



# The Technology Sector's Role in Washington's Economy and Economic Recovery

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# **WASHINGTON TECHNOLOGY INDUSTRY ASSOCIATION**

## TECHNOLOGY SECTOR ROLE IN ECONOMIC RECOVERY



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## EXECUTIVE SUMMARY

The tech sector is a pillar of Washington's economy. The sector—which includes activities spanning software, e-commerce, cloud computing, telecom, electronics manufacturing, and various computer services—creates significant economic wealth and job creation across the state through both its sheer size and the multiplicative impacts of tech industry purchases and tech worker household spending.

This study illustrates the large and growing role of the tech sector as an economic driver for Washington state, including over the past two recessions. This report then details the essential role of the tech sector in efforts to combat COVID-19 and economic relief, and why it is important to nurture and cultivate the sector in order to remain globally competitive.

### *Tech Sector's Increasing Share of the State Economy*

In 2020, the ICT sector directly employed more than a quarter of a million workers (278,900) in Washington state. And this impact is growing. Between the lowest point in employment during the Great Recession (2009-2010) and 2019, just prior to the pandemic; **the tech sector nearly doubled (84% growth), adding 120,100 jobs.** By comparison, statewide employment across all other sectors grew by just 19%.

**Nearly a quarter (24%) of all wages earned statewide were for tech workers in 2020. This was up from 10% as recent as 2007.** Between 2010 (Great Recession) and 2020, the tech sector represented nearly 40% of state economy-wide wage and salary disbursements growth. Between 2015 and 2020, the sector was responsible for 46% of all wage and salary growth and 66% of net job growth. **Between 2010 and 2020, in inflation-adjusted terms (2020 dollars), tech sector wages increased by \$41.3 billion, whereas wages amongst the rest of the economy grew by \$47.7 billion.**

**Key Takeaway:** In the last five years, Tech provided 46% of all wage growth and 66% of job growth in Washington state.

### *Tech Sector Was Key to State's Recovery from the 2009-2010 Great Recession and 2020 COVID-19 Recession*

The tech sector has been a catalyst of growth and economic recovery during the last two recessions. In 2010, during the Great Recession, ICT represented roughly 5% of Washington's statewide employment. However, **between 2010 and 2019 (the post-Great Recession recovery period), ICT net employment increases represented nearly 20% of all statewide covered net employment growth.**

Amid the 2020-2021 pandemic and global recession, the ICT sector in Washington added nearly the same number of new jobs in 2020 as it did in 2019 (20,300 new workers, compared with 21,800 in 2019 and 10,600 in 2018). By contrast, statewide employment fell by 180,800 jobs in 2020. **While**

**statewide employment contracted 5.3% in 2020, ICT employment grew 7.8%.**

**Key Takeaway:** Tech provided 20% of Washington state's job growth between the two recessions.

## *Tech Generates Employment and Economic Growth Across the Economy*

Tech employment, operations, and wages support additional jobs across the state economy. This occurs through tech firm upstream business purchases (indirect) and household consumption among workers employed in tech firms and suppliers (induced), such as on groceries, dining out, and entertainment. In 2020, factoring in indirect and induced impacts, more than 1.2 million jobs in Washington state can be traced to the ICT sector. **Each direct job in the tech sector was associated with a total of 4.0 jobs across the state economy (a jobs multiplier of 4).**

## *Tech Continues as a Top Contributor to State Fiscal Revenues*

The tech sector shoulders a disproportionate share of state business taxes. In 2020, the ICT sector directly contributed nearly \$415 million in business & occupation (B&O) taxes and \$829.4 million in sales and use taxes to the Washington state budget. By comparison, the aerospace sector contributed \$83.5 million in 2020. In inflation-adjusted terms, the tech sector pays 69% more in state business and occupation taxes than it did in 2007. That is nearly double the real rate of growth for Washington state overall over the same period (35%).

ICT workers spent an estimated \$35.5 billion in personal consumption expenditures in Washington state in 2020. Through their purchases, tech workers alone provided over \$1 billion in state sales tax revenues, or more than 9% of the statewide total. This equates to more than \$3,600 per worker in 2020 (including the self-employed).

**Key Takeaway:** Tech pays 69% more in state business taxes (in real terms) than it did in 2007.

## *Tech Enables Essential Operations During the Pandemic*

Beyond employment and wage impacts, the tech sector has played a critical and foundational role supporting our ongoing efforts against COVID-19. Tech firms headquartered or with operations in Washington have led the way in digital infrastructure to support small business, collaborative research and open data, remote work solutions, and robust philanthropic work statewide and in local communities.

## Combating COVID-19

The tech sector provided leadership in the fight against COVID-19 through several key areas. (1) Early on, supporting testing, diagnostics, treatment, and broad-based, eco-system-based support; and (2) beginning in 2021, tech solutions to support vaccination drives. Some of the largest tech firms led the way in transitioning to remote work to contain the spread of the virus.

### *Spotlight on the VACCS Command Center*

Notably, **Amazon**, **Microsoft**, **Expedia**, and **Starbucks** were all leading participants of the Governor's Vaccine Command and Coordination System (VACCS) Command Center. For example, **Amazon** supported booking vaccine appointment in Washington state by providing surge support to the state call center, which had previously been overloaded with wait times and scheduling backlogs. Early in the pandemic, **Microsoft's AI for Health** partnered with the Washington State Department of Health to help build the department's own interactive COVID-19 data tracking dashboard. Many local technology companies provided computers, communications technology and cloud capacity to support remote working and service delivery in state government and to secure and distribute medical supplies to healthcare workers. Microsoft, Expedia, and Starbucks collaborated on the development of an online information dashboard and vaccine locator app, with Starbucks leveraging its inhouse expertise to develop a simple, clean user interface for the tool.

### *Research*

Washington tech firms and organizations have provided grants, online collaborative platforms, and supported the use of AI and data science for COVID-19 research. The University of Washington has been at the forefront of much of this work, including such areas as monitoring technologies.

## Supporting small businesses

**Tech has provided key support for small businesses, helping many of these businesses be more resilient and connected to customers during the pandemic.** Local businesses relied on various tech solutions to enable critical operations during evolving stay at home, social distancing, and other public health mandates. Restaurants relied on app-based technology platforms such as DoorDash, Instacart, and Grubhub to take orders, provide curbside services, and deliver to off-premises customers. Digital marketplaces such as Amazon and OfferUp enabled thousands of small businesses in Washington state to transact sales online. Business offices transitioned to remote work solutions, such as Zoom, Microsoft Teams, Slack, Amazon Chime and Google Meet.

## Education

Tech firms have provided essential digital solutions for online learning. Zoom, WebEx, and Microsoft Teams have enabled remote classroom teaching, while Google Classroom, Canvas, and Blackboard have all provided essential learning management systems. Proctorio, a Google Chrome extension, is used by teachers to monitor students while backing an exam.

Amazon has also donated 8,950 Chromebook laptops, valued at over \$2.2 million, to Seattle Public Schools elementary school students for online learning. Google engineers provided much needed free technical support to recipient families. Microsoft partnered with the Seattle Seahawks to provide 300 Surface Go 2 devices and pens, plus new internet hotspots, to support technology needs at Boys & Girls Club of King County as they provide childcare to essential workers throughout the pandemic.

The Seattle tech sector nonprofit **sea.citi** has been central to many of these efforts. In 2020, sea.citi and the Alliance for Education, leveraging a \$200,000 grant from the Tableau Foundation, launched the **Family Tech Support Center**, a volunteer-led technical support resource for families adjusting to Seattle Public Schools online education. The funds will also support the creation of a Digital Equity Manager position for Seattle Public Schools, responsible for coordinating all efforts to ensure that students and families have access to the tech support they need, and that equity is kept at the center of remote learning strategies. **All in Seattle**, a tech sector-driven initiative, has raised more than \$30 million for COVID-19 relief.

**Key Takeaway:** Tech has been a critical partner in the state's efforts to combat COVID-19 throughout the pandemic, including taking the lead in remote work; support for testing, diagnostics, and treatment; solutions to support vaccination drives; and providing solutions for small businesses.

## *Tech is Driving Future Growth in Washington State*

The tech sector continues to invest across Washington and the Puget Sound area. According to the commercial real estate brokerage firm CBRE, **the Seattle area in 2020 surpassed the Bay Area as the number one location for new commercial lease space in the country, with 14 mega deals totaling 3.4 million square feet.** The tech sector is the leading driver of this growth.

Tech firms were the primary source for these new leases. For example, **Amazon** has committed to 25,000 new jobs in Bellevue as part of an expansion of their Puget Sound headquarters. The downtown Bellevue headquarters will include 12 buildings all within one mile walking distance. The site will have total capacity for more than 7,000 workers and 37,000 square feet of ground floor retail. The site will be directly adjacent to the Bellevue Transit Center and Downtown Bellevue Link Light Rail station.

**Google** is moving forward with plans for two new campuses, in addition to its existing 375,000 square foot facility there. The new Kirkland Urban campus will include four buildings and 760,000 square feet of office space. Facebook is also expanding its presence in the region. In September 2020, the company purchased a 6-acre, 400,000 square-foot complex from REI in Bellevue's Spring District.

But there is an inherent fragility to this growth. It assumes that all hires by Washington companies will be in Washington. Class A office space can be found anywhere, and the COVID-19 work-from-home experiment has already fundamentally shifted long-held assumptions about big headquarters, and even hub-and-spoke models that concentrate tech jobs in a particular region.

Zillow, for example, announced it will allow 90% of its workforce to work remotely at least part of the time on an indefinite basis. Many other firms are enacting similar policies. Talent pools and relocation investments by large companies have always been the driver behind every tech hub. Recruiting by tech is no longer constrained by geography or relocation logistics. Companies in Washington are increasingly recruiting talent that permanently resides in other states.

For Washington to remain attractive to employers in an increasingly remote-work industry, we cannot rely solely on a higher education system whose STEM tracks cannot keep pace with demand. The public sector must join the private sector as investors in successful adult worker reskilling programs such as ADA Developers Academy and Apprenti. Other states like Pennsylvania, Ohio, and Massachusetts are already making those investments, which means in the near term, more jobs created in Washington will be filled by residents of other states. Longer term, the state must join the private sector in recruiting entrepreneurs and tech talent to live and work in Washington.

Talent and private equity are very competitive environments, and other states are rapidly increasing efforts to recruit and attract these assets. As this report details, the tech sector helped rescue Washington state from the past two recessions and it remains one of the largest contributors of jobs and state revenue. The state must continue to find ways to cultivate and nurture this sector, as well as expand pathways for Black, indigenous, and people of color (BIPOC) into the sector, in order to retain and grow the sector for the benefit of all residents.

**Key Takeaway:** The state must continue to find ways to support the tech sector as a means of driving broad-based economic growth.



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# INTRODUCTION

## *Background and Purpose*

The COVID-19 global pandemic has upended supply chains, the nature of work, consumption patterns, and the economic stability of millions of workers and households across the United States. Many businesses, particularly those whose primary services are consumer-facing, have been acutely impacted by the pandemic and mandated closures. Most office workers have been forced to work remotely, travel has been steeply curtailed, and businesses have been compelled to find or innovate new ways to maintain operations and serve their customers and clients.

After the initial shock of the pandemic and deep economic downturn, the United States is now in a period of phased economic recovery. The information and communication technology (“tech”) sector has been essential both during the recession and economic recovery periods. Washington’s tech sector has played a critical role innovating and deploying software and online solutions to help businesses, households, and governments adjust to these sudden changes.

Tech solutions—such as online product sales platforms, mobile apps, and videoconferencing platforms—have proven crucial for the economy, both in Washington state and globally. Numerous small businesses, from restaurants to hair salons, have relied on mobile apps and online platforms to manage reservations, transition to takeout and delivery services, reach new customers, and sell their products remotely to customers. E-commerce firms have rapidly expanded employment in Washington state and elsewhere to support surging U.S. and global demand for online retail services. Washington’s economic recovery during the pandemic would not have been possible without the contributions of the tech sector.

The tech sector has also provided the tools necessary to use big data to track the spread of the virus and for coordinating and deploying vaccines. Digital solutions have been critical for supporting mass-vaccination efforts, vaccine call center surge support, follow-up with vaccine recipients, cold storage logistics management, and many other elements in the production, delivery, and administering of vaccines (Guerhazi, 2021).

Lastly, despite the steep downturn in the U.S. economy in 2020, one of the rare sources of economic growth is the tech sector. For example, in 2020, while Washington statewide nonfarm employment fell 5.3% year-over-year, software publishing industry employment in Washington state *increased* by nearly 8%. These workers often earn wages that can support a family, a large share of which is spent on household goods and services, which in turn supports local businesses.

**Key Takeaway:** Washington’s economic recovery during the pandemic would not have been possible without the contributions of the tech sector.

The Washington Technology Industry Association (WTIA) has commissioned this report to assess:

- The tech sector as an economic driver during the pandemic and the 2009-2010 Great Recession.
- State fiscal revenues generated directly and through broad-based economic impacts of the tech sector, and the growing share of state revenues provided by the tech sector.
- The positive contributions of the tech sector for small businesses, communities, and pandemic response efforts.
- Going forward, how the tech sector will be a leading and growing economic driver, especially during the post-COVID economic recovery.

