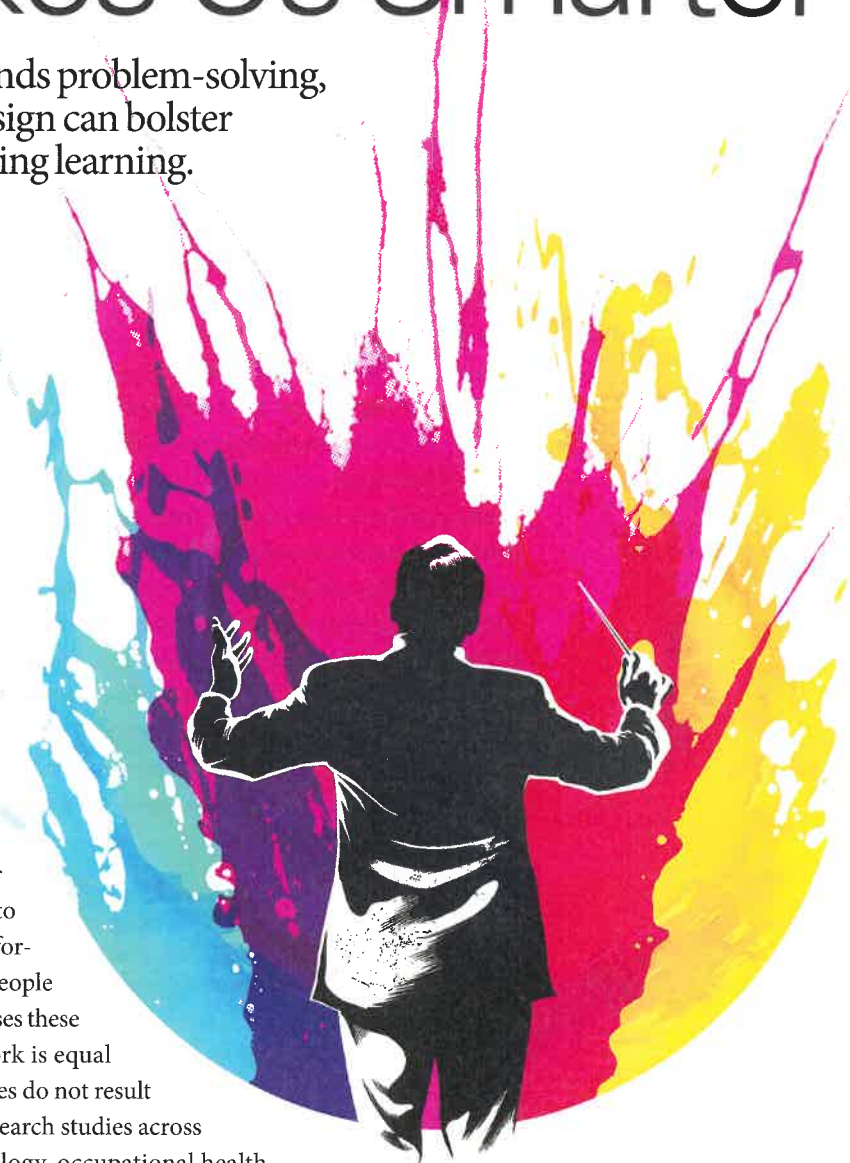
Work that permits autonomy, demands problem-solving, and meets other criteria for good design can bolster employees' cognitive skills and ongoing learning.

BY SHARON K. PARKER AND GWENITH G. FISHER

**P**romoting worker learning is an increasingly urgent priority: To succeed at executing technology-driven strategies, a company must have a workforce that can rapidly adapt to and master new tools, processes, and roles. As AI systems automate more manual and routine tasks, humans will likely take on work that is more cognitively challenging.<sup>1</sup> All of this makes it increasingly critical that managers understand how to foster cognition and accelerate learning in the workplace.<sup>2</sup>

We already know that both on-the-job learning and expert knowledge are strong drivers of higher worker performance.<sup>3</sup> But how can we further enhance work to promote learning? Is it possible to speed up people's informal learning at work? Can some types of work make people more (or less) intelligent over time? Our research addresses these important questions. The results show that not all work is equal when it comes to fostering learning — but the differences do not result from the type of work being done. From a review of research studies across multiple disciplines (including organizational psychology, occupational health, ergonomics, and gerontology), we identified the powerful role of work design for enhancing workers' cognition.<sup>4</sup> This means that, irrespective of a person's occupation, more learning will happen when work is well designed.

