WHY ENGINEERING MATTERS IN MANAGEMENT

To set the international business agenda appropriately, MBA programs must pay attention to operations

BY BUBLU THAKUR-WEIGOLD AND STEPHAN M. WAGNER

One glance at MBA curricula worldwide will suffice to show that virtually no institution considers operations to be a viable part of strategic leadership. The typical business school offers at most one class, and that one usually is associated with tools. Here is a sample:

Harvard (U.S.): One class, which is combined with technology
IMD (Switzerland): One class
INSEAD (France): One class – This compares to the four finance courses offered in its core.
Wharton (U.S.): One class

Because what happens in business schools has such a tremendous and growing influence on what happens in the world, it is worth examining the assumptions that shape our programs.

Renowned management professor Sumantra Ghoshal spent decades teaching and researching. He had a physics degree along with doctorates from the MIT Sloan School of Management and Harvard Business School and was a faculty member at INSEAD and London Business School. Shortly after he died, his paper "Bad Management Theories Are Destroying Good Management Practices" was published in *Academy of Management Learning & Education*. Ghoshal had come to the conclusion that business schools generate self-fulfilling prophecies, writing, "Negative assumptions become real through the process of double hermeneutic."

Unlike scientific theories (in physics, for example), where an incorrect understanding of gravitational forces will have no effect on how gravity actually works, Ghoshal noted that the ideologies and assumptions of social sciences actively influence the behavior of the objects (managers) they study because the managers under scrutiny are simultaneously the "consumers" of these theories.

In other words, if MBA programs characterize managerial behavior in a particular way, then that's what their graduates will put into practice. Although Ghoshal claims that pseudo-scientific methods motivate egregious managerial behavior, we assert that business education actually underserves scientific and engineering analysis. MBA programs that don't emphasize the importance of operations perpetuate these assumptions at considerable expense to society. The leadership culture of European industry differs from the United States, but both regions deliver evidence of this trend.

Marginalizing the important things

Indeed, what are the assumptions and the implications of MBA programs, which place operations at the sidelines of managerial action? Do the COO and her team not really belong to the cadre of business leaders? Are they technical specialists of infrastructure, but not the visionaries who define a company's strategy and set its agenda? When we evaluate the status of operations through the eyes of MBA designers, it is hard not to arrive at this conclusion.

The marginalization coexists with proof that operations create competitive advantages beyond mere efficiency. Research has established that those companies with more perfect order fulfillment and fewer supply chain disruptions deliver higher profits and better shareholder value. In practice, managers from industries as diverse as car manufacturing, garment retail, fast-moving consumer goods and high technology have originated well-publicized innovations. The Toyota Production System, lean manufacturing, and minimizing the global footprint have revolutionized our thinking to the point where its nomenclature is popular culture.

Most managers strive to be "just in time" while running a "lean" operation. We still meet executives whose first response to financial distress is to "reconsider their global footprint" or launch a "lean program," assuming that they are losing money because something has become "flabby" or "overweight." Our discussion will return to the power of these metaphors.

Zara's model of fast fashion has made its inventor (a tailor without an MBA) the richest man in Spain, and the company remains peerless in its cutthroat industry. Procter & Gamble's recognition of how handoffs distort information across the supply chain was a stroke of genius. The collaborative planning it drove with Wal-Mart has achieved benchmark status and is an evergreen source of competitiveness. Hewlett-Packard and Benetton made late ("postponed") product completion a lucrative reality back in the day. Each of these breakthroughs has become a classic case study published by top-tier business schools, teaching how operational strategy makes the difference between success and failure. The more brutal the market – demanding consumers, spiraling commoditization, low margins, cutthroat competition – the more valid it is to note that the supply chains, not the companies, are the competitors.

