CALIFORNIA COMMUNITY COLLEGES
ECONOMIC & WORKFORCE DEVELOPMENT PROGRAM

BUSINESS AND WORKFORCE PERFORMANCE IMPROVEMENT INITIATIVE

Industry Scan Report

Orange County

Biomedical

"Production & Manufacturing"

Prepared By:

Center of Excellence, Orange County

Hosted at Rancho Santiago Community College District

August 2005

BUSINESS AND WORKFORCE PERFORMANCE IMPROVEMENT INITIATIVE*

Strategic Opportunities for Community Colleges in Biomedical "Production and Manufacturing"

August 2005

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PRODUCTION AND MANUFACTURING JOBS WITHIN THE BIOMEDICAL CLUSTER ARE PROJECTED TO GROW AT 34% AND ADD 1,957 JOB OPENINGS FROM 2004-2006.[1]

Executive Summary

During 2004 and 2005, the Orange County Center of Excellence hosted at Rancho Santiago Community College District began conducting an Industry Scan to identify Strategic Opportunities for Community Colleges to meet high-growth, high demand training needs of employers in the surrounding community and region.

It was discovered that the biomedical industry within Orange County will grow 34% and add 1,957 new jobs to the workforce by 2006. A biomedical cluster study commissioned by the Orange County Workforce Investment Board (*OCWIB*) indicated that these new jobs include: assemblers & fabricators, technicians, technologists, inspectors and auditors.[2]

According to the Orange County Business Council, "Orange County is known as the birthplace of the medical device industry and has significant emerging clusters in pharmaceuticals and biotechnology."[3] The county has seen the development of the significant biomedical cluster with an estimated 31,300[4] workers and 769 firms.

That development has been spurred, in part, because biotechnology firms are receiving the major share of venture capital investments in Southern California (*23.4% or $395 million in 2003*) with Orange County firms leading in awards.[5] Proposition 71, the $3 billion stem cell research initiative, has further made California a key center for biomedical researchers and investors.

In addition to the expected job growth, the pay scales within these occupations compare quite favorably with those of Orange County. Medical lab technologists can start at $31,200 in the county's biomedical cluster according to the OCWIB. Chemical technicians can start at $27,600 and assemblers & fabricators can begin at $20,400. In each case, they can earn more money than the average starting salary in all jobs in Orange County (*$17,931*).

The Orange County Biomedical strategic opportunity was identified for prospective adaptation of Community College education and training programs. The opportunity is detailed within this report along with reference to key data sources, a profile of the industry and specific training needs to address this opportunity.

[1]OCWIB, Biomedical Industry Cluster, Pg. 20-21
[2]OCWIB, Biomedical Industry Cluster, Pg. 20-21
[3]Orange County Business Council, Biomedical
[4]California Healthcare Institute, California's Biomedical Industry 2004 Report
[5]Larta Institute, Life Sciences Dominate Venture Capital Investment, 2003

Overview of the Strategic Opportunity

The strategic opportunity identified by this report is for production and manufacturing employees of biomedical firms involved in manufacturing a variety of medical and laboratory devices, pharmaceutical, and biological products as well as firms engaged in research and development focusing on biotechnology.

*Description***.** Orange County's community colleges have a strategic opportunity to play a major role in the county's high-technology economic development. This is the case because the county has seen the development of a significant biomedical cluster with an estimated 31,300[6] workers and 769 firms.

That development has been spurred, in part, because biotechnology firms are receiving the major share of venture capital investments in Southern California (*23.4% or $395 million in 2003*) with Orange County firms leading in awards.[7] Proposition 71, the $3 billion stem cell research initiative, has further made California a key center for biomedical researchers and investors. These facts, combined with Orange County's well-educated labor force (*Exhibit 1 below*), wide range of lifestyle options and coastal location have given it competitive advantages for becoming a long term center of biomedical research, development and production.

While many of the jobs associated with such a high technology sector, of necessity, require workers with advanced degrees, Orange County's biomedical firms also have a need for a variety of production and manufacturing employees. A biomedical cluster study commissioned by the Orange County Workforce Investment Boards (*OCWIB*) indicated that these include:[8] assemblers & fabricators, technicians, technologists, inspectors and auditors. From this grouping, the largest demand will be for:

- Assemblers & Fabricators
- Medical Lab Technologists
- Chemical Technicians

The OCWIB study indicated that its survey of 103 companies showed, "employers are having more difficulty recruiting qualified applicants for those manufacturing and production positions that require relative more education." Significantly, it concluded that *the community colleges should consider formal certificate programs* based around the skills and programs in these fields with an emphasis on "bench" skills, *i.e.,* laboratory skills. [9]

[6]California Healthcare Institute, California's Biomedical Industry 2004 Report
[7]Larta Institute, Life Sciences Dominate Venture Capital Investment, 2003
[8]Orange County Workforce Investment Board, Biomedical Industry Cluster, Labor Market Survey, 2004, pg 6-7
[9]OCWIB, Biomedical Industry Cluster, pg. 8

Demand. Biomedical production workers are in demand across a large spectrum of businesses and demand for the biomedical technician is expected to grow with the industry. The growth will come due to the factors cited earlier plus industry demand from increased FDA drug approvals and our growing and aging population[10] With specific regard to the three occupations for which the OCWIB's research indicates community colleges should be training, the interviews with local companies indicated, "these positions are all expecting **over 20 percent growth** and as the biomedical cluster emerges the skills required for these production and manufacturing positions are likely to change as well." Specific forecasts for the three include (*Exhibit 9 below*): [11]

- **Assemblers & Fabricators**, up 1,530 jobs in the county's biomedical industry from 2004-2006. California Employment Development Department (*EDD*) forecasts growth of 15% statewide for this occupation in all sectors from 2002-2012.

- **Medical Lab Technologists**, up 301 jobs in the county's biomedical industry from 2004-2006. EDD forecasts statewide growth of 22% for this occupation in all sectors from 2002-2012.