Findings will be used to highlight the essential and growing role of the tech sector in our economy and advocate for policies to support the continued vitality and growth of the sector in Washington state.

## *Methods and Definitions*

### **Data Sources**

This report makes use of multiple data series, published from state, federal, and private vendor sources. Employment, wage, and estimated revenues come from the Washington State Employment Security Department, Washington State Department of Revenue, U.S. Bureau of Labor Statistics, U.S. Economic Census, and U.S. Bureau of Economic Analysis. Auxiliary sources include tech sector business financial statements and public filings, reports, and published research. Stories and information about tech's role in pandemic response and relief efforts, critical services and solutions for small business, and the role of tech in near-future economic growth in the region, are sourced from news reports, press releases, and public documents.

The periods defined in this report are: (1) the Great Recession, from 2009-2010; (2) the economic recovery period, from 2010 to 2019; and (3) the pandemic recession, from 2020 to 2021.

Data collected for each period represent annual averages. For example, employment data in 2020 is the average of employment for all four quarters of the year, as reported in the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) series.

### **Definition of the Tech Sector**

The tech sector is comprised of internet services and publishing activities, electronic retail, software and computer business services, software publishing, telecommunications, services, and related manufacturing. Business services includes cloud computing, computer training, and various software and computer business consulting. Amazon's activities are split between e-commerce and its cloud computing operations (AWS) under business services, while Microsoft constitutes the largest share of software publishing employment. Industry codes included in this definition are presented in **Exhibit 1** below.

## Exhibit 1. Components of Washington's ICT Employment

Subsector	NAICS	Subsector
Business Services	541511	Custom computer programming services
	541512	Computer systems design services
	541513	Computer facilities management services
	541519	Other computer related services
	611420	Computer training
	811211	Consumer electronics repair and maintenance
	811212	Computer and office machine repair
	811213	Communication equipment repair
Electronic Retail	561499	All other business support services
	45411	Electronic shopping and mail-order houses
Telecommunications Services	517	Telecommunications
Manufacturing	334	Computer and Electronic product mfg. (most subsectors relating to computer parts and equipment manufacturing)
	333316	Photographic and photocopying equipment mfg.
Internet Services & Publishing	518210	Data processing, hosting and related services
	519130	Internet publishing and web search portals
Software Publishing	511210	Software publishers

### Appendix A.<sup>1</sup>

## Organization of Report

The remainder of this report is organized as follows:

- Tech industry growth during the pandemic, economic contributions, and comparison with tech's role during the Great Recession recovery period.
- Tax contributions of the tech sector to Washington state.
- Role of tech in supporting small businesses.
- Tech's contributions to pandemic response, relief, and recovery efforts.
- Looking forward, how tech will continue to anchor and drive economic growth in Washington state.

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<sup>1</sup> Some ICT companies, such as Amazon, have business units classified across more than one NAICS code. For example, Amazon Web Services, Amazon's cloud computing division, is reported under "business services," whereas most of its e-commerce operations are classified under "electronic retail."

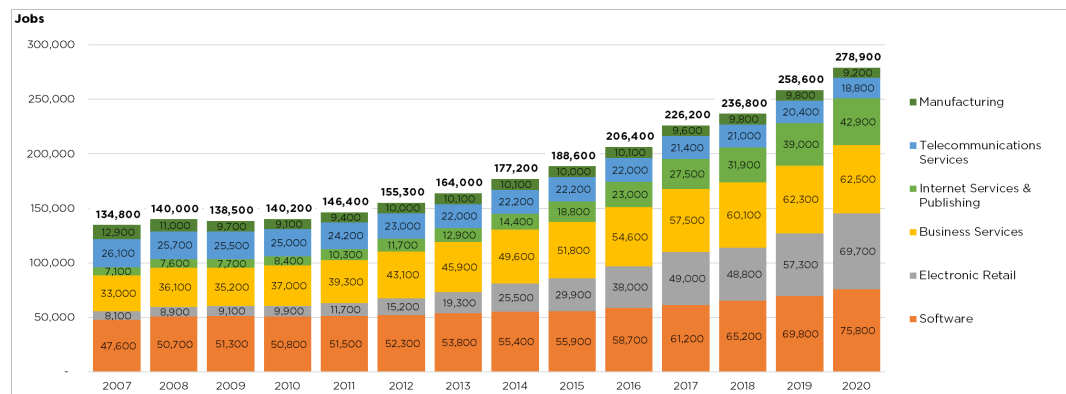
# TECH SECTOR ECONOMIC CONTRIBUTIONS

## Jobs and Wages

By far, the tech sector is the fastest growing sector in Washington state. In **2020, the ICT sector directly employed more than a quarter of a million workers in Washington state (Exhibit 2)**. Amid a pandemic and global recession, the ICT sector in Washington added nearly the same number of new jobs in 2020 as it did in 2019 (20,300 new workers, compared with 21,800 in 2019 and 10,600 in 2018). By contrast, statewide employment fell by 180,800 jobs in 2020. Among ICT subsectors, only manufacturing and telecommunications experienced a decline in employment in 2020.

**Key Takeaway:** By far, the tech sector is the fastest growing sector in Washington state, employing more than a quarter of a million workers in 2020.

**Exhibit 2. Washington ICT Employment, Covered Workers, 2007-2020**



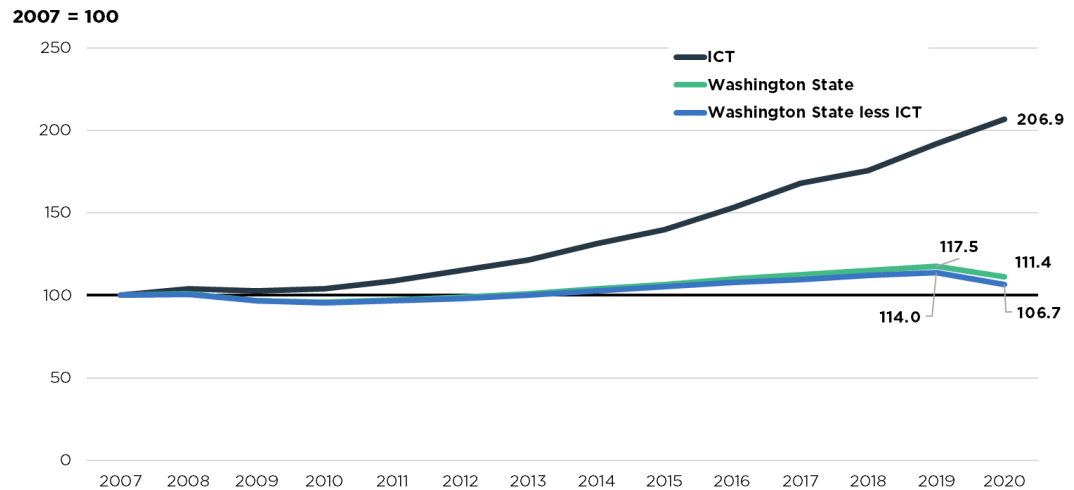
The tech sector unquestionably powered Washington's economy through the past two recessions. Between 2007 and 2019, Washington's statewide covered employment increased by 17.5% (index value of 117.5), before falling to the equivalent of 11.4% of employment in 2007. ICT sector employment is now nearly 107% larger than its employment base in 2007 (more than double), or 160% when excluding manufacturing and telecom (**Exhibit 3**). In 2011, the first year of statewide employment recovery following the Great Recession—and beginning a streak of nine straight years of employment growth—statewide employment increased by 1.3%. That same year, tech sector employment grew 6.3%, adding 6,700 jobs.

**Key Takeaway:** The tech sector unquestionably powered Washington's economy through the past two recessions. Tech sector jobs in Washington state have grown 107% since the Great Recession.



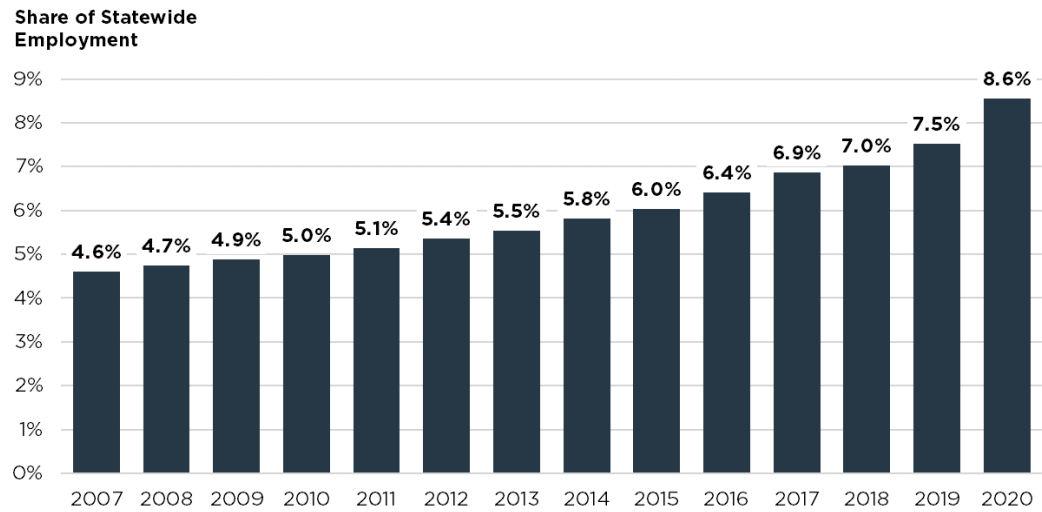
Since the low point in employment during the Great Recession (2010) until 2019, just prior to the pandemic, statewide employment across all sectors grew 22%; **the tech sector, by comparison, nearly doubled (84% growth) and added 120,100 jobs**. In 2010, ICT represented roughly 5% of Washington’s statewide employment. However, **between 2010 and 2019 (the post-Great Recession recovery period), ICT net employment increases represented nearly 20% of all statewide covered net employment growth**.

### Exhibit 3. Washington State Overall and Tech Employment, Indexed to 2007



The tech sector’s role in economic recovery has become much more profound during the latest economic downturn. The tech sector has nearly doubled its share of statewide covered employment, rising from less than 5% in 2007 to nearly 9% in 2020 (**Exhibit 4**). The tech sector’s share increased more than one percentage point in 2020, as the sector continued to grow while state overall employment declined due to the pandemic and business closures.

#### Exhibit 4. ICT Covered Employment as a Share of Washington State Total Covered Employment, 2007-2020



In 2020, the pandemic upended state, national, and even global economies. However, the ICT sector, during this period of upheaval, added 20,300 jobs in Washington state. This compares with a loss of 20,900 manufacturing jobs—including an 8,500 net job loss in aerospace—and net losses of 66,700 jobs in accommodation and food services and 5,800 jobs in construction (**Exhibit 5**). Within ICT, the largest annual employment gains were in electronic retail (+12,400), followed by software (+6,000) and internet services and publishing (+3,900). Only manufacturing and telecom experienced job losses (**Exhibit 6**).

Many Washington state tech firms have also been key sources of job growth across the United States in 2020 through the pandemic. Amazon hired 175,000 workers in 2020 during the first two months of the pandemic—the largest peacetime worker mobilization in history (Amazon, 2020). Amazon is now the largest private employer in Washington state with more than 80,000 employees across thousands of diverse job types. More than 16,500 of those workers were new hires in 2020 as part of the statewide response to the COVID-19 pandemic. And those jobs are not just in Seattle. They are in 160 buildings in six counties across the state, which are home to 59% of Washington's residents.

**Key Takeaway:** Amazon hired 175,000 workers in 2020 during the first two months of the pandemic—the largest peacetime worker mobilization in history.

While much of this growth has occurred among Washington's largest tech firms, many smaller firms have also been important economic drivers in recent years. By the end of 2020, Seattle was home to 10 unicorns (start-ups with valuations of \$1 billion or more). Five years earlier, there were no unicorns in Seattle (Cook, 2020). The rapid growth of these firms has helped drive new employment in the region. For example, **Convoy**, a machine learning and

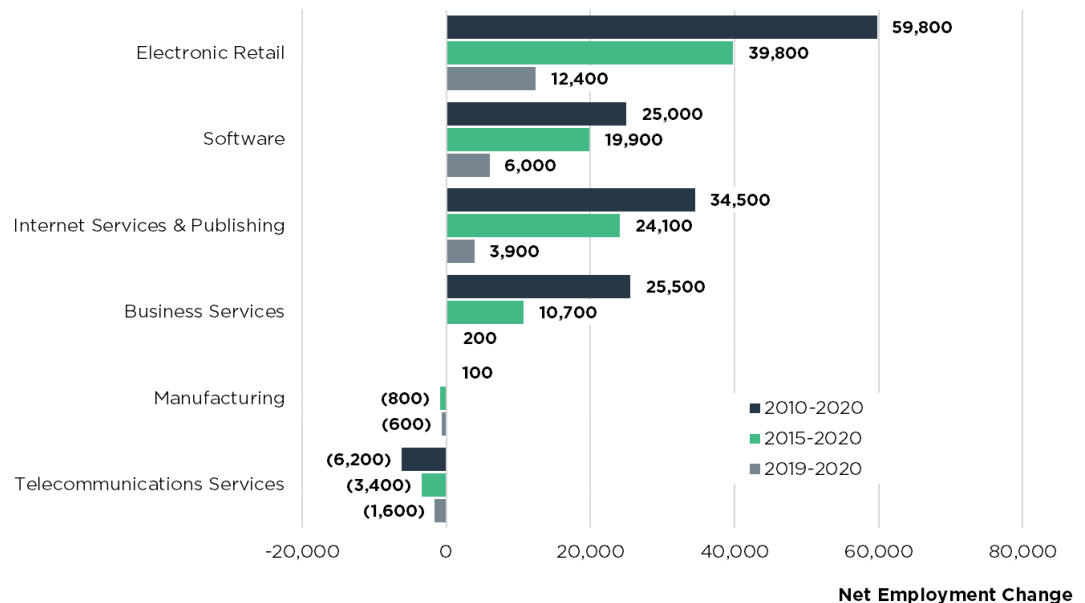
automation-based digital platform solution for freight logistics, reached 1,000 employees in 2021, just six years since it was founded in 2015 (Morgan, 2021). **Remitly**, a fintech peer-to-peer mobile payment service, also surpassed the 1,000 worker threshold by the end of 2020, with 25% growth in 2020 alone (Morgan, 2020). The first quarter of 2021 marked a record for start-up funding in the Seattle area, with more than \$1.6 billion raised across 88 deals (Soper, 2021).

