Tony Gambell, Parag Patel, and Anand Shekhar

A best-seller from two decades ago proves surprisingly relevant for today’s manufacturing footprint questions.

In the top-selling motivational business book *Who Moved My Cheese?*, Dr. Spencer Johnson describes two mice and two people who live in a maze and search for cheese. Through a series of allegorical scenarios, Johnson articulates several truths about change and suggests how managers should consider the organizational psychology associated with change. We believe the same principles are transferable to the topic of manufacturing network strategy.

For at least half a century, companies have developed their manufacturing network strategies according to relatively stable assumptions, often on multidecade time horizons. Decisions to make major investments in brick-and-mortar sites were typically straightforward, albeit nontrivial. The optimization of total landed cost was the dominant objective, and most network changes were motivated by the pursuit of low-cost-country arbitrage opportunities.

Today, the same economic principles still guide decision making and are top of mind for most manufacturing executives; however, many additional factors now render decision making much more complicated. Companies need not only to drive cost optimization, but also to fend off the headwinds of softening growth in developed markets, ever-rising factor costs, global regulatory and tariff uncertainty, and disruptive technologies. Heuristics and algorithms provide only a baseline answer, upon which a company must build strategic alternatives.

The world is changing dramatically, and so, too, must the lens through which we perceive manufacturing network strategy. The change principles outlined in Dr. Johnson’s book provide a framework for guiding this transition.
Change happens

Through its manufacturing network strategy, a company aims to establish a web of factories that best serve its customers by providing the lowest-cost, highest-quality products and by meeting service-level requirements for lead times—all while satisfying the company’s own aspirations. These usually include minimizing landed cost in order to deliver the greatest return to shareholders, providing predictability and security to the workforce, and ensuring reasonable fixed costs related to any changes to network design (such as consolidation, transition, and investment). Furthermore, the company must pursue these objectives while defending against competitive threats.

When optimizing these objectives, companies typically assume the decision factors will be “frozen” for a reasonable amount of time, often three to five years. In highly capital-intensive industries, it may be much more: the investment horizon for a chemical company’s ethylene crackers is often 10 to 15 years. At the other extreme, an apparel maker might change locations every two to three years.

Today, consumer needs, factor costs, and factory economics are all changing—and faster than most executives have expected. Furthermore, they promise to change even more in ways we cannot fully anticipate.

Anticipate change

In the past, the most unpredictable factor that manufacturing network strategies had to accommodate was uncertainty of demand. That’s still important, but today change is coming from many additional sources all “moving the cheese” at once: from technological advances in equipment to digital and analytic techniques that are spurring innovation. New entrants, potentially disruptors from outside the industry, are seeking to take advantage of sleepy incumbents. And governments are considering or implementing changes to taxation, trade, and labor policies. Let’s explore each of these changes.

Technology. Increased use of digital and analytics is already improving manufacturing productivity, efficiency, and effectiveness. The Internet of Things (IoT) and big data analytics are not only increasing responsiveness, but also improving outcomes, such as significant yield increases that have resulted from using advanced analytics to optimize input parameters. Digital advances and better human-machine interfaces will enhance problem solving, operator training, and overall visibility into performance. At the same time, lower automation costs are fundamentally changing discussions about when and how to use automation in manufacturing.

Changes in equipment use and design also are raising productivity. Additive manufacturing
(or 3-D printing), for example, could intensify localization in specific applications, such as spare-parts manufacturing. Installing sensors on manufacturing-line equipment will make significantly more data available, increasing equipment uptime through better predictive maintenance.

**New entrants.** Disruption is also coming from innovative players, often outside of incumbent industries, that are well equipped to take advantage of technology trends. Recent examples include Amazon’s entry into brick-and-mortar retail with pop-up stores promising more-efficient shopping experiences, IBM’s foray into healthcare technology with IBM Watson Health, and Uber’s move into food delivery with the launch of UberEats.