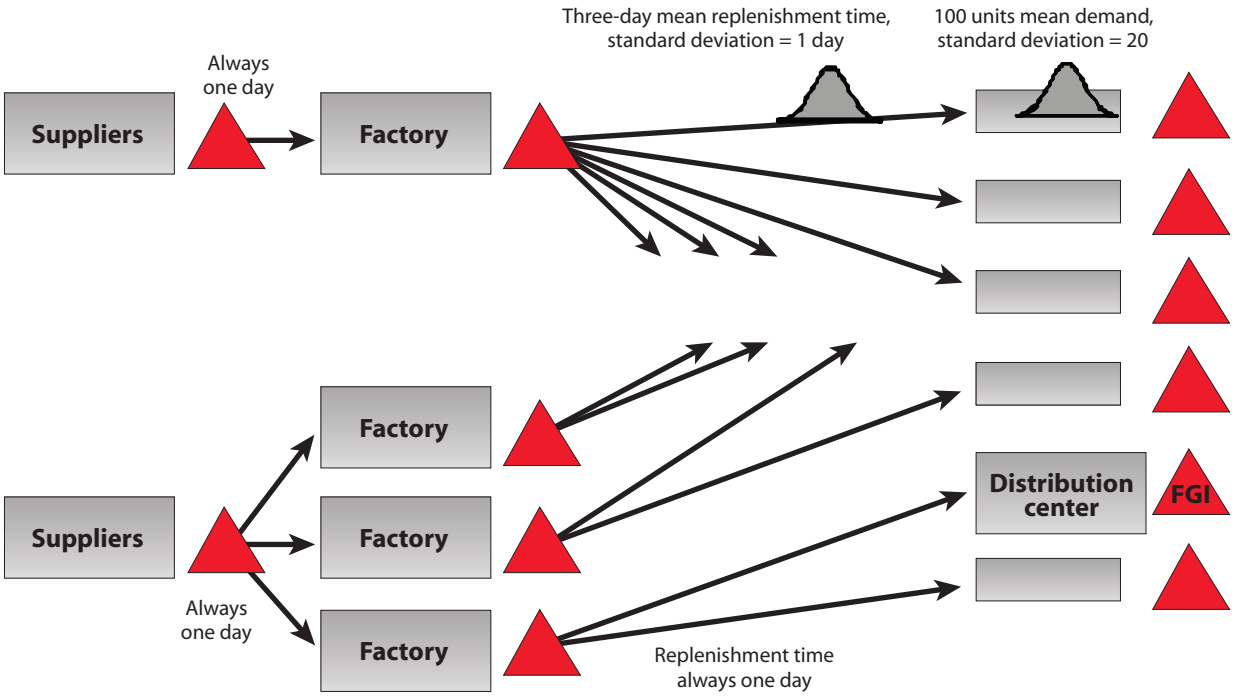
Math is hard

The problem with these stories, and with industrial engineering in general, is that implementation is hard, complicated, mathematical and counterintuitive. Even our own articles gloss over the details, as if they were inappropriate for popular (i.e., managerial) consumption. Tom Davis' seminal article "Effective Supply Chain Management" in *MIT Sloan Management Review* insists that, "Only analytical techniques – or darned good luck – can precisely tune a supply chain. In our experience ... even the best-run supply chains could reduce their inventory investment by 25 percent. ... More typically 50 percent reductions are possible."

In spite of the fact that a staggering 50

WHEN YOU NEED MORE THAN A LOOK

Figure 1. Which supply chain requires less inventory? A couple of pages of undergraduate statistical analysis, not intuition, are needed to answer that question.



percent cost reduction is at stake across a multienterprise system, Davis withholds the mathematics of the model itself. Is it out of delicacy that the reader is spared the unsightly, but indispensable, techniques? By sanitizing the story of the detail necessary for implementation, it perpetuates the widespread belief that managers should not have to deal with anything more than a one-page summary or the arithmetic they learned in grade school.

More than 10 years ago, *The Economist*'s special report on supply chain management declared that, "Managing a supply chain is becoming a bit like rocket science," a description that is positive at first glance only. The industrial engineer is the equivalent of the proverbial rocket scientist, and who does not enjoy being held up as exceptionally clever? But if we follow the metaphor to its end, a less flattering portrait emerges: the introverted nerd, the mad scientist, the IT guy spouting jargon in a dim server room. The cliché of the powerless genius has its grain of truth in the fact that only the rare scientist can tell a good story, whereas the leader has rhetorical confidence.