Sector	2019	2020	Net Change	Percentage Change
Manufacturing*	295,500	274,600	(20,900)	-7.1%
Aerospace	88,500	80,000	(8,500)	-9.6%
Ship and Boat Building	19,300	19,400	100	0.5%
Food and beverage processing	49,500	46,700	(2,800)	-5.7%
Construction	206,200	200,400	(5,800)	-2.8%
Healthcare and social assistance	488,200	484,900	(3,300)	-0.7%
Agriculture, forestry, fishing and hunting	103,300	99,600	(3,700)	-3.6%
Real estate and rental and leasing	58,100	55,200	(2,900)	-5.0%
Accommodation and food services	288,600	221,900	(66,700)	-23.1%
<b>ICT</b>	<b>258,600</b>	<b>278,900</b>	<b>20,300</b>	<b>7.8%</b>
Statewide, all sectors	3,439,200	3,258,300	(180,900)	-5.3%

Source: U.S. Bureau of Labor Statistics (2021).

\*Manufacturing excludes activities captured under "ICT."

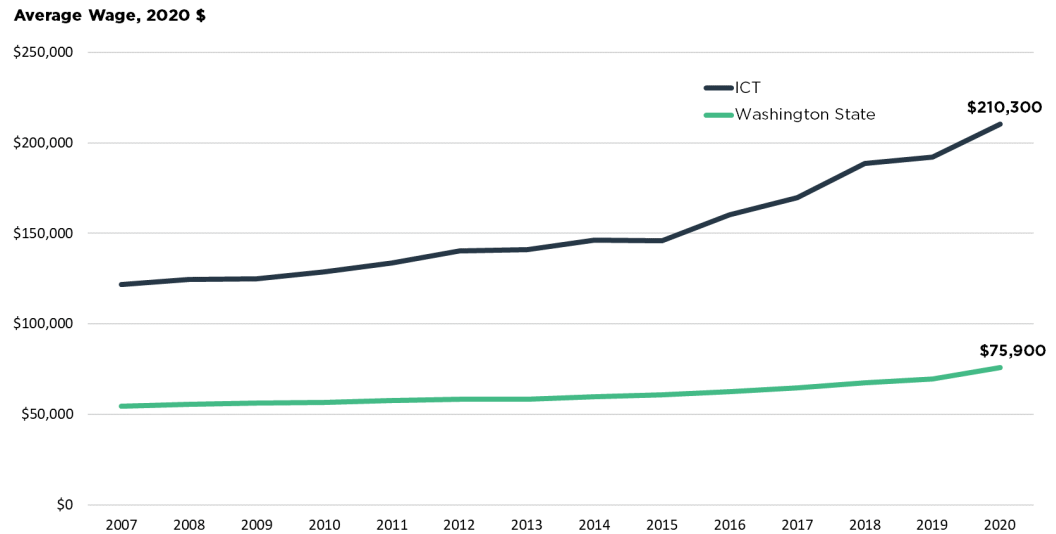
#### Exhibit 6. ICT Employment Net Growth by Subsector, 2010-2020, 2015-2020, and 2019-2020



Source: U.S. Bureau of Labor Statistics (2021).

Tech sector employment on average provides a much higher level of compensation compared with other sectors of the economy. For example, in 2020 the average wage, before benefits (e.g., monetary value of healthcare) in the tech sector was \$210,300, 177% higher than the statewide average wage of \$75,900 (**Exhibit 7**).

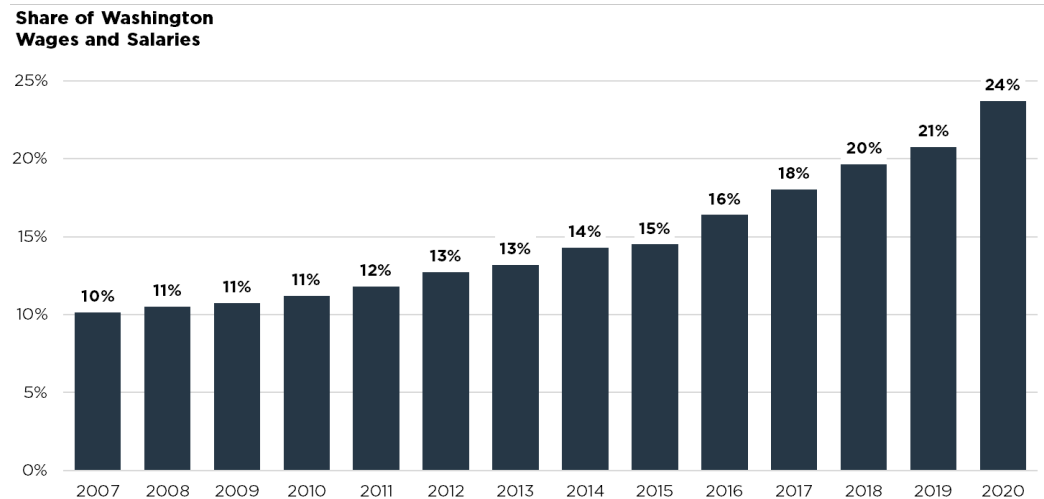
#### **Exhibit 7. ICT and Washington State Average Wage, 2020 \$**



Sources: U.S. Bureau of Labor Statistics (2021); U.S. Bureau of Economic Analysis (2021).

The tech sector's share of Washington's statewide wages has likewise increased, from 10% in 2007 to nearly a quarter (24%) in 2020, including a large jump in 2020 (**Exhibit 8**). Put differently, during the period of post-Great Recession economic expansion, from 2010 and 2019, the tech sector represented 33.4% of statewide wage and salary disbursements growth. Between 2015 and 2020, the sector was responsible for 46% of all wage and salary growth and 66% of net job growth (**Exhibit 9**). Between 2010 and 2020, in inflation-adjusted terms (2020 dollars), tech sector wages increased by \$41.3 billion, whereas wages amongst the rest of the economy grew by \$47.7 billion (U.S. Bureau of Labor Statistics, 2021; U.S. Bureau of Economic Analysis, 2021).

### Exhibit 8. ICT's Share of Washington State Wage & Salary Disbursements, 2007-2020



Source: U.S. Bureau of Labor Statistics (2021).

### Exhibit 9. ICT's Share of Washington State Net Growth in Wage & Salary Disbursements and Employment

Period	Tech sector share of net wage growth	Tech sector share of net job growth
2010-2015	25.6%	15.4%
2015-2020	46.0%	66.6%

Source: U.S. Bureau of Labor Statistics (2021).

All this data clearly demonstrates that a primary driver of Washington state's booming economy is the tech sector, and the state's recovery from the past two recessions would have been much weaker in the absence of tech sector growth. Excluding the tech sector, employment in the rest of the Washington state economy grew 19% between 2010 and 2019, just prior to the pandemic. Without the tech sector—growth closer to North Dakota.

**Key Takeaway:** Washington owes its booming economy to the tech sector, and without tech the state's recovery from the past two recessions would've looked more like North Dakota.

## Tech Occupations and Workers Throughout the Economy

ICT occupations include software developers, computer scientists, electrical engineers, and web developers. In total, there are 15 specific occupations identified as ICT occupations (**Exhibit 10**). Statewide, across all sectors, in 2020 there were an estimated 220,900 workers employed in ICT occupations, of which nearly half were software developers. These jobs exist both within the tech sector and other, non-tech sectors of the economy.



## Exhibit 10. ICT Occupations, Statewide Across All Sectors, 2020

Occupation	Estimated Jobs, 2020
Software Developers	104,300
Computer Systems Analysts	19,500
Web Developers	17,500
Computer User Support Specialists	17,000
Computer and Information Systems Managers	14,700
Computer Occupations, All Other	10,900
Network and Computer Systems Administrators	8,600
Electrical Engineers	7,100
Computer Network Architects	4,000
Computer Network Support Specialists	3,500
Information Security Analysts	3,500
Database Administrators	3,300
Operations Research Analysts	2,600
Computer and Information Research Scientists	2,500
Computer Hardware Engineers	1,900
Total	220,900

Sources: U.S. Bureau of Labor Statistics (2021); Washington State Employment Security Department (2021); Washington Technology Industry Association (2015).

Some of the largest sectors outside ICT for ICT-specific occupations (listed above) include aerospace (7,300 ICT workers), management of companies and enterprises (4,900 workers), and architectural and engineering services (2,300 workers). There were nearly 2,200 ICT workers employed in freight, logistics, and transportation operations in 2020.

In addition to ICT sector-based firms and operations, there are divisions and units within non-tech firms that develop ICT-based solutions. For example, units within large companies such as Boeing and Starbucks that develop in-house software solutions or consumer apps. **These operations, referred to as “tech units,” employed an estimated 75,700 workers in 2020.**

Tech units are estimated based on the number of so-called ICT core occupations, defined in the 2015 WTIA economic impact report (2015, p. 17). Tech units include these occupations plus estimated additional non-ICT workers—such as accountants and administrative staff—whose labor is tied to the in-house production of ICT products and solutions. These jobs represent additional tech employment outside the ICT sector.

### *Economic Impacts of Tech*

The tech sector plays a central role in increasing prosperity across other sectors of the state economy. These broader impacts, referred to as “economic impacts,” include jobs, income, and revenues supported through direct activities of the tech sector, as well as secondary impacts, which are comprised of indirect and induced impacts. **Indirect impacts** refer to

additional jobs, income, and revenues supported through upstream business-to-business transactions, such as supplies purchased by tech firms from other Washington state businesses. **Induced impacts** represent further economic activities supported through tech workers and workers employed among suppliers spending earned income on household goods and services. These include spending on groceries, gasoline, take-out, entertainment, appliances, and various other household expenditures.

In 2020, the ICT sector was associated with an estimated 298,700 workers and \$68.3 billion in total income, including wage and salary outlays and benefits. This higher employment count represents both workers employed in ICT firms (i.e., covered employment) and estimated additional business owners and sole proprietors.<sup>2</sup> **Factoring in indirect and induced impacts, more than 1.2 million jobs in Washington state can be traced to the ICT sector (Exhibit 11).** This employment impact is equivalent to an estimated 27.4% of all in jobs in Washington state (including covered and self-employed workers).<sup>3</sup>

The primary driver of this large impact is the much higher wages ICT workers earn relative to other sectors of the economy. A large share of these earnings is then spent on various household goods and services across the state economy. **Each direct job in the ICT sector is associated with 4.0 jobs across the state economy.**<sup>4</sup> By comparison, the jobs multiplier in 2020 was 2.4 for aerospace and 3.3 for credit intermediation (**Exhibit 12**).<sup>5</sup> The ICT sector has the highest jobs multiplier of any major sector of the state economy.

**Key Takeaway:** Washington's tech sector accounts for 1.2 million direct and indirect jobs, and for every one tech job in the state, three more jobs are created.

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<sup>2</sup> Business owners who include themselves in payroll are accounted for under covered employment.

<sup>3</sup> Estimated total employment in Washington state in 2020 was 4,385,827, based on data from the U.S. Bureau of Economic Analysis (2021) for wage and salary employment (3,496,277) and proprietors employment (889,550).

<sup>4</sup> The most recent (2012) Washington State Input-Output Model estimates a jobs multiplier of 4.7 for the I-O model sector "Software Publishers, Data Processing & Internet Service Providers" (Roberts & Beyers, 2021, p. 17). The ICT jobs multiplier is slightly lower due to the presence of other activities, such as ICT-related manufacturing, telecommunications, and various computer systems design and support services. The jobs multiplier for "sector "Software Publishers, Data Processing & Internet Service Providers" is also significantly higher than estimated in the prior Washington State Input-Output Model (3.96 total jobs per direct job), benchmarked to year 2007 (Beyers & Lin, 2012, p. 18).