Work design is about the nature of people's work — for example, which tasks workers do and how many tasks they have — as well as how the work is organized, such as whether people work on a team or independently.<sup>5</sup> In this article, we'll describe five aspects of work design that we identified as shaping worker cognition, and ways to maximize them to boost learning. We'll also discuss the implications that this research has for an aging workforce and provide recommendations that managers can put into practice. But first, we'll explain what is meant by cognition, and the two types of intelligence that are important for worker performance.



**THE RESEARCH**

The authors systematically gathered research on work design and cognition from across multiple disciplines, including neuroscience, public health, aging, experimental psychology, gerontology, and management.

They identified over 180 articles through this process, which they synthesized into six distinct perspectives: work design, learning, human factors, lifespan/aging, occupational health, and neurology.

Based on an analysis of the research within these perspectives, they identified short-term and long-term processes by which key aspects of work design affect workers' cognition.

**Crystallized and Fluid Intelligence**

There are two key types of human cognition, both of which are crucial for worker performance: crystallized knowledge and fluid cognitive abilities. *Knowledge* includes the facts we know, our understanding of how to do things (procedural knowledge) and what is referred to as *tacit knowledge* (noncodified knowledge that's informally acquired and hard to explain, like driving a car). When people learn, they acquire new knowledge. Across a whole career or lifespan, knowledge typically increases as people gather experience and develop expertise and wisdom. (See "Fluid and Crystallized Intelligence Across the Lifespan.") This change is referred to as a growth in *crystallized intelligence*.<sup>6</sup>

Consider a sales representative who applies their knowledge of a product's features to sell it to clients. With repeated sales, they will learn more about the product and the clients, developing expertise. Over many years, their accumulated knowledge makes them an unusually effective and wise judge who can manage challenging clients and complex product issues. The sales rep's knowledge (crystallized intelligence) has grown.

The second type of cognition is *fluid cognitive abilities*, which is our capacity for paying attention, reasoning, and processing information. People use their perception and working memory, for

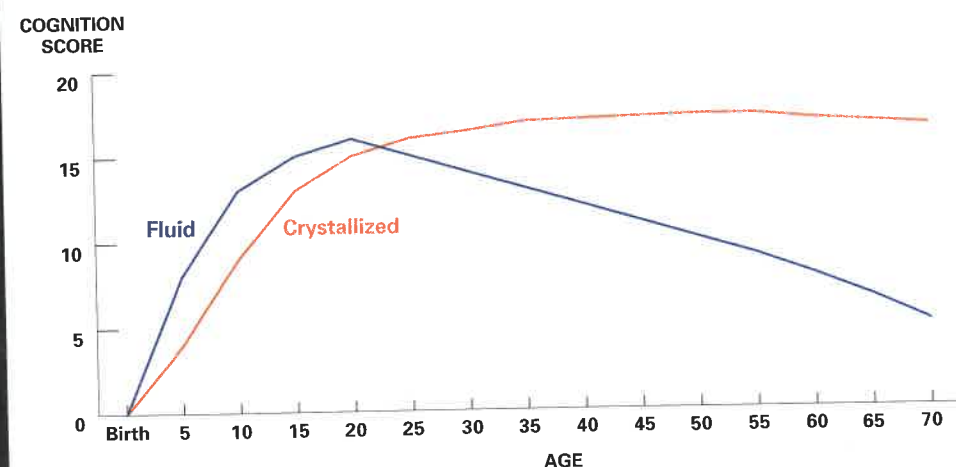
example, to reason, solve problems, and make decisions. For the salesperson described above, the underlying working memory capacity and speed of processing complex information enable them to solve a client's problem. In contrast to knowledge, which accumulates and continues to increase across the lifespan, on average these fluid cognitive abilities, sometimes referred to as *fluid intelligence*, tend to decline as people age.<sup>7</sup>

