SANTA CLARA UNIVERSITY ECONOMIC IMPACT ON THE SAN FRANCISCO BAY AREA

Report from data prepared by ICF International

Executive Summary

As an employer; a generator of revenue; and a hub for students, alumni, and visitors, Santa Clara University's impact is multifaceted and pervasive. The benefits of this impact are bidirectional. SCU leverages its Silicon Valley location to increase educational and career opportunities for students. At the same time, the University contributes to the region by providing skilled knowledge workers, by generating new ideas and technologies, and by advancing entrepreneurial skills.

SCU provides a significant portion of the employees engaged in the San Francisco Bay Area's key employment clusters:

1. IT/Computer Engineering
2. Mechanical and Electrical Engineering
3. Life Sciences

All three clusters are supported by business/financial services and legal services. SCU's business school and law school provide well-prepared graduates in those fields.

Santa Clara's programs, labs, and departments have a direct impact on the three phases of innovation:

1. Applied Research
2. Product Development and Prototyping
3. Technology Commercialization

The University advances entrepreneurship in the Bay Area via the following activities:

1. Instilling an Entrepreneurial Mindset
2. Supporting Startups
3. Accelerating Social Entrepreneurship

Introduction

Universities are powerful engines for economic growth in their regions. They expend in and attract dollars to the region, produce skilled employees for regional industries, seed the economy with new ideas, provide services directly to local firms, and strengthen collaborative linkages in the economy by convening public and private economic actors around issues of shared concern.

Through education, universities prepare the workforce of tomorrow to achieve personal aspirations and become engineers, lawyers, business owners, teachers, life sciences professionals, and more. Degree holders are better prepared to succeed in and adapt to a rapidly changing world. A university education is widely recognized as an investment that pays a lifetime of dividends in the form of better jobs and higher incomes.

Santa Clara University is deeply embedded in—and a major contributor to—the regional economy and its innovation ecosystem. Founded in 1851, in what is now known as Silicon Valley, an area of the San Francisco Bay Area, SCU is the oldest-operating university in California, and one of only a few top-ranking universities in the region. SCU draws about half its students from California. Moreover, SCU has strong links to specific industries and local companies, and it plays an important role in providing midcareer education to professionals working in the region through its part-time and executive education programs.

But Santa Clara University does not simply provide its students a high-quality education. It is directly and indirectly involved in generating employment and revenue through day-to-day operations, student and visitor spending, and—equally important—regional alumni. A high proportion of SCU graduates stay in the region to work and contribute to the regional economy.

The full range of SCU programs and activities has even broader positive impacts on the region (e.g., social, environmental, and community impacts), but this economic impact analysis limits its scope to those University activities with direct linkages to, and impacts on, key industries that drive the regional economy. Thus this report does not exhaustively capture every relevant SCU activity. Its intent is to highlight several representative programs with strong connections to the regional economy.

Regional Context

The Bay Area is an economic powerhouse, with nearly five million jobs and an annual gross regional product (GRP) of $670 billion. Service sector industries (e.g., restaurants, education, health care) provide significant employment in the region, but the Bay Area's competitive advantage lies in its more specialized and export-oriented industries, such as information technology, life sciences, and engineering, and the highly specialized professional services that support them. These are the industries that now drive the regional economy.

In recent decades, Silicon Valley has become a global center of innovation, drawing extraordinary talent and resources to the Bay Area and spawning new scientific and technological industries and trailblazing ventures. Recent analyses have described the region as an "innovation ecosystem" and have increasingly focused on the role that culture and collaborative relationships play in the region's success.