<sup>5</sup> The jobs multiplier for ICT reported in the 2015 WTIA study was 3.7. The 22% increase in the size of the jobs multiplier, in addition to the higher jobs multiplier for software publishing in the 2012 Washington State Input-Output Model, is the rapid growth in wages relative to the rest of the state economy. Between 2013 (study year for the 2015 report) and 2019 (just prior to the pandemic), the statewide average wage grew in real (inflation-adjusted) terms 19%, whereas the ICT average wage growth was nearly double, at 36%.

### Exhibit 11. ICT's Total Economic Impact, Washington State, 2020

	Direct	Indirect	Induced	Total
Employment	298,731	220,348	683,595	1,202,674
Labor Income (mils \$)	\$67,485.0	\$15,169.2	\$37,874.9	\$120,529.1
Output (mils \$)	\$138,321.9	\$45,888.9	\$114,485.6	\$298,696.4

Sources: Washington State Office of Financial Management (2021); High Peak Strategy (2021).

### Exhibit 12. Jobs Multipliers for Select Sectors, Washington State, 2020

Sector	Jobs Multiplier
Credit Intermediation and Related Activities	3.3
Wood Product Manufacturing	3.3
Ship and Boat Building	3.2
Highway, Street and Bridge Construction	3.0
Air Transportation	2.8
Aircraft and Parts Manufacturing	2.4
Truck Transportation	2.0
<b>ICT</b>	<b>4.0</b>

Sources: Washington State Office of Financial Management (2021); High Peak Strategy (2021).

## TECH'S STATE FISCAL CONTRIBUTIONS

### *Direct State Tax Payments*

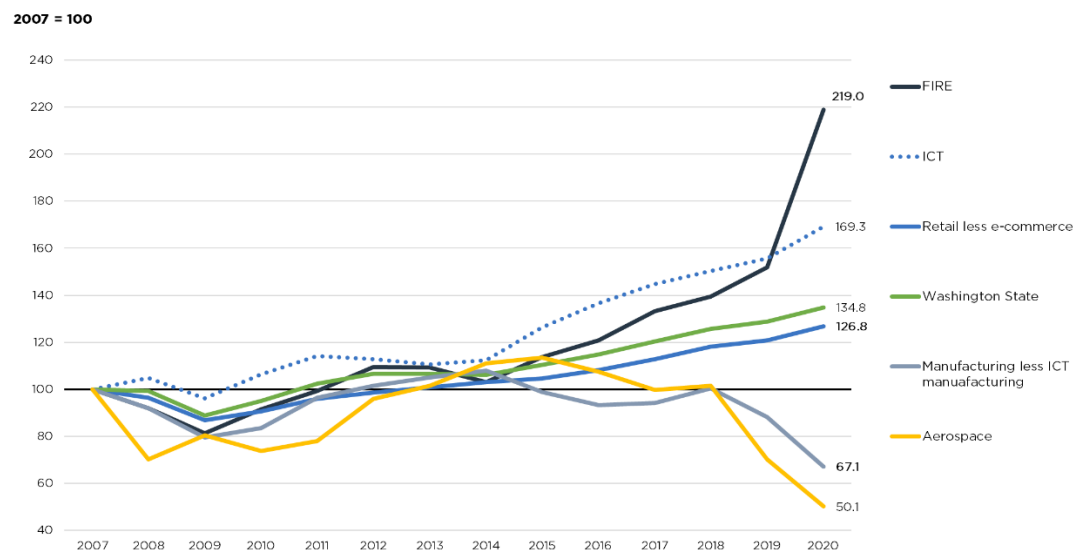
The tech sector shoulders a disproportionate share of state business taxes. In 2020, the ICT sector directly contributed nearly \$415 million in business and occupation (B&O) taxes to the Washington state budget. The ICT sector's B&O contributions have also grown over time, increasing in real (inflation-adjusted) terms 69% between 2007 and 2020 (**Exhibit 13**). By comparison, the aerospace sector contributed \$83.5 million in 2020, while restaurants and food service businesses, acutely impacted by the pandemic, contributed \$64.9 million. ICT B&O payments grew at double the rate of aerospace between 2007 and 2020. Tech firms also collect and pay sales and use taxes. In 2020, these firms were directly associated with an estimated \$829.4 million in sales and use taxes, equal to 7% of all statewide sales and use tax collections in 2020.

Tech firms contribute to state and local tax revenues through various other direct taxes, most notably property taxes. No statewide data on tech payments for these taxes is available, but some information is made available through news reports.

The tech sector has made enormous capital investments in rural Washington by building data centers, spurring property tax revenues. Data centers are the critical infrastructure necessary to provide cloud and online services to businesses, government agencies, and private consumers. Rural Washington is home to the largest concentration of data centers in the state, adding \$2.7 billion to the 2020 property tax rolls and generating over \$27 million in property tax revenue in 2020.

**Key Takeaway:** The tech sector shoulders a disproportionate share of state business taxes. Tech's tax burden in Washington grew at double the rate of aerospace over the past decade.

### Exhibit 13. B&O Tax Payments by Sector and Statewide, Adjusted for Inflation, Indexed to 2007, Washington State



Sources: Washington State Department of Revenue (2021); U.S. Bureau of Economic Analysis (2021).

FIRE = "Finance, Insurance, and Real Estate."

Note: sectors chosen based on largest contributors to state B&O tax in 2019.

ICT workers spent an estimated \$35.5 billion in personal consumption expenditures in Washington state in 2020. **This spending alone supported nearly \$1.1 billion in state sales tax revenues, equal to 9.3% of total state sales taxes.** This equates to more than \$3,600 per worker in 2020.

**Key Takeaway:** Through their purchases, tech workers alone provided over \$1 billion, and 9% of the state's sales tax revenue.

ICT workers represent approximately 6% of all workers in Washington (including covered workers and the self-employed), but nearly 9.3% of retail sales taxes generated at the state level.<sup>6</sup> In 2019, each job (covered and self-

<sup>6</sup> The difference between ICT and non-ICT workers based on retail sales revenues is even greater, given that a share of state sales tax revenues is generated by spending among non-Washington workers and outside residents.

employed) in Washington state was associated with 1.6 residents. This ratio would imply that ICT workers were associated with 489,400 residents in 2019, or approximately 6.4% of the state's total population (U.S. Bureau of Economic Analysis, 2021). ICT workers' household spending and associated sales taxes are disproportionate relative to their share of the workforce and population.<sup>7</sup>

## **TECH SUPPORT FOR SMALL BUSINESSES AND COMMUNITIES DURING THE PANDEMIC**

*"From Microsoft and Amazon to Qumulo and Tableau, these companies worked across sectors and in some cases with key competitors to spearhead and support the effort to combat this deadly virus and help those most affected by it in their own backyard."*  
(The Guardian, 2021)

The tech sector has played a vital role in pandemic response and providing support to communities and small business support throughout the first phase of the pandemic from 2020 and 2021. From the onset of the pandemic, tech companies have been critical partners with government agencies—including providing data visualization platforms to track the virus's spread and disseminate key public health information, collaborated with national and global research entities, retained workers directly impacted by the virus's spread and closures, and made significant philanthropic contributions to local communities, schools, nonprofits, and families. This was all while continuing to grow and hire new workers throughout 2020 and 2021. This section details these efforts and solutions.

### *Small Businesses and Small Business Solutions in Washington State*

Small businesses—those with less than 100 employees—constituted nearly half of all employment in Washington state in 2020.<sup>8</sup> These businesses were disproportionately and acutely impacted by the pandemic, and many are customer-facing operations that faced extraordinary challenges staying in operation during the pandemic. Tech sector solutions during the pandemic have been far-reaching and foundational for many of these businesses. Cloud services, remote work, app-based technology platforms, and various other tech solutions have allowed businesses to stay open and deliver goods and services during the pandemic. These solutions have allowed employees to work safely from home, able to coordinate, meet, and conduct client engagement over online platforms, access company servers via the cloud, and coordinate with team members through online project management and virtual office solutions.

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<sup>7</sup> During the last economic expansion, from 2010 to 2019, statewide sales tax revenues increased by more than \$5.2 billion, whilst wages grew by \$103.1 billion.

<sup>8</sup> Business establishments with employment of less than 500 workers represent nearly 80% of all employment statewide. Among restaurants and bars, establishments with less than 100 workers represent nearly 90% of all establishments across the state (Washington State Employment Security Department, 2020).



Even before the pandemic, tech solutions were increasingly core to small business operations, marketing, supply chain management, and sales. According to a U.S. Chamber of Commerce national small business survey—conducted prior to the pandemic—84% of small enterprises reported using at least one major digital platform to provide information to customers; 80% were using at least one such platform to show products and services and for marketing; 79% were using digital platforms for communicating with customers and suppliers; and 75% were using digital platforms for sales (Quaadman, 2020).

A small business survey conducted by the Small Business and Entrepreneurship Council and TechnoMetrica (2020) showed that cloud services have become increasingly critical to small business operations during the pandemic. Over three-quarters (76%) of small businesses reported that cloud services have been critical to the survival and operation of their business during the COVID-19 pandemic. The most common applications of cloud services were for cloud storage, followed by email hosting, web hosting, and apps hosting. Slightly more than a third (35%) of surveyed small businesses reported using cloud computing for communication and collaboration, video conferencing and webinar services, and invoice, sales, and expense tracking.

A Verizon (2020) small business survey conducted in May 2020 found that 43% of business respondents planned on expanding their business through digital and related technologies, and 30% had already added ways to deliver their products and services digitally.<sup>9</sup>

### **Online Marketplaces**

Many small businesses relied heavily on online marketplaces when unable to directly serve customers on-premises due to the pandemic. Washington-based and Washington-operating firms, from Amazon, Google, Comcast, and local governments and non-profits, expedited and eased access to these tools during the pandemic.

**Amazon** regularly works with more than 48,000 small and medium-sized business sellers and independent authors in Washington (Amazon, 2021). For many of these small businesses, Amazon's online marketplace was critical to their survival and one of the only ways to get their products to customers during the pandemic. In 2020, more than 398,000 Washington businesses received requests via **Google** for directions, phone calls, bookings, reviews, and other direct connections to their customers (Google, 2021). Other common platforms availed to traditional retailers included Shopify, Etsy, and promotional events on Facebook Live.

Local government and the tech sector have also collaborated to develop and make available online marketplaces for brick-and-mortar businesses. For example, the Seattle Office of Economic Development (OED) and **Comcast** have partnered on two initiatives in 2021 to support businesses adversely

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<sup>9</sup> The Verizon survey was conducted by Morning Consult and focused on 500 small and medium businesses that are currently open or plan to reopen.

impacted by COVID-19. Comcast has contributed nearly \$40,000, in addition a \$50,000 investment by OED, in social impact nonprofit Kay Ita to implement a new Digital Sales Access Program. The program will support 50 small businesses by equipping them with a point-of-sales (POS) system and connecting participating businesses with tools and training needed to pivot their operations to a new digital system. The system will help small businesses transition from cash-only to accepting debit, credit, and digital payments (Oceguera, 2021). Also, in partnership with OED and **HomeSight**, Comcast has invested \$50,000 to support the development of the online marketplace **Essential Southeast Seattle**. This program includes an e-commerce platform for Southeast Seattle small businesses; digital access support to get their business online; and technology equipment to meet business needs (Essential Southeast Seattle, 2021).

### **Remote Work**

Unable to meet in person in most cases, businesses have relied on online meeting and coordination platforms. According to data from **Zoom**, daily meeting participants of the online meeting platform increased from 10 million in 2019 to 350 billion by December 2020, while business customers reached 470,000 by the end of 2020 (Iqbal, 2021). **Microsoft Teams** daily active users reached 145 million by Q2 2021, up from 20 million in 2019 (Curry, 2021). Other remote work and meeting platforms, such as **Slack**, **Amazon Chime**, and **Google Meet**, have similarly seen a surge in use during the pandemic.

### **Food Delivery and Curbside Restaurant Services**

Some of the most immediate small business applications of tech solutions during the pandemic have been restaurants and food service businesses. Since early in the pandemic, an estimated 60% of restaurants nationwide have added curbside pick-up, and more than a third of customers who have ordered food for in-store or curbside pick-up were first-time users of this service (Dua, Mahajan, Oyer, & Ramaswamy, 2020).

Online, mobile food ordering and delivery services such as **Instacart**, **Grubhub**, and **Uber Eats** were key to small restaurant resilience during the pandemic. Grubhub took on 20,000 new restaurants in March 2020, compared with its previous monthly high of 5,000. Uber Eats partnered with Europe-based supermarket giant Carrefour in France to offer 30-minute home delivery of essentials and has forged similar partnerships in Spain and Brazil. Early in the pandemic, Uber Eats customers were able to make \$3 million in direct contributions to restaurants through a new COVID-19 feature on the mobile app. By late summer, the delivery service has surpassed the size of its original ride-hailing service by revenues (Korosec, 2020; Korosec & Wilhelm, 2020). In July 2021, the company announced plans to expand its grocery delivery service to more than 400 U.S. cities and towns, as part of a new partnership with Albertson's (Holt, 2021). Amazon Fresh, a popular grocery delivery service, has similarly seen a surge in use during the pandemic.

