

This ROI calculator provides default variables, values and assumptions for each selected industry. These default values are based on feedback from Oregon employers; Oregon employment and wage data; Washington employment wage and gross business income data; existing literature; and selected national averages.

These default values and assumptions are industry averages, individual companies can expect to experience different costs and benefits than those presented in the default values. The average values and assumptions are included as a starting point to help users understand the many ways that the tool can help estimate the costs and benefits of apprenticeship.

COST VARIABLES

Wages

Default wages are sourced from occupational wage data from the State of Oregon Employment Department. The Oregon Bureau of Labor and Industries provided common apprenticeable occupations within the manufacturing, construction, healthcare and IT industries. The hourly wages for each industry are an average of common apprenticeable occupations by industry. Average hourly wages are converted to annual wages based on a 2,000-hour year.

Construction industry average wages have taken into consideration the impact of the prevailing wage in establishing the estimated wages set forth in this tool. Prevailing wages are generally higher than the average wage paid in most construction occupations, however, the Oregon Employment Department wage data includes both prevailing wage and other construction wages for workers covered through unemployment insurance.

An off-the-street hire, or the Without Apprenticeship scenario, is assumed to receive the full value or 100% of the average industry wage. The apprentice, or the Apprenticeship Program scenario, is assumed to receive a portion of the average wage. The portion of the wage that an apprentice receives is determined by the approved standards for the specific program and occupation. The portion that an apprentice receives increases over time at a set schedule.

The default assumption for the apprentice wage scale by industry are averages across each program for each common apprenticeable occupation by industry. Wage progression standards are typically set by period based on on-the-job hours. These standards were converted to years based on a 2,000-hour year by program. In most cases the program duration is the same across occupation, but some programs will differ. The most common duration was identified by occupation and the wage progression for each of these programs was averaged by year to arrive at an average wage progression by occupation. Then the most common duration by industry was identified and all occupations with that duration were averaged. The resulting wage progression is used as the default assumption for each industry.

Benefits & Taxes

Default benefits and taxes are calculated as a percentage of the wage. Benefit and tax assumptions were developed using an estimate of benefits and taxes as a share of wages from the Washington State Office of Financial Management's (OFM) Washington State Input-Output Model (IO model). The IO model provides an estimate of the average load wage by detailed industry. The average load wage includes wages, benefits and taxes.

Using Washington wages from the Washington State Employment Security Department's (ESD) Quarterly Census of Employment and Wages (QCEW) an estimate of the benefits and taxes adjustment is developed by detailed industry. In order to arrive at an average industry adjustment for Oregon, the detailed industry

adjustment was applied to 2016 Oregon wages from the Oregon Employment Department's QCEW data and summed together by high-level industry, construction, manufacturing, healthcare, IT and other. This estimated total load wage by industry was then compared to wages by industry to arrive at the benefits and taxes assumptions used as the default assumptions.

Tuition and Related Training

Tuition and related training costs for year one for the manufacturing industry are an average of data provided by an Oregon employer and yearly costs estimated from data sourced from Case Western Reserve's November 2016 study, "The Benefits and Costs of Apprenticeship: A Business Perspective."

Construction industry tuition costs are based on interviews with Oregon construction employers. Construction employers interviewed were primarily union employers. In their case, the cost of tuition is paid into a training fund as a per hour contribution for each journey worker. The contribution that interviewed employers make is \$0.80 per hour. The standard ratio of journey workers to apprentices is three to one. Therefore, the average contribution per worker per year is \$0.80 multiplied by 2,000 hours per year, or \$1,600 per journey worker per year. The total contribution is then multiplied by the assumption of 300%, representing the ratio of three journey workers per apprentice, resulting in the total training cost per year per apprentice.

Healthcare tuition costs are the average employer contribution for the medical assistant and dental assistant apprenticeship programs through the Washington Association of Community and Migrant Health Centers. At the time of development, a healthcare industry apprenticeship program did not yet exist in Oregon.