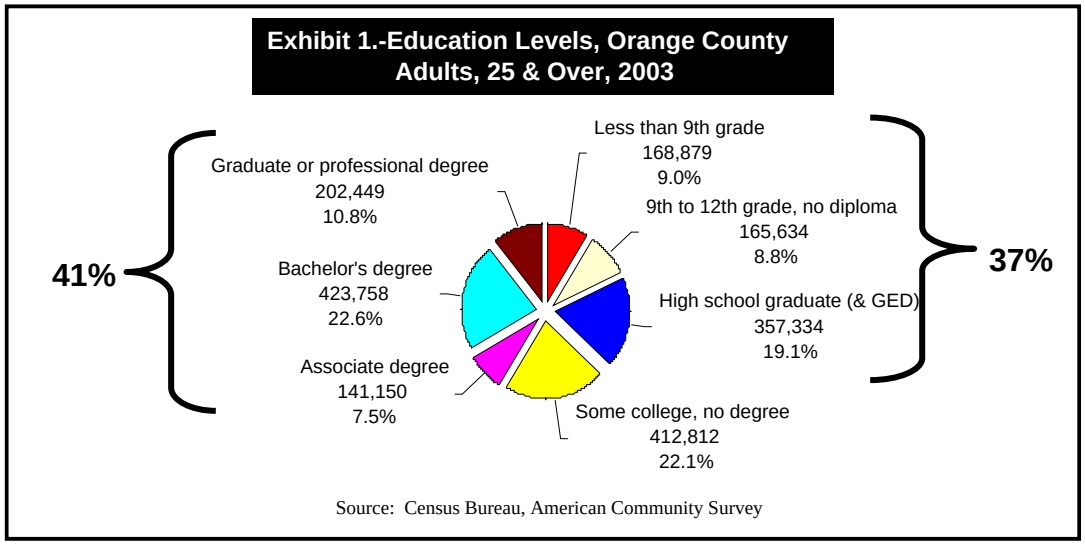
- **Chemical Technicians,** up 126 jobs in the county's biomedical industry from 2004-2006. EDD forecasts statewide growth of 17% for this occupation in all sectors from 2002-2012.

These forecasts and the difficulties the industry is having in "recruiting qualified applicants for those manufacturing and production positions …" are the reasons the OCWIB research called for the community colleges to start providing certificate training. The specific skills to be trained are shown in the Industry Training Needs: Skills section below.

Value To Colleges. Though Orange County's is generally well educated, a set of biomedically-based community college certificate programs could make an important contribution to the upward economic and social mobility of the county's workforce. This is the case as the Census Bureau's 2003 American Community Survey found that 37% of the county's adults had not taken one college class (*Exhibit 1*). A program of this type can thus help adult workers or new entrants to the labor force enter a technology field that has a growing future and pay scales above the county's average (*Exhibit 10*).

[10]CA Employment Development Department, Under the Microscope, Biotechnology Jobs in California, June 2004, pg 13
[11]OCWIB, Biomedical Industry Cluster, pg 18

Exhibit 1.-Education Levels, Orange County, 2003



From the standpoint of Orange County's business community, the community colleges would be responding to an identified need articulated by the county's biomedical companies. The colleges would thus be playing an important role in helping to implement the area's economic development strategy. In the process, they would be developing a close working relationship with both industry and the OCWIB.

From the forecasted data on the demand for each of the three occupations, it appears that the initial training requirement would be relatively small. However, the industry statement that demand for workers will rise 20% and the EDD forecast that occupations would grow from 17% to 22% statewide from 2002-2012 indicate that the training programs would ultimately find themselves in a growing environment. This is why the study commissioned by the OCWIB specifically recommended that the community colleges create certificate programs to fill these gaps.

Students exiting such programs would enter a strong job market as indicated by the fact that 53% of Orange County's employers indicated they were having "great or some difficulty in recruiting entry-level employees with adequate training and education."[12] That would be applicable to a certificate program teaching manufacturing skills to assemblers & fabricators. Meanwhile, certificate holders from the suggested medical laboratory technology and chemical technician programs should also be readily employable as the county's biomedical ranked these occupations as the third and four most difficult for which "to find qualified job applicants."[13]

[12]OCWIB, Biomedical Industry Cluster, pg. 13
[13]OCWIB, Biomedical Industry Cluster, pg. 19

The strength of interest in the field would also appear to open the possibility of contract training programs to assist specific firms in upgrading the skills of their existing employees in these fields. This view is reinforced in that the OCWIB study found that "most firms in the Biomedical cluster rely on "Informal on-the-job training" (97%) to develop their employees, followed by "Formal on-the-job training" (85%), "Employer-Paid outside training" (70%), and "In-House classroom training" (60%). About half of biomedical firms reported offering "Career Development/Career Ladders" (49%) or "Tuition assistance at a college or university" (46%) for their employees.[14]

Labor Market Projections. Production and manufacturing jobs within the biomedical cluster are projected to grow at 34% and add 1,957 job openings from 2004-2006.[15] Within this context, the Demand section of this report indicated that the OCWIB study found that there would be a growing demand for Assemblers & Fabricators (*up 1,530 jobs*), Medical Lab Technologists (*up 301 jobs*) and Chemical Technicians (*up 126 jobs*). Separately, the Orange County Business Council reports that there is a "severe shortage of qualified biomedical technicians. Moreover, the most recent data project this scarcity to intensify in the next five to 10 years."[16] A survey by that organization to quantify this last shortage is underway. When it is published it will be incorporated into this report.

Meanwhile, it was earlier shown that EDD forecasts that these three sectors will respectively grow by 15%, 22% and 17% statewide from 2002-2012. This forecast is likely conservative as it was made prior to the passage of the state's Stem Cell Proposition.

Industry Validation. Throughout its history, Orange County has been concerned about expanding the high technology sector of its economy. Advances in the biomedical sector have brought a focus to this sector by both the OCWIB and the Orange County Business Council. Their concerns about retaining and expanding the sector are clearly expressed in the two studies repeatedly cited here:

- In the case of the OCWIB, it is found in the Biomedical Industry Cluster, Labor Market Survey 2004 conducted on their behalf by Godbe Research. Most of this study was designed to gain an understanding of the industry's workforce issues. However, one section of this survey of 103 of Orange County's 769 biomedical

[14]OCWIB, Biomedical Industry Cluster, Pg. 15
[15]OCWIB, Biomedical Industry Cluster, Pg. 20-21
[16]OCBC, Increasing the Supply of Biomedical Technicians, April 2005

firms (*5 or more workers*) contained several questions asking firms if they had plans to leave the county or put their expansions outside of it.

