

Employment in Logistics and International Trade

Opportunities with Limitations



Information and Acknowledgements

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Executive Summary

Overview

Cargo moving through Puget Sound ports is projected to increase dramatically into the foreseeable future, from 65 million metric tons in 2002 to 107.8 million metric tons in 2025. As that cargo moves, it is creating a wide range of jobs in the newly-identified “Logistics and International Trade” (LIT) sector.

Many of the same global economic forces that are driving that growth are also fueling a decline in Manufacturing jobs across the U.S. and in the Puget Sound region. Some observers have raised alarm bells at the loss of those jobs. For many people, Manufacturing has been a pathway to the middle class. This was a sector where workers with limited education could find well-paying jobs with good opportunities for advancement.

This study asks the following question: As the LIT sector grows alongside the burgeoning movement of cargo, can this new sector provide the same kind of career opportunities once provided by Manufacturing? This initial scan of the data finds that in the Seattle area the LIT sector provides a good number of entry level jobs that are comparable to those provided in the Manufacturing sector.

In Detail

This study found some 35,846 people working in 224 different occupations in the LIT sector in 2002, compared to 115,170 people working in 395 different Manufacturing occupations. When all occupations were ranked by the number of workers in each and compared, some 89.1% of all LIT workers (31,922) could be found in the top fifty occupations, compared to 67.0% of Manufacturing workers (77,146). This concentration of workers in a smaller number of jobs appears to be a key characteristic of the LIT sector.

The LIT sector pays wages that are comparable to those in Manufacturing. The average entry wage for the top fifty LIT jobs is \$15.60 compared to \$16.52 for the top fifty Manufacturing jobs. The average mean wage for the top fifty LIT jobs is \$24.49 compared to \$24.22 for Manufacturing.

Wages in the LIT sector are relatively high. The LIT sector can be divided into categories, based on the type of transportation (Air, Truck, Freight and Warehousing, and Water). Average mean wages for each of those categories is higher than what the average Seattle worker earns. Looking at only entry-level positions in each of those categories, the average entry-level wage for those jobs requiring the least training is greater than the state minimum wage. Moreover, in Air Transportation, Truck Transportation and Water Transportation, the average entry level wage for the jobs requiring the least training is greater than ten dollars per hour, making these good employment options for entry-level workers.

Out of the top fifty occupations in LIT and Manufacturing, those that only require minimal on-the-job training were taken out and compared. Again, the concentration of workers in the LIT sector is notable, with 56.3% of all LIT workers (20,195) in those occupations compared to 28.3% of all

Manufacturing workers (32,555). Wages in the LIT sector were found to be slightly higher than for Manufacturing. The average mean wage for those occupations is \$16.98 for LIT and \$16.22 in Manufacturing.

When the rest of the top fifty occupations in each sector – those that require additional training and education – are compared, an important difference between LIT and Manufacturing emerges. While 11 of the top fifty LIT occupations (22%) require only additional work experience for advancement, 16 of the top fifty Manufacturing occupations (32%) require additional training or education, either at a community college or university.

While that finding might suggest that advancement up the LIT career ladder may be easier than in the Manufacturing sector, a closer look at all LIT occupations presents something different. While 45.9% of all LIT occupations (103) can be classified as “entry level” based on the limited training required, 66.0% of all LIT workers (23,639) can be found in those jobs. This suggests that opportunities for career advancement within the LIT sector may be somewhat limited. Moreover, the largest share of “advancement” positions (29.5% of all occupations) requires some kind of vocational or university training to qualify. This suggests that advancement within the LIT sector may require as much education as advancement within Manufacturing.

Additional Study

This is an initial scan that looks at King County data only. Additional study is required in order to determine the exact nature of employment opportunities and career ladders within the LIT sector, and to determine whether local resources such as training and public investment are adequate to support this growing sector. Further studies may add other counties in the Puget Sound region, such as Kitsap, Pierce or Snohomish counties. Other valuable studies might include detailed mapping of the career pathways and union density within the LIT sector, identification of transferable skill sets for LIT occupations, a review of LIT training providers, a survey of LIT employers, a national scan to discover whether other communities are engaged in LIT-related workforce and economic development activities, a study of how public agencies such as the Port of Seattle could play a role in LIT sector workforce and economic development, and a review of current and potential freight mobility and environmental quality improvement projects that can help to ensure sustainability of the LIT sector in the Puget Sound region.

Employment in Logistics and International Trade

Report Narrative

Introduction

Manufacturing as an industry and an employer has been on the decline across the U.S. and in the Seattle area for a number of years. Many of the same global economic forces that have led to a decrease in manufacturing jobs in the U.S. have led to a rise in the number of jobs transporting goods and people both globally and domestically. The Puget Sound region with its large port facilities and close ties to Asian producers and markets has been at the epicenter of a major boom in international trade, and growth in logistics- and trade-related jobs.

This study seeks to determine whether the booming Logistics and International Trade (LIT) sector can replace the shrinking Manufacturing sector as a creator of jobs with above average earnings and advancement opportunities for Seattle area workers with limited training and education.

This study finds that the answer to that question is a qualified yes. Occupations in LIT are relatively easy to enter, pay entry level wages above minimum wage and pay mean wages above what the average Seattle area worker earns. Wages in the LIT sector are not significantly lower than wages in Manufacturing. Moreover, LIT occupations are projected to have nearly as many openings per year as Manufacturing occupations. Opportunities for advancement in LIT, however, may be more limited.

The first section of this report describes the recent growth in the LIT sector and defines the sector more specifically. The second section details the research question. The third section specifies the methodology and data sources utilized. The fourth section presents the research findings. The fifth section reviews potential challenges to growth in the LIT sector. The sixth section provides an overview of training opportunities for the top ten LIT occupations. The seventh section provides analysis, answering both the overall research question and five key sub-questions. Detailed tables are provided in the appendices.

The Growth of Logistics and International Trade

Manufacturing as an industry and an employer has been on the decline across the U.S. for a number of years. In the Seattle area, manufacturing was long dominated by the transportation equipment sector, primarily in airplane-related manufacture and the Boeing Company. After a peak in 1998, manufacturing in the region dropped by nearly 50,000 jobs by 2003, with 30,000 of those jobs eliminated in the manufacture of transportation equipment.¹

The manufacturing sector has long been a place where workers without a college degree could find well-paying jobs with benefits, and with career ladders that allowed those workers and their families rise to the middle class. With the decline of the manufacturing industry and the concomitant rise of the relatively low-paying service sector, questions have arisen as to where workers with limited education and training can find living wage jobs in the evolving economy.

Many of the same global economic forces that have led to a decrease in manufacturing jobs in the U.S. have led to a rise in the number of jobs transporting goods and people globally and domestically. Puget Sound airports and seaports are at the epicenter of the expansion of international trade in goods in the Seattle region. The Port of Seattle is the nation's fifth largest container port and the twentieth largest worldwide.

Combined, the Port of Seattle and the Port of Tacoma are the second largest container load center in the U.S., behind the Ports of Los Angeles/Long Beach and ahead of the Ports of New York/New Jersey. In 2002, Puget Sound ports handled 65 million metric tons of cargo. The 2004 Marine Cargo Forecast estimates that through 2025, tonnage will grow by 2.5% per year to 107.8 million metric tons.

The *2003 Economic Impacts of the Port of Seattle*² report states that port activities – including both air- and seaports – have five levels of employment impacts: direct employment, induced employment, air visitor industry employment, indirect jobs and related user employment. It estimates that 115,835 direct jobs are created by port-owned facilities, and 51,308 additional jobs

¹ Washington Manufacturing Research Project, **Seattle-King County Workforce Development Area Report**, <http://www.workforceexplorer.com/article.asp?ARTICLEID=3600>.

² Martin Associates, **2003 Economic Impacts of the Port of Seattle**, January 25, 2005, <http://www.portseattle.org/business/economicdevelopment/economicimpact.shtml>.

are induced in the region. A further 27,319 indirect jobs are supported by \$1.5 billion of local purchases by businesses supplying services at port-owned facilities.

The Washington Public Ports Association estimates that nearly 740,000 wage and salary workers and proprietors in the state depend on exports, and 161,000 workers depend on imports.³ Approximately one in every four jobs in Washington is tied to foreign exports. The volume of freight moving through Washington is growing almost twice as fast as the state's overall population and traffic growth.⁴

As the share of products Americans consume that comes from overseas has grown in recent years along with the amount of goods exported from the U.S., so has the complexity of the chain of transportation and logistics required to move them from their points of origin to the final consumer. Component parts may be manufactured in one or more countries, moved to another for assembly, and then moved to a third or more for final sale. Once a container arrives at a place like the Port of Seattle, it must be moved by truck or rail – or both – to get it to a regional transshipment warehouse and to the store. Evidence of this growth in international trade can be seen in the dramatic 19% increase in TEU⁵ (20-foot equivalent container) traffic at the Port between 2003 and 2004.

