TECH

A LOOK AT THE SAN DIEGO REGION'S **78 CORRIDOR**

CARLSBAD
ESCONDIDO
OCEANSIDE
SAN MARCOS
VISTA

UNDERWRITTEN BY

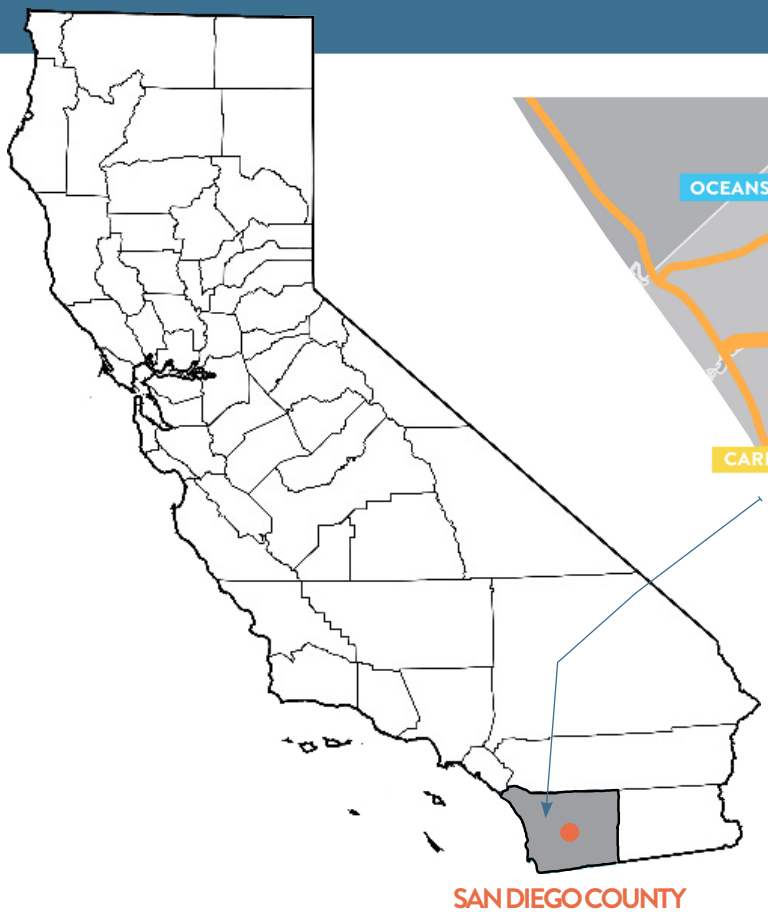
INNOVATE 78

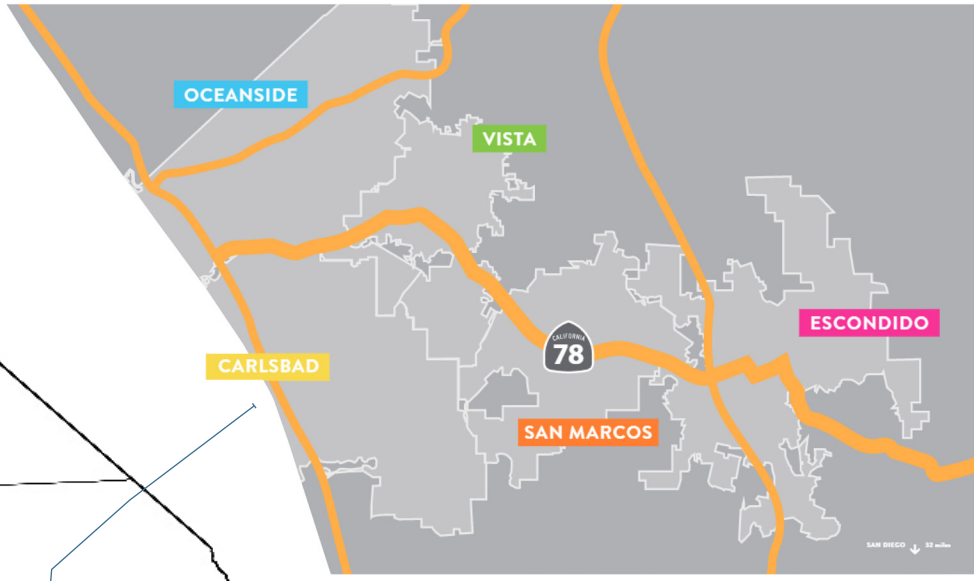
TECH
ALONG THE 78 CORRIDOR

INTRODUCTION

The 78 Corridor includes the cities of Carlsbad, Escondido, Oceanside, San Marcos, and Vista. With a population totaling 630,000, the Corridor is home to nearly one-fifth of residents in the San Diego Region. Employment along the Corridor exceeds 290,000 jobs - roughly 19 percent of the regional total - and annual gross regional product (GRP) surpasses $36 billion, making the Corridor a major player in the regional economy. Moreover, North County has emerged as a leader of technological innovation; with over 850 total tech firms - a concentration nearly 42% above the national average - the Corridor's diverse and well-established tech cluster has seen steady growth in recent years. Contributing more than $6.1 billion annually and directly employing nearly 25,000 people, tech along the Corridor is a major engine of economic growth within the region.

Innovate78 is a marketing and economic development initiative led by five North County San Diego cities - Carlsbad, Escondido, Oceanside, San Marcos, and Vista . Along the 78 Corridor, elected leaders, city staff, businesses, and educational institutions are working to leverage the area's collective strengths and assets - speaking with one voice to retain, expand, and attract talent, companies, and investment.





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OBJECTIVES

OUR FOCUS

The goal of this study is to better understand the technology cluster along the 78 Corridor in terms of its overall size, composition, occupational profile, customer base, and strengths and areas for growth. Produced by San Diego Regional EDC, this study focuses on the universe of companies broadly defined as falling under the umbrella of "technology," and parsed into three distinct segments - biotechnology and biomedical devices, information and communications technology, and defense, aerospace, and transportation manufacturing. This study is broken down into three main components:

THE TECH ECOSYSTEM

This study profiles three distinct, yet interdependent segments that, together, comprise the 78 Corridor's technology cluster.

