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Apprenticeship Benefits and Costs

A Roadmap to Measurement

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Some studies have estimated the benefits of apprenticeships to U.S. workers or society, but there is very little research on how apprenticeships benefit U.S. businesses. In 2016, researchers conducted a study (Case Western Reserve University and U.S. Department of Commerce 2016) to better understand the costs and benefits of a diverse set of Registered Apprenticeship programs in 13 firms and intermediaries, such as nonprofits and labor unions, from different states and across the manufacturing, health care, retail trade, and information technology (IT) sectors.

Interviews and site visits with each entity resulted in a road map to help companies measure the costs and benefits of their apprenticeship programs. Firms that are considering a new apprenticeship program, just starting one, or with one well under way all could use the road map to improve their current or future programs. Detailed data analysis from two firms show a positive return on investment relative to filling the jobs by another means.

WHAT IS APPRENTICESHIP?

The U.S. Department of Labor (DOL) defines Registered Apprenticeship programs as “innovative work-based learning and postsecond-

ary earn-and-learn models that meet national standards.” These programs have five defining features:

- 1) Participants are paid by employers during training.
- 2) Programs meet standards for registration established by the DOL or federally recognized State Apprenticeship agencies.
- 3) Programs provide on-the-job learning and job-related classroom or technical instruction.
- 4) On-the-job learning is conducted under the direction of one or more of the employer’s personnel (mentors).
- 5) Training results in an industry-recognized credential that certifies occupational proficiency.

At a minimum, programs must combine classroom instruction with paid on-the-job training that teaches workers practical skills, and the full apprenticeship must last at least one year. The classroom training is usually tuition free to the apprentice. Many of the companies with whom researchers spoke also pay hourly wages or a flat stipend to the employees for their classroom time. Some firms provide all classroom training in-house, while some partner with local community colleges to outsource this training while providing hands-on training at the company. Others partner with other firms to form consortia, like Apprenticeship 2000 or the North Carolina Triangle Apprenticeship Program, to jointly provide classroom training to apprentices across several firms all at once.

Mentors take time from their regular duties to guide the apprentice’s acquisition of technical skills, help integrate the apprentice into the company, and pass on practical knowledge. Although the mentor may also be the apprentice’s supervisor, the roles and responsibilities of mentor and supervisor are distinct. A supervisor provides administrative oversight and may or may not have experience in the apprentice’s occupation, whereas a mentor oversees the apprentice’s on-the-job training as an experienced worker in that occupation.

Other types of work-based learning share many elements of apprenticeships. For example, internships and apprenticeships both provide work experience. Apprenticeship, however, is not just work experience, nor is it just on-the-job training to do a specific task. Other types of on-the-job training can involve formal, paid hands-on training, and for-

mal classroom lessons, like apprenticeships. A registered apprenticeship provides formal classroom and on-the-job training under a mentor, includes pay progression, and culminates with the apprentice graduating with a certification (and in some cases, multiple certifications) showing he or she is fully proficient to do a job. In the vast majority of the cases, apprentices transition directly into permanent employment after graduating.

STUDY METHODOLOGY

Researchers sought to understand why firms choose apprenticeship as a training strategy and what makes apprenticeship successful by studying organizations across a variety of industries, occupations, regions, and firm sizes. Notably, the study group is not representative of all firms and intermediaries that have considered or started apprenticeship programs. However, even with this small sample, similar themes and challenges emerged across the organizations, as detailed in the full report.

Researchers conducted phone interviews, primarily with senior human resources managers and production managers, who noted anecdotal evidence that apprenticeships benefited employers. Most firms easily provided some cost information, such as the cost of hiring workers off the street versus apprentices or the cost of training and educating one apprentice. However, it was evident that most firms did not carry out full cost and benefit analyses to know the full impact of their apprenticeship programs.