- Similarly, the Orange County Business Council states that its reason for worrying about the shortage of biomedical technicians is that, "as the biomedical industry increases in importance and impact in the local economy, it is clear that the need for action is urgent."[17]

Very significantly for the community colleges, both business groups indicate that they believe the community colleges must be at the center of solving the workforce shortages occurring in the production, laboratory and technician level:

- "Findings from the research reveal several opportunities for OCWIB to further develop Orange County's biomedical workforce. These opportunities include **expanding certificate programs at regional community colleges** to train and educate Orange County residents for production and manufacturing positions in the Biomedical cluster, and prepare Orange County students for senior research positions in the biomedical cluster."[18] [*emphasis added*]

- "In response to this workforce crisis, OCBC has partnered with the **School of Continuing Education at the North Orange County Community College District** to look for creative solutions to increase the supply of biomedical technicians.[19] [*emphasis not added*]

Source Data.

The following are the major data sources which led to the identification of this strategic opportunity:

- Orange County Workforce Investment Board. Contact: Andrew Munoz, Website: http://www.ocwib.org/lmi/index.asp
- Orange County Business Council. Contact: Wallace Walrod. Website: www.ocbc.org
- Employment Development Department, Labor Market Division. Contact: Maritza Gamboa, Website: http://www.labormarketinfo.edd.ca.gov
- U.S. Department of Labor. Website: www.dol.gov

[17]OCBC, Increasing the Supply of Biomedical Technicians, April 2005
[18]OCWIB, Biomedical Industry Cluster, pg. 7
[19]OCBC, Increasing the Supply of Biomedical Technicians, April 2005

- U.S. Bureau of Labor Statistics, Occupational Outlook Handbook http://www.bls.gov/oco/
- California Community Colleges Economic and Workforce Development Program, Biotechnology Initiative, www.ccewd.net
- Southern California Biotechnology Center http://www.miramar.sdccd.net/programs/biol/biotech/
- Larta Institute, (*formerly Los Angeles Regional Technological Alliance*) http://www.larta.org

Industry Overview

The following industry information is presented based on its relevance to the strategic opportunity.

State of the Industry.

The Biomedical cluster is included in the emerging and rapidly growing industry of Biotechnology. Biotechnology is defined by the U.S. Department of Commerce as "the application of molecular and cellular processes to solve problems, conduct research and create goods and services." Unfortunately, the cluster is so new that definitions of what sectors to include in biotechnology differ and causing federal state and local data to be inconsistent with each giving only an impression of the sector's anticipated growth.

According to the U.S. Department of Labor, Biotechnology Industry Snapshot:[20]

- The biotechnology industry employed 713,000 workers in 2002 and is anticipated to employ 814,900 workers in 2007. *(Economy.com)*

- The biotechnology industry is a vast field with much potential. Industry revenues more than quadrupled from $8 billion in 1992 to $33.6 billion in 2002. *(Ernst & Young)*

- Biotechnology-related Research and Development (R&D) expenditures amounted to $16.4 billion in 2001, about 10% of all U.S. industry R&D that year. (*U.S. Department of Commerce*)

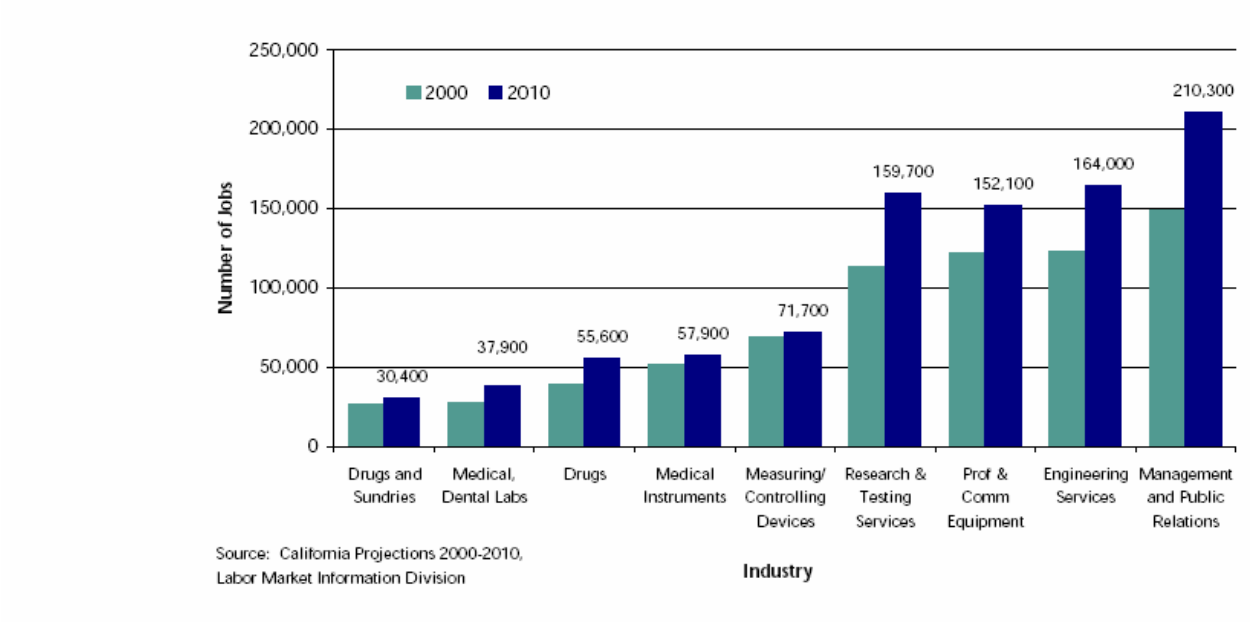
Under definitions used by EDD in California, it is predicted that the state's biotechnology industry will grow from 720,600 jobs in 2000 to 939,600 in 2010, an increase of 219,000 jobs or 30.4% (*Exhibit 2*). In 2010, the biomedical group of sectors will represent 181,800 of these jobs or 19%. That does not include pure research and testing firms.[21]

In Orange County, research by the Orange County Business Council, published in their annual 2004 Workforce Force Report, found that the biomedical cluster contained over 25,000 jobs and was very sensitive to lulls in California's overall job growth and tracked fairly closely to its increases. The California Health Care Institute put the county's 2004 employment at 31,300. The OCBC report indicated that when the state's non-agricultural employment rose 0.86% in the 2002 recession, the biomedical cluster's workforce declined 6.8%. In 2000, when the state's

[20]U.S. Department of Labor, Employment & Training Administration, Biotechnology Industry Snapshot
[21]EDD, Biotechnology Jobs in California, Pg. 14

job growth was 3.6%, the cluster grew 2.9%.[22] The forecasted growth for the cluster in 2005 is 1%. That is much less than the growth projected from 2004-2006 by the biomedical firms themselves among their assemblers & fabricators (*28%*), medical laboratory technologists (*57%*) and chemical technicians (*24%*) (*Job Growth, below*).