Our research suggests that work design can shift both the crystallized and fluid intelligence curves. We identified the following five aspects of work design as important for cognition:

- *Job autonomy*, or job control, refers to how much opportunity workers have to make or influence decisions and choose when they work on particular tasks, and how they go about doing their work.
- *Feedback* is the information a worker receives about the effectiveness of their work behaviors. Feedback can come from the job, such as when a customer offers praise or criticism, or when a sales rep can see how many orders they have booked; from formally structured systems, such as performance appraisal systems; from others in the environment, such as peers and supervisors; from electronic systems; and from the worker's own efforts to obtain feedback.

**FLUID AND CRYSTALLIZED INTELLIGENCE ACROSS THE LIFESPAN**

Although fluid intelligence — which includes working memory and reasoning — typically begins to decline in early adulthood, crystallized intelligence (or wisdom, knowledge, and expertise) does not deteriorate with age and often increases.



• *Job complexity* refers to the extent to which a job puts mental demands on a worker that require aptitude, skill, training, thought, creativity, and independent judgment.

• *Relational aspects* of work concern the social context within which tasks are executed, such as the degree of social contact, social support, task interdependence, and interaction with people outside the organization relevant to the job.

• *Psychosocial job demands*, such as workload and emotional demands, include those social and organizational elements of a job that require sustained physical or mental effort and incur physiological or psychological costs such as increased cortisol release, fatigue, and/or feelings of anxiety.<sup>8</sup>

**Enriched Work Design Boosts Cognition**

When work is well designed, it gives workers a chance to use their cognition by applying their existing knowledge and abilities and to further develop them. For example, if a salesperson has a highly complex job in which they repeatedly sort out challenging contracts, they have the opportunity to apply their knowledge of contracting, and they engage in problem-solving, which relies on cognitive processes like working memory.

But if the sales rep has no autonomy to address customer complaints and instead is required to refer every small problem to their supervisor, this reduces the salesperson's chance to apply their product knowledge or engage in problem-solving that draws on their expertise. As we will see shortly, these diminished opportunities for using cognition not only affect learning in the short term but can influence whether fluid intelligence declines as one ages.

The way that work is designed does more than shape whether people have the opportunity to use their cognition: Work design can also *accelerate learning*. Especially important is having complex and challenging tasks, job autonomy, and feedback. Complex, challenging tasks stimulate the *need* for employees to explore effective work strategies to achieve their goals. Job autonomy then allows people the chance to explore and experiment with

different strategies. And finally, feedback provides *information* regarding which strategies are effective. Together, these aspects of work design speed up workers' learning.

Some of the best research supporting the idea of accelerated learning comes from the University of Sheffield.<sup>9</sup> In a series of studies in manufacturing, the researchers showed that machine operators learned to anticipate and then prevent faults when they were given greater job autonomy. Using a novel methodology in which they analyzed the pattern of machine breakdowns before and after the intervention, the researchers showed an initial decrease in machine downtime of 20%, followed by a larger decrease in downtime of 70% in the long run. The initial decrease in machine downtime was due to the fact that when operators were given the autonomy to solve problems themselves, they could respond more quickly than when they had to call on specialists like engineers. But the lagged and larger decrease in machine faults occurred because over time, operators' greater autonomy meant they were able to learn how to prevent faults from occurring in the first place.

Examples of how poor work design can impair learning have also emerged in the context of automation. Sometimes workers become passive monitors of the machines, with their main role being to watch the machine in case it breaks down. In such jobs, workers have low active engagement with the automated system, with little autonomy to influence its operation, little opportunity to use knowledge and solve problems, and little feedback based on their actions. The consequence is that workers lose touch with what is happening; they are left out of the loop. When the automation fails (as it invariably does, since no automation is 100% reliable), the workers' limited awareness regarding what is happening with the machine makes it impossible for them to recover the situation effectively.<sup>10</sup>

Aviation provides a classic example of this sort of failure. Analyses of several plane crashes have revealed situations in which the autopilot failed, and the work design of the pilot meant that they had insufficient situational knowledge to quickly address the problem and recover the plane.