To move that amount of goods requires many workers, and the number of workers has grown as the amount of goods and services being moved have grown. New occupations have emerged, and training requirements for existing occupations have changed.

Commonly-known positions such as truck drivers, airplane pilots, flight attendants and longshore workers are accompanied by lesser-known occupations such as environmental compliance inspectors, warehouse stockers, and clerks with various job titles like freight forwarder, expeditor, cargo handler, import clerk, transportation clerk and document manager. This burgeoning employment sector has been called by several different names, with different definitions and boundaries. For example:

³ See <http://www.washingtonports.org/trade/tradestatistics.htm>.

⁴ Barb Ivanov and Elizabeth Stratton, Washington State Department of Transportation, **Washington Transportation Plan Update: Freight Movement** (draft), June 20, 2005, http://www.wsdot.wa.gov/NR/rdonlyres/016E3392-8D9D-49DD-A9A9-B827A51D8B4A/0/WTPFolio_062304Update.pdf.

⁵ TEUs are twenty-foot equivalent containers, the standard measure for an intermodal cargo container. Often referred to simply as a container.

- The Council of Supply Chain Management Professionals defines *Logistics Management* as “that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirements.”
- The National Association of State Directors of Career Technical Education defines the *Transportation, Distribution and Logistics* career cluster as “Planning, management, and movement of people, materials, and goods by road, pipeline, air, rail and water and related professional and technical support services such as transportation infrastructure planning and management, logistics services, mobile equipment and facility maintenance.”
- Dr. John E. Husing and the Southern California Association of Governments define the *Logistics and Distribution* sector as comprising the following North American Industry Classification System (NAICS) codes: 42 (Wholesale trade), 481 (Air Transportation), 482 (Rail Transportation), 483 (Water Transportation), 484 (Truck Transportation), 488 (Support Services For Transportation), 492110 (Non-Local Couriers) and 493 (General Warehousing and Storage).
- The Prosperity Partnership, a coalition of over 150 government, business, labor and community organizations in King, Kitsap, Pierce, and Snohomish counties, follows the Competitiveness Group, Inc. and Global Insight, Inc., defining *Logistics and International Trade* as comprising 36 different 6-digit NAICS codes.⁶

⁶ See <http://www.prosperitypartnership.org/clusters/logistics/naics.htm>.

Can Logistics and International Trade Replace Manufacturing?

No matter how this sector is defined, it is an important part of the economy of Washington state and of the Puget Sound region in particular. For the purposes of this study, the name and definition used by the Prosperity Partnership is employed: Logistics and International Trade (LIT). This study seeks to determine whether the job opportunities provided by the growing LIT sector are a good replacement for the Manufacturing jobs that have been lost in recent years. Specifically, it asks the following five sub-questions:

1. Does the LIT sector provide an adequate number of job opportunities for workers with limited education?
2. Do those jobs in the LIT sector pay higher than average wages?
3. Are training requirements for LIT jobs low enough for workers with limited education to qualify for them?
4. Are there opportunities for career advancement within the LIT sector?
5. What challenges does the LIT sector face that might lead to a decline in job opportunities?

Methodology

This study utilizes and adapts a methodology developed by Dr. John E. Husing of Economics and Politics, Inc. in California.⁷ In 2004 he completed a study for the Southern California Association of Governments asking whether the growing Logistics sector offered job opportunities to replace declining job opportunities in Manufacturing in that region. His study, *Logistics & Distribution: An Answer to Regional Upward Social Mobility*, found that Logistics can provide “a growing base of good paying jobs which its marginally educated workers can learn via on-the-job experience and learning.”

Dr. Husing’s methodology began by defining the Logistics and Distribution sector through a series of codes in the North American Industry Classification System (NAICS). Once the sector was defined, employment, wages and training requirements for occupations in the sector were tallied using Standard Occupational Codes (SOCs) associated with each of the NAICS codes. This methodology builds a data set up from data by specific occupations and industries, rather than averaging backward from aggregated figures.

This study began by defining the sector using the definition of the pilot cluster Logistics and International Trade (LIT) supplied by the Prosperity Partnership. This cluster is made up of 36 six-digit NAICS codes. A full list of the codes included in the definition can be found in Appendix 1.

Understanding the Term “On-the-Job Training”

The U.S. Bureau of Labor Statistics classifies occupations into one of eleven categories based on the amount of postsecondary-education or training required to learn that job. BLS defines on-the-job training categories as follows:

Short-term on-the-job training: One month or less of on-the-job experience or instruction

Medium-term on-the-job training: One to twelve months of combined on-the-job experience and informal training

Long-term on-the-job training: More than twelve months of on-the-job training or combined work experience and formal classroom instruction.

⁷ Dr. John Husing, Economics & Politics, Inc., **Logistics & Distribution: An Answer to Regional Upward Social Mobility**, study completed for the Southern California Association of Governments, June 9, 2004, <http://www.scag.ca.gov/goodsmove/pdf/HusingLogisticsReport.pdf>.

Washington data at the six-digit code level was not available, so data at the four-digit code level was substituted (Husing's definition and his study primarily used three-digit NAICS code data). In most cases, each four-digit code captured only those six-digit sub-codes used in the Prosperity Partnership's definition. In two cases, one additional six-digit sub-code was picked up by the four-digit code. A decision was made to include those additional codes rather than eliminate the entire four-digit code, which would exclude important aspects of the LIT sector. However, the three six-digit codes in Finance –522293 (International Trade Financing), 523130 (Commodity Contracts Dealing) and 523140 (Commodity Contracts Brokerage) had to be eliminated because the corresponding four-digit NAICS codes picked up *eight* additional six digit codes that are not included in the LIT sector. This was judged to include too many additional occupations and workers to measure the Finance category accurately.⁸

Data was collected from three primary sources through the Washington state Employment Security Department (ESD):

- 2002 employment by SOC code cross-referenced to NAICS codes can be found at www.wa.gov/esd/lmea/ocdata/stafpatpubl.xls;
- Wage data (March 2005) and projections for 2002-2012 by SOC code is available at through the Occupation Explorer at <http://www.workforceexplorer.com>; and
- Training requirements by SOC code are available at <http://www.wilma.org/wdclists>.

ESD provides hourly wage data collected at the Seattle-Bellevue-Everett metropolitan statistical area (MSA) level, while it provides employment projections collected at the level of the Seattle-King County workforce development area (WDA). Where no local level data was available, state data was used. Where neither local nor state data was available, national figures were secured from the Department of Labor's O*NET. These cases are marked in the tables. Wage data provided here does not include benefits or other non-wage earnings.

⁸ NAICS classification codes range from two to six digits. Moving from the two-digit to the six-digit levels provides increasing detail regarding the businesses that are included in that sector. For example, NAICS code 48 includes businesses in the *Transportation and Warehousing* sector. NAICS code 481111 includes only those Transportation and Warehousing businesses in the sub-industry *Scheduled Passenger Air Transportation*.

Finally, it is important to note that not all employment data on the railroads is collected in the same way that employment data is collected in most fields. For that reason, much rail employment data is missing from this analysis. Where overall statistics are reported, the rail data that is available was included. In more detailed breakdowns this was sometimes eliminated, and where relevant is noted.

Two data sets were built using the three sources of data described above. For the purposes of comparing the LIT sector to Manufacturing, data was compiled for the top 50 occupations in each sector as defined by the number of workers employed in that occupation in the sector. In the second data set information on all 224 occupations in the LIT sector was compiled. These two sets of data were analyzed to answer the five sub-questions listed in the previous section.

Findings

Logistics and International Trade compared to Manufacturing: The Top 50 Occupations

In 2002 in King County, some 35,846 people worked in 224 different occupations in Logistics and International Trade (LIT). That compares to 115,170 people working in 395 Manufacturing occupations. Although this difference may at first seem dramatic, it is important to look in more detail at the types of jobs available, the training required and their projections for the future.

To do that, the occupations were ranked by the number of people who worked in each occupation in 2002.⁹ The top 50 occupations were selected, and the two sectors compared. Appendices 2 and 3 provide detailed tables. The key findings are shown in the following table:

Table 1. Top 50 occupations in Logistics and International Trade (LIT)

	LIT	Manufacturing
Number employed in top 50 occupations	31,922	77,146
Employment in the top 50 occupations as percent of all occupations	89.1%	67.0%
Number of top 50 occupations requiring only short-term or moderate-term OJT	24	25
Most common training requirement (N)	Short term OJT (16)	Moderate term OJT (13)
Number of top 50 occupations requiring a bachelor's degree	3	12
Average entry level hourly wage	\$15.60	\$16.52
Average mean hourly wage	\$24.49	\$24.22
Projected annual openings for the top 50 occupations, 2002-2012¹⁰	9,870	11,293

While there were many more jobs in Manufacturing in 2002, projected growth in those occupations is not much greater than the projected growth in the top 50 jobs in LIT. Moreover, entry level hourly wages and average mean wages in the two sectors are not significantly

⁹ The most recent year for which data is available.