**Government policy.** Finally, governments are taking a closer look at a wide range of measures that could upend long-unquestioned orthodoxies underpinning manufacturing network decisions. Among the furthest-reaching are proposed changes in corporate-tax structures, with potentially significant effects for manufacturers. In addition, major policy changes in global trade are affecting perceptions of manufacturing companies, whose decisions are more public—and therefore more constrained. And new regulatory provisions governing issues such as minimum wages and worker mobility add further wrinkles to strategic planning.

**Monitor change**

By now you may have accepted that change is imminent and must be anticipated, but can you anticipate everything? No. In a world defined by uncertainty, manufacturers must isolate the factors that matter uniquely to their businesses and focus more on the cost sensitivity of the outcome.

This means paying much more attention to the sensitivity of the network-optimization scenarios and understanding how different factors influence each other and the outcome. For some companies, managing capital intensity is the most important concern. For others, availability of skilled labor or relative factor-cost fluctuations will matter most.

One consumer packaged goods company’s manufacturing economics were most sensitive to labor costs. Given the expected market mix, the company could produce in two countries. In the end, the relative factor-cost fluctuations between the two supply countries mattered more than the sensitivity of costs between the supply country and the demand market. This gave the company a strategic option to shift production volumes between two sources and recognize the labor-cost arbitrage every time.

Traditionally, network reviews are triggered by a major strategic action or event (such as a spinoff or acquisition) or conducted as part of a four- to five-year strategic review. Increasingly, companies are reviewing their network view every year. In the end, companies still need to make bets and take calculated risks, but as the frequency of the bet taking increases, companies are better able to dampen the fluctuations.

**Adapt to change quickly and change**

Given the magnitude of change today, manufacturers that are willing and able to adapt to the change quickly can capture significant first-mover advantages, such as in reputation, revenue growth, or standing with governments. Moreover, many of the forces of change, such as advanced manufacturing technologies and new digital capabilities, are creating new pools of talent that fast movers are better at attracting.

Most important, the ability to capitalize on changes quickly will allow companies to tap into new sources of value that boost their bottom lines. New factor-cost opportunities will keep emerging, as will microclusters offering deep talent specialties, such as Shenzhen or Tel Aviv in high tech and Boston in biotech. Low-cost natural gas is promoting a boom in downstream petrochemical production.
in North America, with up to seven million metric tons of ethylene capacity forecast to be added by 2019.

Although traditionally manufacturing has not been driven by technology innovation, many companies are now fostering innovation with strategic bets. Johnson & Johnson’s Janssen pharmaceutical business, for example, has said that by the mid-2020s, 70 percent of its products will be manufactured via continuous manufacturing. Meeting ambitions such as these will require new organizational capabilities and infrastructure to support innovation, with many companies creating roles such as for chief digital officers or heads of analytics and digital.

Enjoy change

Even after identifying the actions to take and the mind-sets to move, manufacturers still must ask how managers can motivate their people to embrace (and even enjoy) this cycle of ever-quicker responses to change.

Looking to history

Companies that have reinvented themselves have profited handsomely, while there are multiple examples of companies that failed to adapt, leading to their eventual demise. Blockbuster Entertainment, once the largest video-rental company in the United States, proved unable to respond quickly enough to competition—especially from newly viable video-on-demand services—and entered bankruptcy less than a decade after its peak. By contrast, Blockbuster competitor Netflix transitioned from mail-based DVD rentals to video on demand to becoming a content creator in its own right.

Similarly, Toyota provides an example of adaptation in automaking, from the creation of its production system (the basis for much of today’s lean management) to its expansion of global production, to its early commitment to hybrid powertrains. And oil refineries have increased their built-in ability to manage complexity, which enables rerouting of production capacity to the most profitable products and encourages continuous cost optimization.

Apart from the long-term strategic wins, organizations that embrace this philosophy of frequent change experience almost an endorphin rush, just as occurs when a person exercises vigorously. Talented employees feel suitably challenged and motivated by opportunities for advancement, and they adopt an external focus—examining effects of changes on customers and competitors, rather than being bogged down in internal considerations.