Specifically, few of the 13 organizations had data on the benefits they identified from their apprenticeship programs. One barrier to doing so was that key benefit data are derived from companies' production metrics, while cost data come from human resources or payroll information. Most firms did not blend those data sets to examine how their productivity measures related to how workers were hired and trained. The few firms with solid data on benefits did weigh these data against program costs, and one even went as far as calculating a measure of the firm's return on investment (ROI) for apprentices versus other hires. Such complete analysis, however, was not the norm. Following the ini-

tial interviews, researchers visited several firms that offered to share cost and benefit data and calculated ROI for apprenticeship programs.

ROAD MAP FOR MEASUREMENT

With information collected through interviews and site visits, consistent themes emerged regarding cost and benefits of apprenticeship programs. Evaluating success is much easier if firms collect data from the beginning or even prior to starting their program. Regardless of when data collection begins, firms should consider alternative scenarios, or “counterfactuals,” to evaluate how apprenticeship compares to other ways of building a skilled workforce (such as hiring off the street, using temporary or contract workers, or paying existing staff overtime).

The following six steps will help firms measure the return to investing in apprenticeships and improve their programs over time. While they may seem obvious, they are not necessarily easy to implement. The rest of this chapter offers a general approach to completing these six steps and provides examples of best practices.

DETERMINE THE TOTAL COSTS OF APPRENTICESHIP AND THE COSTS OF ALTERNATIVE HIRING METHODS

For most firms, identifying costs is relatively straightforward. Table 4.1 provides some examples of these costs, and the following sections provide more detail about how they are defined and measured.

Fixed Costs

Some costs remain more or less constant regardless of the number of apprentices in a program. To a large extent, these “fixed costs” represent the cost of setting up the program in the first place. Firms can develop a curriculum in-house or they can outsource this job to a local community college, workforce development organization, intermediary, or other partner organization. Modifying a preexisting curriculum,

Table 4.1 Costs of Apprenticeships

Fixed costs	Variable costs
Curriculum development	Wages and benefits of apprentices
Equipment purchases	Time provided by mentor
Staff time spent on setup	Supplies and uniforms
Overhead and management	Tuition, books, and classroom materials
Classroom space	
Recruitment	

such as an associate’s degree program, may be relatively inexpensive. Developing a new approach from scratch can be fairly costly, whether done by staff on the company payroll or by a private agent for a fee.

Purchases of equipment that can be used by all apprentices and by future classes also count as fixed costs. Hypertherm, a New Hampshire–based precision manufacturer, teaches students in the classroom using the same kinds of machines they will later operate on the factory floor. Dartmouth-Hitchcock, a medical center also in New Hampshire, provides each of its medical assistant apprentices with a loaner laptop to use for the duration of the program and uses a projector and models of various organs in the classroom to teach students about human anatomy.

Most of the 13 programs in the study relied on at least one staff member to manage the program, and some maintained a larger staff. These staff members managed relationships with consortia, educational institutions, community groups, government agencies, and even other groups within the company. They usually monitored overall performance of the program and managed records as well. At many firms, the staff who managed the apprenticeship programs spent the rest of their time with other workforce management or operational tasks.

It is also important to count what economists would call “opportunity costs”—that is, the cost of using a resource for apprenticeship rather than another purpose, such as facility space used for apprenticeship functions. Many companies repurposed conference rooms or other spaces within the existing facility to train their students. Others assumed facility costs directly when they built or retrofitted spaces. These costs can be significant, depending on the size and nature of the training facility—Hypertherm spent \$2 million to construct the Hypertherm Technical Training Institute to train their skilled manufacturing workers.

Recruiting costs are twofold: identifying the target population and reaching it.¹ Job postings, participation in career fairs, and presentations at local high schools or colleges all entail hard costs and staff time to attend events.

Variable Costs

Wages and benefits, which vary based on the number of apprentices in the program, comprise the largest costs associated with apprenticeship programs. Most, though not all, of the firms in the study paid their apprentices for on-the-job duties and classroom time, and also paid for apprentices' tuition, books, and supplies.

