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INTRODUCTION

This report examines the current and future workforce needs of high technology industry employers in San Bernardino County. For this study, the high technology industry was defined as firms categorized into one of the four general industry classifications that included the following NAICS classifications;

- 3254 - Pharmaceutical and Medicine Manufacturing
- 3344 - Semiconductor and Other Electronic Component Manufacturing
- 3345 - Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
- 5417 - Scientific Research and Development Services

Under most industry definitions, this includes employers in the bio-technology, advanced manufacturing, and facets of the computer industry.

The primary research in this report is based on 20 qualitative survey discussions with high technology employers. These qualitative survey discussions allowed us to gather information in an open-ended format regarding the current and future workforce needs of regional high technology employers.

I. FUTURE OF THE INDUSTRY

1. WHERE IS THE INDUSTRY GOING AND HOW WILL CHANGES IN THE INDUSTRY SHAPE THE WORKFORCE?

The first section of the report focuses on the future of the industry, where it may be going, and how changes are anticipated to shape the workforce.

- ***What are the issues/ideas driving your industry? What do you see as the next frontier? The next great breakthrough?***

ISSUES AND IDEAS DRIVING YOUR INDUSTRY

When asked to reflect on the issues and ideas driving their industry, responses generally fell in to one of three categories: economic issues, technology, and environmental and government regulations.

Economic Issues: Ten of the 20 respondents revealed that economic issues were driving their industry. Responses centered on a variety of topics, including the importance of decreasing costs, the impact of high petroleum prices on manufacturing, the trend toward manufacturing moving to low cost locations, the need for flexibility in these changing times, and the ability to adapt and respond to market demand and the rapidly changing international business market.

Technology: Five of the 20 respondents indicated that the need for new technology and better products was driving their industry.



Environment and Government Regulations: Four of the 20 respondents noted that issues related to the environment and government regulations were driving their industry. Two respondents mentioned that government regulations, including Environmental Protection Agency (EPA) requirements, are a hindrance to many businesses. Others noted general environmental issues and the impact of global climate change and the “conflict between development and conservation.”

NEXT GREAT BREAKTHROUGH

Respondents were next asked to think about the next great breakthrough or frontier for their industry. One in five respondents had difficulty providing a response to this question. However, among those who did, responses centered on two themes: technological advances and the development of new equipment and changes in energy production and less dependency on oil.

Technological Advances and Development of New Equipment: Half of all participants indicated that the next great breakthrough would be technological advances and the development of new equipment. Responses were varied, reflecting respondents’ niche or area of focus. Examples include advances in superconductors, electronic equipment, circuitry, sensors, improvements in wireless technology, access to web-based data, infrared communication, bio-engineering, and biological electronics. One respondent summed it up succinctly: “Being able to make things smaller, faster, and reduce the power needs.”

Changes in Energy Production and Less Dependency on Oil: Five of the 20 respondents indicated that the next great breakthrough would revolve around changes in energy production (for example, more advanced solar panels), reducing power needs, moving to materials that are not oil-based, and using less petroleum.

- ***How do you think the future of the industry will impact the skills needed in the workforce?***

When asked how the future of the industry will impact the skills needed in the workforce, responses generally fell in to one of three categories: understanding new technologies, equipment, and automated machinery, improved skills and education, and increased customer service, marketing, and communication skills.

Understanding New Technologies, Equipment, and Automated Machinery: Eight of the 20 respondents indicated that understanding new technologies, equipment, and automated machinery will be essential for the future workforce. Responses varied from understanding specific technologies and equipment, such as nanotechnology and new diagnostics, to increased understanding of computer technology, computer-run machinery, and automated equipment. Related to the development of new equipment, one respondent noted that “Things are getting smaller and that optical and manual dexterity is going to be very important.”

Improved Skills and Education – More Math, Science, Engineering, and Computer Skills: Seven of the 20 respondents mentioned that the future workforce is going to need improved skills and education, especially in math, science, engineering, and computers.



Customer Service, Marketing, and Communication Skills: Five of the 20 respondents noted that there will be a need for increased customer service, marketing, and communication skills among the future workforce.