Business leaders are expected to be articulate masters of the metaphor. They tell the story in compelling form, using the jargon of their trade. The division of labor (and prestige) into the analytical and the narrative explains, to some extent, why the CEOs of large multinationals are often trained lawyers or CPAs. By contrast, the engineer-scientist withdraws to his or her complicated, but low-profile job. The popular U.S. TV show "The Big Bang Theory" draws laughs via four different caricatures of the rocket scientist as a buffoon.

Here we must return to the double hermeneutic, or self-fulfilling prophecies of higher education. Engineering schools do not usually include leadership in their curricula, either because they do not imagine their graduates moving into this role or because its status among "quants" is equally frivolous. For example, a definitive supply chain management textbook by Sunil Chopra and Peter Meindl does not include a chapter on leadership or change management. In turn, the MBA graduates who formally learn leadership and finance are expected to relegate the rocket science to specialists in their server rooms.

This division is increasingly artificial and costly to society. Because they design the product, compute the best manufacturing location, select who supplies what and at what price, configure distribution networks and more, industrial engineers set the parameters of global trade as much as the WTO does, although their work is rarely picked up by popular radar. While the complex work of supply chain management shapes the world, it remains invisible. If MBA program design is any indication, business leaders should put their faith in arithmetic and cost-cutting checklists. Presumably, the rarefied work of strategy is above analytics.

A recurring example from our teaching practice at ETH Zurich helps to illustrate this. When confronted with the supply chain problem displayed in Figure 1, a startling number of management students felt confident enough to venture an answer after a few minutes of "eye-balling" the problem.

In fact, the correct choice can be determined only after a statistical calculation of medium difficulty – two pages of calculations, to be exact, applying no more than undergraduate-level statistical methods. Millions of dollars prove to be at stake in the deceptively simple scenario. Were the real decision to be made with the same overconfidence, the real company could be set up for significant losses. Perhaps, after a few quarters of chagrin, the enterprise might even launch a comprehensive lean manufacturing program. Noteworthy are not the mathematical facts, but how uncritically students of management overrated their ability to judge them.

Recent history bears this out. Entire facilities have shifted to Asia based on swift, decisive executive reviews, and some of these facilities are now being "reshored" with the same tell-tale speed, admitting that outsourcing to low-cost locations did not always yield the expected benefits. The cost of unscientific decisions to society – to individual workers, communities, shareholders, and national economies that depend on tax income – is untold. If the knowledge of industrial engineers is to be trusted, then Tom Davis' predicted 50 percent savings through supply chain analytics is surely worth a day or two of work with the scientific expert who can compute the difference between the top and bottom scenario in Figure 1.

Furthermore, if the recent flurry of press on the re-industrialization of Western economies is any indication, the work of operations has considerable political significance. President Obama established an office for manufacturing in order to "bring" factory jobs back to the United States. Consider the irony of politicians in free-market countries publicly contemplating interventions in global supply chains. We should recall that what appears today as pernicious de-industrialization is the logical consequence of decades of incremental managerial decisions in search of best value. Outsourcing remains a form of global competition enabled by technology, progress that both U.S. and European leaders were proud of at the time.

Analytics beats political science

It is symptomatic that the loudest voices in the current debate come from economists, legally trained politicians and journalists – everyone except the engineer/scientist. A noteworthy example is the political scientist professor Suzanne Berger. She was appointed the leader of MIT's Industrial Performance Center, which conducted a comprehensive study on competitiveness in global markets. Her multidisciplinary research team, which included not a single industrial engineer or operations professor, re-established the fact that it is possible for high-cost countries to compete globally if companies adopt supply chain innovations like Zara's fast fashion model.