Exhibit 2.-Biotechnology Jobs in California, 2000-2010



People choosing to work in the biomedical field in Orange County will find the sector involved in a wide array of cutting edge research and product areas including:[23]

- Aging
- AIDS research
- Brain projects
- Cancer research
- Clinical programs
- Corneal transplants
- Gerontology
- Infant heart transplants
- Laser studies
- Molecular Ecology
- Neonatal care
- Out-patient surgery
- Simulations laboratory

[22]Orange County Business Council, 2004 Workforce Report, Pg. 25
[23]Orange County Business Council, GIS: Industry Clusters: Biomedical

Most of the 769 firms working in the field are quite small. Among the major firms are:

3M Healthcare
Advanced Sterilization
Alcon Laboratories Inc
Allergan
B. Braun McGaw
Beckman Instruments Inc.
Biopsys Medical Inc.
CardioVascular Dynamics Inc.
Chiron Vision Corp.
Cocensys
Codan U.S. Corp.
Cortex Pharmaceutical
Edwards Life Sciences
Gish Biomedical Inc.
Hycor Biomedical Inc.
ICN Pharmaceuticals Inc.
Imagyn Medical Technologies
Mallinckrodt Medical Inc.
Medtronic Inc.
Newport Corp.
Sechrist Industries Inc.
SensorMedics Corp.
Sim's Respiratory Support
Sorin Biomedical Inc.
The Cooper Cos. Inc.
Toshiba America Medical
Trimedyne Inc.
VitalCom Inc.

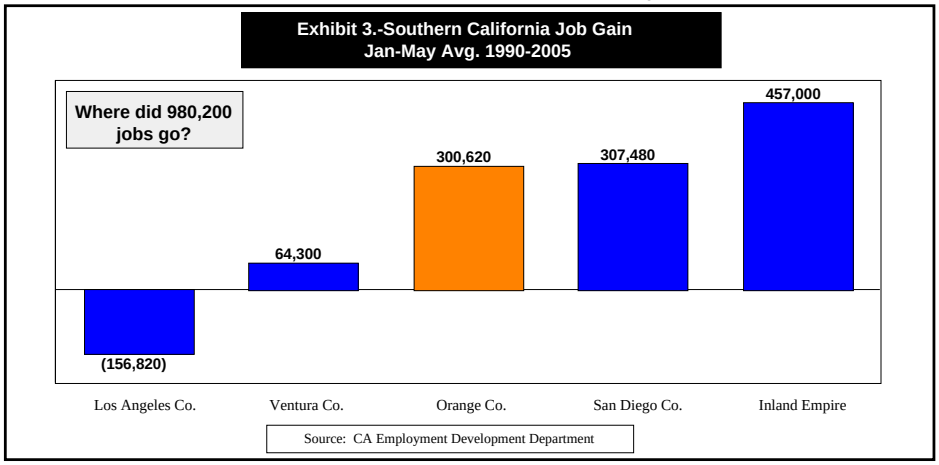
State of the Region.

Orange County has one of Southern California's most dynamic economies. In 2003, the Census Bureau's American Community Survey found it had the region's best educated adult population with 41.0% of people 25 and over having an A.A., B.A. or higher degree. San Diego County was second at 39.8%. This is why these counties are a good fit for a high technology sector like the biomedical industry (*Exhibit 1 earlier*).

In 2003, the U.S. Bureau of Economic Analysis found that Orange County's per capita income was **$39,268**, the sixth highest level among California's 58 counties and highest in Southern California ahead of San Diego County (*$35,891*). The level was 17.5% higher than California (*$33,415*). However, despite the county's prosperous climate, the American Community Survey still found that 179,250 of its 968,213 households (*18.5%*) had incomes below $25,000. This is a group that could benefit the most from having training available for an expanding base of entry-level jobs in a high technology sector.

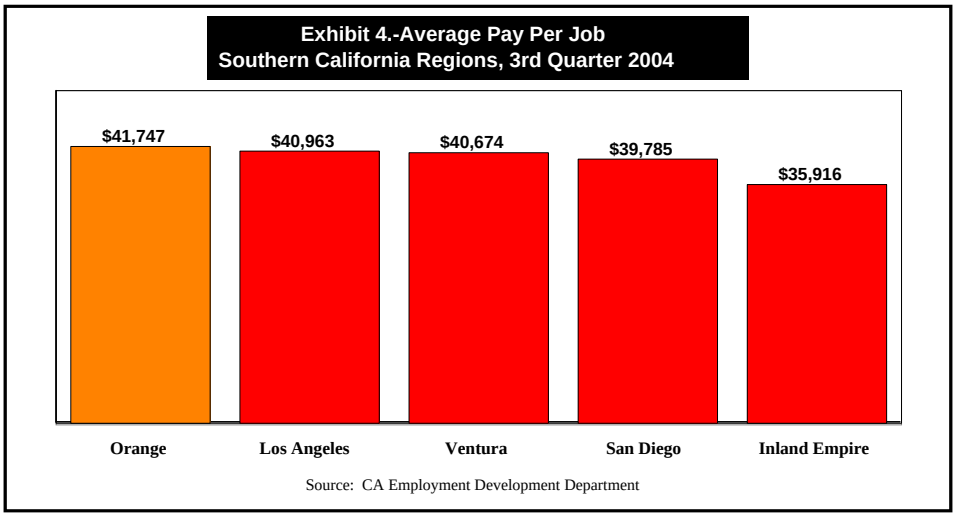
Job creation in Orange County has been quite strong. In 2004, it added an annual average of 30,708 jobs, second highest in California after the Inland Empire (*49,090*) according to the CA Employment Development Department (EDD). The county's share of California's job growth in 2004 was 22.0%. From 1990-2005, Orange County's job base expanded by 300,620 (*Exhibit 3*). That was roughly equal to the 307,480 in San Diego County and in sharp contrast to the 156,820 lost in Los Angeles County. Orange County added 14.1% of all new California jobs in this 15-year period. Meanwhile, its May-2005 unemployment rate of 3.3% was one of the state's lowest.