¹⁰ Occupational projections are not limited to jobs in LIT or Manufacturing. Therefore they reflect all employment opportunities in the relevant occupations.

different. Another important difference is the much larger number of occupations in Manufacturing that require a bachelor's degree.

However, these figures are averages for all workers in the sector, and a review of the top 50 occupations in each sector reveals a number of occupations that are outliers to the overall trends. For example, the fifth largest occupation in LIT is *Airline Pilots, Copilots, and Flight Engineers* with a mean wage of \$61.59 per hour, and the number one occupation in Manufacturing is *Aerospace Engineers* with a mean wage of \$37.19. Both of those occupations require at least a bachelor's degree, and this study is particularly interested in entry level job opportunities for workers with limited education. Therefore, those jobs out of the top 50 occupations that only require either short-term or moderate-term on-the-job training were taken out and compared. These can be considered entry level occupations in each sector. Table 2 shows the results:

Table 2. Top 50 entry level occupations in LIT

	LIT	Manufacturing
Number employed in entry level occupations in the top 50	20,195	32,555
Employment in entry level top 50 occupations as percent of all occupations	56.3%	28.3%
Number of entry level occupations in the top 50	24	25
Average entry level hourly wage for entry level occupations	\$11.95	\$11.04
Average mean hourly wage for entry level occupations	\$16.98	\$16.22
Projected annual openings for the top 50 entry level occupations, 2002-2012	5,633	6,399

When looking at entry level jobs, the difference between the LIT and Manufacturing sectors shrinks even further. Wages and projected annual earnings trend slightly higher for LIT than for Manufacturing.

Perhaps the most striking difference between LIT and Manufacturing in both of these comparisons is the greater concentration of occupations in LIT. Fully 89.1% of all LIT jobs can be found in 50 occupations compared to only 67.0% of those in Manufacturing. Among those top 50 occupations, 56.3% of all LIT jobs can be found in the entry level category, compared to only 28.3% in Manufacturing. This might suggest that Manufacturing has a “deeper bench” with more opportunities for career development. At the same time, this also suggests an advantage for training providers interested in the LIT sector. Those programs can focus on developing a

smaller number of training programs, because the opportunities for placement in any single occupation are greater.

Each occupation in the SOC codes is categorized by the U.S. Department of Labor's Bureau of Labor Statistics (BLS) according to the level of training required for that occupation. Full definitions of each training category can be found in Appendix 5. The top 50 occupations in each sector were organized according to their training requirements, and the two sectors compared. Table 3 shows, for example, that while only three LIT occupations (6%) require a bachelor's degree, twelve Manufacturing occupations (24%) require a bachelor's degree.

The table below ranks the training requirements from those that are easiest to qualify for with the least amount of training (short-term on-the-job training) to that requiring the greatest amount of training (first professional degree), with a final category for those occupations that are not categorized by the amount of training required.

Table 3. Training required for top 50 occupations in LIT

Training level	LIT		Manufacturing	
	Occupations	Share	Occupations	Share
Short-term OJT	16	32%	12	24%
Moderate-term OJT	8	16%	13	26%
Long-term OJT	3	6%	4	8%
Post-secondary vocational training	5	10%	2	4%
Work experience in related occupation	8	16%	1	2%
Associate degree	0		2	4%
Bachelor's degree	3	6%	12	24%
Work experience, & bachelor's degree	3	6%	3	6%
Master's degree	0		0	
First professional degree	0		0	
No category defined	4	8%	1	2%

While the number of entry level occupations is almost equal, slight differences appear when other jobs are compared. While 30% of Manufacturing jobs require a bachelor's degree (including the category *Work plus a bachelor's degree*), only 12% of LIT jobs do.

These training requirements can be combined to create a typology that helps to shed light on career advancement opportunities in the two sectors. Entry level jobs have been defined earlier

as those that require only *short-term on-the-job training* or *moderate-term on-the-job training*. Other jobs that require greater training might be seen as opportunities for advancement. Occupations that require *long-term on-the-job training* and those that require *work experience in a related occupation* can be combined as advancement opportunities that require work experience only.

Those jobs that require *post-secondary vocational training* can be combined in a single category with those that require an *associate degree*, a *bachelor's degree*, a *master's degree* and a *first professional degree* to create a category of jobs that require additional training and/or education for advancement. The final category, jobs that require *work experience and a bachelor's degree* would stand on its own. Table 4 compares advancement opportunities in LIT with those in Manufacturing, according to this typology.

Table 4. Advancement opportunities in top 50 occupations

Advancement method	LIT		Manufacturing	
	Occupations	Share	Occupations	Share
Work experience only	11	22%	5	10%
Additional training and/or education	8	16%	16	32%
Both work experience and additional training	3	6%	3	6%

As Table 4 shows, career advancement in the Manufacturing sector requires additional training and education rather than on-the-job experience twice as often as LIT. LIT includes more occupations in the top 50 that require only work experience for advancement.

One final factor that may have an impact on job opportunities and earnings in these two sectors is the rate of union representation in each. Local data on specific occupations is not available. However, national data from the BLS shows that both by occupation and by industry, transportation-related fields have higher union density than manufacturing. Table 5 shows data on union membership and representation in 2004 by occupation and by industry.

This data should be used with care. The categories used here are not exactly the same as those used to define the LIT sector in this study. Moreover, these are national statistics, and Seattle may or may not reflect national trends. The same BLS data shows that union density in Washington state was 19.3% in 2004, ranking it sixth nationally. It is also important to note that the share of union membership has fallen in both sectors.

Table 5. Union density in LIT and Manufacturing¹¹

	2004			2003		
	Total employed	Union members	Percent members	Total employed	Union members	Percent members
All adult workers	123,554,000	15,472,000	12.5%	122,358,000	15,776,000	12.9%
<i>By occupation</i>						
Production occupations	9,085,000	1,485,000	16.3%	9,261,000	1,624,000	17.5%
Transportation and material moving occupations	7,891,000	1,483,000	18.8%	7,814,000	1,572,000	20.1%
<i>By industry</i>						
Manufacturing	15,754,000	2,036,000	12.9%	16,130,000	2,173,000	13.5%
Transportation and warehousing	4,043,000	976,000	24.2%	4,081,000	1,051,000	25.8%

Logistics and International Trade in more detail

In order to understand the opportunities in the LIT sector, a deeper look at occupations in the sector was completed. All 35,846 jobs in the 224 occupations were subdivided into categories by type of transportation. Table 6 shows the breakdown, ranked according to the number of workers in each occupation category.

Table 6. Logistics and International Trade Jobs by Type

	Total # employed	% of Total	# of Occupations	Average Mean Wage
Air Transportation	14,726	32.8%	135	\$28.13
Truck Transportation	7,622	17.0%	86	\$25.95
Freight & Warehousing	7,176	16.0%	103	\$24.36
Water Transportation	5,013	11.2%	93	\$25.78
Rail Transportation	1,130	2.5%	98	\$24.60
Other	179	0.4%	27	\$21.58
TOTAL	35,846	100%		

¹¹ **BLS Data on Unions**, U.S. Department of Labor, Bureau of Labor Statistics, January 27, 2005, <http://www.bls.gov/bls/blsuniondata.htm>.

Air Transportation makes up nearly 33% of all jobs in the LIT sector, followed by jobs in Truck Transportation, then by Freight and Warehousing. More than half of all the jobs in Truck Transportation are in a single occupation, *Truck Drivers, Heavy and Tractor-Trailer*, the top ranking LIT job with 4,050 workers.

Each of these types of transportation was further broken down by training requirements and the number of jobs, number of occupations and wages associated with each. This information was used to construct a detailed career ladder, similar to that found in the Husing report. Rail Transportation is not included because of the limited data in this field, as described in the methodology section. The Other category is not included because of the small number of jobs included (179 workers or 0.4% of the total). See Appendix 4 for the full career ladder table.

Table 7 highlights some of the key findings. For example, a total of 14,726 workers are employed in 135 Air Transportation occupations. 35.4% of those jobs (the largest share) require only short-term on-the-job training. The average entry-level wage for those Air Transportation occupations that only require short-term on-the-job training is \$10.88 per hour, while the average mean wage for Air Transportation occupations that only require short term on-the-job training is \$14.81. In the ten year period from 2002-2012, some 19,527 openings are projected in the occupations that can be found in Air Transportation.

