



The Hiring Dilemma for High-tech Firms: 'Make vs. Buy'

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One particular hiring conundrum is hardly a new one for those in human resource management: Is a company better off developing and training specialized workers in-house or hiring skilled workers from outside the company? The question is especially important in fast-paced, technology-based industries where investment in human capital is critical.



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"If firms need to augment the skill of their workforce to complement an investment in technology, they face a traditional 'make vs. buy' problem," write Wharton management professor [Benjamin Campbell](#) and four co-authors -- Clair Brown and Yooki Park from the University of California at Berkeley, and Fredrik Andersson and Hyowook Chiang from the U.S. Census Bureau -- in a recent paper titled, "The Effect of HRM Practices and R&D Investment on Worker Productivity." Firms can "structure their HRM (human resource management) system to develop the necessary skills in-house or they can structure their HRM to attract workers with the necessary skills on the external market," he notes.

In response to this make vs. buy dilemma, Campbell and his co-authors think they have found the answer for industries that compete in cutting-edge technology. Using U.S. Census Bureau data recently made available to external researchers, Campbell says his team has statistically demonstrated when companies should hire from outside and when they should develop from within.

For Campbell, the paper's findings are particularly important on two fronts. First, his conclusions can "lay the foundation for how to think about technology and HR at the same time. HR strategy complements technology strategy, yet often people developing these strategies don't work together.... I think this is especially true in younger firms. But if you want to be in a fast-paced industry, you need to invest in an HR system that gives you the skills you need. And it has to start at the CEO level. It has to come from the top down."

Second, Campbell believes that these issues will be increasingly relevant. "More and more firms will be evolving to the spot market [external labor market] model," he says. "Most industries tend to operate in a faster-paced environment [than before]. Product life cycles across all manufacturing industries as a whole are growing shorter. Firms are facing more opportunities for change and more adjustments to the workforce." When skills need to be adjusted, "it pays to buy the skills instead of developing them. And as all industries evolve, I predict we will be seeing more and more firms adopting the buy strategy."

The Hewlett Packard Case

Using examples from the semiconductor industry, Campbell presents these scenarios. If a firm is faced with significant marketplace and technological changes, Campbell argues that it is "better off hiring workers from the outside labor market who have the skills it needs, rather than investing in developing those skills inside the firm." Examples of such firms are found in the graphics chips industry, where leading companies like NVIDIA, VIA Technologies and ATI Technologies come out with a new product generation every 12 to 18 months. "When product generations are short, there is not necessarily time to develop the necessary skills for the next generation in-house, so these companies benefit from hiring skills from the external labor market," he says.

The opposite is true for slower moving industries operating in marketplaces with less change -- for instance, companies like Bosch and Delphi-Delco that manufacture automotive chips which often last four or five years before a new generation makes them obsolete. "When product generations last a long time, it becomes feasible to develop talent in-house in preparation for the next product generation. It is better for these firms to take the long approach and develop the necessary skills within the firm," he says.

The impact of Campbell's findings, he believes, could be significant for human resource management strategies. "As the pace of technological change has quickened, and as global competition has shortened product life cycles, firms have had to rethink their technology investment strategies and their human resource management practices in order to remain competitive," writes Campbell.

"A classic example of this phenomenon is Hewlett Packard over the last 20 years," he suggests. "They had such a reputation for these internal labor markets, where they hired employees at an early stage and then developed them throughout their careers. That was the company's reputation. But over the last 20 years, the Hewlett Packard way has eroded. They are now operating more on the spot market. In order to keep pace with other technology firms, they are forced to hire on the outside."

In their paper, Campbell and his co-authors note that "although the relationship of technological change, compensation and tenure at the individual level has been well-studied, surprisingly little is known about the relationship between technological change and an (individual) firm's HRM decisions. Previous research on this topic has been either case study oriented or has utilized data from broad establishment-level surveys. This project connects these micro and macro approaches by using data that allows us to capitalize on the strengths of each type of research."

The report pulls data from the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Program, which covers seven large states from 1992 to 1997. Specifically, Campbell chose to look at the impact of R&D and HRM systems on firms' performance within the electronics industry "where technological investment is a critical strategic variable."

Writes Campbell: "Although firms in the electronics industry have a high level of R&D investment relative to other industries, there is a large variance in investment between firms within the industry. This variance can be observed in the length of product life cycles: from 12 months for fast-evolving consumer-based products such as graphic chips, to five years or more for slowly-evolving analog products."

Campbell acknowledges that "in the industries we are studying, 'cutting-edge' is such a complex term because there are so many facets of technology. Someone might have skills that are cutting-edge for some products, but another (level) in the industry wouldn't be interested in that worker. It becomes a problem of identifying the right workers, including some who may be undervalued by the current workplace."