ECONOMIC IMPACTS

This study analyzes economic impacts of the technology cluster on the Corridor's economy in terms of employment, gross domestic product (GDP), earnings, sales, and exports.

BUSINESS CLIMATE

This study elucidates local tech firms' perceptions of the business climate including ease of obtaining capital, attracting and retaining talent, and overall sentiments toward North County as a place to do business.

KEY TAKEAWAYS

Diverse ecosystem: The 78 Corridor is home to a vibrant, well-established, and diverse technology cluster spanning **70** different industries, nearly **25,000** jobs, and **200** unique occupations.

Economic impact: Technology has an enormous economic impact on the local economy totaling **$6 billion** annually.

High-tech manufacturing: The Corridor's technology cluster has a competitive advantage in **precision manufacturing** - specializing in the production of biomedical devices, telecommunications equipment, and defense-related products such as search, detection, and navigation instruments.

Job growth: While software developers, the keystone tech occupation, remain in demand, growth is more pronounced in the biotech and biomed devices (B&BD) segment. In fact, the ten **fastest growing** tech occupations are all in B&BD industries.

Higher-than-average wages: Tech pays **nearly double** the average local wage, and provides abundant opportunity for local talent, including many entry-level jobs requiring less than a bachelor's degree.

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TECH BREAKDOWN

THE TECH CLUSTER BREAKDOWN

The 78 Corridor's tech cluster can be broken down into three distinct segments that, together, represent more than 70 industries and nearly 25,000 jobs. The collaboration between the three segments fosters technological breakthroughs, spurs economic growth and development, and keeps the Corridor on the cutting edge of technology.

BIOTECHNOLOGY & BIOMEDICAL DEVICES (B&BD)

This segment focuses on development and production of medical devices and pharmaceuticals and includes the research, testing, and analyses of medical products and services. Most biotechnology applications are in medicine and health, and in diagnosis, treating, and preventing disease.

INFORMATION & COMMUNICATIONS TECH (ICT)

As the traditional anchor of a technology cluster, this segment comprises software and video game development, design and production of computers and related hardware, data hosting, and wired, wireless, and satellite telecommunications products and services.

DEFENSE, AEROSPACE, & TRANSPORTATION MFG (DATM)

This rapidly emerging segment supports the local defense industry with navigation equipment and technology, ship and boat building, and other defense-related products and services. Firms specialize in explosives, small arms and ammunition manufacturing, truck and automobile manufacturing, as well as aircraft and equipment manufacturing.

JOBS & WAGES

	B&BD	ICT	DATM	TECH
JOBS	12,493	9,515	2,677	24,685
JOBS MULTIPLIER*	1.69	1.73	1.46	1.68
AVERAGE WAGES	$115,579	$107,317	$80,565	$108,516

*Number measures the total employment effect - direct, indirect and induced - that each segment has on the region.
Source: EMSI, 2015 & 2016

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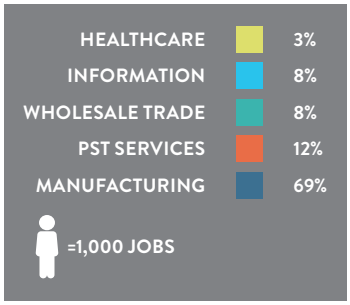
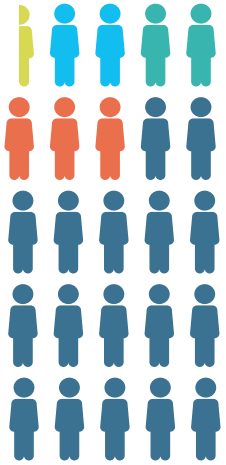
TECH JOBS

WHERE THE JOBS ARE

The tech cluster makes up eight percent of total employment along the 78 Corridor. A closer look at each segment reveals the importance and dependency that each segment, and thus the cluster, has on manufacturing.

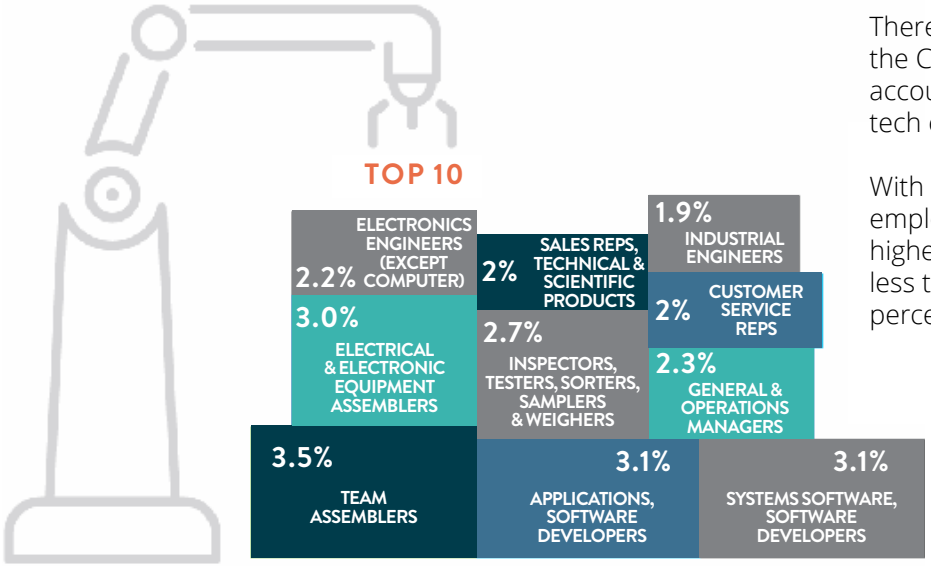
While manufacturing accounts for nearly 70 percent of employment across the cluster, there are other key industries that contribute to the production of tech goods and services.





Source: EMSI, 2016

TOP OCCUPATIONS IN TECH



Source: EMSI, 2016

There are more than 200 occupations within the Corridor's tech cluster, with the top ten accounting for nearly 26 percent of total tech employment.

With 851 jobs, or 3.4 percent of total tech employment, team assemblers are the highest source of employment and require less than a bachelor's degree, similar to 62 percent of entry-level occupations.