Table 7. Key Findings from the LIT Career Ladder Table

	Total number employed	Training required for largest share of jobs (%)	Total number of occupations	Total average annual openings 2002-2012	Average entry level wage for short-term OJT occupations	Average mean wage for short-term OJT occupations
Air Transportation	14,726	Short-term OJT (35.4%)	135	19,527	\$10.88	\$14.81
Truck Transportation	7,622	Moderate-term OJT (58.8%)	86	18,513	\$10.25	\$13.90
Freight & Warehousing	7,176	Short-term OJT (47.5%)	103	20,961	\$9.74	\$13.38
Water Transportation	5,013	Short-term OJT (33.5%)	93	18,272	\$10.73	\$14.65

In total, out of the 224 different occupations in the LIT sector, 143 of them require only short-term on-the-job training. Those occupations account for 12,426 jobs in 2002, or 34.7% of all the workers in that sector. If entry level jobs are defined as those that only require short-term or moderate-term on-the-job training, then fully 60.7% of all the LIT jobs met that requirement.

This suggests that the LIT sector may offer many opportunities for workers with limited education and training. For all but one of the four categories of LIT detailed above, the average entry level wage for jobs requiring the least amount of training is above \$10 per hour, and all pay well over the Washington state minimum wage which rose to \$7.63 in January 2006. In all of the categories of jobs above, experience on the job translates into higher wages of at least 34%.

The findings also suggest some trends that should be followed by any agency that seeks to provide training and job placement in the LIT sector. While Air Transportation provided work to the largest number of people in 2002 (14,726) and the largest number of occupational titles are included in this category, Freight and Warehousing is projected to have the largest number of annual average openings in the period 2002-2012.

Table 8 breaks the LIT occupations according to their training requirements. When the entire LIT sector is reviewed, 12,426 workers (34.7% of all LIT workers) can be found working in 54 occupations that only require short-term on-the-job training (24.1% of all LIT occupations). The average entry level wage for LIT occupations that require only short-term on-the-job training is \$10.29 per hour, while the average mean hourly wage for those jobs is \$13.83. The occupations within LIT that only require short-term on-the-job training are expected to have 12,372 annual openings in the period 2002-2012.

Table 8. Training Requirements – All LIT Occupations Combined

	Occu- pations	Share	Number employed	Share	Average entry wage	Average mean hourly wage	Proj. Annual Openings 2002-2012
Short-term OJT	54	24.1%	12,426	34.7%	\$10.29	\$13.83	12,372
Moderate-term OJT	30	13.4%	9,337	26.0%	\$13.25	\$19.30	3,612
Long-term OJT	21	9.4%	3,311	9.2%	\$14.99	\$21.53	1,775
Post-secondary vocational training	16	7.1%	2,210	6.2%	\$16.81	\$23.06	903
Work experience in related occupation	19	8.5%	2,829	7.9%	\$17.46	\$27.19	1,777
Associate degree	7	3.1%	66	0.2%	\$18.28	\$24.77	1,149
Bachelor's degree	40	17.9%	2,843	7.9%	\$22.46	\$34.08	5,258
Work experience, & bachelor's degree	15	6.7%	930	2.6%	\$29.01	\$49.15	1,322
Master's degree	2	0.9%	7	0.0%	\$21.79	\$29.95	53
First professional degree	1	0.4%	11	0.0%	\$27.68	\$52.98	325
No category defined	9	4.0%	1,776	5.0%	\$17.29	\$29.30	1,431
Training info unavailable	10	4.5%	99	0.3%	\$15.71	\$20.15	7
TOTAL	224	100.0%	35,846	100.0%			29,984

The second largest share of occupations in the LIT sector, 17.9%, requires a bachelor's degree. However, in terms of the number of workers, 7.9% of all jobs were in those occupations requiring a bachelor's degree, ranking it a distant third after short-term and moderate-term OJT occupations. Still, training agencies should be aware of the large number of occupations requiring a degree.

All LIT jobs were analyzed according to the advancement typology described earlier. Table 9 shows the findings, by both occupations and by the number of workers found in those jobs in Seattle in 2002. As Table 9 shows, while nearly 30% of all the occupations in LIT require additional training and/or education, less than 15% of the LIT workforce was found in those occupations. The predominance of those occupations is further countered by the sheer number of workers who are not found in any of the advancement categories who are working in entry level positions that require only short-term or moderate-term on-the-job training. Of all occupations in

LIT, 37.5% are entry level positions, but 60.7% of all LIT workers work in those entry level positions.

Table 9. Methods of advancement within the LIT sector

	Occupations	Share	Number employed	Share
Work experience only	40	17.9%	6,140	17.1%
Additional training and/or education	66	29.5%	5,137	14.3%
Both work experience and additional training	15	6.7%	930	2.6%
TOTAL Advancement Opportunities	121	54.1%	12,207	34.0%

Potential Challenges for Logistics and International Trade

While the growth of freight movement through the Puget Sound region has had positive impacts in the form of jobs and money, it has also had some negative impacts as well. Most notably, Seattle area roads have become more congested, and the environmental impact of so many diesel-powered vehicles is beginning to be observed by local residents.

At the same time, population growth in the Northwest has also increased congestion and emissions. The result is that these are two areas that, if they were to become a significant problem for companies that move freight or for local residents, they could negatively impact the LIT sector overall.

Road Congestion

Growth in the LIT sector is closely tied to growth in the movement through the region of cargo and, to a lesser degree, people. Therefore, as a potential regional employer this cluster will only be as strong as the movement of vehicles on Seattle area roads. Road congestion is a major issue for everyone in the region. Seattle may be the 23rd largest city in the country by population, but it has the 12th worst travel time index for peak travel, according to Texas Transportation Institute's annual mobility study. Local and regional governments have been working with private industry to find ways to ease congestion, with freight mobility as a major consideration.

Freight mobility is of vital concern for every business and worker in the LIT sector. Efforts to improve mobility through the Puget Sound region include the FAST (Freight Action Strategy for Seattle - Tacoma – Everett) Corridor Project, the Regional Freight Mobility Roundtable, the City of Seattle's Freight Mobility Program, the Freight Mobility Strategic Investment Board and the Washington State Department of Transportation's Freight Office. City, county and state governments have been engaged, along with port authorities and private businesses.

Seven of FAST's original fifteen railroad grade separations and port access projects to improve freight movement along the I-5 corridor have been completed. Maps have been developed showing the "best" truck routes through Seattle and Tacoma. While many studies have been completed, recommendations made and partnerships developed to discuss and advocate for these activities, only a limited number of them have been implemented, as costs for major infrastructure projects such as these are high.

All cargo that arrives at the Port of Seattle freight is moved by truck, either on “land bridges” to the rail yards, or to points well beyond city limits, and traffic bottlenecks are increasing delays for those trucks and for the freight mobility system. Projects like the FAST Corridor are “working to streamline the movement of freight through the central Puget Sound region,” but road congestion continues to be a challenge.

At the Ports of L.A./Long Beach, traffic on the roads and the rails has slowed the movement of freight so badly that some companies chose to move their freight through other ports, including Puget Sound ports. The Port of Seattle uses this as a selling point to importers and freight forwarders – freight moves more quickly from port to railhead, and it moves more quickly via rail and truck to points east and south.

While the Seattle area does not experience delays of the scope and scale of those in southern California, the lesson is that companies do have choices about where and how they ship their goods, and when congestion begins to cut into company profits they will go elsewhere. As significant as the Port of Seattle’s impact on employment in the region is, the loss of that freight could be significant as well on employment in the LIT sector.

Environmental Issues

As the number of container ships and trucks grow with the movement of freight, ports across the country are increasingly seen as a major source of air, water and noise pollution. Environmental justice advocates and others are pressuring ports and terminal operators to alter their operations to cause less environmental damage. Neighborhood groups and activists have raised questions about air and sound pollution emanating from activity at Sea-Tac Airport, and about air, water and noise pollution due to marine port and cruise ship activities. At times, those groups have been able to put up at least temporary barriers to increases in port activities.

Puget Sound ports and terminal operators are actively engaged in efforts to reduce the environmental impact of the burgeoning movement of goods and services. The Port of Seattle’s maintenance department has switched to ultra-low sulfur diesel (ULSD) fuel. The Northwest Cruise Ship Association has signed an agreement with the Port and the Washington State Department of Ecology that bans the discharge of untreated wastewater. Only wastewater treated by advanced treatment systems can be discharged. In addition, facilities have been installed at

Pier 30 that allow some cruise ships to turn off diesel engines while in port and plug in to cleaner electrical power as a way to cut air pollution.

In 2005 the Puget Sound Maritime Air Forum launched a study to quantify the level of emissions contributed from marine sources. The Forum is made up of the Port of Seattle, Port of Tacoma, Port of Everett, Puget Sound Clean Air Agency, Pacific Merchant Shipping Association, the American Lung Association of Washington, Washington State Ferries, Western States Petroleum Association, Port of Anacortes, and others. Data collection will focus primarily on diesel-powered maritime sources, such as ships, cargo-handling equipment, locomotives, and trucks.