Exhibit 3.-Southern California Job Gain, 1990-2005



Significantly, EDD found that Orange County's $41,747 average pay per job in 2004 was the Southern California's highest ahead of Los Angeles County (*$40,963*) (*Exhibit 4*). In part this is due to a manufacturing sector that averaged $49,081 in *2003* and remains an important part of the county's economy. In 2004, it represented 15.3% of the county's total jobs (*215,500*). Of these, 41.6% were in high paying technology sectors (*125,800*) including: computers & electronic (*51,900*), biomedical (*25,000*) and aerospace (*12,800*). These sectors are thus an important reason for the county's continued prosperity. At the same time, they are likely located in the county due to its well educated workforce, a key condition for the success of technology sectors.

Exhibit 4.-Average Pay Per Job, 2004



Key Associations. The key associations for Orange County's biomedical industry are:

- **Southern California Biomedical Council** (SCBC), used to validate industry needs. Contact is Ahmed A. Enany, Website: www.socalbio.org
- **Biotechnology Initiative**- California Community College Economic and Workforce Development Program. Contact is Wendie Johnson, Website: http://www.paccd.cc.ca.us/biotech/ednet/home.html
- **Orange County Technology Association Network** (OCTANe), Contact Gary Augusta, Website: www.octaneoc.org
- **Biotechnology Industry Organization (BIO)**- www.bio.org

Industry Workforce Challenges. The biomedical cluster research conducted by the OCWIB in 2004 reveals that there are three primary workforce concerns for biomedical employers in the Orange County:[24]

- 53% state that they are having "great or some difficulty" in their "recruiting entry-level employees with adequate training and education." By this they meant, that they are having trouble finding workers of this type with the manufacturing, production and laboratory testing (*bench*) skills the industry needs, and that no training pipeline existed to fill this gap.
- 64% of firms indicate that they are having "great or some difficulty" in their "recruiting non-entry-level employees with adequate skills and experience." By this they meant workers requiring bachelor's or higher degrees such as physical, chemical and biological scientists. Despite their university degrees, the industry felt their employees were "often lacking skills related to their positions."
- 61% report having "great or some difficulty" in their "recruiting employees with reasonable salary requirements." The survey did not collect information elaborating on this question.

Of these three issues, the first one is the most relevant to the community colleges is the need for trained entry-level workers. Demand was previously indicated to be (also *see Exhibit 9 below*):

[24]OCWIB, Biomedical Industry Cluster, pg. 13

- From 2004-2006, the industry expects to need 1,530 more assemblers & fabricators, up 32%, to cover turnover and expansion.
- From 2004-2006, the industry expects to need 301 medical laboratory technologists, up 46%, to cover turnover and expansion.
- From 2004-2006, the industry expects to need 126 chemical technicians, up 59%, to cover turnover and expansion.

In addition, every source looking at the biomedical industry anticipates that the growth rates in these sectors will be greater over the long run as the industry matures, expands and moves increasingly into production.

Given this demand, there is unfortunately no specific data on the local supply of trained people to fill these entry-level positions. However, it is known that Orange County has a very low 3.3% unemployment rate, the work in the cluster is highly technical, and there is a lack of local training to give workers the required needed skills. Together, these facts strongly imply that there is neither an available supply or a training pipeline to meet the biomedical industry's need for workers that can allow it to expand.

This demand and supply situation is the reason that the OCWIB study's first recommendation was that the community colleges begin certificate training for these positions. It is also the reason the Orange County Business Council has cited a crisis in the lack of medical laboratory technicians as their reason to work with the North Orange County Community College District to find ways to fill it.

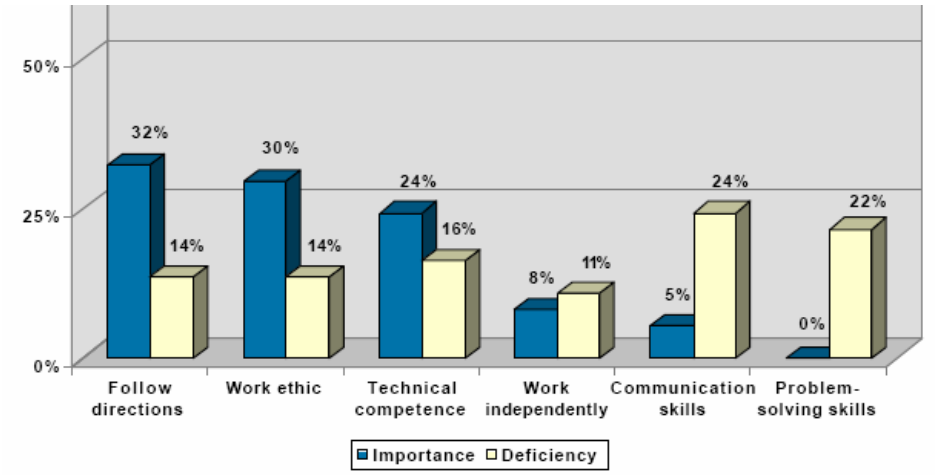
Industry Workforce Needs.

Within the production and manufacturing area of the biomedical cluster, the OCWIB research identified three specific strategic opportunities for the community colleges (*see Demand Section for specific skills*):[25]

Normally, assemblers & fabricators require a high school diploma and no experience to start work. However, the OCWIB study recommends that a certificate program be started to give assemblers and fabricators the specific skills applicable to biomedical production as well as soft skills in following directions and having a "conscientious work ethic and positive attitude." Currently, no such local training exists (Exhibit 5).

[25]OCWIB, Biomedical Industry Cluster, pg. 7. Graphs, pgs. 28-32

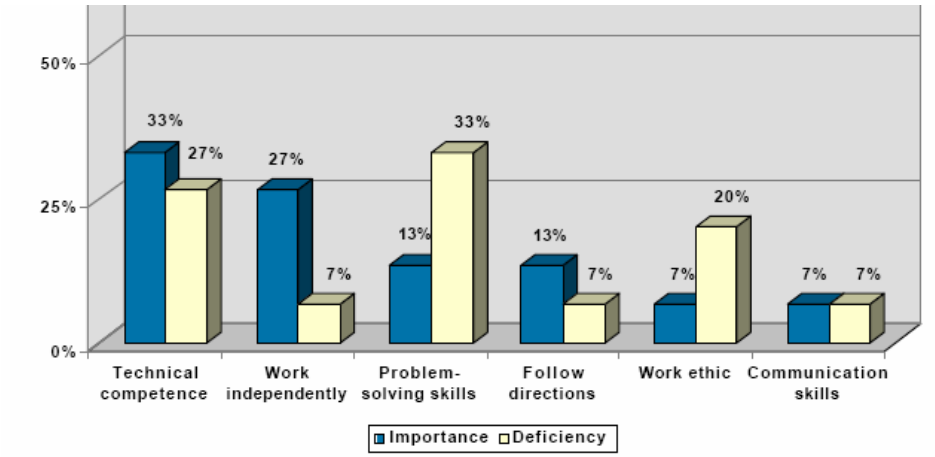
Exhibit 5.-Assemblers & Fabricators, Required Abilities & Deficiencies



Source: Orange County Workforce Investment Board, Biomedical Industry Cluster

Normally, medical laboratory technologists require an Associate of Arts degree. In the biomedical industry they also require specific laboratory skills (Exhibit 6). There is also no local program training providing this training.