69%

OF TECH EMPLOYMENT IS IN MANUFACTURING

TECH WAGES

With an average wage of $108,500, tech jobs pay double the average along the Corridor. In fact, 48 out of the 72 tech industries pay an average wage that is higher than the Corridor's average.

Leading the way is the pharmaceutical preparation manufacturing industry, which employs 1,570 people and pays an average of $240,600. Research and development in biotechnology follows with an average wage of $187,800. At the opposite end are motor vehicle parts merchant wholesalers and dental laboratories, which pay an average wage below $40,000.

$108.5K
AVERAGE TECH WAGE

$53.5K
AVERAGE WAGE

Source: EMSI, 2015

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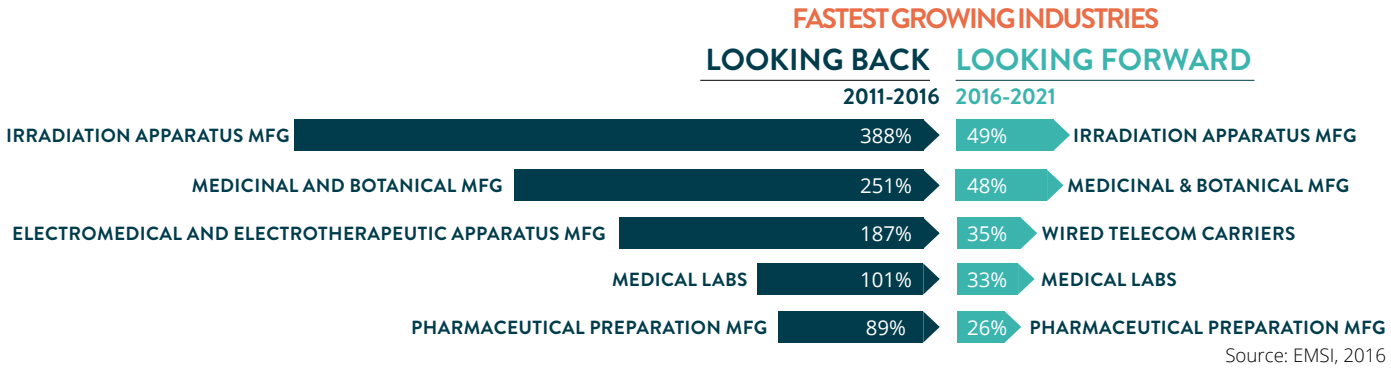
GROWTH TRENDS

GROWING INDUSTRIES

B&BD has been the fastest growing segment in tech, with a nine percent increase in employment since 2011. Looking forward, it is expected that manufacturing within B&BD will remain the primary source of job growth for the tech cluster. In the next five years, only wired telecom carriers is projected to break into the top five, displacing electromedical and electrotherapeutic apparatus manufacturing.



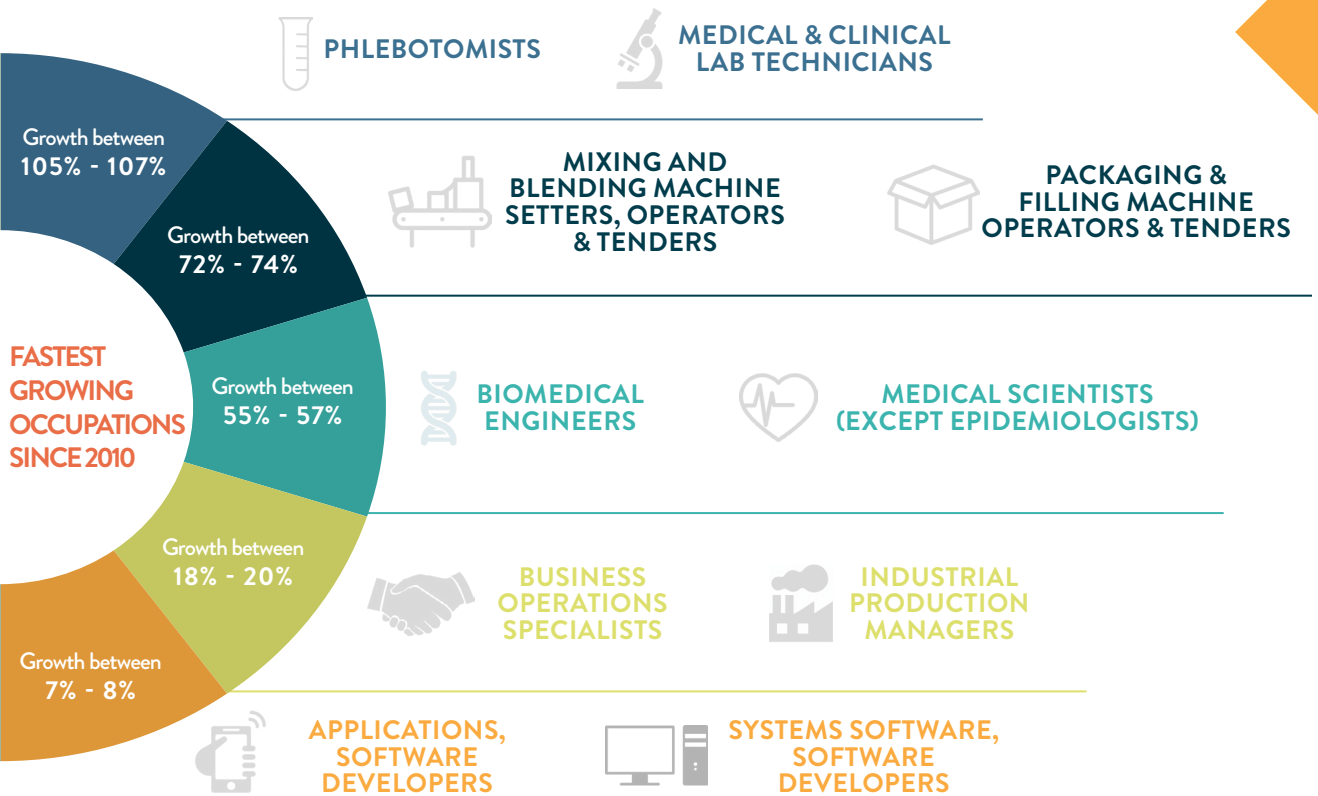
Source: EMSI, 2016

GROWING OCCUPATIONS

Software development is traditionally thought of as being the keystone tech occupation. And while the number of software developers has continued to grow steadily since 2010, this growth is primarily coming from within the B&BD segment. In fact, the ten fastest growing tech occupations are all in B&BD industries. Medical technician and machine operator jobs are growing nine to fifteen times faster than software developers and typically don't require a college degree.