- Respondents who mentioned customer service skills were fairly general in their response, indicating a need for increased customer service and people skills.
- Respondents who mentioned marketing skills stressed the importance of understanding the target market as well as the ability to discover new business opportunities.
- Respondent who indicated communication skills noted the importance of increased written, verbal, and multilingual skills.



II. IDEAL SKILLS, EDUCATION AND EXPERIENCE NEEDED TO EFFECTIVELY STAFF UP BOTH NOW AND IN 10 YEARS

The next section of the report focuses on the skills, education, and experience needed by San Bernardino employers to effectively staff up both now and 10 years from now.

2. WHAT COMBINATION OF EDUCATION, SKILLS, AND EXPERIENCE WILL BE THE MOST VALUABLE IN THIS INDUSTRY AT EACH LEVEL? WHERE WOULD YOU RANK THE NEED FOR MANAGEMENT EXPERTISE, SCIENCE EXPERTISE, INTERDISCIPLINARY EXPERTISE, ETC

- **Managerial Level:**

Combination of Education and Experience: The majority of San Bernardino respondents (11 of 20) indicated that a combination of education and experience was most valuable in their industry at the managerial level.

Experience is Most Important: Three respondents noted that experience is the most important for managers and that many are often promoted from within the organization.

Combination of Technical Skills, Education, and Experience: Three respondents indicated that a combination of technical skills, education, and experience is needed to be effective.

- **Professional Level:**

Combination of Education and Experience: Similar to the responses for the managerial level, a combination of education and experience was the most frequently cited response for success at the professional level (noted by 7 of 20 respondents). Most respondents mentioned a preference for a Bachelor's degree or higher.

Education is Most Important: Five respondents indicated that education is most valuable for success at the professional level. Many of these respondents mentioned a technical degree, such as engineering and the hard sciences, or a degree specific to their area of specialization or focus.

Broad Range of Skills and Experience: Three respondents noted the importance of individuals at the professional level having a broad range of skills and experience in a variety of areas such as manufacturing, sales, accounting, human resources, and market analysis. One respondent commented that "We are a pretty small company. We need someone who can do a lot of things at the same time, different aspects of the business at the same time."

Knowledge of Confidentiality and Regulations: Two respondents remarked on the importance of knowledge about confidentiality and regulations (for example: the Health Insurance Portability and Accountability Act, HIPAA).



- **Technician Level:**

Education: The majority of San Bernardino respondents (11 of 20) indicated that education is the most valuable at the technician level. Most respondents noted the need for a high school degree, certificate, or an Associate’s degree.

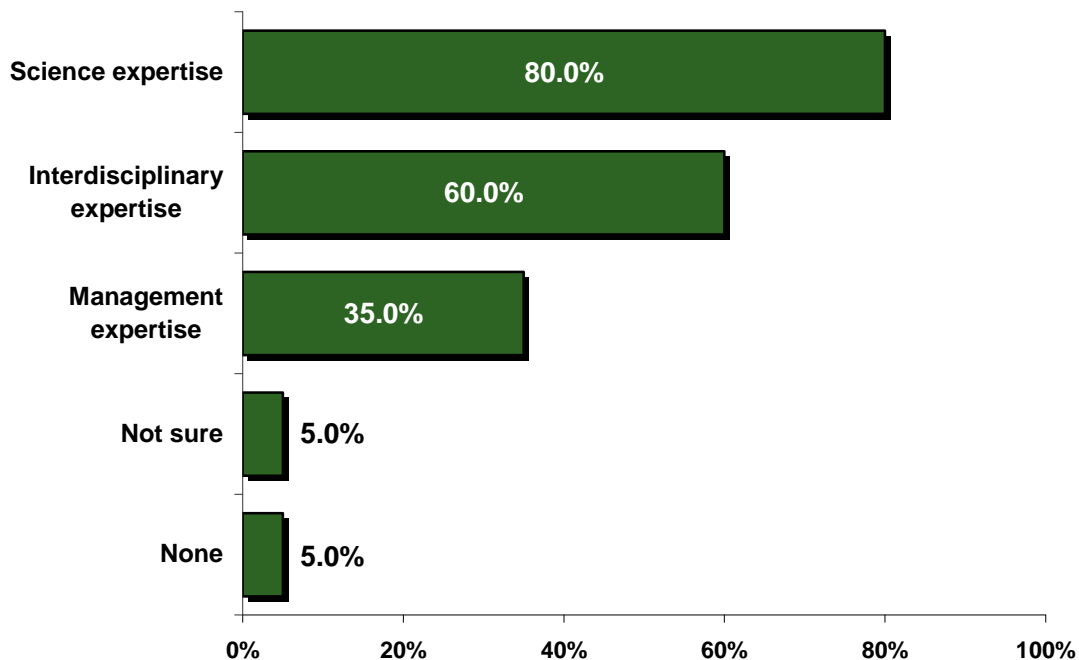
Hands-On/ Technical Experience: Seven respondents remarked that hands-on and/ or technical experience was the most important at the technician level. Two respondents noted that they prefer a technician with a minimum of five years experience, but the rest of the respondents just indicated that experience, hands-on training, or experience working with their specific equipment was preferred.