Offer Training or Go Outside

As Campbell notes, finding and keeping talent as it relates to the electronics industry boils down to one main issue: Make vs. buy. To answer this question, Campbell's paper proposes that companies analyze another question first: "How does the firm's product life, and thus its rate of R&D spending, affect how the HRM system operates?"

"We assume that a new technology requires a mix of experience on the previous generation of technology and new skills that don't currently exist in the firm," he writes. "We assume that experience and new skills are complements and firms differ in their mix of experienced and new workers. Technology firms in short product life markets, and thus with high R&D spending, must have a mix of engineers dominated by the new skills required for the new technology with a small emphasis on engineers with experience on the last

generation of technology. Firms in long product life markets, and thus with low R&D spending, rely more on a workforce with experience since the firm has greater gains associated with cutting costs, improving quality, and improving throughput over the life of the product than the gains associated with developing a new product."

In short, firms must make two major decisions in creating the optimal skill-experience composition in the workforce: First, decide whether to provide formal training in the new technology to their existing workers or to purchase these skills through new hires, which is the essence of what Campbell calls the "make-buy decision;" and second, decide which experienced engineers and other workers to retain.

"The firm makes the first decision based upon the relative costs, including both the payroll costs and the time-to-market costs, of making or buying the required skills for the new technology," he writes. "The cost of 'making' the required skills is the worker adjustment cost of acquiring skills (training costs) and is proportional to the size of technological jumps over a given time. The cost of 'buying' the required skills is the firm's adjustment costs in hiring new workers, which does not depend on the size of the technological jump.

"Therefore, depending on the firm's underlying cost structures, for sufficiently large technological jumps, 'buying' will be less costly than 'making' new skills."

While high R&D firms are more likely to buy new skills compared to low R&D firms, there is an important caveat to this finding. "There are experienced workers who have firm-specific knowledge that can't be replaced on the outside market," notes Campbell. His research shows that high R&D firms in particular suffer if they lose too many experienced workers, which is why these firms must decide which experienced engineers and other workers to try and retain. Often, this can be a problem. "When you are not investing a lot in developing the skills of a work force, [employees] will leave," he says.

Campbell's research looks at many factors within human resource management practices that affect worker productivity, including performance incentives, multiple ports of entry, and low and high turnover rates. It compares different educational levels of workers; varying accession rates (ratio of total number of new hires to the total number of workers); separation rates for workers with two and five years of experience; standard deviation of earnings for various worker levels, and wage growth for workers with five years of experience. In order to characterize the human resource practices of a firm, Campbell and his fellow researchers use earnings, earnings growth, accession rates and separation rates for selected cohorts within each firm.

And finally, the researchers perform a cluster analysis of firms and HRM measures to identify and describe the four most common HRM systems that firms set up as a result of the make-buy and retention decisions:

- **Bureaucratic ILM (Internal Labor Markets):** Initial earnings of new hires are similar (low variance) since most workers enter at the same level and have similar (and reliable) earnings growth. Firm experiences a low separation rate.
- **Performance-based ILM:** Entry of workers and their initial earnings reflect skill requirements so average initial earnings of new hires are higher with higher variance than for bureaucratic ILM. After approximately two years, workers are selected (based upon performance) for faster career development and members of a cohort compete for entry into these favored positions, which have higher earnings growth and lower separation rates. Those who do not receive skill development have lower earnings growth and higher separation rates.
- **Spot Market (External Labor Markets):** Firms can identify workers' talents and skills, and hire and pay accordingly. Firm can monitor worker performance and pay worker according to contribution. Initial

earnings and earnings growth reflect market rates for skill and talent, with large initial variance, and variance does not increase over tenure. Separation rate is higher than in ILMs.

· Spot Market with Rewards: Firms hire and pay workers in spot market, but identification of workers' talents and effort at hire is imperfect and monitoring of worker performance is imperfect. Variance of initial earnings is lower than in spot market. Firm must include performance rewards and tournament or wage-efficiency type incentives; thus variance of earnings increases over tenure. Earnings growth is higher than in spot market. Separation rate is higher than in spot market since the bad matches (both at hire and in rewards) end.

Ultimately, the report concludes, "Firms with high R&D that choose a Spot Market with Rewards HRM system will have higher worker productivity than those that choose other HRM systems. And firms with low R&D that choose Performance-based ILM HRM systems will have higher worker productivity than firms that choose other HRM systems." Interestingly enough, Campbell's research suggests that "a surprising" number of firms do the exact opposite of what the research showed was best.

"These results suggest that high R&D firms are more likely to buy new skills compared to low R&D firms, and yet these high R&D firms suffer if they lose too many experienced workers," Campbell and his colleagues write. "These findings are consistent with the implications of our 'make versus buy' model of workforce skill adjustment as a response to technological change."

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