Exhibit 1. The Regional Innovation System
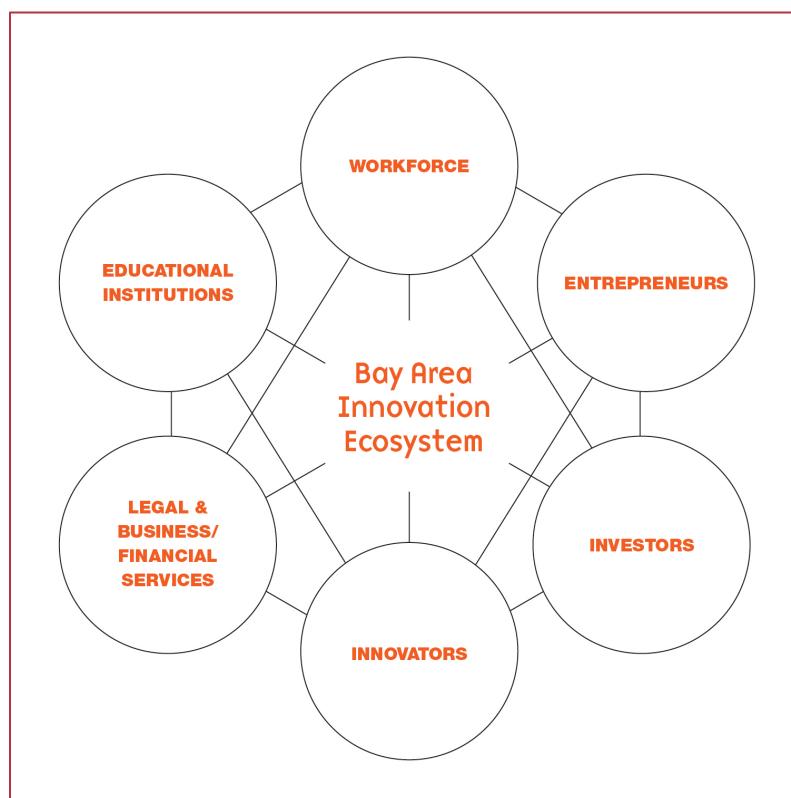
The innovation system functions as a web of network relationships among regional actors—researchers, inventors, educators, workers, investors, accelerators, startups, and large corporations—bound together through a shared culture of creativity, risk-taking, trust, and collaboration.

Since 1851, SCU has worked to meet the needs of the region, educating its residents, collaborating with the important industries of each era, and being responsive to the needs of the community. The benefits of these relationships are bidirectional: SCU leverages its location in Silicon Valley to increase educational and career opportunities for its students and, at the same time, contributes critically to the regional economy by way of skilled workers, new ideas and technologies, and entrepreneurial activity.

At the broadest level, the University's unique educational approach—focused on experiential learning, collaboration, and educating the whole person—has produced graduates with the creativity, independence, problem-solving skills, and ethical grounding to be successful employees in the region, across all industries. In more recent years, as the regional economy has evolved toward high tech, SCU has also evolved its approach to meet the needs of the region's critical industries.

The University has developed degree programs and a number of important programs targeted directly at innovation and entrepreneurship. It has also built a range of strong partnerships and collaborative relationships with important regional firms, industries, and institutions. Contributing to innovation and entrepreneurship are now central to SCU's identity and vision for itself. The University's Integrated Strategic Plan includes, as one of its six strategic goals, "fostering innovation and entrepreneurship in service of humanity."

Fueling the Economy

Santa Clara University has a measurable impact on the San Francisco Bay Area because of its current employees, students, and investments, and the thousands of alumni it has prepared for the workforce. The resources invested in creating a thriving intellectual community benefit the Bay Area immediately and continue to provide economic benefits when students receive their degrees. In this assessment of the University's economic impact, two types of economic impacts are presented: the impacts generated by University-related expenditures and the impact of earnings of Santa Clara alumni that are attributable to their degrees.

Direct spending by Santa Clara University, faculty, staff, students, and visitors is the most obvious economic impact of the system. Not only does the University purchase goods and services from local businesses, but it is also an important employer. Direct spending by the University—its operations, visitors, and students—and the multiplier effect of this direct spending is a major part of the University's overall regional economic impact.

