This case study originally appeared in a report published in 1997 by the American Society for Training and Development, in collaboration with the National Employer Leadership Council (NELC). The report, entitled Learning and Earning: An Employer's Look at School-to-Work Investments (coauthored by Lauri J. Bassi, Theresa Feeley, John Hillmyer, and Jens Ludwig), was based on data gathered by field researchers working with eight U.S. employers offering student internships, apprenticeship programs, or paid part-time employment. Along with Autodesk, Inc., these firms included BellSouth, Charles Schwab, Crown Auto World, Eastman Kodak, McDonald's, Siemens, and Sutter Health.

AUTODESK, INC.
San Rafael, California

Program
Student internship.

Participants
- approximately 150 high school students have interned at Autodesk's San Rafael headquarters since 1994
- 40 students are currently interning
- about 25 managers have participated.

Costs
- salaries for student interns, average roughly $7 per hour across divisions
- supervisory costs from $50 to $440 per week during the first month, $50 or less per week thereafter.

Benefits
- $15 to $40 per hour of intern labor
- increased employee morale and workplace environment
- increased productivity for regular employees
- supervisory experience for Autodesk employees.

Benefits/Costs
Benefit/cost ratios for Autodesk departments range from 1.15 to 3.00 (median of 2.32), using conservative discount rate of 10 percent. These ratios are calculated using the value of the intern's labor as the only benefit to Autodesk from the program, and are thus conservative in that we cannot quantify additional benefits from the increased productivity, morale, or skill development among Autodesk's incumbent workers.

Abstract
Since the inception of its internship program in 1994, Autodesk has provided 150 students with exposure to advanced computer-aided-design (CAD) software, as well as lessons in corporate culture. Student interns tend to be fairly computer literate and have high productivity after brief training periods; as a result, most departments within Autodesk have benefit/cost ratios well in excess of 1 from the productivity of student labor alone. The program seems to be well received

by full-time Autodesk employees because the students free up other employees from mundane tasks. Over time, the company's hiring of full-time workers may be affected by the availability of lower-cost student labor for these mundane tasks. Students learn general and firm-specific computer and professional skills through their projects at work.

Introduction

Program History

Since its founding in 1982, Autodesk, Inc. has grown to be the fourth-largest personal computer-software company in the world, with 1996 revenues of $534 million. The world's leading supplier of computer-aided design and desktop multimedia software, the company employs 2,200 people worldwide; most of its employees work in the San Francisco Bay area.

Autodesk's involvement with high school interns began in the early 1990s, when students began to contact the company looking for opportunities to work with the company's AutoCAD and Multimedia 3D Studio software. AutoCAD is the industry-standard design automation software package used by an estimated three million customers worldwide.

These first contacts led to the formation of an informal internship program administered by Judy Morgan, school-to-career program manager at the Autodesk Foundation. The Foundation was created by Autodesk in 1990 "to identify and develop strategies and model programs for improving public schools and expanding educational opportunities beyond the walls of the classroom." Morgan, an 11-year employee of Autodesk who moved to the Foundation in 1992, started the program by contacting managers who might be interested in working with students and whose departments might benefit from additional staff.

Managers in Autodesk's quality assurance (QA) departments quickly realized the benefits of bringing in young computer students to test software products; by the summer of 1995, there were 50 students working at Autodesk. Student demand for the program grew rapidly through word of mouth as students began to tell their friends and classmates about the opportunities at Autodesk. As the number of interested students grew, Morgan began contacting additional managers and placing students in many different divisions within Autodesk. To date, students have interned in human resources, finance, multimedia marketing, technical publications, image archives, desktop services, and the technical assistance center. Several interns have been hired on a project basis by the Foundation to help administer and maintain the internship program itself.

Program Mechanics

Student interns at Autodesk often begin working in unpaid internships five to 12 hours per week. After working three to six months, managers typically begin paying them a small hourly wage—starting at $5-7 per hour, with increases over time (some interns are now being paid as much as $15 per hour). Most students work part-time during the school year (10-20 hours per week) and full-time over the summer months and holidays. Individual managers make all decisions about employing interns and pay students out of their own internal budgets. Unpaid interns are not classified with the human resources department and have no official status in the

company. Once managers decide to give them a wage, interns are classified as "project employees." The project employee classification at Autodesk is similar to a consultant or independent contractor. Taxes and Social Security contributions are withheld from paychecks, but no benefits are included. Students fill out weekly time sheets, which are approved by managers and sent to human resources for processing.