Be Trainable: Five respondents commented on the need for individuals at the technician level to be trainable and willing to learn. One respondent remarked that “Mainly what I’m looking for when people come in to interview for that type of thing is that they think fast on their feet, are motivated, and are willing to do training.”

GREATEST NEED

When asked where they saw the greatest need, 80 percent of respondents felt that there was the greatest need for science expertise, 60 percent noted interdisciplinary expertise, and only 35 percent indicated management expertise (multiple responses permitted for this question).

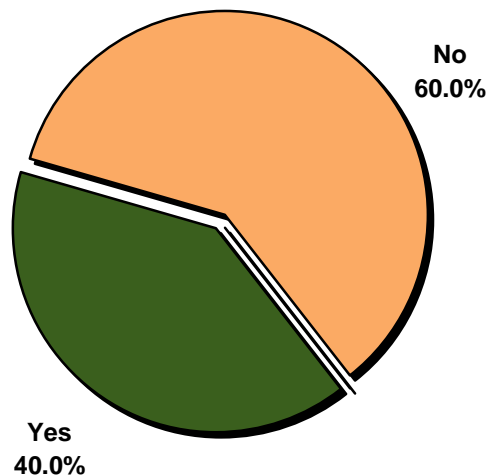
Figure 1 Overall Greatest Need



3. IS THERE A CRITICAL SKILLS SHORTAGE IN THE TYPE OF SKILLS NEEDED FOR 21ST CENTURY INNOVATIVE BUSINESSES – AND IF SO, WHAT SKILLS ARE MISSING AT EACH LEVEL? AT WHICH LEVEL IS ANY GAP MOST CRITICAL?

Overall, 40 percent of respondents indicated that there was a critical skills shortage in the type of skills needed for 21st Century innovative businesses.

Figure 2 Critical Skills Shortage



The responses to follow for each level are among the 40 percent of respondents (8 of 20) who indicated that there was a critical skills shortage.

- **Managerial Level:**

Respondents felt that people skills, understanding and relating to their employees, leadership skills, having a multi-disciplinary background, and hands-on experience and background in their field were the skills missing at the managerial level.

- **Professional Level:**

At the professional level, respondents stressed the importance of an industry specific background and knowledge, education in science and engineering, staying up-to-date in the field, and knowledge of related industries.