The time that mentors spend teaching apprentices, and therefore not doing their own production work, represents another opportunity cost for companies. One way to measure this cost is to estimate the output of mentors, prorated to reflect the percentage of their work time spent as mentors.

Adding up the Costs

The total per-apprentice costs of the 13 organizations ranged from under \$25,000 to around \$250,000. This limited sample portrays the large variation in per-apprentice costs across companies. All the companies, whatever their apprenticeship investments, believed that the pay-off justified the cost.

Dartmouth-Hitchcock Medical Center provided a detailed breakdown of costs for its medical assistant apprentice program, including classroom training, tuition, on-site classroom space, wages of apprentices, a workforce development consultant, and two apprentice supervisors. These costs totaled approximately \$60,000 per apprentice for its one-year program.

A fundamental goal of companies is to hire and retain skilled workers, and apprenticeships are just one way to do so. Many of the costs listed above are also incurred when the job is filled through a direct hire of a fully skilled worker, the contracting of a temp worker, increasing the hours of existing staff, or some other method. Firms need to compare the costs of an apprenticeship program to the costs of these alternative hiring methods when considering or evaluating an apprenticeship

program. For example, although wages make up a significant portion of apprenticeship costs, an apprentice's labor cost is usually less than that of an off-the-street hire. Only one firm in the study regularly did this type of cost analysis, as well as a benefit analysis. It noted a positive ROI from its multiple apprenticeship programs.

DETERMINE THE MEASURABLE BENEFITS OF APPRENTICESHIPS

While calculating costs is fairly straightforward, determining the benefits of an apprenticeship program is often much more challenging. Many costs associated with running an apprenticeship program appear on a company's balance sheet or accounts payable, but the benefits of apprenticeship rarely do.

All the organizations in the study believed that there were sizable short-term benefits realized during the apprenticeship period and other long-term benefits down the road. Table 4.2 lists the most common benefits. Many firms believed that their apprentices became as equally productive as—or even more productive than—traditional employees before the apprenticeship was over. As a result, apprentices' production work more than offset their wage and tuition costs.

Production Metrics

To measure the production-related benefit, a firm should emphasize the quantitative metrics used to judge the success of its particular business, such as parts per minute, number of prescriptions filled, or computer coding projects successfully completed. Performance reviews are not a good substitute for these metrics. They are ubiquitous but can be subjective and difficult to quantify. Rigorous analysis of key metrics can uncover the extent to which apprentices and graduated apprentices have higher productivity than workers trained in other ways.

The 13 organizations frequently cited the benefits of classroom training, including the theory of their work processes. Employees learned not just what tasks needed to be performed but why. This broad knowledge helped them diagnose potential production issues, quickly troubleshoot problems after they occurred, and improve on-time delivery.

Table 4.2 Common Benefits of Apprenticeships

Production	Workforce	Soft skills
Output during the apprenticeship at a reduced wage	Reduced turnover	Employee engagement and loyalty
Higher post-apprenticeship productivity relative to similarly tenured employees	Pipeline of skilled employees	Greater problem-solving ability and adaptability
Reduction in mistakes or errors	Better matching of employee skills and character with employer needs and firm culture Lower recruiting costs Development of future managers	Reduced need for supervision

Workforce Metrics

Many other key benefits of apprenticeship programs are not directly related to production outcomes or easy to measure, but companies tried to take them into account. These benefits, if measured, would likely increase the proven payoff of apprenticeships.

Among the most-cited benefits was reduced employee turnover—in many cases, firms considered it even more important than increased productivity. During site visits, apprentices described a feeling of loyalty to their hiring firm for the opportunity the apprenticeship provided them and for the relationships they developed along the way with other apprentices and their mentors. CVS-Health officials said employees who started at the company as apprentices were twice as likely to stay. Blue Cross Blue Shield of South Carolina (BCBSSC) cited an attrition rate of 4 percent for employees who graduate from their apprenticeship program, compared to a 13 percent industry average. Dartmouth-Hitchcock went further, noting that its apprentice medical assistants reduced workload and stress of other employees, including physicians, and drove a companywide reduction in turnover.