Cloud kitchens, also known as “virtual kitchens” or “ghost kitchens,” have become a popular solution for many restaurants in 2020 and 2021. These kitchens are food service outlets that take orders and deliver them without

offering the option to dine in. Virtual kitchens were already an ascendant trend in 2019. Dine-in restaurants faced battles related to automation and shifting millennial preferences, and this served to shift investment in favor of food delivery, particularly cloud kitchens (CB Insights, 2020). The cloud kitchen model allows restaurants, unable to provide dine-in services, to prepare food solely for delivery, leveraging app-based technology platforms such as DoorDash and Grubhub (Lucas, 2020).

Tech firms and their workers have led philanthropic efforts supporting displaced food service workers. Employees from **Amperity**, an AI-powered data management company in Seattle, helped build a website for The Plate Fund which supports out-of-work restaurant company workers (The Guardian, 2021).

### *Virus Tracking, Contact Tracing, and Information Tools*

Tech companies have been at the forefront of combating the virus. Businesses large and small have aided in virus tracking, contact tracing, and deployed critical information tools used by public health professionals. Seattle-based **Tableau's** data visualization tools have been helpful for monitoring COVID-19 deaths and projections and disseminating this information at the national, state, and county levels. Applications of the Tableau platform include the **University of Washington's** COVID-19 Case Tracking Dashboard and the King County daily COVID-19 outbreak summary web apps (King County, 2021; University of Washington, 2021).

**Microsoft's AI for Health** has partnered with the Washington State Department of Health to help build the department's own interactive COVID-19 data tracking dashboard. The platform uses PowerBI to track cases, hospitalizations, deaths, vaccines, and other key indicators statewide and by county (Washington State Department of Health, 2021). Within Washington, Microsoft has also provided significant additional Azure capacity, Surface computers, and communications technology to both the emergency management teams and the broader state government to support remote working and service delivery.

The University of Washington's Institute for Health Metrics and Evaluation (IHME) emerged early in the pandemic as a leading data authority on virus deaths and projections across the United States. Its dashboard has been regularly cited by the White House and top federal government agencies throughout the pandemic. The institute, recognizing the need to quickly and continuously publish and update their data, has partnered with **Microsoft** to assist in fast-tracking their modeling and **Qumulo**, a local data storage company, with data growth. **Redapt**, a nearby technology solutions provider, donated a much-needed \$200,000 GPU server for them to use for this work (The Guardian, 2021).

**Google Cloud, SADA, and HCA Healthcare** partnered on the development of an open data platform. The online tool helps accelerate analysis and response by aggregating data on ICU bed and ventilator utilization, testing results, and total number of patient visits to U.S. hospital systems. The platform runs on Google Cloud and is designed to help healthcare providers "safely share and

display anonymous, aggregated metrics from hospital systems into a single platform” (HCA Healthcare, 2020; Kent, 2020).

**SmartSheet**, based in Bellevue, has offered free-of-charge its coronavirus preparedness template. The tool allows businesses to communicate guidance and status of the virus in real-time, track and assign each office an “escalation tier,” and survey employees, recent travelers, and symptomatic individuals (SmartSheet, 2021).

## *Vaccination Administering and Support*

Tech firms have made considerable contributions to the vaccination efforts. These include novel and robust solutions to address critical bottlenecks in vaccination administration efforts in 2021. These include everything from scheduling an appointment, opening business campuses for large-scale vaccination drives, and working with state officials and the Governor’s Office on vaccine deployment.

**Curative**, a health-tech startup launched just weeks before the pandemic struck, used Amazon’s cloud tools as the backbone to offer COVID-19 testing services. It has since expanded and now uses AWS to provide complete end-to-end vaccination services from the ground up—not only preregistration and appointment scheduling, but also for medical staff to administer the shots—working in partnership with state and local health officials (Loten, 2021).

Tech companies across the state have provided, often for free, solutions to address backlogs in vaccination appointment scheduling, information services, and outreach. Through its leadership role on the Governor’s Vaccine Command and Coordination System (VACCS) Command Center, **Amazon** made it easier to book a vaccine appointment in Washington state by providing surge support to the state call center which had previously been overloaded with wait times of up to one hour, and a backlog of 4,500 voicemails. Volunteer customer service agents from Amazon Headquarters were supported by an Amazon Connect system that uses the same interactive voice technology used in Alexa. The system eliminated wait times and processed over 100,000 calls (Loten, 2021; Amazon, 2021a; Amazon, 2021b).

Since January, Amazon has opened its Seattle campus to Virginia Mason Franciscan Health for public COVID-19 vaccinations. As of April, 50,000 immunizations had been administered to the public through weekend pop-up clinics staffed by Amazon and community volunteers (King 5 News, 2021). Half a million frontline workers and their families have been provided access to COVID-19 vaccines through Amazon on-premises vaccination sites (Amazon, 2021a). And in August 2021, Amazon announced a plan to offer \$2 million in cash and prizes including new cars in a lottery for vaccinated frontline workers (Schlosser, 2021).

**Starbucks**—not traditionally viewed as a tech firm but with a deep pool of software developers and data scientists—is helping lead VACCS’s operational efficiency, scalable modeling, and human-centered design expertise and support (Washington Governor’s Office, 2021).

In April 2021, **Microsoft** partnered with EvergreenHealth, Overlake Medical Center & Clinics, and Public Health – Seattle & King County to open a public vaccination site at Microsoft’s Redmond campus. Since the site opened, it has provided more than 150,000 vaccine doses to the community (Microsoft, 2021; Plenefisch, 2021). Microsoft also hosted a pop-up clinic with Centro Cultural Mexicano in March, where hundreds of people received vaccinations. In March, more than 1,300 Microsoft employees volunteered at the COVID-19 vaccination site at Lumen Field Event Center, the largest civilian-run mass vaccination site in the country (Ray, 2021).

## *COVID-19 Research*

Washington tech firms have played a key role in funding, technical support, and critical collaborative platforms for urgent COVID-19 research.

Local leaders **Amazon** and **Microsoft** have been critical contributors to the Seattle Coronavirus Assessment Network (SCAN), a research initiative examining how the virus is spreading across the region. Amazon shipped almost 4,000 testing kits for the project, while Microsoft created the SCAN HealthBot, allowing epidemiologists to gather important information from those being tested as part of the project (The Guardian, 2021).

In April 2020, **Microsoft** awarded \$20 million to institutes and nonprofits for advanced use of artificial intelligence and data science in COVID-19 research, with a focus on diagnostics, hospitals, and other core areas (Kent, 2020; Microsoft, 2021). **Microsoft** has also been working with **Adaptive Biotechnologies** to study the immune response to COVID-19. The research goal is to study the population-wide immune responses to the disease. Findings are being made publicly available via an open data portal, ImmuneCODE. The online, publicly available database is regularly updated in support of efforts to develop better diagnostics, vaccines, and therapeutics for the COVID-19 virus (Nickelsburg, 2020; Adaptive Biotechnologies, 2021).

Several leading tech companies, based in Washington and elsewhere in the United States, have participated in the **COVID-19 High Performance Computing Consortium**. The consortium is a private-public partnership spearheaded by the White House Office of Science and Technology Policy, U.S. Department of Energy, and IBM to allow COVID-19 researchers access to the world’s most advanced computers for collaborations across the fields of biology, medicine, and public health. Participants in the tech sector include Microsoft, Amazon Web Services, IBM, AMD, D.E. Shaw Research, Dell Technologies, Google Cloud, Hewlett Packard Enterprise, NVIDIA, and Intel (COVID-19 High Performance Computing Consortium, 2021).

Washington research institutions have also been spurred into action. Universities and university-industry partnerships have led the way in development of novel technology solutions for pandemic response efforts.

## *Education, Remote Learning, School Philanthropy*

Tech companies have been instrumental in developing and deploying platforms for online education across all levels. The need was immediate and urgent. In March 2020, school closures across the state forced many districts to quickly find tools to continue education remotely. By the fall of 2020, 80% of school districts statewide planned to start the school remotely, representing more than 94% of all K-12 students statewide (Bazzaz, 2020).

Tech solutions have been critical during this period of upheaval. Common tools used in online education include video conferencing apps such as Zoom, WebEx, Amazon Chime and MS Teams. Google Classroom, Canvas, and Blackboard have all provided essential learning management systems. Proctorio, a Google Chrome extension, is used by teachers to monitor students while backing an exam (Dignan, 2020).

Tech firms have also been philanthropists, donating computers and subscription services to school districts across the world. In the UK, Amazon donated 10,000 Fire tablets to schools lacking technology and delivered more than four million breakfasts to children in need through charity partner Magic Breakfast. In Italy and Spain, Amazon donated millions of euros to over 35,000 schools through a program that allows customers to choose the schools to which Amazon will donate. Amazon has also donated 8,950 laptops, valued at over \$2.2 million, to Seattle Public Schools elementary school students for online learning (Dignan, 2020). Microsoft partnered with the Seattle Seahawks to provide 300 Surface Go 2 devices and pens, plus new internet hotspots, to support technology needs at Boys & Girls Club of King County as they provide childcare to essential workers throughout the pandemic (Seahawks, 2021).

The Seattle tech sector nonprofit **sea.citi** has been central to many of these efforts. In 2020, sea.citi and the Alliance for Education, leveraging a \$200,000 grant from the Tableau Foundation, launched the **Family Tech Support Center (FTSC)**, a volunteer-led technical support resource for families adjusting to Seattle Public Schools online education. The funds will also support the creation of a Digital Equity Manager position for Seattle Public Schools, responsible for coordinating all efforts to ensure that students and families have access to the tech support they need, and that equity is kept at the center of remote learning strategies (Juneau & Merriam, 2020). To date, the Family Tech Support Center has fielded 2,500 calls, making 631 unique contacts with families (sea.citi, 2021).

## *Donations and Community Philanthropy and Support*

Numerous tech firms have contributed funds and equipment, such as PPE, to pandemic response efforts across the region. For example, in the early phase of the pandemic, **Microsoft** mobilized its global supply chain to secure and distribute medical supplies to healthcare workers. These include 15,000 protection goggles, infrared thermometers, medical caps, and protective suits. **Facebook** donated more than 85,000 gloves, masks, and thermometers through the King County regional donations connector. Nationwide, by March

2020 Facebook donated 720,000 masks to healthcare providers (Reuters, 2020).

The pandemic has highlighted the predominance of food insecurity and the importance of safe, reliable food delivery. As Washingtonians adapted to the pandemic, **DoorDash**, the last-mile logistics platform and technology company, has provided lunches for frontline responders (NY Business Daily, 2020).

In just a few months, “Dashers” in Washington earned an estimated \$75 million from April through June 2021. Similarly, Washington-area restaurants joined the DoorDash community as merchants to earn revenue. These efforts resulted in an estimated total of **over \$200 million in merchant earnings from April through June**.

Another example is Doordash’s work with Eloise’s Cooking Pot Food Bank, the largest independently owned and operated food bank in Pierce County, serving an average of 19,000 people with over 150,000 pounds of food and other goods each month. They recently partnered with DoorDash to help deliver food to Tacoma’s most vulnerable. Another nonprofit partner, United Way of King County, is now working with DoorDash to facilitate up to 3,500 deliveries per week to King County households unable to access their local food bank or grocery store. Across the state of Washington, with a variety of community partners, DoorDash has facilitated over 164,000 deliveries connecting meals and grocery boxes to community members in need.

As the COVID-19 pandemic unfolded in early 2020, **FlowPlay** identified organizations with which its employees had a connection and those in extreme need of financial aid, including the Seattle Theater Group, West Seattle Food Bank, Northwest Harvest, UW Medical Center ICU, Mary’s Place and Nijo. In total, FlowPlay donated over \$130,000 to businesses across the state (FlowPlay, 2021).

To protect the health and safety of its workers, **Amazon** invested over \$11.5 million in 2020 on COVID-related initiatives. This included more than 100 million masks and the addition of 2,298 handwashing stations, 5,765 janitorial staffers, and almost 200 points of contact per site. Amazon has also distributed 34 million gloves, 48 million ounces of hand sanitizer, 93 million sanitizing spray and wipes, and 31,000 thermometers and procured more than 1,115 thermal cameras (Amazon, 2021).

Since the start of the pandemic, Amazon has donated more than \$10 million in cash and in-kind support to **All in WA**, plus a \$50 million match by Jeff Bezos (All in WA, 2020). The company has also provided more than \$11 million in cash grants and free rent given to more than 900 businesses from their Neighborhood Small Business Relief Fund; more than 73,000 meals distributed to 2,700 elderly and medically-vulnerable residents in SHA and KCHA housing; 1 million donated to kick-start Seattle Foundation’s COVID-19 Response Fund; and 250,000 critical items donated to individuals in King County quarantine facilities. A \$25 million **Amazon Relief Fund** was created to support delivery service partners, Flex participants, and seasonal employees.



In March 2020, **Microsoft** announced it would retain and pay the wages of its campus vendors and hourly workers during the pandemic. These workers included 4,500 based in Microsoft's various Puget Sound facilities, of which 1,300 are food services workers on campus. Instead of serving meals to now absent Microsoft employees, these food services were repurposed for needy children and families that rely on school lunches but were unable to access these meals during closures due to COVID-19 (Microsoft, 2020). **Microsoft** has committed more than \$110 million in additional support for Washington state-based non-profits, workers, and schools (Smith, 2020).