Another pathway by which work design affects cognition is *motivated exploratory learning*.

Well-designed work generates motivation, such as feelings of enthusiasm and commitment that in turn foster engagement and learning. A motivated sales rep who is interested and engaged in their job will do things that boost learning, such as ask questions, observe other salespeople to see what strategies work for them, try new approaches, and seek out novel projects. All of these motivated behaviors — inquiring, observing, exploring, and taking on stretch work (tasks that exceed their existing competencies) — will boost the salesperson's knowledge and provide opportunities for using increasingly complex cognitive abilities, such as reasoning, problem-solving, and creativity.

Several aspects of work design have been implicated in this motivational pathway. When people have job autonomy, they develop a strong sense of ownership over their work, which motivates them to go above and beyond to solve problems in their jobs. When jobs are complex, it gives motivated individuals the chance to demonstrate and reinforce their sense of competence on the job. A supportive social context also motivates learning, because workers feel psychologically safer to try new things. In other words, they have an opportunity to apply their knowledge and engage in problem-solving, with little risk of negative consequences if they make a mistake. In one study, researchers reported that support from peers/managers predicted engagement in informal learning behaviors, which in turn predicted knowledge and skill acquisition.<sup>11</sup>

Interestingly, from a motivational perspective, feedback can be a double-edged sword. Sometimes, too much feedback can become a crutch, focusing workers' attention on the goal of getting positive feedback and shortcutting one's actual learning.<sup>12</sup> In addition, when feedback is strongly evaluative and focused on the person more so than on the task, feedback can become negative for learning. Strong evaluative feedback, such as personal judgments about how well one is performing, causes people to focus on themselves in an anxious way, which can become demotivating and distracting. The reduced motivation from highly evaluative feedback explains why feedback from the job — such as direct feedback from customers — is sometimes more powerful for learning than feedback from others, such as peers or supervisors.

Such findings have led researchers to advocate for the importance of having a supportive feedback environment in which, for example, feedback comes from credible peers or supervisors, involves acknowledging positive performance, is specific and provided frequently, and is delivered in a supportive and task-oriented manner.<sup>13</sup>

### Excess Demands Impair Cognition

Although complex and stimulating work is generally positive for learning, it is important that this challenge does not become too great. Highly demanding work can invoke a physiological stress response that interferes with learning and workers' abilities to focus attention, via the process of *strain-impaired cognition*. The stress response includes the more rapid secretion of cortisol and other glucocorticoids in the body, which increases the amount of sugar, or glucose, in the bloodstream. Although the boost of glucose increases energy and may improve short-term memory at the time, over longer periods this stress response can impair longer-term memory and block learning.<sup>14</sup>

Aspects of work design that can result in strain-impaired cognition include a lack of job autonomy; a lack of social support; and excessive psychological demands, such as long work hours, a high workload, time pressure, high levels of role conflict (being pulled in different directions to fulfill different work goals), or exposure to interpersonal conflict such as incivility, harassment, or bullying. One study, for example, showed that when workers experience disrespect and rudeness from others at work, their ability to pay attention is reduced, interfering with cognition and impairing problem-solving and creativity.<sup>15</sup>

In a final process that we refer to as *depleted cognitive capacity*, excessive complexity can be a particular block when workers are learning a new task. Humans' working memory and attentional capacity are finite, so when tasks are too complex, an individual is no longer able to absorb information, and learning is impaired. The implication is that when teaching someone a highly complex task, it is important to break it down into simpler steps or subtasks. It is also important not to add to the cognitive burden, such as by providing poor instructions.