For example, in March 1995 (during his sophomore year of high school), Justin Rainwater started as a part-time, unpaid intern in the AutoCAD quality assurance lab. During the summer of 1995, he began working up to 20 hours per week and eventually was brought on as a project employee at $6 per hour in the fall of 1995. One year later—after working 30-40 hours per week during the summer of 1996—his wage was raised to $10; six months later, it was raised to $15. Rainwater was hired as a full-time employee in May 1997 as a quality assurance analyst.

The only formal structure of the program is the placement of interns with managers. Managers fill out a simple one-page form describing their requirements for student interns. The completed forms are sent to Judy Morgan, who screens students who have shown an interest in working at Autodesk. All prospective interns must create a resume and interview with Morgan, who then recommends students to managers she feels would be a good match. Managers arrange interviews with the students and make hiring decisions on their own. Morgan maintains informal contacts with the managers and students involved and keeps a database of participants.

Of the 37 interns who were active during the summer of 1997, about one-third were enrolled in a two- or four-year college program. Most of the remaining students in the program were in 11th or 12th grade, though there were a handful of younger students who were earlier in their schooling careers (8th or 9th grade).

For our case study, we interviewed a convenience sample of six students between the ages of 15 and 18. Each of these students had some previous work experience prior to interning at Autodesk, though these experiences were limited to work in the retail, manual labor, or informal sectors. Five of the six students had mothers with at least some college education (two had college degrees). The self-reported grades of these students reveal few signs of "creaming": two of the six students earned mostly Cs or Ds in school prior to joining the program, and only one earned mostly As. Each student expected to earn at least a college degree.

Costs

The costs of administering the internship program are approximately $60,000 to $65,000 per year. This total includes the salary and benefits of a full-time employee (Morgan) who devoted 85 percent of her time to the intern program, plus several hours per week for five other full-time employees. In addition, the Foundation pays about $3,000 per year in other expenses toward the internship program.

Once an intern is placed with Autodesk, the costs to individual managers are incurred primarily in the form of salaries paid to the students, as well as training and supervision costs. Most

managers said that interns required an equal or "normal" amount of training time compared with full-time employees or contractors; several cited examples in which students actually learned faster than other employees. Managers indicated that no special requirements were made for interns concerning formal training or equipment. In many situations, student interns worked on spare computers or old machines that were no longer being used. Because students presumably are short-term employees and Autodesk does not expect training spent on them to remain in the company, any time invested in an intern could be considered more costly than for full-time employees. Because Autodesk hires a large number of short-term contractors who require a similar time investment and have a high turnover rate for many full-time positions, however, the difference in total costs of training between interns and other employees is negligible.

Some managers indicated that space was a problem when bringing in new interns and that this constraint inhibited increases in the program. In all cases, however, managers emphasized that bringing students into the workplace did not involve obstacles above and beyond those involved in bringing on adult employees.

Benefits

The most visible initial benefit from the program has been the positive public exposure Autodesk has received in the community, particularly with its "Mustang Project." The other direct and indirect benefits of program participation show some variation across individual internship placements, so we present separately the estimated benefits from interns in several different departments (technical publications, information systems, quality assurance, Kinetix multimedia, technical assistance, and the Autodesk Foundation).

Several experiences were similar across departments. Most students produced net benefits to their departments because their wages were lower than those paid to adult labor for whom these interns were substituting. By assigning interns to lower-level tasks, managers were able to dedicate more full-time staff to more complex, long-term projects. Managers emphasized the important benefits that this program had in helping to keep long-term workers fresh and interested, with a commensurate reduction in burnout. Most managers who were involved cited their desire to provide students with opportunities to learn and grow and to give something back to the community, though these managers also soon realized the benefits to their own working groups and organizations. Managers cited other benefits from having student interns, ranging from the fresh ideas and new perspectives that students provided to opportunities for supervisory experience provided to full-time employees.