Also in 2005 the Port of Seattle was awarded two grants from the U.S. Environmental Protection Agency. One will support the Forum's emissions study. The second is for the port's Diesel Emissions Reduction Project, which will implement the priority strategies developed in partnership with the Puget Sound Clean Air Agency and the terminal operator, including retrofit of off-road and on-road vehicles at one of the port's terminals.

Elsewhere in Puget Sound, the Port of Tacoma Commission earlier this year directed that all diesel equipment at Port-operated facilities utilize ULSD fuel. The Evergreen Group also announced that all of their diesel-powered equipment at the Port's Pierce County Terminal will use ULSD as well. The Port of Los Angeles is working to identify an operator for its new "green terminal" that will include environmental initiatives such as the Alternative Maritime Power (AMP) Program, rail access, low sulfur or alternative fuel use, clean yard equipment and energy saving measures. These changes are not without cost to the companies that operate and work out of port terminals and will require investment by public agencies.

Training for Logistics and International Trade Jobs

More than half of all LIT workers (52.4%, n=18,775) can be found working in the top ten occupations in the sector. Training and licensing requirements for those top ten jobs were reviewed through the state ESD website¹² and the BLS's Occupational Outlook Handbook.¹³ Most of these jobs (70%) can be learned through short-term or moderate-term on-the-job training, although prior training is available for many of them.

1. Truck Drivers, Heavy and Tractor-Trailer (moderate-term on-the-job training): This job requires specialized training and licensure. Both can be obtained through community colleges and apprenticeship programs. Instruction includes the operation of gas, diesel, or electrically-powered vehicles, loading and unloading cargo or passengers and verifying loads against shipping papers. Many employers – both public and private – provide Commercial Drivers License (CDL) training and licensure to entry level workers.¹⁴

2. Flight Attendants (long-term on-the-job training): While airlines traditionally required only high school degrees, they increasingly prefer applicants with a college degree, particularly those in people-oriented disciplines such as psychology and education. At least three to eight weeks of formal on-the-job training at the specific airline's flight training center is required for all new flight attendants. Nonetheless, some schools and colleges offer certificated flight attendant training programs, and a certificate from one of these is beneficial when applying for a job as a flight attendant.

3. Laborers and Freight, Stock, and Material Movers, Hand (short-term on-the-job training): Most work skills are learned informally on the job from more experienced colleagues. The most important skills are physical abilities to lift and move materials and to follow directions, either verbal or written. Automation is starting to require some skill with computers in these jobs.

4. Reservation and Transportation Ticket Agents and Travel Clerks (short-term on-the-job training): This is primarily a sales position, so training in sales and promotion skills such as

¹² See <http://www.workforceexplorer.com/cgi/databrowsing>.

¹³ **Occupational Outlook Handbook, 2006-07 Edition**, U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/oco>.

¹⁴ Three of the top ten LIT occupations are related to truck driving, requiring many of the same skills and training. More detailed research on truck driving occupations has been conducted by and is available from Port Jobs.

consumer psychology, image projection, public speaking and interpersonal communications, sales organization and operations and customer relations is needed. Strong computer skills are also required. A high school diploma is generally required, and vocational training or job-related course work is helpful. In some cases, an associate's or bachelor's degree could be needed

5. Airline Pilots, Copilots, and Flight Engineers (bachelor's degree): Specialized training and licensure through the Federal Aviation Administration (FAA) is required for these positions. Many airline pilots learned their skills during previous stints in the military. In addition, community colleges such as Green River Community College have Aircraft Pilot and Navigator degree programs which prepare individuals to apply technical knowledge and skills to the flying and/or navigation of commercial passenger and cargo, agricultural, public service, corporate and rescue aircraft.

6. Customer Service Representatives (moderate-term on-the-job training): Highline Community College offers a new program in Customer Service Support/Call Center/Teleservice Operation. Students are prepared to assist customers with inquiries and problems in frontline call centers, help desks, teleservice centers, and online. This includes instruction in user interfaces and user behavior, principles of hardware and software systems operation, customer interaction skills, telephone and e-mailing skills, data entry, and database and internet search and retrieval.

7. Truck Drivers, Light or Delivery Services (short-term on-the-job training): Entry into these positions is similar as for heavy truck drivers. The same programs that teach heavy truck driving also provide skills needed to operate light or delivery trucks. These positions may not require CDL licensure.

8. Cargo and Freight Agents (moderate-term on-the-job training): The skills required for these positions are similar to those required for general office clerks. Many of them can be learned on the job, while training in typing, keyboarding, filing, general business correspondence, office equipment operation, and communications skills can be acquired through Office Occupations and Clerical programs at community colleges and private training institutions.

9. Captains, Mates, and Pilots of Water Vessels (no category defined): Training for these positions include Marine Science/Merchant Marine Officer programs available from Seattle Central Community College, and from private training providers such as Northwest Merchant Marine Training Services, Crawford Nautical School and the Pacific Maritime Institute. These

programs prepare individuals to serve as captains, executive officers, engineers and ranking mates on commercially licensed inland, coastal and ocean-going vessels. Instruction is provided in maritime traditions and law, maritime policy, economics and management of commercial marine operations, basic naval architecture and engineering, shipboard power systems engineering, crew supervision and administrative procedures.

10. Industrial Truck and Tractor Operators (short-term on-the-job training): This occupation can be seen as a hybrid of two listed above: *Truck Drivers, Light or Delivery Services* and *Laborers and Freight, Stock, and Material Movers*. These workers drive small trucks and tractors on a worksite, primarily moving materials from one place to another. They can commonly be found in warehouses and on construction sites. Specialized training may be helpful for qualifying for these occupations, although the skills are often learned on the job.

Analysis

This study seeks to determine whether the growing LIT sector as an employer offers a viable alternative to the shrinking Manufacturing sector. Five key sub-questions were used to answer this overall research question.

1. Does the LIT sector provide an adequate number of job opportunities for workers with limited education? At first glance it appears that Manufacturing continues to offer more employment opportunities than LIT. In 2002 more than twice the number of people in the Seattle area worked in the top 50 Manufacturing as worked in the top 50 jobs in LIT. However, projections of future employment in those same occupations suggest that opportunities may be changing.

In the period 2002-2012 nearly as many annual openings are expected in the top 50 LIT occupations as are expected in the top 50 Manufacturing occupations. Moreover, when entry level positions among those top 50 occupations are compared, employment in Manufacturing is not nearly as dramatically higher, and the number of annual openings is projected to be almost equal.

Overall, the 224 occupations found in the LIT sector are projected to provide a combined total of 29,984 annual openings in the period 2002-2012. 9,870 (32.9%) of those annual openings are in occupations that require only short-term or moderate-term on-the-job training. Therefore, it is likely that the LIT sector will provide nearly as many job opportunities if not more than Manufacturing.

2. Do those jobs in the LIT sector pay higher than average wages? The comparison of the top 50 occupations in these two sectors shows that entry level hourly wages in Manufacturing are only marginally higher than those in LIT. The overall average mean hourly wage for LIT workers is marginally higher than for Manufacturing. Again, when entry level jobs are looked at alone, the advantage goes to LIT, with both entry level and mean hourly wages higher.

Also important is the fact that wages in LIT entry level jobs – the lowest wage of all that were calculated – is higher than the statewide minimum wage of \$7.63 per hour. Earnings for entry level positions in the top 50 LIT occupations is lower than the \$18.82 per hour earned by all Seattle area blue collar workers, but higher than the \$14.21 per hour earned by service workers. In the top 50 LIT occupations, average mean hourly wages are higher than those in

Manufacturing. They are also higher than the overall average hourly wage for Seattle workers of \$22.39.¹⁵

This trend plays out similarly among all LIT jobs. In general, entry level positions in each of the categories of LIT jobs offer an average mean hourly wage that is less than the overall Seattle average, but advanced positions that require greater training and education pay more than the Seattle average. Nearly all jobs in all categories have an average mean hourly wage higher than what the average service worker earns, and in nearly all categories (82%) average mean hourly wages are higher than that earned by blue collar workers. Therefore jobs in the LIT sector above entry level generally pay higher than average wages.

3. Are training requirements for LIT jobs low enough for workers with limited education to qualify for them? 24 of the top 50 LIT occupations and 25 Manufacturing occupations require only short-term or moderate-term on-the-job training. However, in terms of the number of workers in those occupations, 56.3% of all LIT workers can be found working in those 24 occupations, while only 28.3% of all Manufacturing workers can be found in those entry level occupations. This suggests that the opportunities for entry are higher in the LIT sector. The number of top 50 occupations in Manufacturing that require a bachelor's degree is four times greater than in LIT, with twelve occupations requiring that high level of training. Whether Manufacturing has always included such a large number of occupations with such high training requirements, or whether this is a result of the changing structure of the Manufacturing sector as a result of the same global economic forces, is unknown.