IT apprenticeship tuition costs were based on information provided by interviewed employers participating in the Apprenti program. Interviewed employers were located in Washington, at the time of development Oregon employers had not yet finalized participation in the Apprenti programs.

Default values for the Other industry is an average across the values used for manufacturing, construction, healthcare and IT.

Mentor Time

Mentor time is highly variable depending on the employer. Case studies from Case Western Reserve's November 2016 study, "The Benefits and Costs of Apprenticeship: A Business Perspective" found that over three and a half years the total cost of a manufacturing apprentice is \$187,000, of which 96%, or \$179,500 were apprentice and mentor wage costs. This same case study found that in years three and four of the apprenticeship the apprentice earned \$23 per hour. Assuming a standard apprentice wage scale, based on the journey level wage of \$56,000 from the study, total apprentice wage costs are estimated at \$133,000. The remaining \$46,500 are the estimated total mentor cost over the program lifespan. This results in an estimated \$13,300 per year in mentor cost as a sample default value for the manufacturing industry.

The default assumptions represent the loss in productivity during the mentor's time spent training the apprentice. One Oregon manufacturer reported that mentor time is completely non-productive, while Case Western Reserve's case studies from two employers reported zero loss in productivity due to mentoring. The average of these three case studies is a 33% loss in productivity during mentor time.

Interviewed Oregon construction employers mentioned that mentors lose approximately 10% productivity while training apprentices. The default value for construction is the journey worker wage. The default assumption is equal to the 10% loss in productivity reported by employers.

One IT employer participating in Washington's Apprenti program reported that on average one to three mentors train an apprentice for a total of 10 hours per week. The average wage for these mentors is \$70 per hour. This is an estimated cost of \$35,000 in mentor wages per year. This employer additionally reported that mentors during the training time loss 15% in productivity, the default assumption used here.

No data was available to estimate the value of mentor time or an assumption to estimate loss in productivity. The Other industry default values and assumptions are an average of the data for each industry when available.

Recruitment

Recruitment is a one-time cost incurred due to hiring. According to the Society of Human Resource Management the average cost of recruitment was \$4,000 in 2016. This national average is used as the default value for the Without Apprenticeship scenario for the construction, healthcare and other industries. Recruitment costs for an individual company could include hiring a staffing firm, job fair participation, advertising and more.

One Oregon manufacturer reported that the cost to hire off-the-street is \$2,000. An employer from the Case Western Reserve study reported that it cost \$1,000 to recruit off-the-street. The rounded average of these two is used as the default value for manufacturing.

Employers from the IT industry noted higher costs of recruitment, particularly due to the cost of signing bonuses. The default value therefore is the sum of the average recruitment cost and an assumed \$2,500 signing bonus.

BENEFIT VARIABLES

Employee Output

Employee output measures the value to the company of the product, service or activity that the worker is employed to produce. This can vary significantly between companies even within the same industry. The default values used here are the cost in terms of wages, benefits and taxes for each industry. The default assumptions are a percentage that demonstrates the value of output per dollar paid in wages and benefits.

The percentage for each industry was estimated for Oregon by using a ratio of gross business income per worker by detailed industry from the Washington State Department of Revenue's (DOR) Gross Business Income Data and employment from ESD's QCEW data. These ratios were then applied to Oregon employment from the Oregon Employment Department's QCEW in order to arrive at an estimate of gross business income by detailed industry for Oregon, which was then aggregated into the five high-level industries within the tool. Estimated gross business income by industry in Oregon was divided by the total load wage by industry for Oregon to arrive at an estimate of gross business income per dollar of wages, benefits and taxes paid by each industry, shown as a percentage in the default assumptions for employee output.