Companies also save on potential recruitment costs by having a pipeline of skilled employees available to replace retirees or others who leave the company. Building trades traditionally have used an apprenticeship model to move workers from apprentice to journey worker to supervisor, providing guidance and mentorship to new apprentices at every step. BCBSSC has adopted the same model, with each employee responsible for training employees at the level below. Dr. Schneider, an auto parts manufacturer in Kentucky, has not conducted a formal study on the ROI of its apprenticeship program but believes that apprenticeship saves the firm 20 percent on recruitment costs alone, aside from the other benefits the program provides.

Many firms used apprenticeships to find workers from a diverse, previously untapped pool of candidates, including women, minorities, veterans, and the long-term unemployed. Apprenticeships offered these candidates an opportunity to gain entry to a field or industry that otherwise may have been difficult to enter. CVS-Health, in partnership with community organizations, was a strong proponent of this approach, citing both high-minded goals like corporate social responsibility and the everyday need to expand the labor force and fill positions.

Finally, a long-term measure that firms can use is leadership development. Many firms believed that the intensive training, immersion in company culture, and strong theoretical underpinning provided by apprenticeships were ideal for preparing future managers. Other soft skills that many programs emphasized, such as attendance, writing, and public speaking, were also key for developing future leaders. BCBSSC estimated that 22 percent of graduates from its apprenticeship program have been promoted to leadership roles.

Soft Skill Metrics

Apprenticeships are likely to provide other benefits that are even harder to measure. For example, former apprentices might help to recruit friends to new positions, reducing the workload for supervisors.

Because they understand the principles behind their work, apprentices may be more “flexible” in several senses: they carry out a greater variety of routine tasks at a point in time (leading to increased capacity utilization), they can do higher-value tasks (such as those requiring judgment or initiative), and they can facilitate innovation because they

learn quickly and have problem-solving skills. Such broad skills can be especially difficult to capture through regular production or performance metrics.

Adding Up the Benefits

The value of apprentice output should be compared to a baseline “counterfactual” level of output for an employee that would have been hired had an apprentice not been available.² Many companies in the study, including LaunchCode, Siemens, and Hypertherm, claimed that apprentices were significantly more productive than other hires. In some cases, firms truly cannot find workers that meet their minimum standards and, as a result, turn down or delay work. When this happens, the counterfactual level of output is zero, and the entirety of an apprentice’s output should be counted as a benefit to the firm.

The firms studied in this research cited varying benefits from apprenticeships. Not every metric will matter to every firm, so it is important for firms to consider which benefits to specifically measure in advance. For some companies, long-term loyalty may not be an important goal. If an apprentice is productive during his or her training, and then chooses to leave after completing the program, a firm may have already recouped the costs of its investment. BCBSSC requires apprentices to continue working for two years after program completion, essentially guaranteeing a benefit for its investment. For a consortium, such as Apprenticeship 2000 or the North Carolina Triangle Apprenticeship Program, one of the key outcomes may be the creation of a robust local labor force with manufacturing skills that are readily transferable between member firms. Such an ecosystem benefits all partners, even if any given apprentice may not remain in a single firm for a long time.

LOOK WITHIN DIFFERENT COMPANY DEPARTMENTS FOR APPLICABLE DATA TO MEASURE THOSE BENEFITS, AND BEGIN COLLECTING DATA EARLY AND OFTEN

Once a firm has identified expected benefits from an apprenticeship program, it must collect the data to measure those benefits. It is impor-

tant to begin gathering data early, even if a full evaluation of multiple graduated cohorts is years off. Early data collection may allow a firm to adjust program size and classroom and on-the-job training if the program is not providing the desired initial benefits.