### Implications for Supporting Effective Aging

To this point, we have considered the short-to-medium-term processes by which work design shapes learning, which is important for promoting high job performance. But there is a further important, longer-term value of well-designed work: the intriguing idea that, over time, well-designed work can help maintain workers' cognitive abilities and reduce age-related decline, likely as a result of changing brain structure or function. This *cognitive preservation pathway* dovetails with the "use it or lose it" process discussed by neurologists: Individuals who are consistently mentally active can preserve their cognitive function (and forestall loss of their cognitive abilities/fluid intelligence) through increased neuronal development in the brain.<sup>16</sup> Research supports the idea that job autonomy, job complexity, and relational work design can help preserve cognition. Through studies in occupational health and lifespan gerontology, work design has been linked to long-term cognitive ability outcomes, such as the prevention of cognitive decline or decreased risk of Alzheimer's disease.

With this domain of research, it is important to rule out the possibility that people with higher cognitive abilities choose more complex or autonomous jobs (that is, the reverse causal pathway of our focus here). Thus, the strongest evidence for a "use it or lose it" process triggered by work design comes from showing a link between work design and a later *change* in cognition.

In one study of this type, researchers analyzed data collected over an 18-year period from the University of Michigan Health and Retirement Study.<sup>17</sup> The researchers found that workers in more mentally demanding jobs had higher levels of cognitive functioning (as measured by tests of episodic memory) and declined less compared with those in less-complex jobs. Another example comes from Sweden, where researchers tracked more than 2,000 dementia-free 60-year-olds for nine years and found that those with high job autonomy and high demands (that is, an *active job*) in their longest-held job had lower cognitive decline compared with individuals with poorer work designs.<sup>18</sup> Moreover, the longer that a worker had been in an active job, the better the cognitive outcomes.

It's likely that good work design, in addition to shaping people's fluid intelligence over a career, also influences crystallized intelligence over the long term. Previously, we discussed how job autonomy, complexity, and feedback can accelerate the acquisition of deeper and broader knowledge. It makes sense, therefore, that long-term exposure to such work designs should result in an accumulation of knowledge, such as the development of expertise and even wisdom. Few studies to date have linked work design to these sorts of crystallized intelligence outcomes, but it is interesting to note that there is strong evidence that job performance does not decline with age, even though people often have age-related declines in fluid cognitive abilities such as memory and reasoning.<sup>19</sup> One explanation for this result is that declines in memory and processing speed are potentially offset by increasing crystallized intelligence.

Finally, just as good work design likely promotes positive changes in cognition over a career, poor work design can drive negative outcomes by impairing health. Although research is still quite scarce, long-term exposure to chronic stressors appears to be associated with a higher prevalence of cognitive decline (including memory impairment and dementia) among older adults. An analysis of a population-based study of dementia in Swedish twins found that if a twin had low job autonomy in combination with low social support and high job demands, they were more likely to get dementia in old age than their twin with better-quality work.<sup>20</sup>

These findings linking work design to long-term cognition are very important. We have an aging population and a growing mature workforce for whom it is vital to maintain cognitive functioning as they continue to work longer than previous generations. Well-designed work may be a powerful protective factor that helps older workers learn new skills, boosting crystallized intelligence and reducing impairments in fluid intelligence as workers age. (See "Influencing Cognition Across the Lifespan," p. 46.)

### Work Design for Cognition Needs Attention From Leaders

Unfortunately, the quality work designs we have discussed as promoting learning tend to be thin on the ground. For instance, one European survey of over

44,000 workers showed that 20% of workers hold a “poor quality” job (with low skill use, little autonomy, and poor work conditions), and a further 13% have a high-pressure job with excess demands.<sup>21</sup> Moreover, Gallup’s recent analysis of U.S. work shows that job quality during the COVID-19 pandemic has declined for at least 40% of workers, and the decline has been greatest for those who had the poorest-quality jobs to begin with.<sup>22</sup> These studies suggest that good work design is not widespread, with spillover consequences for worker learning, job performance, and the long-term cognitive functioning of large numbers of people.

The increasing use of AI systems to perform supervisor tasks also poses a risk for good work design. Research shows that although digitalization can increase job complexity as a result of more routine tasks being performed by machines, it also has the potential to increase computer-based control in the workplace and to create passive “monitoring” jobs with limited autonomy and reduced opportunities for learning. (See “How Algorithmic Management Affects Work Design.”)