Making change happen

As a practical matter, leaders and managers must take several steps to help their organizations embrace change as a force for good. First, they must develop a convincing change story—a strong narrative showing not only that the transformation is absolutely necessary, but also that it is achievable, with lighthouse examples of successful change from within the company or at least the industry. Next, they must disseminate and communicate the story, reaching out to key influencers (including a mix of the risk-averse and those more open to change) through cascaded communication by top- and midlevel leaders. Rewarding and recognizing team members who are eager to embark on the transformation journey helps the rest of the organization embrace this goal. And last, it is critical for leaders to role-model the new philosophy of embracing change by taking bold bets, encouraging external focus, and talking about changes and their implications.

Taken together, these steps could allow managers to succeed at transforming their organizations into a lean and nimble machine that not only is able to respond to change, but also enjoys the challenge it provides.

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Be ready to change quickly—and enjoy it again

In the current era of increased uncertainty, leaders need to maintain multiple options for responding to changing conditions. Increased optionality can be built into both the network design and the implementation road map.

To meet expectations for shorter lead times, companies must design their manufacturing networks to meet different levels of lead-time requirements, optimizing for efficiency in the short term and agility in the longer term.

Agility in design

To meet shorter lead times without adding cost, manufacturers can use three potential levers.

**Late-stage differentiation in distribution.** Although higher inventories may be required, building a more robust delivery infrastructure, such as by establishing partnerships with e-tailers, can help drive late-stage differentiation. But companies must beware that the partner can readily become a competitor in its own right.

**Supply-chain localization.** Manufacturers can shorten end-to-end lead times by establishing in-region supply chains while providing options for backups from outside the region.

**Multi-capability sites.** Many plants are monolithic, capable of manufacturing only a limited set of products under a single capability. This approach results from a desire for scale under an operations-centric view that scale will always reduce costs. Equipping plants with multiple (even redundant) capabilities, as at oil refineries, can build more optionality into the network structure and accommodate changes in the production plan without additional investment.

Agility in implementation

The implementation road map should include multiple stage gates, so companies can skillfully maneuver multiple sources of uncertainty.

**Define clear milestones and trigger points.** With uncertainty looming about tariff and related trade regulations, simply engaging with government—even on a regular basis—is no longer enough. Manufacturers must also incorporate scenario planning into their implementation road maps, with well-defined milestones and trigger points relating to different possible resolutions of the uncertainties. Setting out clear alternatives will help companies meet their overall strategic business objectives, including cost, under a wide range of outcomes.

**Embrace disruptive change.** Manufacturers should also embrace the disruptive change that
technology companies are promoting and partner with them. For example, automotive companies are partnering with technology companies to develop driverless cars. When faced with disruptive manufacturing technologies, companies can mitigate risk by partnering on a limited basis with outside technology experts.

Pilot programs are an effective way to learn about disruptive strategies and break down a big decision into smaller, less risky initiatives. A large industrial-equipment manufacturer implemented a new IoT-based process that fed back quality issues arising from field use directly into the design and production process. Rather than making a big bet on technology that small-scale, disruptive vendors were offering in the market, the manufacturer decided to test out this new technology at one site and measure the impact on sales. When the resulting revenue was less than it had expected, it shut down the program and minimized losses.

Another agile strategy is to be open to acquiring technology start-ups. Some companies are now looking to acquire new manufacturing technologies only after they have matured, which means smaller start-ups take on a larger share of the risk.

What are the implications for manufacturing network strategy?

When thinking about manufacturing network strategy, companies should assume that the pace of change in today’s global economy will continue to accelerate. Companies must no longer think of manufacturing network strategy as an intellectual exercise to be conducted once every five to ten years. Instead, they must now constantly evaluate their asset base and examine if it is best positioned to maximize returns in their business.

Manufacturers must liberate themselves from the constraints of conventional wisdom, inflexibility, and one-dimensional, landed-cost economics. Freed from these constraints, they can formulate multiple network scenarios that not only optimize for today’s realities but also present options for dealing with tomorrow’s uncertainties.

We end with a cautionary message in Dr. Johnson’s book: “If you do not change, you can become extinct.” But with the right moves, manufacturers can evolve with their environment—and thrive.

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