14%

EMPLOYER-PROJECTED GROWTH IN TECH JOBS OVER THE NEXT 12 MONTHS



Source: EMSI, 2010-2016

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SPECIALIZATION

HIGH-TECH MANUFACTURING

Firms along the 78 Corridor specialize in precision manufacturing of medical devices, broadcasting and telecommunications equipment, and aeronautical instruments. The ten highest concentrated tech industries cover a wide range of high-tech manufacturing within the B&BD and ICT clusters. Together, these account for 35 percent of employment, 38 percent of sales, and 39 percent of total economic impact.

With a concentration 23 times that of the nation, radio and telecommunications equipment manufacturing is the second highest most concentrated, and within the top ten highest concentrated industries, provides the most jobs, sales, and contribution to total economic impact.

10 MOST CONCENTRATED TECH INDUSTRIES

		INDUSTRY CONCENTRATION*	DIRECT JOBS	TOTAL SALES	GDP CONTRIBUTION
B&BD	IRRADIATION APPARATUS MFG	27X	695	$217M	$87M
B&BD	MEDICINAL & BOTANICAL MFG	18X	937	$487M	$230M
B&BD	IN-VITRO DIAGNOSTIC SUBSTANCE MFG	16X	767	$622M	$300M
B&BD	OPHTHALMIC GOODS MFG	14X	763	$148M	$66M
B&BD	OPTICAL INSTRUMENT & LENS MFG	10X	372	$81M	$33M
B&BD	SURGICAL APPLIANCE & SUPPLIES MFG	7X	1,447	$722M	$336M
ICT	RADIO & TELECOM EQUIPMENT MFG	23X	2,327	$1.8B	$1.1B
ICT	AUDIO & VIDEO EQUIPMENT MFG	17X	664	$309M	$166M
ICT	OTHER COMM EQUIPMENT MFG	11X	408	$90M	$50M
ICT	ELECTRONIC CONNECTOR MFG	8X	329	$58M	$33M

*Numbers represent an industry's location quotient – a valuable way to quantify how concentrated a particular industry is in the 78 Corridor compared to the nation.
Source: EMSI, 2016

TECH ALONG THE 78 CORRIDOR

COMPETITIVE ASSETS

1,300+ ACADEMIC PROGRAM COMPLETIONS

50+ ACADEMIC PROGRAMS

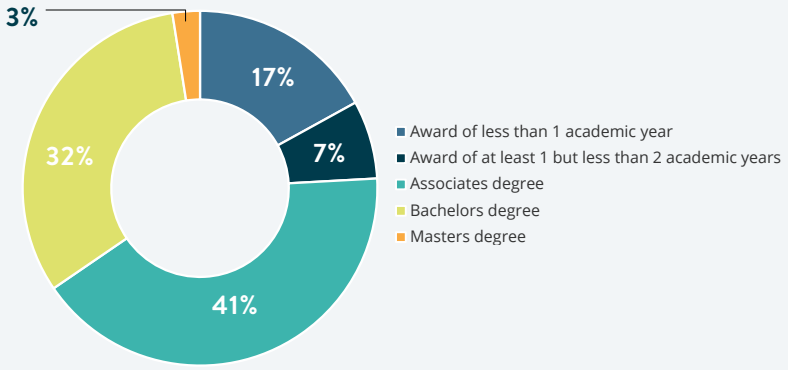
1.2X WORKFORCE AVAILABILITY

GRADUATE PIPELINE

The 78 Corridor's academic institutions play a vital role in supplying tech talent. In 2015, local institutions conferred more than 1,300 degrees in more than 50 different programs suitable to careers in tech. And while many entry-level tech jobs do not require a degree, a college education is a prerequisite for many essential occupations within tech including engineers, scientists, and managers.

Degree programs that equip graduates with the most in-demand skills for tech include information technology, computer science, computer programming, biochemistry, business administration, engineering, and sales to name a few. Additionally, many associate-level and certificate programs exist to train individuals for technical occupations including machinists, laboratory, engineering, computer, and manufacturing technicians.