The University-related expenditures for wages and salaries; capital equipment and supplies; visitor spending to attend sports events, conferences, and tours of the campus; student spending on textbooks, transportation, meals, housing, and personal expenses; and an array

of other items related to the University's educational mission for the 2013–2014 academic year totaled $474.01 million. Within Santa Clara County alone, University operations and capital expenditure, coupled with student and visitor spending, create an annual impact of $606 million, which supports 4,330 jobs and $300 million in labor income.

Exhibit 2. Direct Spending by Spending Category

Category	Amount ($ Millions)
Santa Clara University Operational Expenditures*	$278.30
Capital Costs	41.07
Auxiliary Spending	20.09
SUBTOTAL	**$339.46**
Student Spending	99.34
Visitor Spending	35.21
TOTAL	**$474.01**

Includes Jesuit School of Theology
Source: ICF Analysis of visitor count and student spending, and expenditure data provided by SCU

Within Santa Clara County and across the Bay Area, Santa Clara University operations and capital expenditure, coupled with student and visitor spending, contribute $34.6 million in state and local tax revenue. The majority of the impact—more than $31 million—is felt within Santa Clara County itself. Santa Clara University operations and capital expenditures, when coupled with student and visitor spending, create a total Bay Area annual impact of nearly $664 million, which supports 4,600 jobs, $320 million in labor income, and generates over $34.5 million in annual taxes for state and local governments.

But one way that the full economic impact of Santa Clara University can be estimated is by focusing on the higher earning power of its graduates. In 2013–2014, it was estimated that 41,300 Santa Clara bachelor's and master's alumni were living and working in the Bay Area. They contribute an estimated $2.6 billion in wages to the regional economy, of which an estimated $872.3 million is enhanced earnings power that can be attributed to

> Santa Clara University–related expenditures *plus* the enhanced earnings of graduates in the workforce:
>
> • Generate a $1.2 billion total annual spending impact in the Bay Area
> • Support more than 8,220 jobs in the Bay Area
> • Create $72 million in tax revenue for the state and local governments

their Santa Clara University degrees. Of this, $674.3 million is attributable to undergraduate-degree alumni incremental earning power, and $198 million is attributable to graduate-degree alumni incremental earning power.

Thus, when all impacts are considered together, including the enhanced earning power of Santa Clara alumni, the combined annual impact of Santa Clara University is $1.2 billion on the Bay Area economy. This level of economic activity supports roughly 8,220 jobs annually in the region and generates $72 million in annual tax revenue for state and local governments. Of this, University-related spending enabled 56 percent of the total jobs created, and alumni earnings accounted for the remaining 44 percent of job creation.

Expanding the Workforce

Santa Clara University has leveraged its geographic location and its approach to education to become a key institution for supplying graduates to the region's top industries. In this way, SCU graduates help sustain the Bay Area economy and lay the foundation for new growth.

SCU provides high-quality, rigorous education broadly as well as specifically in programs of study that align with the region's top industries. SCU encourages graduate and undergraduate students to engage in critical, on-the-job learning by leveraging internships—for-credit, in-the-field positions that afford real-world experience—across Silicon Valley, further enriching student learning and increasing a graduate's appeal to employers. SCU produces successful graduates across a diversity of key industries. The majority of graduates remain in the Bay Area to live and work.

Workforce Demand: Snapshots of the Bay Area Economy

The average annual wage in the Bay Area is a little more than $80,000, compared to a little more than $60,000 across the state, which is indicative of an economy that is driven by both knowledge workers and a robust labor market that offers workers a wage premium. The Bay Area, and more specifically Silicon Valley, is known worldwide as a significant producer of goods and services tied to the knowledge economy/IT cluster.

An employment cluster is a geographic concentration of interconnected occupations, businesses, suppliers, and associated institutions that may span several industries. IT clusters are particularly dynamic in that they drive the prosperity in today's economy. They typically have a core set of universities and/or research centers that are critical to their development, in part due to the role that universities play in supplying a skilled workforce. Silicon Valley is the prototypical IT cluster.

