



NATIONAL CENTER FOR  
THE MIDDLE MARKET

In Collaboration With



THE OHIO STATE UNIVERSITY  
FISHER COLLEGE OF BUSINESS



GE Capital

# Building Innovation

## A Case Study on When to Separate R&D and Manufacturing

*Based on research conducted by Professors Aravind Chandrasekaran, John Gray and Ken Boyer of The Ohio State University Fisher College of Business and Research Fellows of the National Center for the Middle Market*

Management thinkers have long debated whether innovation or execution is the more important driver of organizational success. But unless you're a pure design shop or contract manufacturer, you must succeed at both. A 2011 survey by the National Center for the Middle Market of mid-sized-company executives singled out two major challenges: innovating new products and improving operational efficiencies in manufacturing.

The tension between innovation and operational efficiency has bewildered managers across large, sophisticated, resource-rich firms. Companies as diverse as 3M, Samsung, USA Today, Novartis, Kodak, Boeing and Motorola have reported difficulties with simultaneous exploration and exploitation. Operating in a culture of constant idea generation and experimental ferment is very different from operating in an environment of constant iterative process improvement. If large corporations struggle to balance these competing priorities, the challenge is only harder for Middle Market companies.

A central question is whether innovation and execution—which are linked together strategically—should also be linked together structurally. For large and small companies the decision is reasonably straightforward. Large corporations achieve better financial performance when they separate R&D from manufacturing, with distinct reporting structures, metrics and incentives designed to optimize each<sup>1</sup>. By contrast, small entrepreneurial firms—with their limited workforces and facilities—often have no choice but to house the two functions together. Fortunately, that model can benefit them financially<sup>2</sup>. After all, new product development generally necessitates new process development, and resource-strapped firms benefit when the same people manage both.

Middle Market companies are engaged in a bit of a trapeze act: assessing the optimal time to release the small-company, unified model and grasp the large-company, distinct-functions model. They must also weigh the performance implications of making the change too early or too late and how best to execute the transition.

To help executives make that decision, we studied TechCom - a multi-product Middle Market company that has tried several approaches to managing R&D and manufacturing. Naturally, variations in industry, ownership structure, and other characteristics will affect individual outcomes. However, we believe TechCom's archetypal family-business origins, its successful growth trajectory, and the variety of its experiences make it an instructive example.

## THE TECHCOM JOURNEY

TechCom is a fictional name for a real company, based in the Midwest, which designs and manufactures industrial equipment. Founded in 1953, it has about 70 employees and approximately \$100 million in annual sales. TechCom is well known for its reliable and robust industrial designs and has a strong culture of continuous improvement and quality. In 2000 it was acquired by a private-equity firm; but until that time it was a family business with a typical family-business culture. Such cultures prefer to keep as many operations as possible snug behind their own walls.

TechCom's first product was a tool that detects the speed and position of mechanical arms in machinery. In those early years, the company couldn't afford a throng of specialists, so in true startup fashion "everybody had to carry their weight and everybody did everything...from designing the product, feeding them into the manufacturing, all the way to talking to the customers about our design," recalled the president. Specifically, TechCom deployed a cross-functional team to handle R&D and manufacturing, with some employees involved in both activities. The team took insights from its manufacturing tasks that aided its development efforts. It also gained considerable "tacit knowledge" from R&D activities that proved useful in manufacturing. "We learned a lot during these initial stages," said TechCom's president.

The unified model worked while TechCom remained a one-product company—even as it swelled to Middle Market stature. In the mid-1990s, the company added a second product category: DC drive motors for heavy industrial equipment. TechCom tried keeping to the original approach but employees' performances started to deteriorate as they struggled to integrate R&D and manufacturing for the different products. There were two problems. First, the drive motor line required workers to engage in design and development efforts with a new set of customers, and the acclimation process slowed things down. Second, the two products had very different innovation rates, with the mechanical arm requiring the company to innovate much faster to maintain its market position. When the comparably slow paced drive motors were introduced, the company observed the innovation rate for its original product also declined.

Concerned, senior leaders decided the time to separate the functions had arrived. They kept the R&D center and built factories nearby. The metrics responded accordingly: new product introduction rates rose for the mechanical arm tool and time-to-market improved significantly for both lines. TechCom remained profitable every year thereafter.

Recently, TechCom entered a third category. The company had a strong customer base in the drive market and needed to include AC drive motors in its product portfolio. In this instance it was late to the game: AC drive motors are commodity products with standard designs already in place. A number of large companies dominate the market. Furthermore, the technology was not part of TechCom's core competency. Consequently, the company chose to outsource both design and manufacturing from the get-go: a strategy that has produced significant revenue.

The AC drive market represented a new product category with little opportunity for synergy or innovation. TechCom's decision was also influenced by changes in the company itself. "Within the past five-to-seven years, economics, new ownership, and the desire to grow the business at a healthier rate than we were doing changed a lot of those philosophies," said the R&D director. "Now outsourcing or contract manufacturing are fair game to discuss."

## THE CASE FOR SEPARATION

The TechCom case, considered together with publicly available data about other mid-sized organizations, illustrates several factors affecting the decision to split design from manufacturing.

*Firm Ownership:* While startups in general combine R&D and manufacturing because they lack resources to do otherwise, family-owned companies are likely to keep those functions inside the organization and coupled tightly together. This tendency may decrease with other forms of ownership, such as private equity and public firms.

*Firm Size:* So long as the Middle Market firm maintains a narrow product focus, it may be able to effectively use the same teams for R&D and manufacturing. At TechCom, neither innovation nor efficiency suffered, even as sales of its mechanical arm tool grew substantially. But as sales—and consequently volume—increase significantly, the requirement to focus on production may detract from R&D.

*Product Diversity:* The addition of new product categories significantly affects a team's ability to effectively manage both R&D and manufacturing. New products introduce complexity in ways that increased volume does not. Previous studies show that under higher levels of task complexity, employees who shift between R&D and manufacturing don't perform as well<sup>3</sup>. When TechCom began manufacturing drives, its employees demonstrated additional "cognitive burden."

*Specialization of Work:* Process engineers in Middle Market firms, who are responsible for production, are engrossed in maximizing outputs given limitations on workers, raw materials and other constraints. Their intense concentration on improving existing processes leaves little room for innovative thinking about products and technologies that may differ significantly from what is being made.

*Performance:* Declining financial performance may also prompt the separation of R&D and manufacturing as companies seek organic growth through either additional innovation or reduction of manufacturing costs.

*Non-core businesses:* As middle-market firms grow into businesses not core to their operations, they are better off outsourcing both R&D and manufacturing.

---

**For more middle market insights, visit <http://www.middlemarketcenter.org>.**

**Researchers:** Professors Ken Boyer, Aravind Chandrasekaran, and John Gray of The Ohio State University Fisher College of Business are Research Fellows of the National Center for the Middle Market.

---

<sup>1</sup> O'Reilly, C. M., Tushman 2004. The Ambidextrous Organization, Harvard Business Review

<sup>2</sup> Lubtakin, M.H., Z. Simsek, Y. Ling, J. Veiga. 2006. Ambidexterity and Performance in Small-to-Medium-Sized Firms: The Pivotal Role of Top Management Team Behavioral Integration. Journal of Management 32, 646-672.

<sup>3</sup> Staats, B.R., Gino, F., 2012. Specialization and Variety in Repetitive Tasks: Evidence from a Japanese Bank. Management Science 58, 1141-1159; Gavetti, G., Levinthal, D., 2000. Looking Forward and Looking Backward: Cognitive and Experiential Search. Administrative Science Quarterly 45, 113-137