Interviewed employers and prior literature have found that for some industries apprentices are less productive than an off-the-street hire in the early years of their apprenticeship. One Oregon manufacturer found that in year one of the apprenticeship the apprentice is 60% as productive as an off-the-street hire which increases each of the apprenticeship. By year four of the apprenticeship they are 90% as productive as an off-the-street hire.

Construction employers noted that apprentices are about 90% as productive as an off-the-street hire throughout the apprenticeship, because the apprentice is able to do productive tasks that may require less skill from the beginning of their apprenticeship, as they learn the skills of the trade they are able to do increasingly advanced productive tasks.

IT industry employers participating in apprenticeship noted that in the first months of the yearlong apprenticeship, apprentices have very low to zero productivity, but that productivity increases quickly, some even reaching full productivity within 6 months. Based on IT employer feedback, apprenticeship productivity was averaged throughout the year resulting in 75% average productivity in year one.

Prior literature on healthcare apprenticeship noted no difference in productivity between an apprentice and an off-the-street hire. Other industry productivity for year one was averaged across all industries.

Increased Retention

Oregon employers interviewed across all industries noted that they experienced increased employee retention due to their apprenticeship program. This would typically be experienced in the post-apprenticeship period, however, for the purposes of this example it is included as a year one benefit. Increased retention is calculated by estimating the percentage reduction in turnover due to apprenticeship program applied to the cost of recruitment for an off-the-street hire used in the cost section.

The percentage reduction in turnover due to apprenticeship is calculated using feedback provided by interviewed employers and secondary research on turnover rates. For example, feedback from Oregon construction companies indicated a 10% turnover rate among apprentices, and secondary research found that the average turnover rate for the construction industry is 21% from the ADP Vitality Index. The simplest way to calculate the benefit of reduced turnover per employee is the difference between average turnover and apprentice turnover, in this case 11% per year.

Apprenticeship and off-the-street hire turnover for the manufacturing and IT industries were informed by feedback from interviewed Oregon employers. Apprenticeship turnover rates for construction and healthcare were informed by feedback from interviewed Oregon employers. Industry average turnover for healthcare was sourced from the Becker Hospital Review reporting on 2017 survey findings from Compdata. Other industry default assumptions are an average of the percentage reduction in turnover per apprentice for manufacturing, construction, healthcare and IT industries.

Increased Productivity

Increased productivity is typically a post-apprenticeship benefit. For the purpose of illustrating the value of increased productivity it is included as a year one benefit here. Case Western Reserve's case study of Siemens USA found that on average apprentice graduates were able to complete the average nine-hour job six to eight minutes faster than off-the-street hires. The default value is based off the total value of employee output for the manufacturing industry. The percent of that total value generated by an apprentice's increased productivity is estimated by determining how many more jobs on average an apprentice can complete per year using data from Case Western Reserve. The average employee can complete 231 jobs per year ($2,080 \text{ hours per year} \div 9 \text{ hours per job} = 231 \text{ jobs}$), while the apprentice can complete 235 jobs per year ($2,080 \text{ hours per year} \div 8.87 \text{ hours per job} = 235 \text{ jobs per year}$). The difference between the two is an increase of four jobs per year or a 2% increase in jobs per year ($4 \text{ increased jobs per year} \div 231 \text{ average jobs per year} = 0.02 \text{ increase in jobs per year}$).

Insufficient information was available in order to estimate the value of increased productivity to include as default values for construction, healthcare, IT and other industries.

Skilled Worker Pipeline

Employers have reported that one benefit to having their apprenticeship programs is the development of a pipeline of skilled workers. One Oregon manufacturer reported that it takes on average a month to hire a skilled worker, time that is not required happen when those positions are filled by trained apprentices. Assuming that having a position open for a month results in a full month of lost productivity, which is avoided with the apprenticeship program. The default value is equal to the annual value of employee output, the assumption is equal to one month or 8% of the year in avoided productivity losses ($1 \text{ month} \div 12 \text{ months per year} = 0.08 \text{ year}$).