The Bay Area exports $111.7 billion more goods and services than it imports and has continued to gain in overall size and competitiveness. Between 2010 and 2014, the number of jobs across the economy grew by almost 12 percent, and many of the economy's key export industries are highly competitive.

The Region's Key Industries

When identifying important drivers of a regional economy, the location quotient (LQ)—or proportion of employment relative to other parts of the country—is one of the strongest metrics for defining a regional industry, occupation, or cluster as competitive against other regions. An LQ value greater than 1 corresponds to an above average concentration or cluster, compared to the national average, indicating that the region is more specialized in that field than other regions and has a strong basis for competitive advantage.

Exhibit 3 shows that some of the largest industries are in the service sector (e.g., restaurants, education, health care, local government, and real estate). It also shows that these industries, not known to be particularly export-oriented, generally have lower LQs, indicating their lack of specialty in the Bay Area. The exhibit also demonstrates the prominence of the more competitive industries that the Bay Area is known for, such as computer systems design; management, scientific, and technical consulting services; and financial investment activities, all of which have robust growth rates and LQs of greater than 1.

Exhibit 3. Bay Area Top 10 Industries by Size or Total Employment

Industry Description	2014 Jobs	% Change 2010–2014	2014 LQ
Restaurants and Other Eating Places	267,533	19%	1.01
Education and Hospitals	177,785	0%	0.79
Computer Systems Design and Related Services	169,716	30%	2.89
Local Government, Excluding Education and Hospitals	143,542	(1%)	0.97
Personal Services	129,470	272%	2.12
Management, Scientific, and Technical Consulting Services	106,522	16%	1.82
Other Financial Investment Activities	103,969	29%	1.23
Services to Buildings and Dwellings	101,008	10%	0.97
Lessors of Real Estate	99,352	22%	1.03
Activities Related to Real Estate	94,479	11%	1.46

Source: Economic Modeling Specialists Intl.

In determining a region's top industries, more important than the size of the industry is its competitiveness and growth rate. Exhibit 4 shows a separate set of industries that have the highest LQs. The region's most competitive industries are computer and communications-related manufacturing, IT, software development, and other scientific research, all with LQs more than 3.2, indicating a specialization of three times the national average. Many of these industries also have strong recent growth trends.

Exhibit 4. Top 10 Industries by Competitiveness

Industry Description	2014 Jobs	% Change 2010–2014	2014 LQ
Computer and Peripheral Equipment Manufacturing	52,004	23%	11.56
Other Information Services	56,131	118%	7.40
Manufacturing & Reproducing Magnetic and Optical Media	3,898	10%	7.10
Semiconductor & Electronic Component Manufacturing	52,503	5%	5.29
Communications Equipment Manufacturing	11,964	(12%)	4.50
Beverage Manufacturing	24,575	19%	4.45
Software Publishers	35,947	24%	3.89
Natural Gas Distribution	11,343	14%	3.74
Scientific Research and Development Services	64,239	19%	3.47
Audio and Video Equipment Manufacturing	1,843	83%	3.29

Source: Economic Modeling Specialists Intl.

The Region's Key Occupations and Employment Clusters

As discussed, to comprehend how these industries relate to the region's workforce demands, it is useful to assess the region's key occupations and, in turn, the employment clusters. Exhibit 5 shows the regional occupations with the highest LQ, i.e., those that are most concentrated in the region.

The data presented in Exhibit 5 point to the success of the region's key employment clusters:

- IT/computer engineering, including key occupations: computer hardware engineering, IT R&D, and software engineering

- Life sciences, including biomedical engineers, medical scientists, microbiologists

- Mechanical and electrical engineering, including aerospace engineers, electronics engineers, and electro-mechanical technicians

Individually, all of these occupations have significant regional specialization and robust growth.