Through their work experiences, students learned general computer skills (such as local area network administration) in addition to firm-specific skills (such as the operation and testing of Autodesk's CAD software). Two of the six student interns that we interviewed reported an increase in their study time since joining the program; none of the students reported a decrease in study time.

The Mustang Project

The company has had considerable exposure in local and national media beginning with one of its first intern activities. Called the "Mustang Project," this activity began with a manager in the

multimedia quality assurance lab who wanted to give students something exciting and interesting to work on. He decided to have a group of unpaid interns digitize parts from his disassembled Mustang GT convertible racing car. The students then used Autodesk's drafting and multimedia software to animate the parts and electronically reassemble the car. After stories about the project began appearing in several magazines and on the national news magazine *The Site* on MSNBC, Ford Motor Company contacted Autodesk and is now offering resources of its own to continue the project, along with the original manager now at Compaq Computer Corporation, who will be replicating the Autodesk intern program.

Technical Publications

Mary Keane, a managing editor in Autodesk's technical publications group, says she decided to take on a student intern for the good it could bring to both the student and her work group. "I love to coach people," says Keane, who has been working with 19-year-old Brook Shaw for almost a year.

Keane's group writes online and hard-copy editions of software manuals for Autodesk's Mechanical Desktop software. "Brook has done a variety of things for us," says Keane. Brook has created spreadsheets, kept software notebooks up to date, and tested tutorial procedures.

Brook worked in the mechanical publications group from eight to 10 hours per week during the school year at $8 per hour. During the summer, she worked two full days each week. Keane expects to pay her a total of about $4,400 for the year.

Keane estimates that in the beginning, the members of her group (herself included) spent up to two hours per week supervising or training Brook. Since the first few months, Keane says, they spend less than an hour per week advising and directing her. Because full-time employees in Keane's group earn between $30 and $55 per hour (salary plus benefits), the total supervision cost for Brook the first several months was $60 to $110 per week; that cost has declined to less than $50 per week since that time.

Brook works on many tasks with an independent contractor that Keane also has hired. Keane estimates that every hour Brook works frees another member of her staff (usually the contractor) of an hour. Because the contractor is earning $25 per hour, the value of Brook's time creates savings of $17 per hour. Even after subtracting an additional $50 per week in supervisory expenses, Keane is saving approximately $14 per hour.

Keane also notes that Brook brings some important skills of her own to the work group. Because she came from a design background, Brook already knew the AutoCAD software package and could easily find her way around the program. "Other people would take days to test tutorials for us," says Keane, "but Brook [is] faster than any other professionals because she's so focused." Brook's AutoCAD skills make her a valuable member of the group, says Keane—"everybody wants her to help them."

Another benefit that Keane emphasizes is the enjoyable atmosphere that comes from working with a student. Because Brook is removed from the usual day-to-day problems of an office, Keane says that she uses Brook to give her a point of view that other employees can't. Because Brook is free from office politics and "uncluttered," Keane draws on her fresh perspective. Keane hopes that Brook will stay with the group for as long as possible.

"I'd love to have her working for us through college," Keane says of Brook, who will be attending a local community college beginning in the fall of 1997. "We're trying to kind of push her towards going to a four-year college for a bachelor's degree."

Information Systems

Steve Litras, a manager in the Internet technologies group, has hired several interns in recent years to develop Internet applications and maintain Autodesk's Internet infrastructure. Most interns work part-time, usually during the summer months, and not all of them are paid. Litras says that his interns do a variety of projects for his group, including testing new software products, developing new applications, and system administration.

"We started hiring interns because we needed a little help, but now we really rely on them much more," says Litras. He also has personal reasons for wanting to help students: "I came in to Autodesk as a temp; that's the way I got in, so I'm looking for ways to help kids get the same experience."

Litras brought on his current intern, Shannon Fiume, at $10 per hour. Her initial salary was based on the importance of the work she would be doing. She is working as a full-time system administrator, replacing an employee on leave. Litras estimates that he spent four to five hours each week for the first month training Shannon. He emphasizes, however, that this investment entailed no more training time than he would spend on a regular employee.