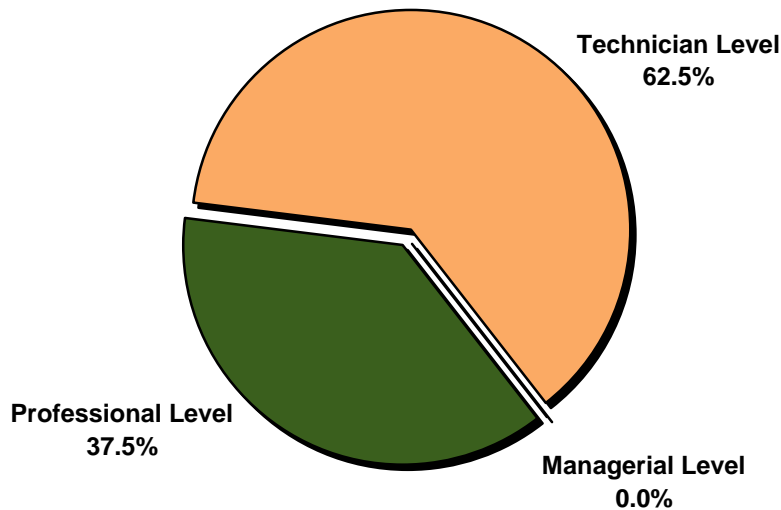
- **Technician Level:**

At the technician level, respondents remarked that individuals need more specific technical knowledge and experience as well as improved language (English and Spanish) and customer service skills to effectively communicate. Respondents also stressed the importance of having a basic education (high school level) and that individuals be trainable and willing to learn the job.

AT WHICH LEVEL IS THE GAP MOST CRITICAL?

Sixty-three percent of respondents in San Bernardino County felt that the gap was most critical at the technician level and 38 percent felt it was most critical at the professional level.

Figure 3 Level at Which Gap is Most Critical



4. WE WOULD BE INTERESTED IN HEARING:

The next series of questions asked respondents to profile effective employees at the manager, professional, and technician levels both today and 10 years from now.

- ***How would you profile today's effective manager?***

The most frequently cited responses to this question centered on managers being good communicators and being knowledgeable in the field. Although only cited by a couple respondents each, other profiles for an effective manager included: being able to lead by example and being an effective leader, being flexible to change with market demand, being innovative and thinking outside the box, and standing up for their ideas and not caving to political pressure.

Below is a summary of the two main themes for an effective manager.

Good Communicator/ Good People Skills: Six respondents indicated that today's effective managers are good communicators and have good people skills, including being responsive to both internal and external customers, having strong customer service skills, being able to relate to their employees, and being able to teach others from their experience.

Knowledge/ Background in the Field: Five respondents remarked that effective managers are knowledgeable in the field and have industry experience or hands-on

project experience. A couple respondents also noted that effective managers have a strong science or engineering background and understanding.

- ***How would you profile an effective manager in 2018?***

Same Qualities as Now: Nine of the 20 respondents indicated that an effective manager in 2018 will have the same qualities as today's effective manager.

Continue to Grow/ Advance with Technology: Five respondents mentioned that managers will need to continue to grow with the times, stay educated, advance with technology, and gain a broader experience base to be effective in the future.

Interpersonal Skills/ People Skills: Similar to the responses for today's effective manager, respondents stressed the importance of interpersonal, communication, and customer service skills for future managers to be effective.

- ***How would you profile today's effective professional?***

Solid Knowledge Base: San Bernardino respondents felt that being knowledgeable in their field and having a strong knowledge base were what most defined today's effective professionals.

Strong Communication Skills: Respondents indicated that today's effective professionals have strong communication skills, interpersonal skills, and a good attitude and personality.

Flexibility, Creative, Proactive, Forward Thinking: Respondents also mentioned that effective professional is flexible in dealing with the changing markets, is creative, and "Someone who is proactive rather than reactive."

- ***How would you profile an effective professional in 2018?***

Same Qualities as Now: Seven of the 20 respondents indicated that an effective professional in 2018 will have the same qualities as today's professional.

Knowledge and Expanding Skills Sets with Technology – Staying Up-to-Date: Many respondents remarked that to be effective in 2018, professionals will need to have increased education, increased knowledge to stay current, and expand their skills sets as technology changes and new technologies emerge.

Multi-Lingual/ Work with Global Market: Although not mentioned by as many respondents as the previous categories, two respondents commented on the need for effective professionals to be able to work in the global market and know more than one language.



- **How would you profile today's effective technician?**

Strong Technical Skills and Knowledge Base: Nine respondents indicated that today's effective technicians are highly skilled and have a strong knowledge base. Specifics included strong electronic and computer skills, hands-on experience, current knowledge of products, and keeping up with their technical trade and developments.