Exhibit 5. Top 15 Occupations by Competitiveness

Occupation	2014 Jobs	% Change 2010–2014	2014 LQ
Computer Hardware Engineers	13,457	20%	5.82
Semiconductor Processors	2,923	(3%)	4.74
Computer and Information Research Scientists	3,313	31%	4.62
Biomedical Engineers	2,296	20%	3.96
Physicists	1,859	16%	3.85
Software Developers, Systems Software	42,240	27%	3.82
Aerospace Engineers	6,669	6%	3.38
Solar Photovoltaic Installers	643	48%	4.05
Electronics Engineers, Except Computer	12,799	13%	3.34
Medical Scientists, Except Epidemiologists	9,801	16%	3.42
Sales Engineers	6,181	21%	3.19
Microbiologists	1,800	14%	3.21
Parking Enforcement Workers	766	(1%)	2.78
Electro-Mechanical Technicians	1,155	4%	2.60
Software Developers, Applications	56,692	34%	2.97

Source: Economic Modeling Specialists Intl.

Understanding the regional industry and employment trends is critical to anticipating the regional workforce demand. Key demand trends include:

• Many of the occupations in the IT cluster are four times more concentrated in the Bay Area than across the country, and yet they continue to grow as much as 5 to 6 percent annually.

• Occupations in the life sciences cluster are three times more concentrated in the Bay Area and are growing at 3 to 4 percent annually.

• Occupations in the mechanical/electrical/aerospace engineering cluster are two to three times more concentrated in the Bay Area and are growing at 1 to 2 percent annually.

These occupations drive the regional economy and provide employment opportunities for SCU graduates who are trained to excel in these areas of expertise.

Workforce Supply: SCU Students and Graduates

No matter their disciplinary focus, SCU graduates are known to be well rounded, creative, collaborative, and ethically minded. SCU's orientation toward social justice stems, in part, from its Jesuit tradition that strives to cultivate a student's intellectual, aesthetic, moral, and spiritual values. The University's commitment to educating the whole person is a differentiator when SCU graduates enter the labor market. According to a survey conducted in 2015 of graduates six months post-graduation, 86 percent of graduates looking for full-time work were successful. Of those working full time, 88 percent indicated that their SCU education provided good to excellent preparation for their careers.

SCU Undergraduate Profile

Santa Clara University supports learning across a broad array of study areas as well as a diversity of student background. In fall 2014, student enrollment at SCU was just more than 9,000, with about 5,500 undergraduate and 3,500 graduate-level students. Per the University's Integrated Strategic Plan, Santa Clara will increase its student undergraduate enrollment from about 5,500 in 2014 to 6,000 by 2024, about 10 percent. Most of this increase will be in the STEM disciplines.

SCU encourages students to participate in internships to gain on-the-job skills. According to the survey of the SCU graduates from the classes of 2007-2014, 67 percent of graduates participated in at least one internship during their time at SCU, and 35 percent of respondents indicated participating in at least two internships. Twenty-seven percent of respondents were employed after graduation by the employer for whom they interned, demonstrating the importance of these internships, both in terms of market-based training and the industry connection they provide.

SCU Graduate Profile

Specific graduation numbers vary year-over-year, but general trends have been largely consistent for the past 10 years. Thus these figures can be interpreted as typical of annual graduates.

According to SCU, for the 2014–2015 academic year, 1,403 students received their bachelor's degree in 2015. Fifty-eight percent of bachelor's degree graduates were from the College of Arts and Sciences, 29 percent were from the Leavey School of Business, and the remaining 13 percent were from the College of Engineering.

In 2015, SCU graduated 1,256 master's or professional degree graduates, including 263 from the law school, 342 from the business school, 345 from the engineering school, 56 from the Jesuit School of Theology, and 139 with certificates in business or education and counseling psychology.

Exhibit 6 provides additional granularity on the disciplines of focus for SCU graduates at both the bachelor's and master's levels.