**Instacart** serves retailers in over 1,200 brick-and-mortar locations and over 29,000 shoppers in Washington throughout the COVID-19 pandemic helping to provide access to essential groceries and a lifeline for those needing to earn flexible income. To ensure the health and safety of shoppers, Instacart has invested more than \$30 million to support shoppers' continued well-being, including telemedicine screenings, the distribution of more than 800,000 free health and safety kits to shoppers, and the Vaccine Support Stipend.

When COVID-19 vaccines became available earlier this year, Instacart was early to support vaccinations with a **COVID-19 Vaccine Stipend Program** for the Instacart shopper community. To date, the company's vaccine stipend has paid out more than \$2.5 million to support Instacart shoppers who received the COVID-19 vaccine (Instacart, 2021).

Instacart additionally partnered with the White House for a national initiative to help support the United State's vaccination efforts. The "Get Vaxxed for Snacks" sweepstakes gave vaccinated customers nationwide a chance to win a summer of free snacks, with 200 winners drawn on July 1.

**Tableau**, through its foundation, dedicated \$2 million in grants to support kids of color in the Puget Sound region through the COVID-19 pandemic and into the future (Myrick, 2020). The grants included \$350,000 grant to the Technology Access Foundation, helping the organization bring online STEM programming to students through partnerships with public schools and through TAF's dedicated school in Federal Way.

Tech firms have also made philanthropic contributions to regional and global efforts to combat COVID-19 and economic recovery. In August 2021, **Expedia** announced it would donate up to \$12 million to UNICEF COVID-19 vaccination efforts (Morgan, 2021). **Google** provided nearly \$15 billion in free advertising for Washington nonprofits through the Google Ad Grants program (Google, 2021). The tech sector also led the **All in Seattle** initiative, quickly raising more than \$30 million for COVID-19 relief (All in Seattle, 2021).

## CALL TO ACTION: LEVERAGING THE TECH SECTOR AND PUBLIC-PRIVATE PARTNERSHIPS TO DRIVE FUTURE GROWTH

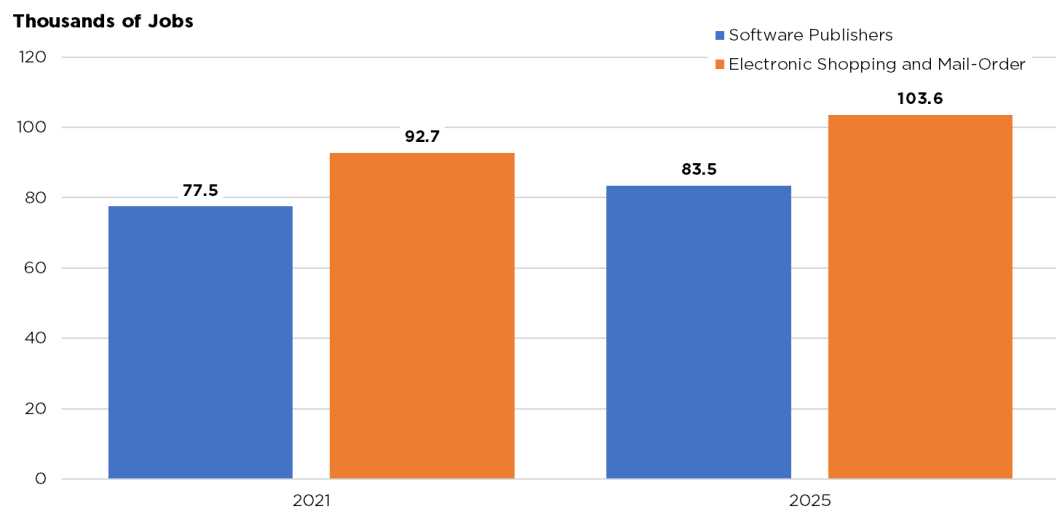
Earlier sections of this report have presented a detailed illustration of how the tech sector has been critical to Washington businesses and communities during the pandemic and economic recovery. Going forward, the tech sector will continue to undergird Washington's economic growth. But this growth is fragile, particularly given changes in the nature of work catalyzed by the pandemic. State and local officials and community leaders have an opportunity to collaborate with the tech sector to both ensure this future growth is retained in Washington and leverage the tech sector to address many of the social challenges facing our communities.

### *Tech Sector Set to Drive Office Growth*

The tech sector's growth is projected to continue well into the post-pandemic near future. According to the Washington State Economic and Revenue Forecast Council, between 2021 and 2025, combined employment in software publishing and electronic shopping and mail-order businesses will increase by 16,900 jobs (**Exhibit 14**). This growth (10% overall for these industries) may in fact be conservative relative to recent employment increases dating to before the pandemic.

**Key Takeaway:** The state's Economic and Revenue Forecast Council predicts tech will continue to grow in Washington by at least another 17,000 jobs over the next five years.

#### **Exhibit 14. Forecast Employment, Software Publishers and Electronic Shopping and Mail-Order Industries, 2021 and 2025**



Source: Washington State Economic Revenue and Forecast Council (2021).

Some of Washington's largest tech firms have already made sizable commitments for new investments in Washington state. **According to a recent report by the real estate brokerage firm CBRE, 14 new "mega leases" propelled the region past the Bay Area for most new tech office space leases in the United States in 2020.** These 14 deals totaled 3.4 million square feet, slightly more than aggregate space leased in 2019 (Schlosser, 2021; CBRE, 2021).

Tech firms were the primary source for these new leases. For example, Amazon has committed to 25,000 new jobs in Bellevue as part of an expansion of their Puget Sound headquarters. It is, by far, one of the largest post-COVID economic development opportunities in the U.S. The company also announced it will invest \$185.5 million in below-market loans and grants to the King County Housing Authority and preserve up to 1,000 affordable homes on the Eastside to mitigate rising housing costs in regions where Amazon expands (Schlosser, 2021).

The downtown Bellevue Amazon headquarters will include 12 buildings all within one mile walking distance. The Bellevue 600 site will include two sustainable office buildings—one 43 stories and one 31 stories—be LEED Gold and Salmon Safe Certified and be fully electric (zero natural gas or fossil fuel utility services). The site will have total capacity for more than 7,000 workers, 37,000 square feet of ground floor retail—including an 8,000 square foot retail and exhibition space—two daycare centers, 1,700 parking spaces, and 1,000 on-site bike storage stalls. The site will be directly adjacent to the Bellevue Transit Center and Downtown Bellevue Link Light Rail station. Amazon recently released an [economic benefits report](#) that describes its growth in Washington state in more detail, including 80,000 jobs created statewide, and over \$129 billion invested in the state over the past decade that has created an additional 258,000 jobs across the state (Amazon, 2021).

**Google** announced plans in March 2021 to invest more than \$7 billion in offices and data centers across the United States in 2021, including new construction projects in Seattle and Kirkland. In Kirkland, Google is moving forward with plans for two new campuses, in addition to its existing 375,000 square foot facility there. The new Kirkland Urban campus will include four buildings and 760,000 of square feet of office space (Stearns, 2021). **Microsoft is rebuilding its Redmond campus, and Facebook** is also expanding its footprint in the region. In September 2020 the company purchased a 6-acre, 400,000 square-foot complex from REI in Bellevue's Spring District (Schlosser, 2021).

## *Emerging Technology Will Help Build a Better World*

In addition to driving economic growth, tech can build a better world for all residents of Washington and the world. **Tech innovations, if retained or achieved in Washington state, will be another driver of growth and economic opportunity.** These innovations and technologies will further grow the sector. Washington is uniquely positioned to economically benefit from these advancements, as new tech companies and innovations take place in the state. Some examples of emerging technology that will create a better future include:

**Autonomous vehicles for disabled persons.** Autonomous vehicles have the potential to significantly improve mobility for the disabled and elderly. An estimated two-thirds of counties in the United States lack public transportation, limiting the ability of many disabled individuals to secure sustainable employment. Autonomous vehicles could fundamentally improve the lives of these individuals by making it easier to get to and from work, helping them transition from a life of poverty and dependence to a life of productivity and financial independence (Wolf, 2019).

**AI for better medical diagnoses.** AI in medicine can save lives. Data from the U.S. Centers for Disease Control and Prevention (CDC) suggests that approximately 60% of maternal deaths are preventable. A promising strategy to identify high-risk mothers and reduce deaths and childbirth complications includes using electronic health records and artificial intelligence (AI) to predict which pregnant women are at high risk of experiencing complications while giving birth (Padilla, Abi, Mark, & Carvalho, 2021).

**5G for improved medical access.** By combining 5G with other technologies, the tech sector can transform the healthcare system to one that is more accurate, more efficient, and more accessible (PricewaterhouseCoopers, 2020). Investment in 5G and broadband will provide more connectivity to rural areas, helping to improve the reach of healthcare services and improve economic opportunities in these often underserved and less affluent regions of the state.

All of these innovations come with challenges but, if done well, they have the capacity to improve the lives of billions of people and create a better world for all.

## *Fragility and Changing Dynamics in the Tech Sector*

Despite its outsized growth and economic contributions, there is an inherent fragility in the tech sector. Class A office space can be found anywhere, and the COVID-19 work-from-home experiment is on track to permanently upend some assumptions about big headquarters, or hub-and-spoke models that concentrate tech jobs in a particular region. For example, in July 2020 Seattle-based Zillow announced it will allow 90% of its workforce to work remote at least part of the time on an indefinite basis (Kathryn Vasel, 2020; Schlosser, 2020). The company also announced it would be growing its workforce by 40% in 2021, adding 2,000 new workers, but based on this new distributed workforce model they can be based anywhere (Soper & Cook, 2021). The decision by Zillow is being embraced by many other firms in the tech sector, as well. This will pose new, previously unanticipated challenges to cities and regions seeking to attract or retain tech businesses and the economic and fiscal benefits they bring.

Moreover, it is a very competitive environment and other regions covet what Washington state has. As this report details, the tech sector helped rescue Washington state from the past two recessions and it remains one of the largest contributors of jobs and state revenue. The state should continue to find ways to cultivate and nurture this sector and allow space for innovation in order to retain and grow it.

## *Public-Private Collaboration*

Retaining this future growth, strengthening Washington's competitiveness for new tech sector opportunities, and more equitable sharing of the benefits of the tech sector will require public-private collaboration and well-designed policy. These partnerships will be key to advancing opportunities for BIPOC, women, and other underrepresented groups in the tech sector, including in engineering and other high-paying positions. Public policy to retain and support the tech sector is based on the following key findings:

- Tech is integral to the success of Washington's economy and key to competitiveness in manufacturing, agriculture, and many other sectors.
- Tech provides key support for small businesses and—as witnessed during the pandemic—is critical to making many small businesses more resilient and connected to customers during disasters and economic downturns.
- Tech supports remote workers and as a strategy for sharing prosperity to all regions of the state. Policies to employ tech workers across all areas of the state is a means of supporting regional economic growth.
- Increasing mobility of tech jobs means that the strength of the sector cannot be taken for granted. There is need for an explicit strategy to retain existing and attract new tech jobs.

The WTIA has identified several key tech-related areas for policy action to improve the lives of Washingtonians. These include advancing diversity, equity, and inclusion within its workforce; closing the digital divide; enabling innovation and growth; fostering a robust startup ecosystem; advancing immigration reform; enacting sensible online privacy regulations; investing in workforce development, education, and apprenticeships; and strengthening our cities and communities.

These goals, especially around diversity, workforce, and innovation, are closely aligned with Washington state's economic development objectives. But to achieve them will require close collaboration between public and private actors. For example, BIPOC and female workers remain underrepresented in the tech sector, and especially in management and higher paying positions. Addressing this challenge will require growing the tech sector to create new opportunities. But it will also require, in tandem with this growth, investing in programs and initiatives that expand both tech recruitment efforts and the next generation of software engineers at our higher education institutions.

## SUMMARY AND CONCLUSIONS

Many of the gains illustrated in this report are hugely significant for the future of Washington state's economy, but they are also fragile. Tech sector businesses prior to the pandemic often made site location decisions based on the presence of a vibrant, dynamic ecosystem of other firms, institutions, and cluster-supporting assets, government policy, and the availability of Class A office space. But the new work-from-home model has upended many assumptions about corporate headquarters or hub-and-spoke models that center jobs in a particular region. Global competitiveness and efforts by other states to lure companies away is another continuous threat. Washington state should continue to find ways to cultivate and nurture the tech sector in order to retain and grow this incredible economic asset.

The findings from this study illustrate the extensive and far-reaching contributions of the tech sector to Washington state, both economically and, most recently, in the state's fight against COVID-19. The sector is integral to Washington's economy, both now and in the future.

The tech sector is an increasing share of the state economy. In the last five years, tech provided 46% of all wage growth and 66% of job growth in Washington. By far, it is the fastest growing sector in Washington state, employing more than a quarter of a million workers in 2020. And for every one tech job in the state, four more are created.

The tech sector unquestionably played a lead role in helping Washington state recover from the past two recessions. Tech sector jobs in Washington have grown 107% since the Great Recession. Washington's economic recovery during the pandemic simply would not have been possible without the contributions of the tech sector. If tech were peeled away, the state's recovery from the past two recessions would've more closely resembled states such as North Dakota.