TOP 75 TECH OCCUPATIONS REGIONAL COMPLETIONS BY AWARD LEVEL



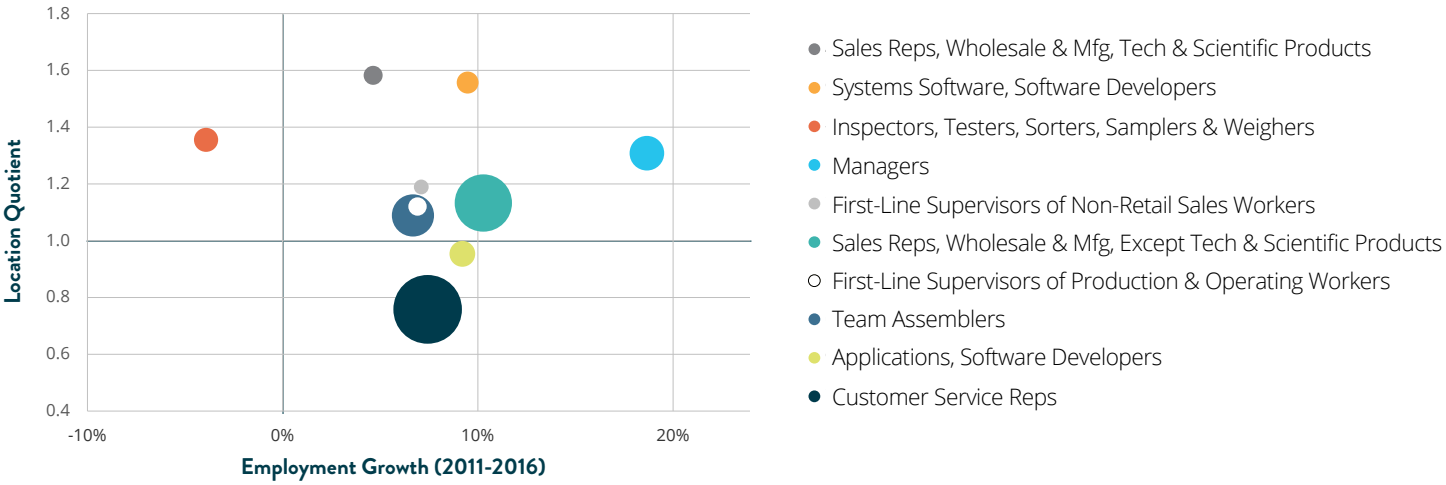
TECH-RELATED DEGREES CONFERRED BY INSTITUTION, 2015

Institution	Certificates	Degrees	Total Completions
California State University San Marcos	-	472	472
Palomar College	142	238	380
MiraCosta College	163	172	335
Golf Academy of America Carlsbad	-	132	132
California College San Diego	-	44	44

Source: EMSI, 2015

WORKFORCE AVAILABILITY

Key occupations for tech have an overall concentration of 1.2, indicating above average workforce availability. These occupations experienced overall job growth of eight percent from 2011 to 2016, indicating that the regional talent pool is increasing.



Note: Bubble size represents number of jobs in each occupation.
Source: EMSI, 2016

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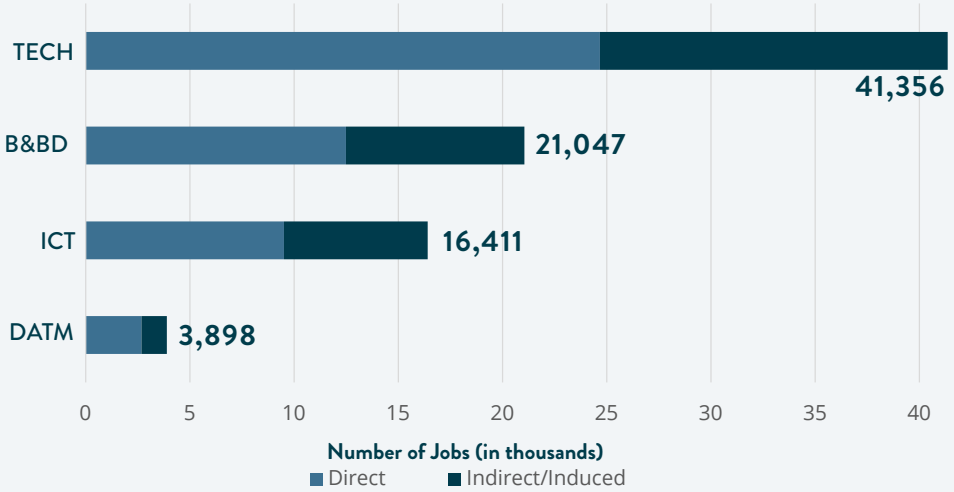
PART 2: ECONOMIC IMPACTS

IMPACTS BY SEGMENT

JOBS IMPACTED

When jobs are created in tech, it results in many more jobs created throughout the economy due to indirect and induced impacts. These additional jobs stem from tech businesses purchasing materials or services from other local firms and tech employees spending their wages on goods and services in the region.

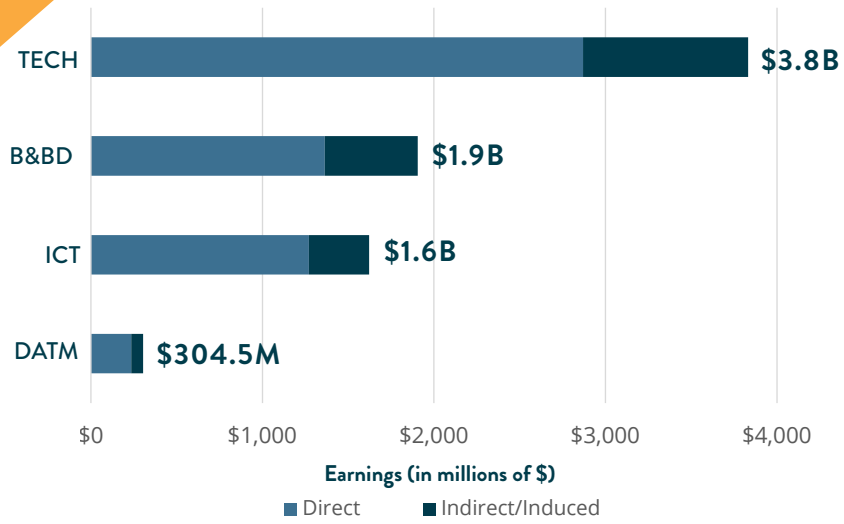


41K

TOTAL JOBS IMPACTED BY THE TECH CLUSTER

	Direct	Indirect/Induced	Total	Multiplier
B&BD	12,493	8,554	21,047	1.69
ICT	9,515	6,896	16,411	1.73
DATM	2,677	1,221	3,898	1.46
TECH	**24,685**	**16,671**	**41,356**	**1.68**

Source: EMSI, 2016



EARNINGS

Earnings include wages, salaries, and employee benefits. Similar to jobs, each new dollar in earnings results in indirect and induced impacts. Total earnings represent the initial dollar as well as the yield from additional impacts.