The largest share of LIT jobs requires only limited training. Fully 44 of the 224 occupations (24.1%) require only short-term on-the-job training, and they make up 34.7% of all the workers in LIT. When short-term and moderate-term on-the-job training workers are combined, they accounted for 60.7% of all workers in the LIT sector. Perhaps most important, in all but one category of LIT (Freight and Warehousing), entry level wages in occupations that require only short-term on-the-job training were above \$10 per hour. In other words, while ease of entry into the occupation is associated with lower wages, those wages are most often higher than minimum wage. Therefore it can be said that there are adequate jobs in the LIT sector for workers with limited education.

¹⁵ **Highlights of Seattle-Tacoma-Bremerton, WA National Compensation Survey**, Bureau of Labor Statistics, October 19, 2005, <http://www.bls.gov/ro9/ncspseat.htm>.

4. Are there opportunities for career advancement within the LIT sector? Career advancement in Manufacturing is linked to additional training and education, such as post-secondary vocational education and college degrees, in many more occupations than in the LIT sector. This suggests that career ladders in LIT may be easier for workers who enter the field with limited education. When all advancement opportunities within LIT are analyzed, 17.9% of them (n=40) require only work experience, while 29.5% (n=66) require some amount of additional training or education. Moreover, there are so many workers in entry level positions that only about 34.0% of the workers in that sector are found in jobs that might be considered “advanced” positions. Together, these two statistics suggest that career ladders within the LIT sector for workers with little education may be somewhat limited. The largest share of occupations outside of entry level work require some kind of formal training or education, and workers are highly concentrated in entry level positions. The LIT sector, therefore, may be an excellent place to find entry level work for decent wages, but it may not provide as many good opportunities for advancement.

5. What challenges does the LIT sector face that might lead to a decline in job opportunities? Freight mobility is vital to the LIT sector. In southern California, increased road and rail congestion has led some importers and freight brokers to select other ports. Although the scale of congestion in the Pacific Northwest is nowhere near what it is in southern California, the lessons learned there should be acknowledged. The economy of the Seattle region is highly trade- and transportation-dependent, and if the movement of goods and people through the region were to decline, the impact would ripple through some 224 occupations and some 35,846 workers.

The impact of environmental protection activities could be similar, although it would be indirect and not entirely negative in terms of job creation. Air, water and noise pollution is caused by many of the vehicles that move goods and people in the LIT sector. Actions by citizen groups and government agencies in this environmentally-conscious region could lead to a reduction in the movement of those vehicles, thus negatively impacting job opportunities. At the same time, installation of equipment and vehicles with lower emissions and education of workers who operate those vehicles could create new jobs with employers in the LIT sector. They could also change the nature of some jobs, potentially impacting training requirements and wages.

Conclusions and Next Steps

This study sought to determine whether the job opportunities provided by the growing LIT sector are a good replacement for the Manufacturing jobs that have been lost in recent years. It did this by reviewing data provided by the Washington state ESD to answer five key sub-questions.

While LIT may provide fewer jobs overall than Manufacturing, entry level occupations within LIT are expected to have nearly as many annual openings over the next six years as Manufacturing. Pay in the LIT sector is about on par with that in Manufacturing, and jobs above entry level generally pay wages that are better than those earned by the average Seattle area worker. Job training requirements are lower for more LIT occupations than for Manufacturing occupations, and more than 60% of all LIT workers work in jobs that require only short-term or moderate-term on-the-job training, providing many opportunities for workers with limited education.

On the other hand, with such a large share of workers in entry level jobs, and with nearly 90% of all LIT workers working in the top 50 occupations, advancement opportunities appear to be more limited in LIT than in Manufacturing. The two primary challenges to the growth of the LIT sector – freight mobility and environmental issues – are both being addressed at multiple levels in the Seattle area.

Training for the most of the top ten LIT occupations – where more than half of all LIT workers work – takes place on the job. For the more clerical occupations, general clerical training programs can be helpful; for more physical occupations strength and hand-eye coordination are the most important skills to develop. Truck drivers and airline pilots require special certificates. In fact, three of the top ten jobs involve driving large commercial vehicles, and those occupations account for 17.5% of all LIT workers.

The answer to the original question, then, is a qualified yes. This burgeoning sector provides many jobs at decent wages to Seattle area workers with limited education, but advancement opportunities may be more limited than in Manufacturing.

This study constitutes only a first scan of data on the LIT sector. Additional study is required in order to determine the exact nature of employment opportunities and career ladders within the LIT sector, and to determine whether adequate training is available within the Seattle area to

meet demand for those jobs. There is a further need to explore the role that public agencies could play in supporting and expanding employment in the LIT sector the way they have done for Manufacturing.

Further studies might include the following:

- Replication of this study with data for Kitsap, Pierce and/or Snohomish counties;
- Mapping the career pathways and union density within the LIT sector, based on detailed interviews with employers, workers and trainers in the sector;
- Identification of transferable skill sets for LIT occupations that could be used for advancement into other sectors;
- Review of training providers serving the LIT sector, combined with surveys of LIT employers to determine whether employment needs are being met by existing programs and where gaps exist;
- An in-depth study of career advancement positions in LIT (this study focused on entry-level positions) – how do people enter those jobs, what training do they need and what are the pay scales;
- A national scan to discover whether other communities are yet engaged in workforce and economic development activities specific to strengthening the LIT sector;
- A study of the concerted role that Puget Sound ports could play in workforce and economic development in the LIT sector, as they are at the heart of the growing movement of freight and people that is driving LIT employment growth; and
- Review of existing freight mobility and environmental quality improvement projects and their progress, to ensure that LIT continues to grow in a way that is sustainable and appropriate to the Pacific Northwest region.

Appendices

Appendix 1: Logistics and International Trade Defined by NAICS Codes

4-digit code used in this study	6-digit NAICS Code	Component
4811	481111	Scheduled Passenger Air Transportation
	481112	Scheduled Freight Air Transportation
4812	481211	Nonscheduled Chartered Passenger Air Transportation
	481212	Nonscheduled Chartered Freight Air Transportation
	481219	Other Nonscheduled Air Transportation
4821	482111	Line-Haul Railroads
4831	483111	Deep Sea Freight Transportation
	483112	Deep Sea Passenger Transportation
	483113	Coastal and Great Lakes Freight Transportation
	483114	Coastal and Great Lakes Passenger Transportation
4832	483211	Inland Water Freight Transportation
	483212	Inland Water Passenger Transportation
4841	484110	General Freight Trucking, Local
	484121	General Freight Trucking, Long-Distance, Truckload
	484122	General Freight Trucking, Long-Distance, Less Than Truckload
4842	484210	Used Household and Office Goods Moving ^a
	484220	Specialized Freight (except Used Goods) Trucking, Local
	484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
4881	488111	Air Traffic Control
	488119	Other Airport Operations
	488190	Other Support Activities for Air Transportation
4882	488210	Support Activities for Rail Transportation
4883	488310	Port and Harbor Operations
	488320	Marine Cargo Handling
	488330	Navigational Services to Shipping
	488390	Other Support Activities for Water Transportation
4884	488410	Motor Vehicle Towing ^a
	488490	Other Support Activities for Road Transportation
4885	488510	Freight Transportation Arrangement
4889	488991	Packing and Crating
	488999	All Other Support Activities for Transportation

4-digit code used in this study	6-digit NAICS Code	Component
4931	493110	General Warehousing and Storage
	493120	Refrigerated Warehousing and Storage
	493130	Farm Product Warehousing and Storage
	493190	Other Warehousing and Storage

^a Added due to use of four-digit codes. See the Methodology section for a more detailed explanation.

Appendix 2: Top 50 Jobs in Logistics and International Trade – by number employed

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
533032	Truck Drivers, Heavy and Tractor-Trailer	4,050	\$17.91	\$14.09	Moderate-term on-the-job training	360
396031	Flight Attendants	2,678	\$36.25 ¹⁶	N/A	Long-term on-the-job training	73
537062	Laborers and Freight, Stock, and Material Movers, Hand	2,294	\$11.83	\$8.27	Short-term on-the-job training	974
434181	Reservation and Transportation Ticket Agents and Travel Clerks	2,101	\$15.65	\$10.33	Short-term on-the-job training	120
532011	Airline Pilots, Copilots, and Flight Engineers	1,751	\$61.59 ¹⁷	N/A	Bachelor's degree	75
434051	Customer Service Representatives	1,583	\$17.88	\$11.62	Moderate-term on-the-job training	628
533033	Truck Drivers, Light or Delivery Services	1,337	\$14.41	\$10.07	Short-term on-the-job training	178
435011	Cargo and Freight Agents	1,126	\$22.75	\$12.12	Moderate-term on-the-job training	59
535021	Captains, Mates, and Pilots of Water Vessels	957	\$28.76	\$18.92	No category defined	64
537051	Industrial Truck and Tractor Operators	898	\$16.04	\$11.34	Short-term on-the-job training	133
535011	Sailors and Marine Oilers	873	\$19.38	\$15.80	Short-term on-the-job training	64
433031	Bookkeeping, Accounting, and Auditing Clerks	867	\$16.03	\$11.37	Moderate-term on-the-job training	529

¹⁶ Washington state – King County data not available.