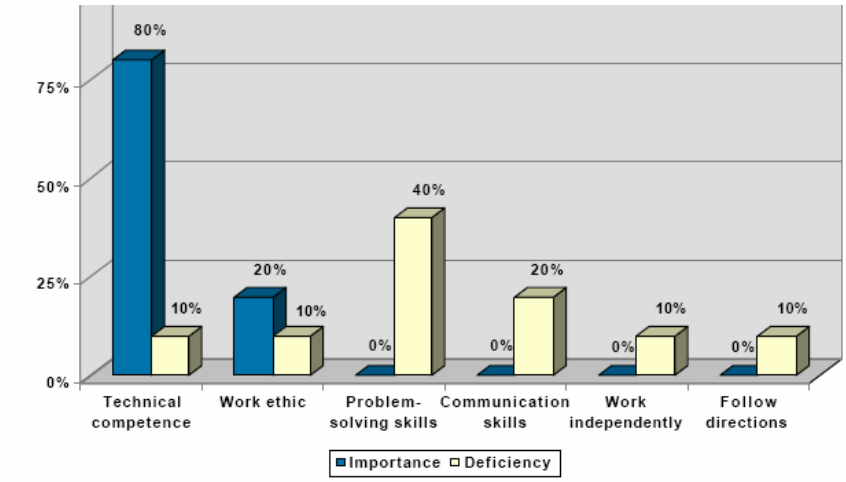
Exhibit 6.-Medical Lab Technologists, Required Abilities & Deficiencies



Source: Orange County Workforce Investment Board, Biomedical Industry Cluster

Similarly, chemical technicians require an Associate of Arts degree and specific laboratory skills for the biomedical industry (Exhibit 7). Again, there is no local program training providing this training.

Exhibit 7.-Medical Lab Technologists, Required Abilities & Deficiencies

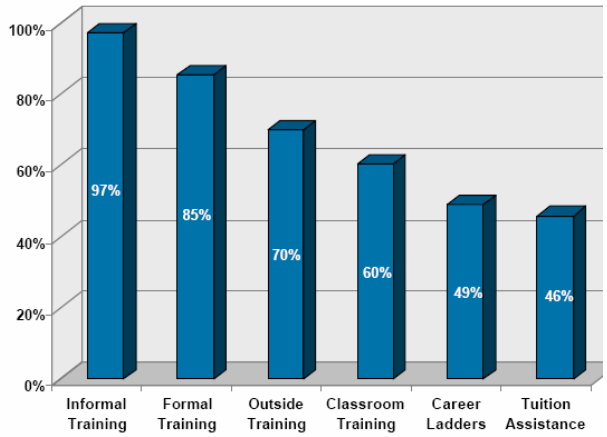


Source: Orange County Workforce Investment Board, Biomedical Industry Cluster

Future Trends.

According to the Orange County Business Council, "Orange County is known as the birthplace of the medical device industry and has significant emerging clusters in pharmaceuticals and biotechnology."[26] The council is heavily involved in setting the county's economic development priorities. They want to see the biomedical cluster stay in the county as firms transition from research and development to production as it is a high technology sector that fits the economic development profile that they feel is necessary for the county's long term prosperity. This goal is consistent with the fact that virtually every national, state and county forecast for the industry cites its short and long term growth potential (*see State of the Industry*).

Exhibit 8.-On-Going Training by Biomedical Firms



Source: Orange County Workforce Investment Board, Biomedical Industry Cluster

[26]Orange County Business Council, Biomedical

For the community colleges, the industry offers the possibility to both train entry-level workers, as well as to work through contract education to provide on-going training to the existing workers within the sector. This is possible because the firm's already believe that their workers have training deficiencies (*see Exhibits 5-7*). In addition, they are engaged in a variety of efforts to overcome those deficiencies and keep workers current. As a result (*Exhibit 8*):

- 85% use formal training
- 70% use outside training
- 60% put employees into classroom situations
- 46% offer tuition reimbursement

Occupational Growth

The following occupational growth information is presented based on its relevancy to the strategic opportunity.

Job Growth. The OCWIB predicts that the highest expected job growth within the Biomedical cluster from 2004-2006 will be with assemblers & fabricators, medical lab technologists and chemical technicians. Their growth will range from 24% to 58% and from 126 to 1,530 workers (*Exhibit 9*). Meanwhile, it has been shown that the expansion of the sectors is expected to increase dramatically in the coming years and these career opportunities will grow with them (*see State of the Industry*).

Exhibit 9.-Biomedical Occupational Growth 2004-2006

Occupation	2004 Jobs	% of Cluster	Expected Turnover	Growth Rate	Openings
Assemblers & Fabricators	4,859	18.8%	8%	24%	1,530
Medical Lab Technologists	657	2.5%	18%	28%	301
Chemical Technician	211	0.8%	2%	57%	126

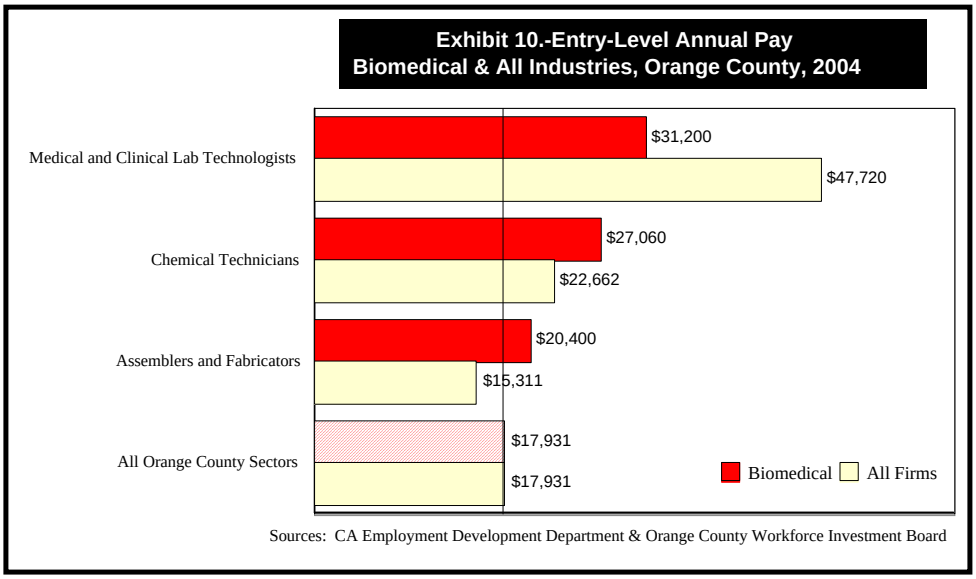
Source: OCWIB, Biomedical Industry Cluster, Labor Market Survey, 2004