To measure all benefits, firms may need to creatively blend new data with existing data from across departments, units, or systems within their organization. For example, in larger organizations, the human resources department has personnel data about wages, benefits, and turnover; the finance department has cost and revenue data that may help measure productivity; and operations has data on the real output of employees.

Organizational barriers are common. In many firms, particularly large ones, one department may be unaware of the existence of data in other departments that are relevant to the cost-benefit analysis of apprenticeships.

Firms should also compare certain measures both before and after the implementation of an apprenticeship program, such as the baseline level of productivity, turnover, and errors. To do so, firms need to have a time-series of consistent data that span several years. For example, measuring the net benefits of a four-year apprenticeship program could require data spanning a decade or more to get a clear picture of productivity before the implementation of the program, the period when apprentices are in the program, and the period after the program.

It is generally easier for firms to precisely measure performance metrics for the entire organization, rather than an individual level. For this reason, firms should first focus on aggregate performance of apprentices within a work unit versus aggregate performance of other workers in those units. Once those measures are fully understood, data should be collected on individual employees to the extent possible. It is essential to separate the analysis of the apprentice program from performance evaluation of individuals. Issues that occur early in the life of a program are not necessarily the fault of individual apprentices or managers.

ACCOUNT FOR OTHER CHANGES AT THE COMPANY, AS WELL AS EXTERNAL FACTORS, THAT AFFECT PROGRAM PERFORMANCE

In any company, it is rare for new initiatives, such as an apprenticeship program, to be adopted independently of other organizational changes. New work processes, new technologies, and changes in training, for instance, also contribute to company and work unit performance. Detailed data from before and after any such change can help illustrate how other variables affect overall performance.

Health care providers such as Dartmouth-Hitchcock have experienced both internal and external changes over the last several years. While Dartmouth-Hitchcock's medical assistant apprenticeship is one factor in the company's increased service metrics over that time, the hospital also cited electronic medical records, the Affordable Care Act, and the overall aging of the population as factors changing the kinds of work Dartmouth-Hitchcock does and how it does that work.

External factors may account for observed changes in performance. Increased company productivity may have to do more with a general economic upturn than with the creation of an apprenticeship program. Correlation does not mean causation. Many factors combined to affect a firm's performance metrics, and detailed data gathered with high frequency help disentangle the individual effects of each factor.

ANALYZE AND SHARE THE COST AND BENEFITS DATA ACROSS THE COMPANY

Performing ROI calculations to understand the value of an investment is nothing new for any company. The goal of this road map is to help companies think comprehensively and creatively about the costs and benefits of apprenticeships to determine the most realistic ROI of apprenticeship programs.

All the companies in the study believed that the benefits of apprenticeships outweighed the costs, but many wanted more complete ROI numbers to make more evidence-based decisions, market to prospective

employees, and convince senior management and boards to approve funding to expand apprenticeship programs. These firms believe that workforce development and talent acquisition strategies, such as the decision to train apprentices, closely interact with decisions in areas such as technology and marketing. Firms with deeply trained workers can invest in more complex equipment and may be able to target more demanding market segments, such as those requiring better customer service or faster innovation.

MAKE IMPROVEMENTS BASED ON THE ANALYSIS

As with any new business process, firms often learn as they go. In interviews, firms shared some of the lessons they learned during planning and implementation of their apprenticeship programs. Below are some examples of tweaks firms made because of experience.

Mentor assignment. Apprentice-mentor pairs may not always turn out to be good matches, for reasons related to training needs or personality. Assessing these relationships is important, and firms should not be afraid to make changes to improve matches.

Apprentice uniforms. It may be useful to have a method to differentiate apprentices from other employees for safety or other reasons. Siemens first had apprentices wear different uniforms than experienced employees, but this made it difficult for apprentices to fit in with existing employees and reduced camaraderie and teamwork. Since then, apprentices wear the same uniforms as other employees but have a special badge sewn onto the uniform. This small difference signifies that apprentices are still in training mode but also allows them to blend in and feel like part of the team with experienced workers.