¹⁷ National figure – King County and Washington data not available.

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
493011	Aircraft Mechanics and Service Technicians	734	\$24.09	\$17.79	Post-secondary vocational training	26
431011	First-Line Supervisors/Managers of Office and Administrative Support Workers	680	\$25.91	\$18.05	Work experience in a related occupation	380
536099	Transportation Workers, All Other	580	\$20.37	\$11.17	Short-term on-the-job training	25
439061	Office Clerks, General	579	\$13.90	\$10.02	Short-term on-the-job training	916
435071	Shipping, Receiving, and Traffic Clerks	563	\$14.20	\$10.23	Short-term on-the-job training	213
435081	Stock Clerks and Order Fillers	488	\$13.15	\$9.24	Short-term on-the-job training	486
537061	Cleaners of Vehicles and Equipment	453	\$11.09	\$8.01	Short-term on-the-job training	191
493031	Bus and Truck Mechanics and Diesel Engine Specialists	435	\$22.66	\$16.95	Post-secondary vocational training	96
435032	Dispatchers, Except Police, Fire, and Ambulance	432	\$19.42	\$13.71	Moderate-term on-the-job training	67
535031	Ship Engineers	429	\$28.41	\$21.35	Post-secondary vocational training	38
531031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	385	\$29.19	\$17.76	Work experience in a related occupation	75

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
532099	Air Transportation Workers, All Other (OES Only)	370	N/A	N/A	Moderate-term on-the-job training	14
419099	Sales and Related Workers, All Other	369	\$18.28	\$9.33	No category defined	311
113071	Transportation, Storage, and Distribution Managers	337	\$46.54	\$26.73	Work experience in a related occupation	34
532022	Airfield Operations Specialists	333	\$33.71 ¹⁸	\$25.92 ¹⁹	Short-term on-the-job training	15
111021	General and Operations Managers	308	\$61.30	\$31.64	Work experience, plus bachelor's degree	248
531021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	301	\$23.29	\$15.54	Work experience in a related occupation	50
396011	Baggage Porters and Bellhops	259	\$12.19	\$8.02	Short-term on-the-job training	37
132011	Accountants and Auditors	258	\$30.57	\$20.79	Bachelor's degree	520
499042	Maintenance and Repair Workers, General	240	\$17.78	\$11.68	Long-term on-the-job training	249
433021	Billing and Posting Clerks and Machine Operators	239	\$15.55	\$12.14	Short-term on-the-job training	174

¹⁸ Washington state – King County data not available.

¹⁹ Washington state – King County data not available.

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
531011	Aircraft Cargo Handling Supervisors	229	\$21.01 ²⁰	\$13.26 ²¹	Work experience in a related occupation	9
435061	Production, Planning, and Expediting Clerks	192	\$19.00	\$13.62	Short-term on-the-job training	76
514121	Welders, Cutters, Solderers, and Brazers	183	\$18.59	\$14.45	Post-secondary vocational training	81
491011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	178	\$30.37	\$20.10	Work experience in a related occupation	111
536051	Transportation Inspectors	178	\$31.58	\$14.83	Work experience in a related occupation	14
396032	Transportation Attendants, Except Flight Attendants and Baggage Porters	174	\$9.92	\$8.15	Short-term on-the-job training	19
131199	Business Operations Specialists, All Other	152	\$32.61	\$21.23	No category defined	622
535099	Water Transportation Workers, All Other (OES Only)	151	NOT AVAILABLE		Short-term on-the-job training	7
534011	Locomotive Engineers	149	\$24.40 ²²	\$15.53 ²³	Work experience in a related occupation	8
499099	Installation, Maintenance, and Repair Workers, All Other	148	\$17.42	\$11.23	No category defined	44

²⁰ Washington state – King County data not available.

²¹ Washington state – King County data not available.

²² Washington state – King County data not available.

²³ Washington state – King County data not available.

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
113031	Financial Managers	140	\$49.41	\$29.94	Work experience, plus bachelor's degree	134
537121	Tank Car, Truck, and Ship Loaders	134	\$18.60	\$12.09	Moderate-term on-the-job training	8
413041	Travel Agents	131	\$15.64	\$11.53	Post-secondary vocational training	108
151031	Computer Software Engineers, Applications	127	\$40.79	\$29.65	Bachelor's degree	636
352012	Cooks, Institution and Cafeteria	125	\$12.42	\$9.47	Long-term on-the-job training	96
113021	Computer and Information Systems Managers	122	\$53.32	\$37.09	Work experience, plus bachelor's degree	135
436011	Executive Secretaries and Administrative Assistants	120	\$20.55	\$15.65	Moderate-term on-the-job training	340
	TOTAL	31,922				9,870
	AVERAGE		\$24.49	\$15.60		

Appendix 3: Top 50 Jobs In Manufacturing - by number employed

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
172011	Aerospace Engineers	8,036	\$37.19 ²⁴	N/A	Bachelor's degree	191
131199	Business Operations Specialists, All Other	4,968	\$32.61	\$21.23	No category defined	622
512092	Team Assemblers	3,411	\$13.70	\$9.29	Moderate-term OJT	164
511011	First-Line Supervisors/Managers of Production and Operating Workers	3,356	\$27.21	\$17.99	Work experience in a related occupation	94
131111	Management Analysts	2,592	\$35.67	\$24.56	Work experience, plus bachelor's degree	286
519061	Inspectors, Testers, Sorters, Samplers, and Weighers	2,288	\$17.78	\$9.72	Moderate-term OJT	113
512022	Electrical and Electronic Equipment Assemblers	2,133	\$15.87	\$10.21	Short-term OJT	32
131023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	2,003	\$28.00	\$19.70	Bachelor's degree	124
514041	Machinists	1,920	\$19.81	\$14.75	Long-term OJT	62
151031	Computer Software Engineers, Applications	1,814	\$40.79	\$29.65	Bachelor's degree	636
414012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	1,769	\$27.11	\$14.99	Moderate-term OJT	530
271021	Commercial and Industrial Designers	1,747	\$25.04 ²⁵	N/A	Bachelor's degree	38

²⁴ National figure – King County and Washington data not available.

²⁵ National figure – King County and Washington data not available.

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
151051	Computer Systems Analysts	1,705	\$35.69	\$26.57	Bachelor's degree	355
435071	Shipping, Receiving, and Traffic Clerks	1,592	\$14.20	\$10.23	Short-term OJT	213
514121	Welders, Cutters, Solderers, and Brazers	1,587	\$18.59	\$14.45	Post-secondary vocational training	81
537064	Packers and Packagers, Hand	1,515	\$10.04	\$7.94	Short-term OJT	210
151032	Computer Software Engineers, Systems Software	1,504	\$42.38	\$31.34	Bachelor's degree	503
173099	Drafters, Engineering, and Mapping Technicians, All Other (OES Only)	1,472	N/A	N/A	Associate degree	50
414011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	1,363	\$33.81	\$19.63	Moderate-term OJT	267
519198	Helpers--Production Workers	1,294	\$11.11	\$8.01	Short-term OJT	161
439061	Office Clerks, General	1,252	\$13.90	\$10.02	Short-term OJT	916
132011	Accountants and Auditors	1,171	\$30.57	\$20.79	Bachelor's degree	520
515023	Printing Machine Operators	1,165	\$18.99	\$11.40	Moderate-term OJT	30
172141	Mechanical Engineers	1,127	\$32.88	\$24.62	Bachelor's degree	75
516031	Sewing Machine Operators	1,119	\$10.66	\$8.26	Moderate-term OJT	7
435061	Production, Planning, and Expediting Clerks	1,116	\$19.00	\$13.62	Short-term OJT	76
434051	Customer Service Representatives	1,099	\$17.88	\$11.62	Moderate-term OJT	628
172112	Industrial Engineers	1,085	\$33.93	\$26.29	Bachelor's degree	32

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
537062	Laborers and Freight, Stock, and Material Movers, Hand	1,078	\$11.83	\$8.27	Short-term OJT	974
111021	General and Operations Managers	1,059	\$61.30	\$31.64	Work experience, plus bachelor's degree	248
499042	Maintenance and Repair Workers, General	1,054	\$17.78	\$11.68	Long-term OJT	249
435081	Stock Clerks and Order Fillers	1,013	\$13.15	\$9.24	Short-term OJT	486
433031	Bookkeeping, Accounting, and Auditing Clerks	990	\$16.03	\$11.37	Moderate-term OJT	529
436011	Executive Secretaries and Administrative Assistants	974	\$20.55	\$15.65	Moderate-term OJT	340
514011	Computer-Controlled Machine Tool Operators, Metal and Plastic	965	\$20.12	\$14.00	Long-term OJT	16
519111	Packaging and Filling Machine Operators and Tenders	952	\$11.82	\$8.22	Short-term OJT	68
119041	Engineering Managers	938	\$53.08	\$40.40	Work experience, plus bachelor's degree	59
512011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	933	\$16.95 ²⁶	N/A	Long-term OJT	20
151099	Computer Specialists, All Other	925	\$34.68	\$22.83	Post-secondary vocational training	94
113051	Industrial Production Managers	914	\$40.80	\$25.80	Bachelor's degree	32

²⁶ National figure – King County and Washington data not available.