	Direct	Indirect/Induced	Total	Multiplier
BBD	$1.4B	$542.0M	$1.9B	1.40
ICT	$1.3B	$351.1M	$1.6B	1.28
DATM	$235.4M	$69.0M	$304.5M	1.29
TECH	**$2.9B**	**$962.1M**	**$3.8B**	**1.34**

Source: EMSI, 2016

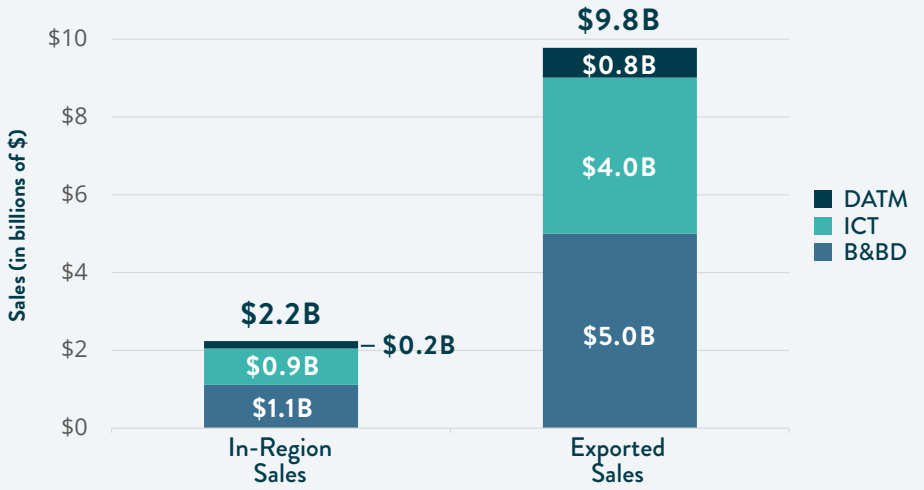
PART 2: ECONOMIC IMPACTS

SALES AND EXPORTS

TECH SALES

Annual tech sales exceed $12 billion, with more than 80 percent exported outside of the Corridor. B&BD accounts for half of all tech sales due to the high value and volume of its exports; medical devices and analytical instruments in particular.

The export-oriented nature of the Corridor's tech cluster makes it a crucial feature of the region's traded economy.



Source: EMSI, 2016

TOP EXPORTERS

Collectively, the top 15 exporting tech industries generate more than $8.6 billion in sales - roughly 72 percent of all annual tech sales. Eleven of these industries are in manufacturing; service providers and wholesalers are also represented.

Industry	Exported Sales
Radio & Television Broadcasting & Wireless Communications Equipment Mfg	$1,829,561,634
Pharmaceutical Preparation Mfg	$1,252,031,802
Surgical Appliance & Supplies Mfg	$721,800,294
In-Vitro Diagnostic Substance Mfg	$621,723,797
All Other Basic Organic Chemical Mfg	$578,282,725
Medicinal & Botanical Mfg	$487,129,128
Wired Telecommunications Carriers	$472,885,495
Electromedical & Electrotherapeutic Apparatus Mfg	$406,049,064
Medical, Dental & Hospital Equipment & Supplies Merchant Wholesalers	$363,571,155
Drugs & Druggists' Sundries Merchant Wholesalers	$356,316,682
Semiconductor & Related Device Mfg	$340,179,519
Other Aircraft Parts & Auxiliary Equipment Mfg	$312,703,750
Audio & Video Equipment Mfg	$309,026,962
Wireless Telecommunications Carriers (except Satellite)	$306,816,315
Search, Detection, Navigation, Guidance, Aeronautical, & Nautical System & Instrument Mfg	$283,233,487

Source: EMSI, 2016

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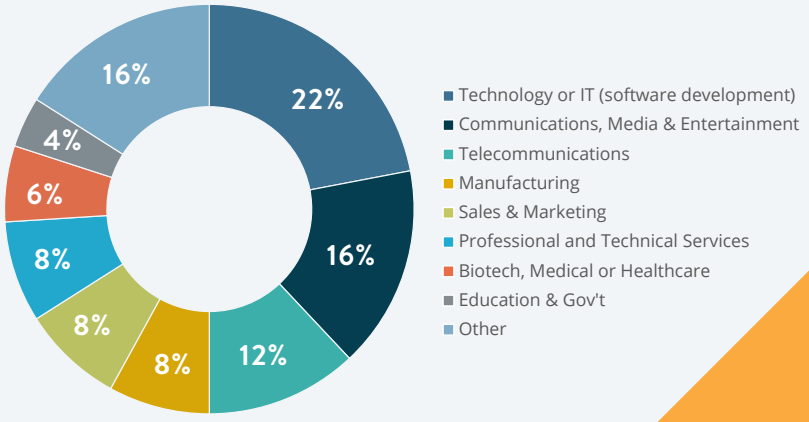
INDUSTRIAL COMPLEX

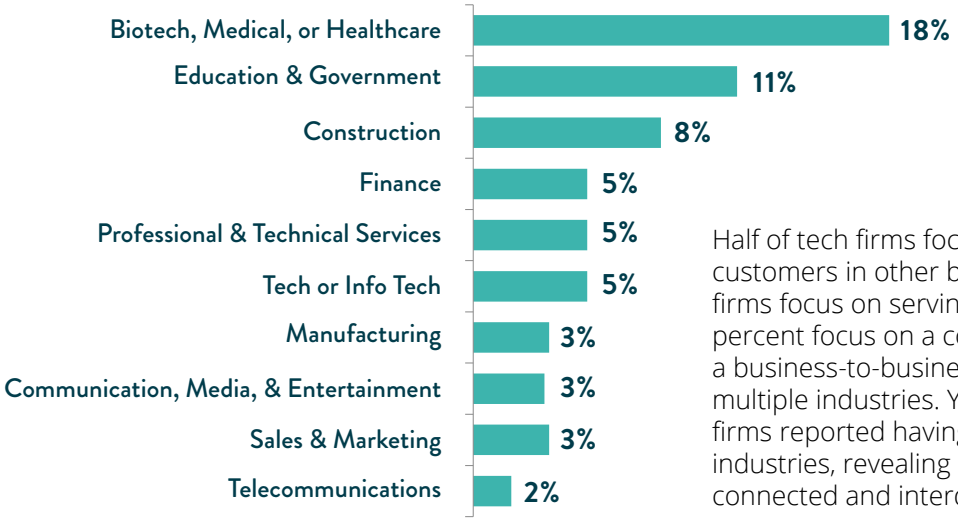
TECH FIRMS REPRESENT A VARIETY OF INDUSTRIES

Half of the tech firms surveyed see themselves as being part of traditional ICT industries. Six percent of firms identify as biotech, biomed, or healthcare; another eight percent are manufacturers. However, the tech cluster also includes industries beyond these three segments. One in five technology firms come from industries as varied as education and government, professional and technical service firms, and sales and marketing.