Exhibit 6. SCU Completions, Top 20 Programs, 2013

Education Program	SCU Completions
Law	323
Business Administration and Management, General	314
Accounting	193
Finance, General	141
Speech Communication and Rhetoric	123
Computer Engineering, General	119
Psychology, General	86
Marketing/Marketing Management, General	83
Political Science and Government, General	78
Engineering/Industrial Management	71
Counseling Psychology	70
Mechanical Engineering	64
Educational Leadership and Administration, General	56
Biology/Biological Sciences, General	55
Economics, General	51
Electrical and Electronics Engineering	51
Civil Engineering, General	44
English Language and Literature, General	38
Sociology	33
Education, Other	32

Source: Economic Modeling Specialists Intl.

By grouping graduation discipline data by likely occupation, we can estimate the number of graduates SCU contributes to each occupation on an annual basis. Exhibit 7 provides 2013 completion figures for occupations that have more than 100 graduates.

Exhibit 7. Completions by Occupation, 2013

Occupational Cluster	Completions
Business and Financial Services	756
Legal Services	323
Mechanical & Electrical Engineering	230
IT/Computer Engineering	157
Psychology/Counseling	156
Speech Communication and Rhetoric	123
Life Sciences	120

Source: Economic Modeling Specialists Intl.

These data show that occupations related to business and financial services, law, mechanical/electrical engineering, IT/computer engineering, and life sciences stand out as strong disciplines for SCU graduates, demonstrating that the University is producing graduates well matched for the region's key occupations and employment trends.

Industry Profiles: SCU Impacts on 5 Key Regional Industries

Student enrollment and graduation data provide only a snapshot of what SCU graduates are trained to do. More important—and more impressive—is the work that SCU alumni actually do in the region. SCU alumni contribute to well-known regional companies, such as Cisco, Apple, Google, Oracle, Lockheed Martin, and HP, and to dozens of Silicon Valley startups.

As discussed, the Bay Area's economic success is dependent on the growth and specialization of its core employment clusters. To remain competitive, each cluster relies on a highly skilled, adaptable workforce. While SCU produces graduates supporting a wide range of industries, including teaching and counseling, the focus of this report—how the University supports the export-oriented clusters that drive the Bay Area economy— involves examining the clusters themselves as well as the related professional support-services industries. The core clusters are:

• Information Technology/Computer Engineering

• Mechanical and Electrical Engineering

• Life Sciences

• Business and Financial Services: Accounting & Finance

• Legal Services

The sections below give detail about these five industry clusters and highlight contributions that SCU is making to these drivers of the regional economy.

Information Technology/Computer Engineering

The Bay Area's IT/computer engineering cluster is a vital part of California's economy, with the computer systems design industry and related services comprising the largest employment subsector. More than 553,000 computer programmers, software developers, engineers, and technicians work in these regional industries. On average, these industries have grown 14 percent between 2010 and 2014 and have a regional LQ of 2.76, indicating a high level of regional specialization, which mirrors the image of Silicon Valley.

SCU's computer engineering program is particularly robust and well established, and it has strong ties to Silicon Valley through internship programs, corporate sponsorships, and a strong network of alumni who have launched startups or joined tech firms in the region. Computer science and engineering is a key discipline at all levels of study—engaging about 28 percent of undergraduate, 46 percent of graduate, and 45 percent of Ph.D. students at the School of Engineering in 2014–2015. The program's popularity has continued to grow in recent years. SCU offers a five-year combined CSE bachelor's/master's program as well as unsurpassed opportunities for students to engage in internships and cooperative education with industry partners across the region.

Chris Malachowsky '86—M.S. in Computer Engineering, Co-Founder of NVIDIA

When Chris Malachowsky enrolled in SCU's graduate program, he was looking for a curriculum to bridge the gap between his theoretical knowledge from undergraduate studies and the real-world challenges he was facing in his job, designing minicomputers for industrial use.