Scheduling. Dartmouth-Hitchcock had trouble in the early stages of a pharmacy technician apprenticeship program because of shift schedules that were incompatible with apprentice work-life balance. Many apprentices were scheduled to work late into the night and return early the next morning. It is difficult for any employee to perform pro-

ductively on little sleep, but it may be even harder when that employee is also engaged in an intense learning process. Dartmouth-Hitchcock subsequently adjusted the scheduling process before relaunching its pharmacy technician apprenticeship program.

As these few examples highlight, no company gets it exactly right on the first try, and what counts as “right” often is a moving target. Firms’ needs change over time, and apprenticeship programs should also evolve to remain useful. The companies that the researchers profiled provide a wealth of experience for other firms looking to develop apprenticeship programs.

CONCLUSION: MEASURING THE HARD TO MEASURE

Leaving out a hard-to-measure cost or benefit is equivalent to assuming its value is zero. For example, the case for apprenticeship at Siemens is strongest when it is based on apprentices’ increased productivity and increased flexibility in performing production tasks. If, for example, the flexibility of apprentices were not valued in the ROI calculation, the case for apprenticeship would be much weaker. It is difficult to put a value on an apprentice’s deep understanding of fundamental principles and hands-on knowledge. However, firms may want to guess at reasonable numbers, drawing on accounts such as this one to generate a range of estimates, or adopt techniques that account for variance in capacity utilization, such as the portfolio analysis described in the Siemens case in the full report (Case Western Reserve University and U.S. Department of Commerce 2016).

The benefits of apprenticeships for the firms studied were greater than most firms had estimated. Siemens obtains at least a 50 percent rate of return on its apprenticeship program compared to hiring machinists from other sources. Most of the gains can be attributed to the flexibility that Siemens gained in employing workers in Charlotte, North Carolina. Apprentice graduates’ ability to perform various tasks and work on multiple machines helps the plant make full use of spare capacity, when available, allowing the plant to take on new work repairing generators, a task that involves more judgment than standard production work. Because Siemens’ apprentice graduates have a strong grasp

of the principles of their work, they can think through more complex processes, making them well suited for tasks that involve judgment.

Dartmouth-Hitchcock found that its medical assistant program nearly paid for itself within the first year. The program had an internal rate of return of 40 percent compared to using overtime with existing medical staff, and it was essential to a major expansion and reorganization of its medical services provisions. Reducing the long-term use of overtime also helped reduce staff burnout and turnover while maintaining high-quality care.

This report thus shows that the performance metrics used by companies may not capture the full benefit of investing in apprenticeship programs. In many cases, firms already have the existing data across departments to highlight such benefits—it is just a matter of merging and tracking such data over time.

Notes

This chapter is a heavily revised excerpt of material previously published as “The Benefits and Costs of Apprenticeship: A Business Perspective.” Please see <http://esa.doc.gov/reports/benefits-and-costs-apprenticeships-business-perspective> for the full version of the report (Case Western Reserve University and U.S. Department of Commerce 2016).

1. Strictly speaking, recruiting costs are not entirely fixed. Researchers decided to group it with fixed costs because it is not a function of the number of apprentices hired, but rather the amount of outreach companies wished to conduct to reach a sufficiently large pool of potential job applicants. Interestingly, some firms found that recruiting costs were lower for apprenticeships than for finding off-the-street hires.
2. For many companies, filling key occupations through apprenticeships or other means is not an either/or decision. Companies typically filled positions in multiple ways. Knowing the full costs and benefits of apprenticeships versus other recruiting methods helps firms determine what share of a specific occupation they would like to fill through apprenticeships.

Reference

Case Western Reserve University and U.S. Department of Commerce. 2016. "The Benefits and Costs of Apprenticeship: A Business Perspective." Cleveland, OH, and Washington, DC: Case Western Reserve University and U.S. Department of Commerce. <http://esa.doc.gov/reports/benefits-and-costs-apprenticeships-business-perspective> (accessed February 20, 2018).