And the tech sector shoulders a disproportionate share of state business taxes. Tech's tax burden in Washington grew at double the rate of aerospace over the past decade, and tech pays 69% more in state business taxes than it did in 2007. Through their purchases, tech workers alone provided over \$1 billion of the state's general fund sales tax revenue.

Beyond employment and wage impacts, the tech sector has played a critical and foundational role supporting the state's ongoing response to COVID-19. Tech firms headquartered or with operations in Washington have led the way in digital infrastructure to support small business, collaborative research and open data, remote work solutions, and robust philanthropic work statewide and in local communities.

The tech sector has been instrumental during the pandemic across multiple fronts. Early on, tech businesses made large, philanthropic contributions of PPE to frontline workers and communities. Tech firms led the way in moving their workforces to remote work-from-home models to contain the spread of the virus. Tech firms were essential partners with state agencies and research institutes, disseminating key information through open data platforms and

collaborating on research on the virus. Once vaccines were developed, Washington tech firms provided critical support for the state's vaccination drive, including through the Governor's VACCS Command Center.

In addition to these efforts, the tech sector provided the tools and solutions that proved indispensable for small businesses. Remote work platforms, mobile food delivery solutions, and digital marketplaces enabled thousands of Washington state small and medium-sized businesses to continue to operate and maintain their workforce during the pandemic.

Going forward, the tech sector has already committed to sizable new investments in Washington state. Amazon's new campus in downtown Bellevue and expansions by Google in Kirkland and Facebook in the Spring District of Bellevue are notable examples of this near-term growth.

Beyond these investments, the tech sector will be a linchpin to future innovations across nearly all sectors of the economy. But challenges remain for both retaining this growth and ensuring new opportunities are accessible to all groups in society, including those currently underrepresented in the sector. Policymakers and tech sector businesses can partner together, through public-private partnerships, on workforce development, expanding opportunities for BIPOC, women, and other underrepresented groups in the sector.

With the right support and opportunities to continue innovating, the tech sector can build a better world for all residents of Washington and beyond, and fuel many more decades of sustainable growth and prosperity in Washington state.

## WORKS CITED

- Adaptive Biotechnologies. (2021). *ImmuneCODE*. Retrieved from Adaptive Biotechnologies: <https://immunerace.adaptivebiotech.com/data/>
- All in Seattle. (2021). *All in Seattle*. Retrieved from <https://allinseattle.org/>
- All in WA. (2020, December 21). *Jeff Bezos pledges an additional \$25 million in matching funds to support COVID-19 relief efforts in Washington*. Retrieved from All in WA: <https://allinwa.org/jeff-bezos-pledges-an-additional-25-million-in-matching-funds-to-support-covid-19-relief-efforts-in-washington/>
- Amazon. (2020, April 13). *The company has brought on 175,000+ new associates during the COVID-19 pandemic*. Retrieved from About Amazon: <https://www.aboutamazon.com/news/company-news/amazon-has-hired-175-000-additional-people>
- Amazon. (2021, February 3). *How we're taking care of employees during COVID-19*. Retrieved from About Amazon: <https://www.aboutamazon.com/news/company-news/how-were-taking-care-of-employees-during-covid-19>
- Amazon. (2021). *Investing in the U.S.* Retrieved from About Amazon: <https://www.aboutamazon.com/investing-in-the-u-s>
- Amazon. (2021a, April 9). *Amazon helps boost vaccine call center in Washington state*. Retrieved from About Amazon: <https://www.aboutamazon.com/news/aws/amazon-helps-boost-vaccine-call-center-in-washington-state>
- Amazon. (2021b, April 29). *Amazon Announced First Quarter Results*. Retrieved from [https://s2.q4cdn.com/299287126/files/doc\\_financials/2021/q1/Amazon-Q1-2021-Earnings-Release.pdf](https://s2.q4cdn.com/299287126/files/doc_financials/2021/q1/Amazon-Q1-2021-Earnings-Release.pdf)
- Bazzaz, D. (2020, September 1). *More than 94% of public school students in Washington state learning remotely this fall, new data show*. Retrieved from Seattle Times: <https://www.seattletimes.com/seattle-news/education/more-than-94-of-public-school-students-in-washington-state-learning-remotely-this-fall-new-data-shows/>
- Beyers, W. B., & Lin, T.-W. (2012, September). *The 2007 Washington State Input-Output Model*. Retrieved from Washington State Office of Financial Management: [https://ofm.wa.gov/sites/default/files/public/legacy/economy/io/2007/I-O\\_2007\\_report.pdf](https://ofm.wa.gov/sites/default/files/public/legacy/economy/io/2007/I-O_2007_report.pdf)
- CB Insights. (2020). *24 Industries & Technologies That Will Shape the Post-Virus World*. New York: CB Insights. Retrieved from [https://www.cbinsights.com/reports/CB-Insights\\_Industries-Tech-Shaping-World-Post-Covid.pdf?utm\\_campaign=marketing\\_tech-post-covid\\_2020-06&utm\\_medium=email&\\_hsmi=89715259&\\_hsenc=p2ANqtz-\\_jUo4FC6jL4VqwMrOxqGrUvEfbAlfuSDxUYMcyTsHhuFDI7nVHpbBHvI294sLCESHvUD3q](https://www.cbinsights.com/reports/CB-Insights_Industries-Tech-Shaping-World-Post-Covid.pdf?utm_campaign=marketing_tech-post-covid_2020-06&utm_medium=email&_hsmi=89715259&_hsenc=p2ANqtz-_jUo4FC6jL4VqwMrOxqGrUvEfbAlfuSDxUYMcyTsHhuFDI7nVHpbBHvI294sLCESHvUD3q)
- CBRE. (2021, March). *Tech Retains Office Space Leasing Crown*. Retrieved from TechInsights: <https://www.cbre.us/Real-Estate-Services/Industry-Solutions/Technology-and-Media/techinsights-tech-retains-office-space-leasing->



crown?utm\_source=March%202021%20TMP%20Flash&utm\_medium=press%20release  
&utm\_campaign=March%202021%20TMP%20Flash%20local%20releas

- Cook, J. (2020, December 16). *Seattle area boasts 10 fast-growing unicorns: Can you name the billion-dollar startups?* Retrieved from GeekWire:  
<https://www.geekwire.com/2020/seattle-area-boasts-10-fast-growing-unicorns-can-name-billion-dollar-startups/>
- COVID-19 High Performance Computing Consortium. (2021). *The COVID-19 High Performance Computing Consortium*. Retrieved from <https://covid19-hpc-consortium.org/>
- Curry, D. (2021, July 29). *Microsoft Teams Revenue and Usage Statistics (2021)*. Retrieved from Business of Apps: <https://www.businessofapps.com/data/microsoft-teams-statistics/>
- Dignan, L. (2020, March 22). *Online learning gets its moment due to COVID-19 pandemic: Here's how education will change*. Retrieved from ZD Net:  
<https://www.zdnet.com/article/online-learning-gets-its-moment-due-to-covid-19-pandemic-heres-how-education-will-change/>
- Dua, A., Mahajan, D., Oyer, L., & Ramaswamy, S. (2020, July 7). *US small-business recovery after the COVID-19 crisis*. Retrieved from McKinsey:  
<https://www.mckinsey.com/industries/public-and-social-sector/our-insights/us-small-business-recovery-after-the-covid-19-crisis>
- Essential Southeast Seattle. (2021). *About*. Retrieved from Essential Southeast Seattle:  
<https://essentialseseattle.com/about/>
- ETGovernment. (2021, August 7). *Govt to introduce biometric boarding system through facial recognition at 6 airports; how it is useful*. Retrieved from The Economic Times:  
<https://cio.economictimes.indiatimes.com/news/corporate-news/govt-to-introduce-biometric-boarding-system-through-facial-recognition-at-6-airports-how-it-is-useful/85120431>
- FlowPlay. (2021). Direct correspondence.
- Google. (2021). *Washington*. Retrieved from Google Economic Impact:  
<https://economicimpact.google.com/state/wa/>
- Guerhazi, B. (2021, January 12). *Digital technologies and vaccine deployment: opportunities and challenges*. Retrieved from World Bank Blogs:  
<https://blogs.worldbank.org/digital-development/digital-technologies-and-vaccine-deployment-opportunities-and-challenges>
- HCA Healthcare. (2020, April 6). *HCA Healthcare Teams With Google Cloud and SADA on Data Portal to Help Communities Respond to COVID-19*. Retrieved from News Details:  
<https://investor.hcahealthcare.com/news/news-details/2020/HCA-Healthcare-Teams-With-Google-Cloud-and-SADA-on-Data-Portal-to-Help-Communities-Respond-to-COVID-19/default.aspx>
- Holt, K. (2021, July 19). *Uber expands its grocery delivery service to more than 400 US cities and towns*. Retrieved from TechCrunch: <https://techcrunch.com/2021/07/19/uber-expands-its-grocery-delivery-service-to-more-than-400-us-cities-and-towns/>

- Instacart. (2021, January 21). *Introducing New Vaccine Support Stipend for Shoppers*. Retrieved from Instacart: <https://www.instacart.com/company/blog/shopper-community/introducing-new-vaccine-support-stipend-for-shoppers/>
- INTERPOL. (2021). *Facial Recognition*. Retrieved from INTERPOL: <https://www.interpol.int/en/How-we-work/Forensics/Facial-Recognition>
- Iqbal, M. (2021, May 24). *Zoom Revenue and Usage Statistics (2021)*. Retrieved from Business of Apps: <https://www.businessofapps.com/data/zoom-statistics/>
- Juneau, D., & Merriam, N. (2020, August 31). *Tech and schools take on digital equity*. Retrieved from Seattle Times: <https://www.seattletimes.com/opinion/tech-and-seattle-schools-take-on-digital-equity/>
- Kathryn Vasel. (2020, August 13). *Zillow exec: Why we changed our minds on remote work*. Retrieved from CNN Business: <https://www.cnn.com/2020/08/13/success/zillow-work-from-home/index.html>
- Kent, J. (2020, April 9). *HCA, Google Cloud Launch COVID-19 Data Sharing Platform*. Retrieved from Health IT Analytics: <https://healthitanalytics.com/news/hca-google-cloud-launch-covid-19-data-sharing-platform>
- Kent, J. (2020, April 13). *Microsoft Gives \$20M to Fight COVID-19 with Artificial Intelligence*. Retrieved from Health IT Analytics: <https://healthitanalytics.com/news/microsoft-gives-20m-to-fight-covid-19-with-artificial-intelligence>
- King 5 News. (2021, March 5). *Amazon to hold 2 pop-up COVID-19 vaccine clinics in Seattle this weekend*. Retrieved from King 5: <https://www.king5.com/article/news/health/coronavirus/vaccine/seattle-amazon-covid-19-pop-up-vaccine-clinics-march-6-7/281-a6936209-fa60-4c83-8f0b-249f3cbf46a0>
- King County. (2021, July 26). *Daily COVID-19 outbreak summary dashboard*. Retrieved from King County: <https://kingcounty.gov/depts/health/covid-19/data/daily-summary.aspx>
- Korosec, K. (2020, April 21). *Uber Eats customers have given \$3 million in direct contributions to restaurants*. Retrieved from TechCrunch: <https://techcrunch.com/2020/04/21/uber-eats-customers-have-given-3-million-in-direct-contributions-to-restaurants/>
- Korosec, K., & Wilhelm, A. (2020, August 6). *Uber's delivery business is now larger than ride-hailing*. Retrieved from TechCrunch: <https://techcrunch.com/2020/08/06/ubers-delivery-business-is-now-larger-than-ride-hailing/>
- Loten, A. (2021, April 20). *Big Tech Uses Cloud to Facilitate Covid-19 Vaccine Sign-ups*. *Wall Street Journal*.
- Lucas, A. (2020, April 15). *Restaurants have laid off thousands in wake of coronavirus—but ghost kitchens are hiring*. Retrieved from CNBC: <https://www.cnbc.com/2020/04/15/coronavirus-restaurants-have-laid-off-thousands-but-ghost-kitchens-are-hiring.html>
- Microsoft. (2020, April 10). *Quiet ingenuity: 120,000 lunches and counting*. Retrieved from Stories: <https://news.microsoft.com/features/quiet-ingenuity-120000-lunches-and-counting/>