Ability to Communicate/ Interpersonal Skills: Five respondents indicated that effective technicians communicate well and have strong interpersonal and customer service skills.

Willing to Train Others/ Team Player: Three respondents noted that today's effective technicians are willing to train and teach others and act as team players.

- **An effective technician in 2018?**

Same Qualities as Now: Six of the 20 respondents indicated that an effective technician in 2018 will have the same qualities as today's effective technician.

Stay Current with Education/ Constantly Learning: Respondents felt that effective technicians in 2018 will need to stay current with education, adapt to changes, and continue to learn to be more well-rounded and knowledgeable.

Keep up with Technology: Related to the previous category, respondents also indicated that effective technicians in 2018 will need to stay current and be aware of emerging technologies.

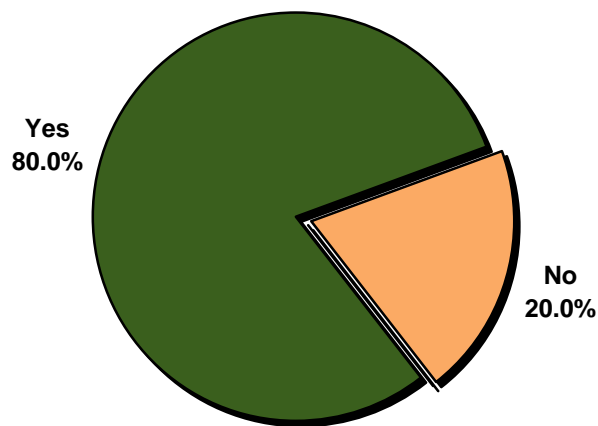
III. LEADERSHIP AND SKILLS GAP ANALYSIS

The next section of the report focuses on leadership and the future skills needed.

5. DO THE CURRENT LEADERS IN YOUR COMPANY HAVE A BROAD SPAN OF KNOWLEDGE THAT CROSSES BEYOND THE SCIENTIFIC FOCUS?

Overwhelmingly, 80 percent of respondents felt that current leaders in their organization have a broad span of knowledge that crosses beyond the scientific focus.

Figure 4 Current Leaders Have Broad Span of Knowledge



- ***What skills will future leaders need to have?***

When asked what skills future leaders will need to have, strong communication and people skills, knowledge in the field and strong technical skills, and being open-minded and visionary were the three areas mentioned by the most respondents. Although not mentioned by as many respondents as the previous three themes, respondents also felt that future leaders would need to have strong marketing skills, a strong understanding of government regulations and how they impact their business, and a solid understanding of the global market and the ability to interact with people in other countries.

Below is a summary of the top three skills that respondents felt that future leaders will need.

Strong Communication Skills, People Skills, and Leadership: Respondents felt that strong communication skills, people skills, and leadership would be very important for future leaders. This included interpersonal communication, strong customer service, the ability to successfully interact with people (both directly and virtually), human resources skills, networking, strong writing skills, listening skills, and emphasis on leadership abilities including the “ability to organize, manage, and delegate.”

Knowledgeable in the Field/ Strong Technical Skills: Many respondents indicated that future leaders would need be knowledgeable in their field and have strong technical skills within their specific area of focus as well as stay up to date with new technologies.

Open Minded – Visionary: Respondents felt that effective future leaders would be open minded and visionary. As one respondent remarked, “they’ll need to be open to new ideas and methods.”

- ***Where will you be looking for the future leaders?***

The majority of respondents indicated that they will look for future leaders directly from **universities**. This included recent college graduates from four year institutions and specialty and technical schools related to their area of focus. A few respondents noted that they will look for the “elite among educational establishments.”

Following universities, the next most popular responses were **professional networks**, **current employees within their organization**, within their own **family** (small family-run businesses), and advertising on major **internet** sites.



IV. EDUCATION REPORT CARD

The next section of the report focuses on educational institutions that have been serving the industry, those that are anticipated to successfully serve the industry, and what educational institutions may need to do to ensure they can meet future industry demands and prepare skilled workers.