As the saying goes, a little knowledge can be a dangerous thing. Recent events reveal well-educated decision makers charmed by metaphors like "Internet time" or "the world is flat," then forced to pay for the unintended consequences (market bubbles or de-industrialization). And still, MBA graduates continue to abhor the analytical like a vacuum, preferring to isolate it in the server room, often literally. The remarkable spread of ERP systems underlines a trend of the past two decades to reduce business processes to tools and delegate change leadership to technology. A black box (like the millennial Internet, ERP or APO systems, the cloud) is given unheard-of power over business policy (service levels, permitted changes to line order quantity, maximum or minimum quantities, planning frequency, user access rules, and so on) and superstitiously is expected to deactivate natural constraints like time and gravity.

Our experience at a technical university in the heart of Europe gives reason for optimism. Ten years ago, ETH Zurich was lobbied by local industry to launch an MBA program specializing in supply chain management. Many of the program's partner companies, including central Europe's "hidden champions" (see sidebar on Page 28) continue to manufacture in high-cost locations and often have top managers who are trained engineers. They argued that supply chain management had matured into a profession comparable to finance or marketing. In the decade of its existence, the MBA ETH SCM has seen attorneys, chemists, accountants and even bureaucrats join classes next to the more typical engineers.

Far from being shunted to a sideline course, studying operations is a core area for this degree. Seven formal courses and numerous case studies in the regular business fundamental classes drive home the consequences of good or poor operations. Students spend approximately 30 percent of their time on operations.

Without a higher political directive, local civil servants have studied the criteria of network design to market the location of Switzerland and attract jobs to the country. The engineers and scientists in the class are learning the language of finance and developing leadership skills to take a seat later at the executive table and set the strategic agenda.

Don't believe the hype: Include operations

There is much work to be done, even as universities around the globe are now setting up MBAs or master's degree programs focused on supply chain

REVEALED TREASURE

The term "hidden champion" was popularized by German author and business leader Hermann Simon's *Hidden Champions: Lessons from 500 of the World's Best Unknown Companies*. The first English version was published in 1996. A follow-up, *Hidden Champions of the 21st Century*, was published in 2009.

Hidden champions are relatively unknown and small companies that, despite not having the size and clout of major multinational corporations, dominate their market, according to Bublu Thakur-Weigold, associate director programs for the executive MBA in supply chain management at ETH Zurich. Most fly under the radar and receive scant attention from major press outlets.

Simon defines hidden champions as having annual revenues of less than $4 billion while being in the top three of their global market or first in their market on their home continent. These companies have mastered supply chain management, customer service and marketing and internal operations. Simultaneously, they avoid trendy management fads in favor of hard work, leadership, strategy and leveraging their human resources to ensure loyalty from both customers and employers.

"The success of these companies is a major reason high-wage European countries such as Germany continue to enjoy manufacturing success in a world where many multinationals search the world for the lowest wages possible," Weigold said.

North American companies looking to compete on the world stage can learn a number of lessons from them to survive in an uncertain world.

management. When *The Wall Street Journal* announces these to be the "hot new thing," the hype of the headline ("Hot New MBA: Supply Chain Management," *The Wall Street Journal*, June 6) should give us pause.

We must make sure that the development is more than an opportunistic expansion of degree portfolios in saturated education markets. Educators should step up to the plate and recast the double hermeneutic that separates the leader and the engineer. Business schools in particular have the potential to develop industrial engineers and supply chain experts who will lead positive change.

By revising the assumptions that hold us back, we could qualify our MBAs to orchestrate the complex industrial systems of the future, creating prosperity for all.

Bublu Thakur-Weigold is a project manager at the Chair of Logistics Management at ETH Zurich and associate director programs for the executive MBA in supply chain management. She formerly was a supply chain consultant, instructor and program manager at Hewlett-Packard and has 15 years of experience in information technology and process consulting. She holds a bachelor's degree in management science from the Massachusetts Institute of Technology and a master's degree in international logistics from the Georgia Institute of Technology.

Stephan M. Wagner holds the Kuehne Foundation Chair of Logistics Management at ETH Zurich and is academic director of the executive MBA in supply chain management. He obtained a doctoral degree and habilitation degree from the University of St. Gallen. He worked for almost 10 years in consulting and industry and now teaches and conducts research in the areas of supply chain management, purchasing and supply management, logistics and transportation management, and the management of logistics service firms.