Fortunately, there is plenty that organizations and managers can do to address these issues.

**1. Develop and train managers who understand how to create high-quality work.** For example, managers should aim to design and

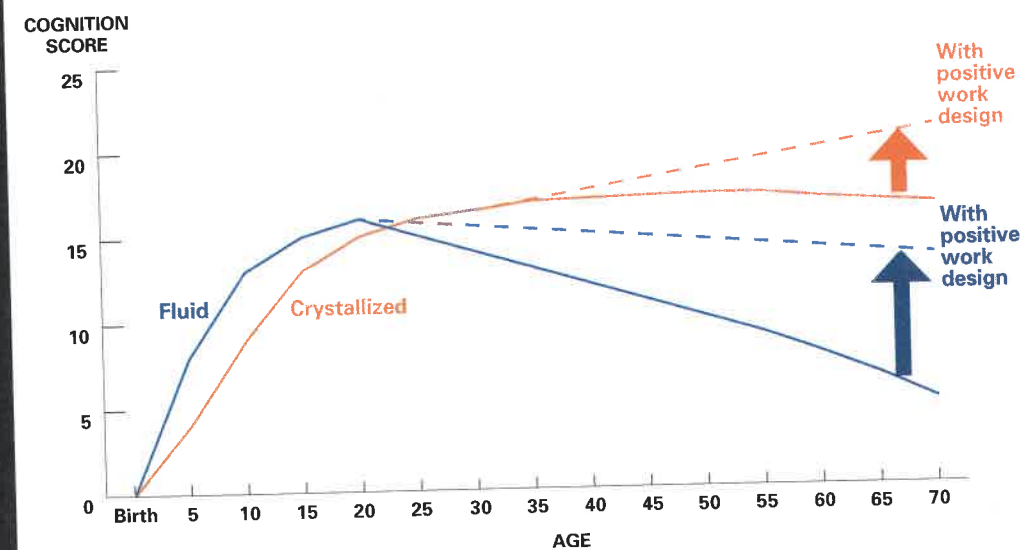
structure work in a way that gives workers autonomy and control over their activities, promotes their engagement in decision-making, and allows them to engage in problem-solving. Managers should also reduce job stressors and fatigue at work, and provide emotional and practical support to help alleviate potential stressors.

This must start with training and awareness-raising for managers. Our own research shows that managers often do not think about designing interesting and stimulating work for people.<sup>23</sup> Managers also often need support to develop the skills required to lead with an empowering rather than autocratic style. Investing in training managers in work design is a necessary component for accelerated learning. A practical approach for improving work design is to apply the SMART model, which synthesizes the key aspects of work design into a holistic framework:<sup>24</sup>

- S** — Stimulating (complex and varied work)
- M** — Mastery (providing job feedback and role clarity to aid mastery)
- A** — Agency (job autonomy and control)
- R** — Relational (social contact, social support, and interaction with others)
- T** — Tolerable (manageable levels of job demands such as workload and time pressure)

### INFLUENCING COGNITION ACROSS THE LIFESPAN

Good work design helps crystallized intelligence continue to increase and prevents fluid intelligence from dropping off steeply as workers age.



**2. Organize work differently to improve workers’ learning.** There is a long history of work design interventions such as job enrichment, empowerment, and self-managing teams, with evidence that these initiatives can improve both worker well-being and performance.<sup>25</sup> Job enrichment, for example, involves not only expanding the variety of tasks that workers perform, but also granting workers greater decision-making responsibility. Decisions that might once have been made by specialists or managers are delegated to workers, with efforts to ensure that they have the training and skills to exercise their greater authority wisely. Tasks that connect with one another can be grouped to form a single job with skill variety instead of being fractured into multiple distinct, narrow jobs. Excessively standardized protocols, such as when teachers are required to follow highly prescribed lesson plans, are avoided where possible. Such steps will help create learning-oriented work design.