6. ARE THERE SPECIFIC EDUCATIONAL INSTITUTIONS OR TYPES OF INSTITUTIONS (E.G. COMMUNITY COLLEGES, FOUR-YEAR UNIVERSITIES, MANUFACTURING TECHNOLOGY CENTERS) THAT HAVE BEEN PARTICULARLY GOOD IN MEETING YOUR SKILL NEEDS? ARE THERE ONES THAT HAVE BEEN BAD?

The first question in this section asked respondents whether there have been any specific educational institutions that have been particularly good, or particularly bad, in meeting their skill needs.

INSTITUTIONS THAT HAVE BEEN PARTICULARLY GOOD

Most respondents mentioned that a university, community college, or technical or specialty school has been particularly good in meeting their skill needs. It should be noted that many respondents mentioned educational institutions in more than one category for this question.

Universities: Twelve of the 20 respondents indicated that four year universities have been successful in meeting their skill needs. Five of the 12 did not provide the name of a specific university. Among those who provided a name, the University of California at Riverside, California State University at San Bernardino, University of Southern California (USC), University of Redlands, Pepperdine University, California Institute of Technology (Cal Tech), California State University at Fullerton, Cal Poly Pomona, and state universities (general) were all mentioned.

Community Colleges: Six of the 20 respondents mentioned that community colleges have been particularly good in meeting their needs. Community colleges specifically mentioned included: Riverside Community Colleges, San Bernardino Community Colleges, San Luis Obispo Community College, Mount San Antonio College, Chaffey College, and Orange Coast College.

Technical and Specialized Schools: Five of the 20 respondents indicated a technical or specialized school. Many respondents provided a general response to this question, such as “the local technical college” or “technology centers,” while a couple respondents specifically mentioned ITT Technical Institute and DeVry University.

INSTITUTIONS THAT HAVE BEEN PARTICULARLY BAD

When asked if any institutions have been particularly bad in meeting their skill needs, 75 percent of respondents indicated “No.” Among the five respondents that indicated “Yes,” two mentioned community colleges (none specifically), one generally mentioned technical colleges, and two mentioned four-year universities. Among the two that mentioned four year universities, USC and Cal Tech were mentioned by one respondent

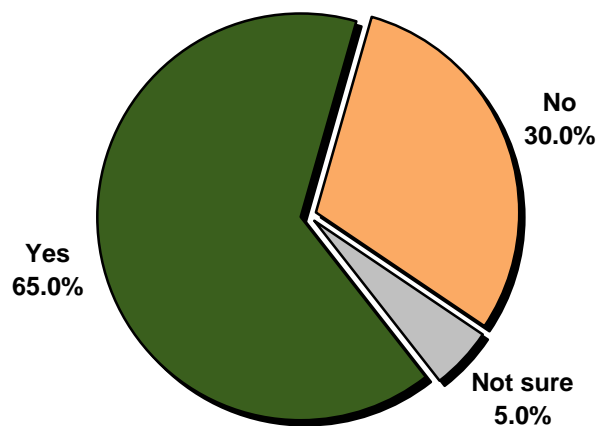


because of the high entry-level pay expectations that graduates expect. Another respondent specifically mentioned Harvard, Yale, Baylor, Berkley, Princeton, Cornell, and Boulder, Colorado because of the politically liberal teachings and atmosphere at the universities.

7. ARE THERE EDUCATIONAL INSTITUTIONS YOU THINK WOULD BE GOOD AT MEETING THE NEW SKILL REQUIREMENTS THAT YOU FORESEE?

Sixty-five percent of respondents indicated that there were educational institutions that would be good at meeting the new skills requirements that they foresee.

Figure 5 Educational Institutions to Meet the New Skill Requirements



Among those who said “Yes,” all respondents either mentioned a four-year university or a technical or vocational school.

Four-Year Universities: The following were specifically mentioned: USC, Cal Tech, University of California at Los Angeles, University of California at Santa Barbara, University of California at Berkeley, University of California at Davis, Cal Poly San Luis Obispo, Cal Poly Pomona, California State University at Fresno, California State University at Chico, Humboldt State University, private schools (general), and state schools (general).

Technical and Vocational Schools: Most respondents provided a general response to this question, such as “technical colleges,” “technical schools,” “vocational places,” and the need to provide more hands-on training.