"If she weren't here, the work would be done by somebody else—but slower," says Litras. He adds that regular employees in this highly competitive field earn approximately $55,000 to $60,000 per year plus benefits, and independent contractors in the area would cost up to $50 per hour.

Shannon began working 10 hours per week at the beginning of the year and moved up to 30 hours per week during the summer. During her first month, the five hours of supervision per week cost Litras approximately $200; together with her $100 salary ($10 per hour for 10 hours), the total cost was $300 per week.

Since that time, however, Litras says that Shannon has provided 10-30 hours per week of productive work with virtually no supervision. If every hour that Shannon works frees an hour for another member of Litras' group, her labor saves $370-$410 per week (when she works 10 hours) or $1,110-$1,230 (when she works 30 hours). Subtracting her weekly salary from this total, the net savings to Litras' group is $270-$310 per week during the school year and $810-$930 per week over the summer—approximately $27-$31 per hour.

Like other Autodesk managers, however, Litras does not see Shannon's work merely as cheap labor for his group; he stresses the positive impact her presence has had on other group members. "The fact that she's here is enabling us to speed up our work," he says. "It's made us a lot happier because it's helped [to] free up time for our system 'admin' staff."

It's also helped to keep up the spirits of other system administrators, he says. "System administrative staff can get kind of jaded towards the job," says Litras. He adds that Shannon has given others a better perspective on why they are doing what they are.

Quality Assurance (QA)

Two years ago, Mahesh Kumar, a manager in the quality assurance division, created a test harness to run evaluation procedures on software products. Knowing that the actual trials didn't have to be conducted by trained engineers, Kumar designed the harness with the intention of bringing in student interns to run the experiments.

"I didn't need highly paid engineers working on something they don't need to be," says Kumar. Now the engineers generate the cases and students run the tests and report the results. "These are highly responsible positions. We value the students' contributions greatly, and I think it's a very rewarding experience for them."

Kumar set $8 per hour as a base wage rate, with a reassessment after one year. He says that it takes about two weeks for his interns to learn the procedures; after that period, his group may spend only 15 or 30 minutes per week explaining new projects. Kumar adds that "interns actually require less supervision than the others who report to me."

His current intern, Tracy Van Patton, is working 14 hours per week at $8 per hour (for a total weekly cost of $112). Kumar estimates that Tracy works at about 80 percent efficiency compared with a full-time employee; that is, the work that she completes in 14 hours could be done by another engineer in the group in approximately 11 hours. With salary and benefits reaching $42 per hour, the costs of accomplishing this work using a full-time employee would be $462. Therefore, Tracy saves Kumar's work group about $350 per week—or $25 for every hour that she works.

In addition to this direct financial benefit, Kumar also highlights the importance of the program in ways that were unexpected. "It has been very positive for us to work with young students. They come up with ideas and completely different sets of priorities," says Kumar.

Kumar adds that the program gives people in his group valuable supervision experience; this experience, in turn, helps the entire team function better. "They have a better appreciation of the things I go through finding work for them," says Kumar. "They all better appreciate the complexities in supervising someone and getting the work done."

Kinetix Multimedia

Tamami Tokutake, a manager in Autodesk's Kinetix multimedia division, has had a similarly positive experience with student interns. Tokutake worked with several interns and four independent consultants on a four-month project to translate a major software package into foreign languages. The students came in part-time after school and on some weekends and worked for $7 per hour; the consultants worked full-time during the four-month project and were paid $15 per hour.

The previous manager initially hired the interns merely to save money and anticipated lower productivity from them. Yet the students proved to be just as productive—and even more skilled—than the consultants hired at twice their salary. Initially skeptical about working with students, Tokutake quickly found that the interns could do anything she asked them to quickly and accurately. In fact, she admitted, because many of the tasks that needed to be done involved technical skills like file conversions and screen captures—which the students already were familiar with—the students actually were easier to train than the consultants. "They were just amazing," Tokutake says of the student interns. "They knew how to do things the consultants didn't."