It is the production and laboratory (*bench*) skills for these occupations that will form the basis for the OCWIB recommended community college certificate programs. It is the overcoming of deficiencies in the existing workforce and the updating of their skills that open the possibility of long term possibilities in contract education.

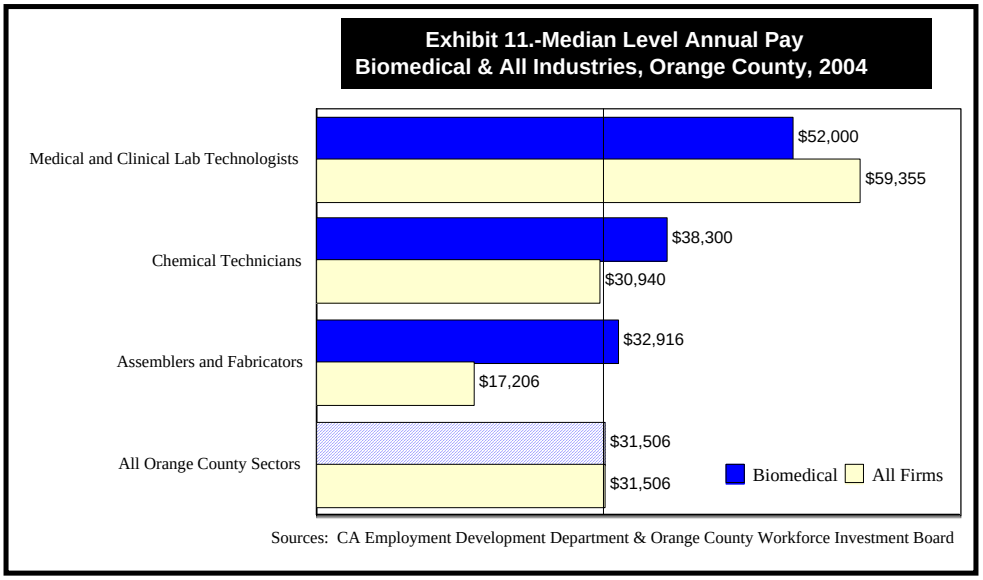
Meanwhile, the pay scales within these occupations compare quite favorably with those of Orange County overall. Medical lab technologists can start at $31,200 in the county's biomedical cluster according to the OCWIB. Chemical technicians can start at $27,600 and assemblers & fabricators can begin at $20,400. In each case, they can earn more money than the average starting salary in all jobs in Orange County (*$17,931*).

Workers in these fields also have opportunities outside of the biomedical cluster. Of these, EDD reports that medical lab technologists can earn higher starting pay in other sectors (*$47,720*). Chemical technicians (*$22,662*) and assemblers & fabricators (*$15,311*) would make less

starting outside of the biomedical cluster. Only the last group would start for less than the county's average starting salary for all jobs (*Exhibit 10*).



At the median pay level, the county's jobs overall level was $31,506. Medical lab technologists compared very favorably with their experienced worker median at $52,000. However, workers in this category had an even higher median of $59,355 in all sectors. Chemical technicians compared favorably as well with their experienced worker median at $38,300. For this category of worker in all sectors, the median was only $30,940. Assemblers & Fabricators roughly matched the county median with their experienced worker median at $32,900. For this category of worker in all sectors, the median was just $17,206 (Exhibit 11).



Career Growth. In looking at the question of training, the OCWIB research indicated that 49% of the Orange County's biomedical employers believe they offer their employees some form of career ladders (*Exhibit 8 above*). However, that research does not elaborate on whether this applies to the jobs being discussed here. This is an area where follow-up research would appear to be necessary.

Job Demand. It has been shown above (*Exhibit 9 above*) that in the 2004-2006 time frame, Orange Counties biomedical companies anticipate increases in employment of 24%, 28% and 57%, respectively in the employment of assemblers & fabricators, medical lab technologists and chemical technicians. Replacement workers to handle turnover are expected to be 8%, 18% and 2% in these job categories.

In this very short run period, these occupations are expected to involve, 1,530 assemblers & fabricators, medical lab technologists 301 and 126 chemical technicians. Meanwhile, every forecast for the sector anticipates that its growth will accelerate over the long run, increasing these demands for workers (*see State of the Industry*).

Industry Training Needs

The following industry training needs information is presented based on its relevancy to the strategic opportunity. These needs were reviewed in the OCWIB research which was specifically designed to determine these requirements and led to the recommendation that the community college undertake certificate programs to fill them.

Skills. The specific skills for which each of the three entry-level occupations needs to be trained include the following: [27]

Assemblers & fabricators working in the biomedical industry must learn production skills as specifically undertaken in the cluster. These skills include:

- Read and interpret engineering specifications from text, drawings, and computer-aided drafting systems
- Use a variety of tools and precision measuring instruments
- Work with engineers and technicians, assembling prototypes or test products
- Work with automated manufacturing systems include applications of robotics, computers, programmable motion control, and various sensing technologies

In addition, the OCWIB research found that these workers need help with such "soft" skills to "conscientious work ethic and positive attitude."

Medical laboratory technologists and chemical technicians need to acquire "bench" skills used in the biomedical industry. These skills refer to those needed to work in laboratory situations and include:[28]

- Cleaning and sterilizing laboratory equipment
- Documenting results of tests and analyses, and writing technical reports or preparing graphs and charts.
- Preparing chemical solutions for products and processes, following standardized formulas or creating experimental formulas.
- Reviewing process paperwork for products to ensure compliance to standards and specifications.
- Analyzing samples of biological material for chemical content or reaction.
- Calibrating and maintaining equipment used in quantitative and qualitative analysis, such as spectrophotometers, calorimeters, flame photometers, and computer-controlled analyzers.