SOC Code	Job Title	Number employed (2002)	Mean hourly wage	Entry wage	Training	Projected Annual Openings 2002-2012
151071	Network and Computer Systems Administrators	912	\$32.06	\$22.92	Bachelor's degree	179
513092	Food Batchmakers	912	\$14.60	\$8.94	Short-term OJT	34
537051	Industrial Truck and Tractor Operators	841	\$16.04	\$11.34	Short-term OJT	133
533032	Truck Drivers, Heavy and Tractor-Trailer	833	\$17.91	\$14.09	Moderate-term OJT	360
514031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	825	\$14.90	\$10.89	Moderate-term OJT	23
512041	Structural Metal Fabricators and Fitters	802	\$15.38	\$10.70	Moderate-term OJT	29
513022	Meat, Poultry, and Fish Cutters and Trimmers	788	\$14.80	\$9.46	Short-term OJT	25
151041	Computer Support Specialists	779	\$26.42	\$17.13	Associate degree	316
172199	Engineers, All Other	735	\$37.66	\$27.48	Bachelor's degree	38
514081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	717	\$14.30	\$10.77	Moderate-term OJT	25
	TOTAL	77,146				11,293
	AVERAGE		\$24.22	\$16.52		

Appendix 4: Logistics and International Trade Career Ladder - detailed table

	Occupations	Number Employed	Share	Entry Wages	Avg. mean hourly wage	Projected Annual Openings 2002-2012
Air Transportation						
Short-term OJT	29	5,216	35.4%	\$10.88	\$14.81	5,895
Moderate-term OJT	13	1,944	13.2%	\$12.31	\$18.59	2,776
Long-term OJT	6	2,771	18.8%	\$14.09	\$23.09	469
Post-secondary vocational training	10	1,023	6.9%	\$17.41	\$23.67	602
Work experience in related occupation	14	821	5.6%	\$17.64	\$27.64	1,235
Associate degree	6	32	0.2%	\$18.42	\$25.50	1,146
Bachelor's degree	32	2,276	15.5%	\$22.29	\$34.56	4,373
Work experience, & bachelor's degree	15	349	2.4%	\$29.01	\$49.15	1,322
Master's degree	1	1	0.0%	\$20.73	\$27.60	32
First professional degree	1	9	0.1%	\$27.68	\$52.98	325
No category defined	7	281	1.9%	\$18.16	\$31.78	1,350
Training info unavailable	1	3	0.0%	\$24.57	\$32.12	2
TOTAL	135	14,726	100.0%			19,527

Truck Transportation						
Short-term OJT	28	1,877	24.6%	\$10.25	\$13.90	8,598
Moderate-term OJT	12	4,484	58.8%	\$13.46	\$19.49	3,102
Long-term OJT	5	30	0.4%	\$17.67	\$24.24	384
Post-secondary vocational training	3	249	3.3%	\$14.53	\$20.37	298
Work experience in related occupation	8	480	6.3%	\$18.78	\$31.16	1,219
Associate degree	1	7	0.1%	\$17.13	\$26.42	316
Bachelor's degree	14	144	1.9%	\$22.21	\$34.77	2,558
Work experience, & bachelor's degree	9	136	1.8%	\$30.59	\$54.09	849
Master's degree	1	2	0.0%	\$22.84	\$32.29	21
First professional degree	0					
No category defined	3	182	2.4%	\$19.68	\$31.83	1,166
Training info unavailable	2	31	0.4%	\$16.31	\$18.38	2
TOTAL	86	7,622	100.0%			18,513

	Occupations	Number Employed	Share	Entry Wages	Avg. mean hourly wage	Projected Annual Openings 2002-2012
Freight & Warehousing						
Short-term OJT	33	3,407	47.5%	\$9.74	\$13.38	9,275
Moderate-term OJT	15	2,167	30.2%	\$12.33	\$18.04	3,075
Long-term OJT	6	47	0.7%	\$14.60	\$19.98	397
Post-secondary vocational training	2	31	0.4%	\$15.70	\$20.63	177
Work experience in related occupation	10	719	10.0%	\$19.33	\$31.13	1,027
Associate degree	2	21	0.3%	\$20.38	\$28.52	1,002
Bachelor's degree	22	286	4.0%	\$23.08	\$33.37	4,001
Work experience, & bachelor's degree	7	304	4.2%	\$30.62	\$53.63	759
Master's degree	1	4	0.1%	\$22.84	\$32.29	21
First professional degree	0					
No category defined	5	188	2.6%	\$15.95	\$25.07	1,227
Training info unavailable	0					
TOTAL	103	7,176	100.0%			20,961

Water Transportation						
Short-term OJT	24	1,681	33.5%	\$10.73	\$14.65	6,607
Moderate-term OJT	14	479	9.6%	\$14.13	\$20.24	3,071
Long-term OJT	8	385	7.7%	\$14.87	\$20.74	1,423
Post-secondary vocational training	6	813	16.2%	\$15.71	\$21.44	389
Work experience in related occupation	8	312	6.2%	\$20.26	\$32.89	924
Associate degree	1	1	0.0%	\$17.13	\$26.42	316
Bachelor's degree	15	112	2.2%	\$23.18	\$33.87	3,054
Work experience, & bachelor's degree	9	123	2.5%	\$32.22	\$49.49	872
Master's degree	0					
First professional degree	1	1	0.0%	\$27.68	\$52.98	325
No category defined	6	1,097	21.9%	\$16.45	\$25.69	1,291
Training info unavailable	1	6	0.1%	N/A	\$14.59	0
TOTAL	93	5,013	100.0%			18,272

Appendix 5: Bureau of Labor Statistics' Training Requirements - definitions²⁷

Occupations are classified into one of eleven categories listed below based on analysis of the occupation's most significant source of postsecondary-education or training according to these principles:

- An occupation is placed into the category that best describes the postsecondary-education or training needed by most workers to become fully qualified.
- Postsecondary awards, if generally needed for entry into the occupation, take precedence over work-related training even though additional skills or experience may be needed for a worker to become fully qualified.
- The length of time an average worker generally needs to become fully qualified through a combination of on-the-job training and experience is used to categorize occupations in which a postsecondary award generally is not needed for entry.

Short-term on-the-job training: Skills needed to be fully qualified can be acquired during a short demonstration of job duties or during 1 month or less of on-the-job experience or instruction.

Moderate-term on-the-job training: Skills needed to be fully qualified can be acquired during 1 to 12 months of combined on-the-job experience and informal training.

Long-term on-the-job training: More than 12 months of on-the-job training or combined work experience and formal classroom instruction are needed for workers to develop the skills necessary to be fully qualified. This category includes formal and informal apprenticeships that may last up to 5 years. Long-term on-the-job training also includes intensive occupation-specific, employer-sponsored programs that workers must successfully complete. These include fire and police academies and schools for air traffic controllers and flight attendants. In other occupations – insurance sales and securities sales, for example – trainees take formal courses, often provided on the job site, to prepare for the required licensing exams. Individuals undergoing training generally are considered to be employed in the occupation. Also included in this category is the

²⁷ See <http://www.bls.gov/emp/noeted/empnumb.htm>.

development of a natural ability – such as that possessed by musicians, athletes, actors, and other entertainers – that must be cultivated over several years, frequently in a nonwork setting.

Work experience in a related occupation: Many occupations requiring work experience are first-line supervisors/managers of service, sales and related, production, or other occupations, or are management occupations.

Postsecondary vocational award: Some programs last only a few weeks while others may last more than a year. Programs lead to a certificate or other award but not a degree.

Associate degree: Completion of the degree usually requires at least 2 years of full-time academic study.

Bachelor's degree: Completion of the degree generally requires at least 4 years, but not more than 5 years, of full-time academic study.

Bachelor's or higher degree, plus work experience: Most occupations in this category are management occupations. All require experience in a related non-management position for which a bachelor's or higher degree is usually required.

Master's degree: Completion of the degree usually requires 1 or 2 years of full-time academic study beyond a bachelor's degree.

Doctoral degree: Completion of a Ph.D. or other doctoral degree usually requires at least 3 years of full-time academic study beyond a bachelor's degree.

First professional degree: Completion of the degree usually requires at least 3 years of full-time academic study beyond a bachelor's degree.