With three students working 15 hours per week and another student coming in for slightly less, Kinetix paid the interns for an estimated 1,200 hours of work on the project. At $7 per hour, the total cost of employing the interns was approximately $8,400. Tokutake estimates that without the students, she would have had to hire another consultant or outsource the work to other firms. Hiring consultants at $15 per hour to replace the 1,200 hours the students put into the project would have cost the project $18,000. Subtracting the salary paid to interns for the same amount of work, hiring the students saved Kinetix about $9,600—or $8 for every hour of the students' labor.

According to Tokutake, outsourcing would have been an even more expensive option. One of the main tasks that the students accomplished on the project was capturing screen images. Screen captures (as they are called) can cost up to $10 each when they are done by an outside firm. The project required thousands of screen captures, with each one taking an average of three minutes. If an intern is able to do 15 to 20 per hour, the project saves $715-$965 for every 100 screen captures performed by student interns—or around $140-$193 per hour. Participation in the Autodesk student-intern program highlighted how expensive it is to subcontract for these services and called into question the wisdom of using external rather than internal staff for such tasks.

Assistance Center/Technical Assistance

Tom Barthold, Assistance Center manager in the information systems group, has hired several interns in the past several years. Barthold has found that student interns are faster to train than other new hires because of their already high level of computer experience. He explains that he used to search for employees who were skilled in pertinent software packages and possessed the necessary people skills for good phone support. After realizing the difficulties in finding such people, he has concentrated on those who would work well in the environment, knowing that he

could teach them the technical skills once they arrived. Unlike with adult hires, when Barthold finds a student who is comfortable working with people, he knows that he or she will have no problem learning the technical skills required for the job. “The students have the computer skills because basically they’ve all used the programs,” says Barthold.

Intern Dan Goldman has been a member of the working group for more than three years. Dan got his start at Autodesk as an unpaid intern in the summer of 1993. He originally worked for the desktop technologies group; he moved to the Assistance Center department in January 1994 and began getting paid $5 per hour. After one year working 25 hours per week (40 hours per week during the summer), his wage was increased to $10 per hour. Six months later, his pay was raised to its present rate of $15 per hour.

Barthold cites Dan as one of the main reasons why the group has been able to increase productivity and efficiency in the past year. “Even though Dan was working [fewer] hours, he was logging 50 percent of the calls for the entire group,” says Barthold. He explains that many of the requests for assistance are routine and don’t require much time or resources; that the sheer backlog, however, was tying up full-time employees. Barthold says that staff members would get burned out quickly and were overworked. With Dan handling the bulk of the routine calls, however, experienced workers could concentrate on the challenging problems. “Having interns helps productivity as well as morale by using those resources so that the experienced people can go off and do more training.”

Having interns in the work group had a direct impact on Barthold’s budget as well. Because of the nature of the work and the high turnover rate, most Assistance Center employees are hired into the group as private contractors rather than as full-time employees. Barthold says that interns and contractors are virtually identical when they arrive. He estimates that both are unproductive for six weeks while they learn the procedures and then 50 percent productive for another six weeks after that.

As far as Barthold is concerned, the only real difference between interns and contractors is their wage rate: Contractors are paid an average of $38 per hour the whole time they are with the group, whereas interns usually start off unpaid while they are training and then move up in $5 increments as they get more experience. The result, Barthold explains, is that interns can save him between $920 and $1,520 per week ($23-$38 per hour) compared with contractors.

Barthold also points to direct savings in the amount of overtime hours his employees work. His group used to log approximately 20 hours of overtime in every two-week cycle. Now, however, with interns cutting down on the workload, his group is down to less than half that amount—about $600 in savings every two weeks. This budget item, Barthold says, is where he gets most of the money to pay for the interns’ salaries.

Even with such sizable savings, however, Barthold stresses that the short-term economic advantages of having interns in his group are not as important to him as the long-term benefits.

He explains that the interns have allowed him to concentrate on long-term projects, which already have reduced the total call load by 20 percent this year alone. The backlog rate for the whole group is down to the lowest it's ever been; for the first time, Barthold says, the department is not understaffed.