- Microsoft. (2021, April 5). *Community partnership hosts public vaccine site to help with safe, equitable distribution*. Retrieved from Microsoft Corporate Blogs: <https://blogs.microsoft.com/blog/2021/04/05/community-partnership-hosts-public-vaccine-site-to-help-with-safe-equitable-distribution/>
- Microsoft. (2021). *Understanding our progress against COVID-19*. Retrieved from AI for Health: <https://www.microsoft.com/en-us/ai/ai-for-health-covid-data#primaryR4>
- Morgan, R. (2020, December 19). *Remitly's workforce grows by 25% with more hiring planned*. Retrieved from Puget Sound Business Journal: <https://www.bizjournals.com/seattle/news/2020/12/19/remitly-now-has-over-1-000-employees.html>
- Morgan, R. (2021, April 9). *Convoy hits 1,000 employees, faces decisions on its office footprint*. Retrieved from Puget Sound Business Journal: <https://www.bizjournals.com/seattle/news/2021/04/09/convoy-hits-1-000-employees.html>
- Morgan, R. (2021, August 5). *Expedia will donate up to \$12M to UNICEF's Covid-19 vaccination efforts*. Retrieved from Puget Sound Business Journal: [https://www.bizjournals.com/seattle/news/2021/08/05/expedia-donating-12m-unicef.html?cx\\_testId=40&cx\\_testVariant=cx\\_42&cx\\_artPos=0#cxrecs\\_s](https://www.bizjournals.com/seattle/news/2021/08/05/expedia-donating-12m-unicef.html?cx_testId=40&cx_testVariant=cx_42&cx_artPos=0#cxrecs_s)
- Myrick, N. (2020, August 20). *Tableau is dedicated to supporting kids of color in the Puget Sound region—through COVID-19 and into the future*. Retrieved from Tableau: <https://www.tableau.com/about/blog/2020/8/tableau-dedicated-supporting-kids-color-puget-sound-region-through-covid-19-and>
- Nickelsburg, M. (2020, March 20). *Microsoft and Adaptive Biotechnologies partner to study immune response to COVID-19*. Retrieved from GeekWire: <https://www.geekwire.com/2020/microsoft-adaptive-biotechnologies-partner-study-immune-response-covid-19/>
- NY Business Daily. (2020, April 8). *DoorDash to Give Free Meals to Mt. Sinai Employees*. Retrieved from NY Business Daily: <https://nybizdaily.com/2020/04/08/doordash-to-give-free-meals-to-mt-sinai-employees/>
- Oceguera, P. (2021, June 7). *Seattle Office of Economic Development Partners With Comcast to Launch New Digital Point-of-Sales Program*. Retrieved from City of Seattle Office of Economic Development: <https://bottomline.seattle.gov/2021/06/07/digital-sales-access-program/>
- Padilla, C., Abi, G., M. Z., & Carvalho, B. (2021, August 9). *How AI Could Help Doctors Reduce Maternal Mortality*. Retrieved from Harvard Business Review: <https://hbr.org/2021/08/how-ai-could-help-doctors-reduce-maternal-mortality>
- Plenefisch, I. (2021, May 19). *Progress in Olympia for all Washingtonians*. Retrieved from Microsoft On the Issues: <https://blogs.microsoft.com/on-the-issues/2021/05/19/washington-state-legislature-2021-progress/>
- PricewaterhouseCoopers. (2020). *5G in healthcare*. London: PricewaterhouseCoopers.

- Quaadman, T. (2020, July 29). *How Technology Enables Small Business*. Retrieved from U.S. Chamber of Commerce: <https://www.uschamber.com/series/above-the-fold/how-technology-enables-small-business>
- Ray, S. (2021, June 17). *Magical momenets at Seattle's mass-vaccination site inspired volunteers to help end the pandemic*. Retrieved from Stories: <https://news.microsoft.com/features/magical-moments-at-seattles-mass-vaccination-site-inspired-volunteers-to-help-end-the-pandemic/>
- Reuters. (2020, March 22). *Facebook donates emergency reserve of 720,000 masks due to coronavirus outbreak*. Retrieved from Reuters: <https://www.reuters.com/article/us-health-coronavirus-facebook-masks/facebook-donates-emergency-reserve-of-720000-masks-due-to-coronavirus-outbreak-idUSKBN21911E>
- Roberts, F., & Beyers, W. B. (2021). *The 2012 Washington input-output study*. Olympia: Washington State Office of Financial Managemenr. Retrieved from [https://ofm.wa.gov/sites/default/files/public/dataresearch/economy/IO\\_2012\\_report.pdf](https://ofm.wa.gov/sites/default/files/public/dataresearch/economy/IO_2012_report.pdf)
- Schlosser, K. (2020, July 29). *Zillow to allow 90% of employees to work from home indefinitely as pandemic 'debunks' old ways*. Retrieved from GeedkWire: <https://www.geekwire.com/2020/zillow-allow-90-employees-work-home-indefinitely-pandemic-debunks-old-ways/>
- Schlosser, K. (2021, March 9). *Amazon leases another Bellevue office tower as it makes room for planned 25k employees in city*. Retrieved from GeekWire: <https://www.geekwire.com/2021/amazon-leases-another-bellevue-office-tower-makes-room-planned-25k-employees-city/>
- Schlosser, K. (2021, August 9). *Report: Amazon offering \$2M in cash and prizes in lottery for vaccinated frontline workers*. Retrieved from GeekWire: <https://www.geekwire.com/2021/report-amazon-offering-2m-cash-prizes-lottery-vaccinated-frontline-workers/>
- Schlosser, K. (2021, March 31). *Seattle region ranks No. 1 in U.S. for tech office space leases as 14 big deals help eclipse Bay Area*. Retrieved from GeekWire: <https://www.geekwire.com/2021/seattle-region-ranks-no-1-u-s-tech-office-space-leases-14-big-deals-help-eclipse-bay-area/>
- Schmelzer, R. (2019, October 31). *Should We Be Afriad of AI?* Retrieved from Forbes: <https://www.forbes.com/sites/cognitiveworld/2019/10/31/should-we-be-afraid-of-ai/?sh=7885d9c04331>
- sea.citi. (2021). *Family Tech Support Center*. Retrieved from sea.citi: <https://www.seaciti.org/our-work/navigating-the-digital-divide/>
- Seahawks. (2021). *Seahawks And Microsoft Team Up To Improve Technology At Boys & Girls Club Of King County*. Retrieved from Seahawks: <https://www.seahawks.com/video/seahawks-and-microsoft-team-up-to-improve-technology-at-boys-girls-club-of-king->
- Small Business & Entrepreneurship Council and TechnoMetrica. (2020). *Small Business Cloud Services Survey*. Vlenna, VA: Small Business & Entrepreneurship Council. Retrieved

- from <https://sbecouncil.org/wp-content/uploads/2020/06/2020SBECSmallBusinessCloudServicesSurvey-Report.pdf>
- SmartSheet. (2021). *Coronavirus Preparedness Template Set*. Retrieved from SmartSheet: <https://www.smartsheet.com/marketplace/template-sets/coronavirus-preparedness>
- Smith, B. (2020, December 17). *Microsoft commits more than \$110M in additional support for nonprofits, workers and schools in Washington state*. Retrieved from Microsoft on the Issues: <https://blogs.microsoft.com/on-the-issues/2020/12/17/microsoft-covid-19-washington-state-support/>
- Soper, T. (2021, April 13). *Funding to Seattle-area startups hit new Q1 record with \$1.6B invested — here were the top deals*. Retrieved from GeekWire: <https://www.geekwire.com/2021/funding-seattle-area-startups-hit-new-record-q1-1-6b-invested-top-deals/>
- Soper, T., & Cook, J. (2021, March 11). *Zillow to hire 2,000 employees — but they won't all be in Seattle as distributed model takes root*. Retrieved from GeekWire: <https://www.geekwire.com/2021/zillow-hire-2000-employees-wont-seattle-new-distributed-workforce-model-takes-root/>
- Stearns, J. (2021, March 19). *Google's 2021 U.S. Investments Include Kirkland, Seattle*. Retrieved from 425Business: <https://425business.com/googles-2021-u-s-investments-include-kirkland-seattle/>
- The Guardian. (2021, March 27). 'The earlier you act, the more impact': how Seattle tech industry led on Covid. *The Guardian*. Retrieved from <https://www.theguardian.com/us-news/2021/mar/27/seattle-tech-industry-covid-coronavirus-response>
- U.S. Bureau of Economic Analysis. (2021). Gross Domestic Product: Implicit Price Deflator [A191RI1Q225SBEA], retrieved from FRED, Federal Reserve Bank of St. Louis. Washington D.C. Retrieved July 8, 2021, from <https://fred.stlouisfed.org/series/A191RI1Q225SBEA>
- U.S. Bureau of Economic Analysis. (2021). Gross Domestic Product: Implicit Price Deflator [GDPDEF]. Washington D.C. Retrieved June 28, 2021, from retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/GDPDEF>
- U.S. Bureau of Economic Analysis. (2021). *SAINC4 Personal Income and Employment by Major Component*. Retrieved from Regional Data: <https://apps.bea.gov/itable/iTable.cfm?ReqID=70&step=1>
- U.S. Bureau of Labor Statistics. (2021). Quarterly Census of Employment and Wages. Washington D.C.
- University of Washington. (2021). *Case tracking dashboard*. Retrieved from University of Washington: <https://www.washington.edu/coronavirus/testing-results/>
- Verizon Communications. (2020, May 26). *Verizon Business survey finds 68% of small businesses believe they can recoup COVID-19 losses*. Retrieved from Verizon: <https://www.verizon.com/about/news/verizon-business-survey-covid-19>
- Washington Governor's Office. (2021, January 18). *Inslee announces state plan for widespread vaccine distribution and administration*. Retrieved from Medium:

<https://medium.com/wagovernor/inslee-announces-state-plan-for-widespread-vaccine-distribution-and-administration-62196dcf5ecf>

Washington State Department of Health. (2021, July 26). *COVID-19 Data Dashboard*. Retrieved from Washington State Department of Health: <https://www.doh.wa.gov/Emergencies/COVID19/DataDashboard>

Washington State Department of Revenue. (2021). Quarterly Business Review. Olympia, WA.

Washington State Economic Revenue and Forecast Council. (2021). *Economic Forecast Calendar Year Summary Tables*. Olympia: Washington State Economic Revenue and Forecast Council.

Washington State Employment Security Department. (2020). Covered employment classified by number of establishments, employment size and three digit NAICS industry subsectors. Olympia, WA.

Washington State Employment Security Department. (2021). Industry-Occupational Matrix. Olympia, WA.

Washington State Office of Financial Management. (2021). 2012 Washington State Input-Output Model. Olympia, WA.

Washington Technology Industry Association. (2015). *Information & Communication Technology Economic and Fiscal Impact Study*. Retrieved from <https://washingtontechnology.org/wp-content/uploads/2015/04/ICT-Economic-Report.pdf>

Wolf, M. (2019, December 10). *How Autonomous Vehicles Can Affect People With Disabilities*. Retrieved from The NCSL Blog: <https://www.ncsl.org/blog/2019/12/10/how-autonomous-vehicles-can-affect-people-with-disabilities.aspx>

## APPENDIX

### *Appendix A. NAICS Codes Used in ICT Analysis*

Subsector	NAICS	Description
Business Services	541511	Custom computer programming services
	541512	Computer systems design services
	541513	Computer facilities management services
	541519	Other computer related services
	611420	Computer training
	811211	Consumer electronics repair and maintenance
	811212	Computer and office machine repair
	811213	Communication equipment repair
Electronic Retail	561499	All other business support services
	45411	Electronic shopping and mail-order houses
Internet Services & Publishing	518	Data processing, hosting and related services
	519130	Internet publishing and web search portals
Software	511210	Software publishers
Telecommunications Services	517	Telecommunications
Manufacturing	334210	Telephone apparatus manufacturing
	334220	Broadcast and wireless communications equipment
	334290	Other communications equipment manufacturing
	335921	Fiber Optic Cable Manufacturing
	334111	Electronic computer manufacturing
	334112	Computer storage device manufacturing
	334118	Other computer peripheral equipment mfg
	334310	Audio and video equipment manufacturing
	334412	Bare printed circuit board manufacturing
	334416	Capacitor, resistor, and inductor manufacturing
	334417	Electronic connector manufacturing
	334418	Printed circuit assembly manufacturing
	334419	Other electronic component manufacturing
	334512	Automatic environmental control manufacturing
	334513	Industrial process variable instruments
	333316	Photographic and photocopying equipment manufacturing
	334413	Semiconductors and related device manufacturing
	325992	Photographic film and chemical manufacturing

## *Appendix B. Comparison with 2015 WTIA Study Economic Impacts*

Statewide total economic impacts of the ICT sector differ by a total of 324,200 jobs between the current analysis presented in this report and figures reported in the 2015 WTIA study. The imputed jobs multiplier between these two studies increased from 3.7 to 4.0. Differences in impacts between these studies are due to the following reasons:

- **Updates to the Washington State Input-Output Model.** The most recent (2012) Washington State Input-Output Model estimates a jobs multiplier of 4.7 for the I-O model sector “Software Publishers, Data Processing & Internet Service Providers” (Roberts & Beyers, 2021, p. 17). The 2007 Input-Output Model, used in the 2015 study, reported a jobs multiplier for this same sector of 3.96 jobs per direct job.
- The ICT jobs multiplier is slightly lower overall as compared with “Software Publishers, Data Processing & Internet Service Providers” due to the presence of other activities, such as ICT-related manufacturing, telecommunications, and various computer systems design and support services.
- **Growth in ICT wages.** Between 2013 (study year for the 2015 report) and 2019 (just prior to the pandemic), the statewide average wage grew in real (inflation-adjusted) terms 19%, whereas the ICT average wage growth was nearly double, at 36%. A large share of these high incomes is then spent on household goods and services throughout the statewide economy, spurring additional job creation.