His master's studies provided that and more. Malachowsky was able to put the applied engineering skills and knowledge garnered from his master's degree to further use a short time later, in 1993, co-founding NVIDIA, the innovative Santa Clara-based computer graphics company with a worldwide reputation for engineering and product excellence.

"I think the fact that I got a solid and diverse understanding of the practical aspects of engineering at Santa Clara enabled me to be a more effective manager, leader, and entrepreneur," Malachowsky says. And, he adds, "SCU, in the heart of Silicon Valley, was the perfect location for learning, as nearly everyone involved with the program had ties to the great breadth and concentration of innovative technology companies that the area is famous for."

While a smaller program overall, the bachelor's degree in Web design and engineering offers an interdisciplinary education that blends the technology of computing with preparation in the aesthetics of graphic design and user-interface design to deliver engaging multimedia content for the Web. As the IT cluster continues to grow rapidly and competition for talent increases, many big firms are actively cultivating relationships with SCU, sponsoring events, getting involved in student organizations, and recruiting graduates.

Santa Clara University is an important contributor to the advancement of these fields. According to regional education completion data for both bachelor's and master's degrees, SCU produces 32 percent of the region's computer engineering graduates. This high figure illustrates SCU's significance to the workforce supply in this region that is known for dynamism in IT.

In recent years, SCU graduates in computer engineering increasingly pursue employment with startup firms in the region, where once they were predominantly being hired by the larger, established technology firms. This is reflective of broader changes in the Bay Area economy and is also a sign of the University's expanded role in the region's entrepreneurial activity. That said, SCU is still the No. 2 institution, behind San Jose State University, as a source of recruitment by Cisco. According to LinkedIn statistics, more than 4,300 SCU graduates in IT-related fields work in the Bay Area, with more than 200 at Cisco, about 150 at Apple, about 100 each at Oracle and HP, and more than 50 at Intel and Google. Last, as information technology is being used in all industries across the economy, recruitment of SCU IT professionals is now coming not only from tech firms but also from companies across the economy, as diverse as health care (Kaiser) and apparel (The Gap, etc.).

Mechanical and Electrical Engineering

The non-IT-related, mechanical/electrical engineering cluster has nearly 70,000 workers, and grew 7 percent from 2010 to 2014. In addition to serving the engineering services industry, the region's engineers support a broad range of R&D and the aerospace industry.

In 2014, the School of Engineering had more than 900 undergraduates enrolled and more than 770 pursuing master's and doctorate degrees. In 2016, the School of Engineering enrollment had grown to more than 1,000 undergraduates and more than 925 pursuing master's and doctorate degrees.

SCU's mechanical engineering program has robust connections to Silicon Valley's aerospace and robotics industries. The University has long-standing collaborative research relationships with major regional institutions such as Lockheed Martin and NASA Ames. As part of its partnership with Lockheed, SCU developed four customized master's of science programs to support staff professional development, based on the needs of the Lockheed Martin

engineering staff. These industry partnerships prepare students for jobs post-graduation by tying student learning to real-world industry operations.

In 2014, SCU graduated 469 undergraduates, 440 master's degree, and 22 Ph.D.-level graduates from the School of Engineering, excluding graduates in IT and life science-related fields. Key disciplines include:

- Mechanical engineering: 267 graduates
- Electrical engineering: 178 graduates
- Engineering management and leadership: 126 graduates

Although engineering management and leadership may be the smallest of the top three programs, according to regional education completion data, SCU graduates 20 percent of the regional graduates in this field, demonstrating its regional significance. Moreover, engineering graduates report that they are very satisfied with the education they received at SCU.

According to the Survey of Recent Graduates, Class of 2015, nearly 89 percent of engineering respondents reported that SCU provided good to excellent preparation for their careers.

According to LinkedIn statistics, almost 7,400 SCU graduates in engineering fields work in the Bay Area. Top firms include Cisco, with more than 300 graduates; Apple Computer and Lockheed Martin, with about 150 graduates each; and Oracle, Intel, and SSL, with about 100 each. The text box includes a small sampling of School of Engineering alumni who have founded tech startups or risen to senior management positions within major technology firms in the region.