**3. Develop work policies and culture to align with enriched work design.** For example, health and safety policies should explicitly include consideration of work design. Mental health policies often focus on the provision of counseling services to stressed employees but pay little attention to the work-based causes of stress, such as excess job demands. Career planning sessions could include explicit discussions of work design as a vehicle for development. A supportive, open, and learning-oriented culture goes hand in hand with efforts to harness the learning benefits of good work design.

**4. Promote individuals’ efforts to improve the design of their own work.** Workers often see formal training as the best or only pathway for their personal and professional development, so it is important to raise their awareness that well-designed work can enhance their learning and cognitive health. Workers can be encouraged to craft their work so that they have more challenging projects, more chances to take the initiative, and stronger social networks. A great deal of research evidence shows the value of such job crafting for creating more satisfied employees in higher-quality jobs.<sup>26</sup>

Workers can deliberately engage in stretch work to build skills over their careers.<sup>27</sup> Seeking promotions, moving to new jobs, or changing occupations will also help to foster positive cognitive outcomes if these moves result in better-designed work. Importantly,

### HOW ALGORITHMIC MANAGEMENT AFFECTS WORK DESIGN

Organizations concerned with how work design affects cognition will want to keep a close eye on the adoption of AI tools that automate employee management tasks. Research that one of us (Sharon Parker) has conducted into so-called algorithmic management finds that these systems may degrade the quality of work experiences to the detriment of employees’ cognitive development.

Xavier Parent-Rochelleau and Parker recently analyzed 45 studies of algorithmic management and found that management tasks undertaken by these systems — monitoring, goal setting, performance management, scheduling, compensation, and termination — can directly affect work design for employees.<sup>1</sup> Namely, each of these functions affects both job resources (such as autonomy, feedback, and complexity) and job demands (such as workload) — all of which can be important to well-designed work that supports cognition.

Algorithmic management most commonly lowers employee autonomy; this effect was seen in every function of the six listed above, except for termination. Automated monitoring and goal setting tend to reduce job complexity, and monitoring also degrades problem-solving opportunities. Higher workloads, lower social support, and greater job insecurity can be further consequences when algorithms take over employee management tasks.

such strategies need to be balanced alongside the awareness that making one’s job too demanding or stressful can cause strain, deplete cognitive resources, and lead to impaired cognitive functioning.

**FINALLY, BEYOND CHANGES** within the organization, leaders must recognize that work design is embedded within a broader public policy and legislative context. Change at this level might well be needed to bring about improved work designs that foster cognition over longer time spans. National policies on issues such as precarious employment and digitalization should be considered from the perspective of the cognitive well-being of members of society. To maintain a skilled and knowledgeable workforce, policy discussions about the implications of digital technologies need to go beyond the current emphasis on ethics (related to biased decisions made by algorithms, for instance), or projected statistics on jobs lost to automation, to include how new technologies affect the quality of people’s work design.

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# When Losing Money Is Strategic — and When It Isn't

A simple but often overlooked analysis of unit economics can help entrepreneurs know early on whether they are driving for unhealthy losses.

BY RAMON CASADESUS-MASANELL, DÓRA HORVÁTH, AND S. RAMAKRISHNA VELAMURI

The bike-sharing company Ofo was founded in 2014 by members of a Peking University bike-riding club without much fanfare. They initially focused on bike tourism but swiftly switched to what they saw as the bigger prize: a bike-sharing app. In the next three years, the company's growth exploded. By 2016, Ofo had a fleet of 85,000 bicycles in China, and it soon began to open locations around the world, including India, Europe, Australia, and the United States. The company would eventually raise a staggering \$2 billion in funding. But by 2018, facing stiff competition and cash flow stress, its leaders considered filing for bankruptcy several times. A year later, Ofo was out of business.

What went wrong?

Ofo, like many new ventures — especially those backed by venture capital — focused on growth in its early years. Often, that means a venture will lose money. That's not unexpected in a startup, of course, but the key question is whether such losses are healthy or unhealthy.

If the business model anticipates both creating and capturing value, the losses occur purely because the entrepreneurs are investing in growth and scale. Over time and with scale, the losses should take care of themselves. These are healthy losses.

But if the business model is fundamentally flawed and fails to capture a part of the value it creates, then