With the reduction in calls, Barthold says his group can run much more efficiently. He may soon be able to reduce the number of full-time employees, although he has no plans to reduce the number of high school interns. In fact, Barthold says, he hopes to increase the number of students working in the group. He also would like to work on implementing a more established set of procedures and agreements with the students to make their experience even more rewarding.

Net Costs and Benefits

Most of Autodesk's intern programs have benefit/cost ratios in excess of 1, even though the only benefits we are able to quantify come from the value of the interns' labor. The following benefit/cost ratios are conservative, calculated using a 10 percent discount rate. These ratios also are calculated under the assumption that each student intern stays with Autodesk for one year, with the exception of Kinetix multimedia division (which used several interns for a specific project for four months) and the Assistance Center (which used one intern for four years). The administrative costs of the Autodesk project are allocated evenly across each of the 37 students active in the program as of summer 1997.

Division	*Estimated Benefit/Cost Ratio*
Technical publications	1.63
Information systems	2.38
Quality assurance	2.28
Kinetix multimedia	1.15
Assistance Center/technical assistance	2.99

The Future of Autodesk's School-to-Work Program

Chris Lee, human resource manager for planning, says that the human resource department is only now beginning to understand the benefits that student interns are bringing to the company. "From a programmatic perspective, this hasn't even been on the screen," says Lee, who is starting to work on implementing college recruitment and internship programs at Autodesk.

One possible long-term benefit of the program could be a reduction in Autodesk's recruitment costs through the hiring of student interns as full-time employees. A handful of interns already have been hired by Autodesk in the past few years, and most managers interviewed expressed their willingness to do so in the future.

Lee says that in the next two months, the human resources department is hoping to initiate a new employment category for high school interns that would give them some limited benefits and (he hopes) keep them with the company when they get out of school. "We should start to try and establish a relationship with them," says Lee, who hopes to create a smooth transition for employers from high school to college and beyond. "It's in our best interest," he says. "We're

going to try and make them productive regular employees."

Bob Pearlman, president of the Autodesk Foundation, says that the program has gone about as far as it can unless some significant challenges are met. The Foundation is working to form a third-party organization made up of business leaders and school representatives that would provide part of the infrastructure for the program in the future. The Foundation also is actively promoting a regional coalition—the Bay Area School-to-Career Action Network (BASCAN)—that would promote school-to-career initiatives in more companies and give opportunities to more students in all schools.

Conclusions and Lessons Learned

Autodesk is one of the primary drivers for the Marin County school system's gradual development of a school-to-work program. The lack of public-sector infrastructure and strong support is reflected in the informality of the Autodesk program. Students typically are assigned to one department for the duration of their internship; they learn general and firm-specific computer skills through their work-related projects. Autodesk does not publicize formal academic or disciplinary requirements for students and does not offer certification in specific academic or trade-related skills. Yet despite a lack of formal academic requirements for participation, two of the six students interviewed reported that participation in the internship program has led them to increase the time they devote to schoolwork.

The student internship program has produced substantial benefits for Autodesk—in part, perhaps, because of two conditions that may be unique to this high-tech company. First, young workers can be unusually productive in the computer software industry: Most of the managers that we interviewed reported that student interns typically have computer skills that are at least as advanced as those of their full-time adult counterparts. Although the availability of intern labor could displace some full-time workers in the long run, in the short run the internship program produces notable benefits to managers and full-time employees. In several cases, the presence of interns allowed Autodesk managers to allocate full-time workers to more complex tasks, thereby increasing the morale of the Autodesk workforce. Several managers also reported improvements in supervisory skills and team cohesion from having full-time employees supervise student interns.

Second, programmers and software engineers command high salaries in the high-technology industries of the San Francisco area. Together, these factors imply that the value of the interns' labor to Autodesk is very high; even though Autodesk pays these students relatively high wages (in light of the fact that these are high school students), the costs of the program typically are covered easily by the wedge between the interns' wages and the value of their hourly product. The strong demand for skilled programmers in the San Francisco area will make it more difficult for Autodesk to retain these students once they enter the labor market full-time, unless a strong college recruitment and college internship program is successful. Nevertheless, our study suggests that Autodesk will still realize net benefits from its participation.