Source: BW Research, 2017

DIVERSE CUSTOMER BASE



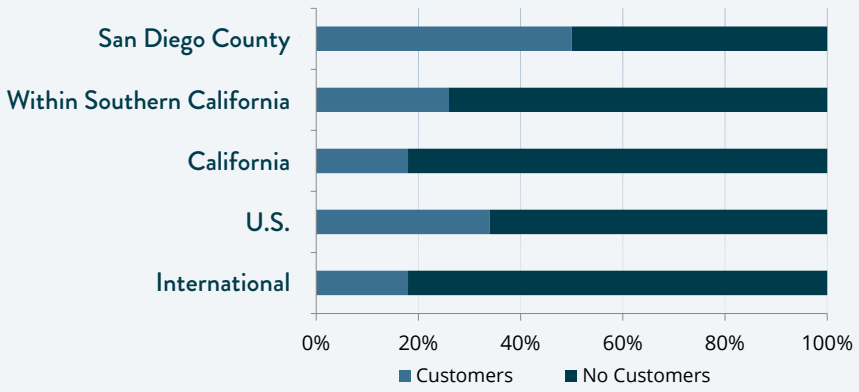
Note: 37% of respondants answered "other," "do not know," or declined to answer.
Source: BW Research, 2017

50%
OF TECH FIRMS PRIMARILY SERVE OTHER BUSINESSES

Half of tech firms focus primarily on serving customers in other businesses. Only ten percent of firms focus on serving consumers directly, while 38 percent focus on a combination of both. Firms with a business-to-business focus have customers across multiple industries. Yet, more than 27 percent of firms reported having customers from within tech industries, revealing a tech cluster that is deeply connected and interdependent.

CUSTOMERS NEAR & FAR

Not only do tech firms have customers that cover an array of industries, they also span the globe. Half of firms sell to customers within San Diego County, 34 percent sell across the country, and 18 percent export abroad.



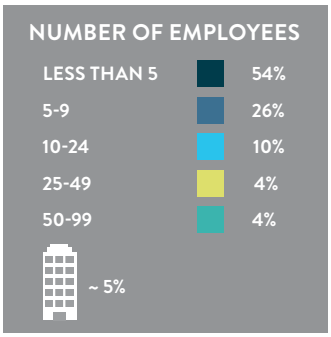
Source: BW Research, 2017

FIRM SIZE BY EMPLOYMENT

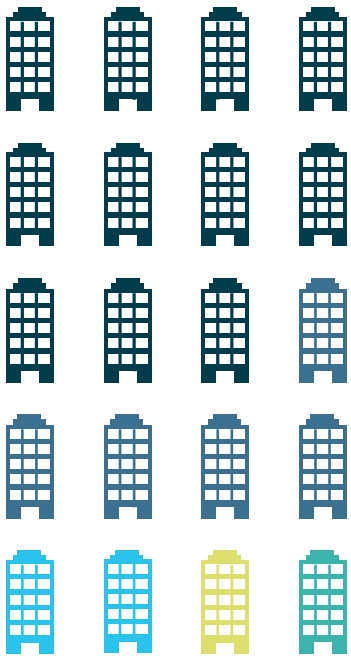
A large majority - 80 percent - of tech firms are small businesses employing fewer than ten people; 54 percent reported having fewer than five employees. Meanwhile, only eight percent of firms reported having more than 25 employees.

Although small in size, tech firms along the Corridor are well-established. Nearly half of the firms surveyed have been located in the region for more than a decade; about a quarter have operated locally for at least 20 years.

72%
OF FIRMS HAVE BEEN IN BUSINESS FOR MORE THAN TEN YEARS



COMPOSITION OF FIRMS, BY SIZE

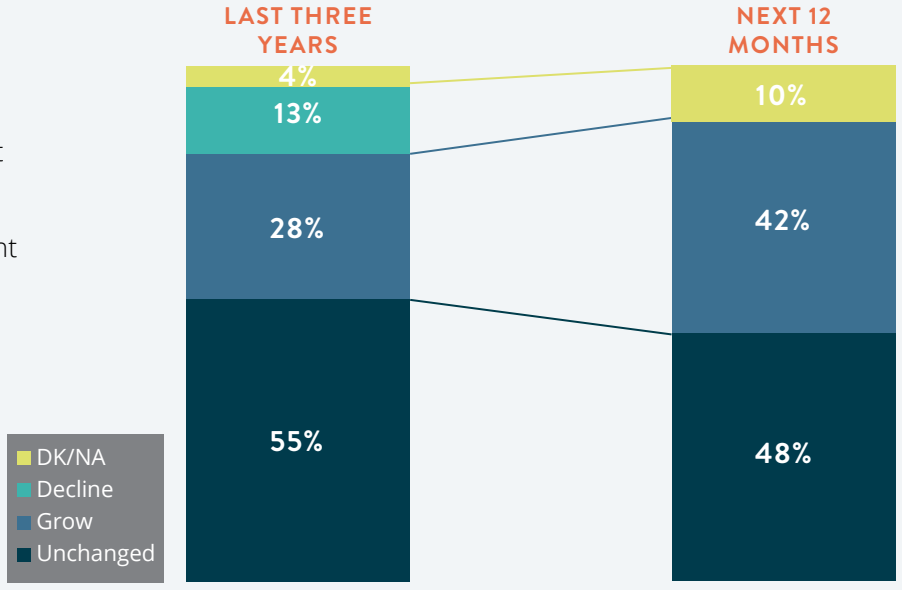


Note: 2% of respondants answered "DK" or "NA".
Source: BW Research, 2017

PAST AND PROJECTED CHANGES

Most firms have either held steady or grown their number of employees in recent years. Only 13 percent of firms reported declines in headcount over the last three years. Though many firms do not foresee staffing changes in the year ahead, 42 percent do expect to add personnel. Even more encouraging, not a single firm surveyed anticipates reducing its workforce over the next 12 months.