8. WHAT DO YOU THINK NEEDS TO BE DONE TO ENSURE THAT OUR EDUCATIONAL INSTITUTIONS PREPARE INDIVIDUALS FOR THE SKILLED JOBS YOU SEE IN THE FUTURE?

Respondents were next asked to weigh in on what educational institutions need to do to prepare individuals for the skilled jobs of the future. Responses to this question were much more varied than many of the other questions presented in the discussion.

Forefront of Emerging Technologies: Four respondents felt that it was important for education institutions to “move with the technology” and stay on the “cutting edge of technology,” including providing hands-on training and having the latest lab gear and equipment.

Doing a Good Job/ Continue: Three respondents indicated that educational institutions are currently doing a good job and that they want them to continue along the same path.

Bring Educational Cost Down: Three respondents provided a response related to the need to bring the cost of education down as well as make student loans more easily available.

Better Instruction/ More Challenging Curriculum: Two respondents remarked on the need for more challenging curriculums and better instruction and preparedness for students.

Understand what Industries Need: Two respondents commented on the need to talk more with industries to explore their needs. As one respondent noted “I would suggest that university management and faculty interact more and talk more with people in business...And I'd also like to see more people in academia come from industry -as opposed to coming up through academia. I'd like the see the universities talk to the business leaders and model their programs on their needs -as opposed to their own agendas and models.”