[27] U.S. Bureau of Labor Statistics, Occupational Handbook, Assemblers & Fabricators
[28] CA Employment Development Department, Occupational Profiles, SOC 19-4031, SOC 29-2011

- Conducting chemical analysis of body fluids, including blood, urine, and spinal fluid, to determine presence of normal and abnormal components.

Here again, the OCWIB research specified that the biomedical industry would like people in these occupation groups to develop these skills with specific applicability to their cluster.

Education Requirement. The OCWIB research specifically identified the need for the community colleges to develop certificate programs to train workers in the three occupational categories mentioned here:

- Workers in the assemblers & fabricators groups would be qualified for hiring with a certificate.
- The greater level of training needed for workers in the medical lab technologists and chemical technician positions would require longer training. This would involve sufficient courses to fill the specialty requirements needed for an Associate of Arts degree. They could receive a certificate for completing this work and be qualified to be hired. With the completion of their general education requirements they could also get the Associates of Arts degree.[29]

Training Needs. To gain a better understanding of the local business training needs, we will review the Biomedical Workforce Survey currently being conducted by the Orange County Business Council. The purpose of this survey is to obtain industry input to ensure that innovative education and training programs are developed that address medical device industry needs. A copy of the survey is found in the Appendix. The survey findings will be incorporated into this report when it is complete.

*Training Preferences***.** In the OCWIB research, employers cited the following training practices (*Exhibit 8 above*):

- 97% informal on-the-job training
- 85% formal on-the-job training
- 70% use outside training
- 60% put employees into classroom situations

[29]OCWIB, Biomedical Industry Cluster, pg. 27

- 49% used career ladders
- 46% offer tuition reimbursement

From this list, and the previous discussion about the deficiencies of the current labor force, it was possible to see the industry's potential support for both community college certificate programs and on-site contract education for their existing labor force.

Further research will delve deeper into the extent to which these results open up the possibility of the community colleges providing contract education.

Training Competitors. Currently in Orange County, there is no community college certificate or associate degree programs to address the needs of this strategic opportunity. As assemblers & fabricators have not traditionally needed college training, these are hired as unskilled workers and trained internally. However, the industry would like them to receive certificate training so that they learn the specific production techniques used in the biomedical sector plus have some awareness of such "soft" skills as "conscientious work ethic and positive attitude."

While it is not explicitly stated in the OCWIB study, the fact that medical lab technologists and chemical technicians require Associated of Arts level training, and no training exists in the county, means that they are either handling residents who received their training elsewhere, or are recruiting outside of the county.

The following organizations provide training for higher level occupations but not specifically for the occupations we are proposing to address:

- University of California, Irvine Biotechnology Center
http://darwin.bio.uci.edu/~bio/biotechnology/javasite/home.html

- California State University, Fullerton Chemistry and Bio-Chemistry Department
http://chemsrvr2.fullerton.edu/DeptWebsite/directory.html

- Biological Sciences Department
http://www.fullerton.edu/catalog/academic_departments/biol.asp

- Chapman University Physical Sciences
http://www1.chapman.edu/wilkinson/physci/

Summary

The external Industry Scan conducted by the Orange County Center of Excellence, clearly demonstrates a growing need for training to support the growing occupation of a production and manufacturing employee in the biomedical industry.

The growing occupations are due in part by biotechnology firms receiving a major share of venture capital investments in Southern California and Proposition 71, the $3 billion stem cell research initiative. Orange County is a key center for biomedical researchers and investors.

The job growth projections for the entry-level worker within the Biomedical field are:

- From 2004-2006, the industry expects to need 1,530 more assemblers & fabricators, up 32%, to cover turnover and expansion.

- From 2004-2006, the industry expects to need 301 medical laboratory technologists, up 46%, to cover turnover and expansion.

- From 2004-2006, the industry expects to need 126 chemical technicians, up 59%, to cover turnover and expansion.

An area where follow-up research would appear to be necessary is looking at the question of career growth. The OCWIB research indicated that 49% of the Orange County's biomedical employers believe they offer their employees some form of career ladders (*Exhibit 8 above*). However, that research does not elaborate on whether this applies to the jobs being discussed in this report.

In a Phase 2 Internal Scan, the Orange County Center of Excellence proposes to identify, clarify and recommend methods of engagement and process adaptation that will enable local Community Colleges to respond to this emerging need.

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The Business and Workforce Performance Improvement Initiative is a grant-funded project through the Economic & Workforce Development Program of the California Community Colleges. Our mission is to strengthen California's workforce and advance economic growth through education, training and job development.

APPENDIX A: How to Utilize this Scan

About Us - Description of BWPI:

The Business and Workforce Performance Improvement (BWPI) initiative is focused on building the capacity of the colleges in the area of economic and workforce development to enhance their ability to deliver education and training services to businesses and workers in high growth industries and new technologies.

The Centers of Excellence (COE) within BWPI provide information regarding workforce trends, increasing awareness and visibility about the colleges economic and workforce development programs and services, and building partnerships with business and industry.

The difference this will make to the colleges is that it will position them as the workforce partners of choice to business and industry and ensure that college programs are current and responsive. This will contribute to the overall economic vitality of the communities in which they serve.

How to Use This Industry Scan:

The Centers of Excellence within the Business and Workforce Performance Improvement Initiative of the California Community College Economic and Workforce Development Program have undertaken Industry Scanning to provide targeted and valuable information to community colleges on high growth industries and occupations.

This scan is intended to assist the decision-making process of California community college administrators and planners in addressing local and regional workforce needs and emerging job opportunities in the workplace as they relate to college programs. The information contained in this report can be used to guide program offerings, strengthen grant applications, and support other economic and workforce development efforts.

This report is designed to provide current industry data that will:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development; and
- Promote a future-oriented and market responsive way of thinking among stakeholders.

This Industry Scan included a review of the California Regional Economies Project reports and Employment Development Department (EDD) Labor Market Information (LMID) projections that cover the communities in this region, as well as many other sources as listed.

***Important Disclaimer**:*

All representations included in this Industry Scan product/study have been produced from a secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings. The purpose of the Industry Scan is to assist the California Community Colleges to respond to emerging market needs for workforce performance improvement. However, neither the Business and Workforce Performance Improvement Centers of Excellence, COE host college nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon this study including components or recommendations.