PROPORTION OF FIRMS REPORTING EMPLOYMENT CHANGES



Source: BW Research, 2017

ACCESS TO RESOURCES & SERVICES

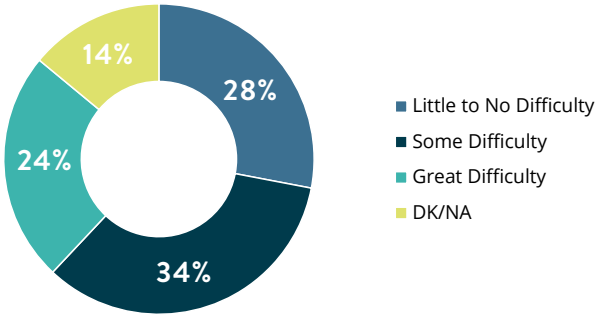
Access to capital, quality of suppliers, and the proximity to clients and complimentary products or services are some of the reasons that 64 percent of tech firms rate the 78 Corridor as either a good or excellent place to do business.

Source: BW Research, 2017

TALENT SHORTAGES

While the majority - 72 percent - of firms are satisfied with their ability to retain high-performing workers over time, more than half expressed having difficulty finding qualified applicants that meet their firm's hiring standards.

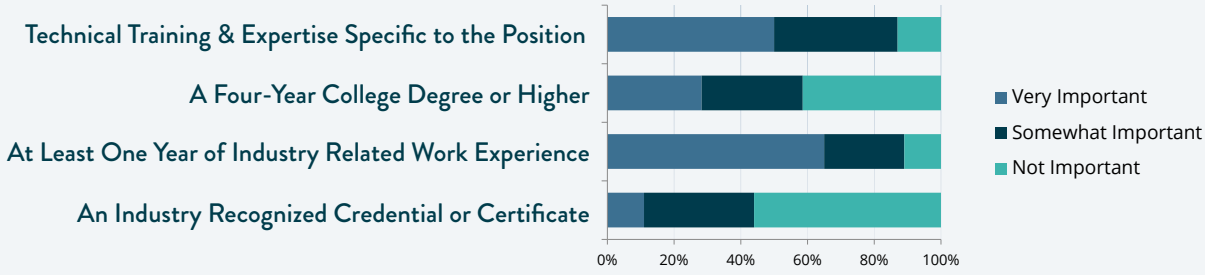
DIFFICULTY FINDING QUALIFIED APPLICANTS



Source: BW Research, 2017

EMPLOYER PRIORITIES

There is great satisfaction with the Corridor's talent pipeline provided by local educational institutions, yet 62 percent of entry-level tech jobs require less than a four-year degree. Employers place greater value on work experience and technical training when considering job candidates.



Source: BW Research, 2017

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APPENDIX
METHODOLOGY

The main research objective of the study was to better understand and quantify the advantages and challenges facing businesses that are engaged in technology along the 78 Corridor. To accomplish this, San Diego Regional EDC hired BW Research to develop and administer a telephone survey instrument and conduct executive interviews with local companies. Additionally, extensive secondary data analysis was conducted to quantify the economic impacts and employment trends of the 78 Corridor's technology cluster.

To define the technology cluster, EDC's research team started with a review of industry clusters from reputable academic research institutions. Occupational data from the Bureau of Labor Statistics was relied on in order to expand the definition beyond traditional ICT to include the industries that comprise the B&BD and DATM segments. These segments were identified to be technology-related based on greater than average concentrations of computer and mathematical occupations. These occupational groups were selected due to their pervasiveness in traditional technology industries. However, this research aimed to not only understand occupational concentrations and composition, but also to determine the industrial makeup of total employment in the cluster.

QUANTITATIVE SURVEY

BW Research developed and administered a telephone survey to meet the research objectives of the study. In developing the survey instrument, BW Research utilized techniques to overcome known biases in survey research and minimize potential sources of measurement error within the survey.

Prior to beginning data collection, BW Research conducted interviewer training and pre-tested the survey instrument to ensure that all words and questions were easily understood by the respondents. The data collection period spanned two weeks from late December 2016 through early January 2017. The telephone survey took approximately 14 minutes to complete, and was taken by 50 technology firms across the five cities along the 78 Corridor. The table below provides an overview of the survey methodology utilized for the project.

Method	Telephone (Mobile & Land Line) Survey
Universe	Businesses engaged in technology and software development and use along the 78 Corridor (Cities of Carlsbad, Escondido, Oceanside, San Marcos, and Vista)
Number of Respondants	50 technology firms in the five cities completed a survey
Average Length	14 minutes per survey
Collection Period	December 29, 2016 to January 12, 2017
Margin of Error	The maximum margin of error for questions answered by all 50 respondents was +/-13.4% (95% level of confidence)

Based on the findings of the quantitative survey, BW Research developed a discussion guide to conduct executive interviews with business leaders within the 78 Corridor's tech cluster. Executive interviews were completed by BW Research with decision makers and hiring managers at different technology firms.

The main goals of the executive interviews were to provide explanations for quantitative findings and explore issues driving specific trends. As challenges, trends, and outcomes were identified through the secondary data analysis and quantitative survey, interviews allowed BW Research to put a "why" and "how" behind these factors.

SECONDARY DATA ANALYSIS

Secondary data analysis was performed by EDC staff using data from EMSI and ReferenceUSA.com that was pulled in Q1 2017. EMSI was used for economic and labor market analysis in order to understand and quantify the technology cluster along the 78 Corridor, including the proportion of employment, sales, and gross regional product that is tied to the various industry segments within the region. Industry and employment concentrations, as well as trends in occupations, sales, output, and purchases were all analyzed. ReferenceUSA.com provides business listings with contact information as well as detail on location and industry classification.

The geography evaluated in the analysis included the five cities of Carlsbad, Escondido, Oceanside, San Marcos, and Vista, which are commonly referred to in the report as the 78 Corridor. All data in this report refers to 2016, except for wage and educational pipeline data, which is from 2015.

ABOUT SAN DIEGO REGIONAL EDC

San Diego Regional Economic Development Corporation's (EDC's) mission is to maximize the region's economic prosperity and global competitiveness. As an independently funded nonprofit fueled by more than 160 companies and organizations, EDC takes a data-driven approach to attracting, retaining and expanding companies and talent across the region's three traded economies: military, tourism and innovation.

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SAN DIEGO REGIONAL EDC

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