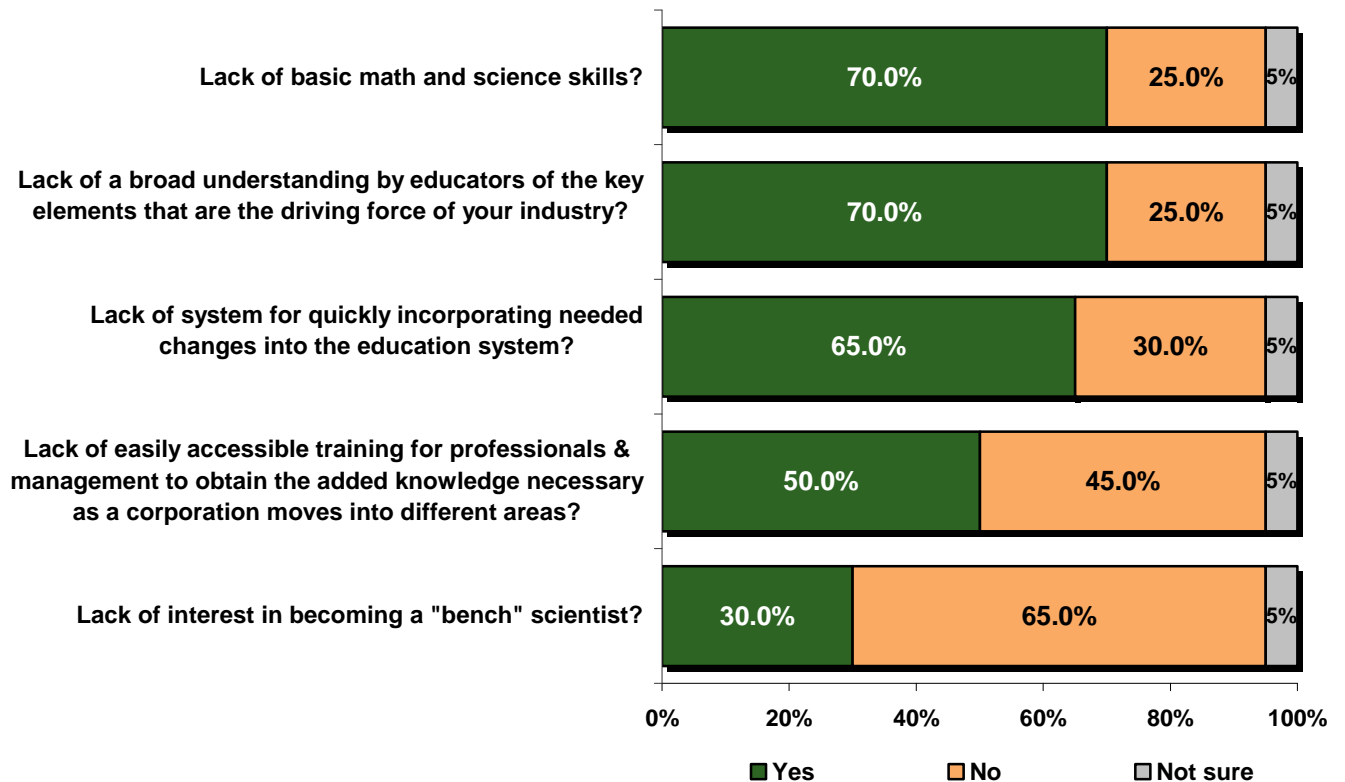
V. PRIMARY CONCERNS & KEY MESSAGE FROM INDUSTRY

The last section of the discussion focused on respondents' key concerns for ensuring a skilled workforce as well as the key message they would like to deliver to California leadership at both the state and local levels.

9. WHAT ARE SOME OF YOUR KEY CONCERNS ABOUT ENSURING A SKILLED WORKFORCE IN THE FUTURE?

Seventy percent of respondents in San Bernardino felt that the lack of basic math and science skills as well as educators' lack of a broad understanding of the key elements driving their industry were their top two concerns about ensuring a skilled workforce in the future (70%). This was followed by the lack of a system for quickly incorporating needed changes into the education system (65%) and the lack of easily accessible training for professionals and management to gain added knowledge necessary to move into different areas (50%). With the exception of lack of interest in becoming a bench scientist, the majority of respondents noted concern with each of the other four areas.

Figure 6 Key Concerns about Ensuring a Future Skills Workforce



10. WHAT IS THE KEY MESSAGE CONCERNING WORKFORCE DEVELOPMENT THAT YOU, AS A EXECUTIVE, WOULD LIKE TO GIVE TO CALIFORNIA LEADERSHIP AT THE STATE AND LOCAL LEVELS?

At the end of the discussion, respondents were asked to reveal the key workforce development message that they would like to give to California leadership.

The majority of respondents (11 of 20) wanted to deliver a message related to the **education system**. Their messages focused on three themes:

- **Improve Basic Education/ Make it More Competitive with Other Countries:** Six of the 20 respondents indicated that they want to pass on the importance of improving basic education in California and making the education system more competitive with other countries.
- **Emphasize Hands-On Training:** Related to improving education, three respondents noted the importance of hands-on education and training in order to produce a highly skills labor force.
- **Keep the Cost of Education Down:** Also related to education, two respondents noted the importance of keeping the cost of education down as well as not reducing funding for education in California.

Alternative Energies and the Environment: Following education, alternative energies and the environment was the next most popular theme among respondents. Responses included the importance of finding a solution to the energy crisis by developing alternative energies, staying persistent with the development of new technology in this area, and addressing the environmental impact of development and growth.

Cost of Doing Business in California: A couple respondents noted the high cost of doing business in California, and especially the impact for small businesses.

Flexible Schedules/ Telecommuting: A couple respondents mentioned the need for increased support of flexible scheduling (one respondent specifically mentioned the need to do away with the eight hour overtime rule to allow for flexible scheduling) and help with telecommuting and opportunities to work from home.



VI. METHODOLOGY

This project was comprised of 20 qualitative survey discussions with high technology employers in San Bernardino County. While qualitative survey discussions are an excellent tool for exploring topics and gathering extensive, in-depth responses, the small sample size and the nature of qualitative research techniques are not meant to result in statistically representative data. Interpretation of qualitative research responses can also be subjective. Prior to writing the report, responses were transcribed and reviewed in their entirety. Responses for each question were then grouped into categories based on their similarities and the themes that emerged.

The table below provides an overview of the methodology utilized for the project.

Table 1 Overview of Project Methodology

Method	Qualitative Survey Discussions (Telephone and In-Person)
Universe	High Technology Employers in San Bernardino County
Number of Respondents	20 High Technology Employers Participated
Average Length	40 minutes
Field Dates	May 29 – June 20, 2008