> **SCU Engineering Alumni Impacting Silicon Valley Tech**
>
> **William Carter '71, '95** – Xilinx fellow, former CTO of Xilinx
>
> **Frank Cepollina '59** – Deputy associate director for the Hubble Space Telescope Development Project at NASA, member of the National Inventors Hall of Fame
>
> **Patrick Gelsinger '83** – President and COO of EMC Information Infrastructure Products at EMC Corp., former CTO and vice president of Intel Corp.
>
> **Rick Justice '71** – Executive advisor, office of the chairman, CEO of Cisco Systems
>
> **Jack Kuehler '54, '86** – Former president of IBM Corp., National Academy of Engineering member
>
> **Chris Malachowsky '86** – Co-founder of NVIDIA (See profile in box on Page 12)
>
> **Gordon Stitt '80** – Founder of Extreme Networks, CEO of Nebula
>
> **Jayshree Ullal '86** – President and CEO of Arista Networks, former senior V.P. of Cisco
>
> **Amin Zoufonoun, '98, '01** – Director, corporate development, of Facebook

Life Sciences

As new discoveries increase the importance of life sciences, the Bay Area has been at the forefront of research, pharmaceutical production, health care, and biotechnology.

Nearly 20,000 workers are employed in the life sciences/biomedical field, and an additional 163,000 are employed in health care in the Bay Area. The life sciences workforce has grown an impressive 17 percent from 2010 to 2014.

Bioengineering is among the fastest growing segments of engineering today, sitting at the intersection of engineering, the life sciences, and health care. SCU bioengineering has seen a six-fold increase in enrollment since 2008. SCU offers both undergraduate and master's of science programs focused on medical devices/bioinstrumentation and molecular/cellular bioengineering. This emerging field is also one of the most diverse programs at SCU, with nearly half of enrollees being women, a far higher proportion than most engineering programs.

SCU has a strong undergraduate program in the mathematics and natural sciences cluster in the College of Arts and Sciences, as well as bioengineering in the School of Engineering. According to department enrollment estimates, there are 1,121 undergraduate students majoring in programs within the mathematics and natural sciences cluster. Biology is the largest discipline, followed by biochemistry and chemistry, and public health. Within the School of Engineering in 2014–2015, 15 percent of undergraduate and 4 percent of graduate students were enrolled in the bioengineering program. Students have opportunities to participate in research collaborations with notable California-based institutes, such as U.C. Berkeley, U.C. San Diego, Scripps, and Stanford as well as national and international partnerships.

According to LinkedIn statistics, more than 1,000 SCU graduates in biological/biomedical fields work in the Bay Area, with alumni employed at biotechnology giants such as Genentech, health care providers such as Kaiser Permanente, and academic institutions such as Stanford and UCSF.

Business and Financial Services: Accounting & Finance

The business and financial services cluster has more than 300,000 workers in the Bay Area, driven by high employment in management and consulting, accounting, and investment subsectors. On average, these industries have grown by an impressive 20 percent between 2010 and 2014. This cluster has a modest LQ of 1.18, demonstrating a slight specialization in the Bay Area. Still this sector is incredibly relevant because it contributes to other industries across the economy, including the IT cluster.

Santa Clara University is an important contributor to quickly growing and in-demand fields, with 350 bachelor-level graduates in addition to 345 master's or professional-level graduates (i.e., MBAs, Executive MBAs and J.D./MBAs) in 2013. According to regional education completion data for both bachelor's and master's degrees, SCU graduates 43 percent of the regional graduates in accounting, 42 percent of the regional finance graduates, and 30 percent of the regional marketing/marketing management graduates, again demonstrating its importance to the region's supply of business-related workforce.

Since 2007, 64 percent of respondents reported that SCU's business program provided "very good" or "excellent" preparation for life after college. Eighty-one percent of graduates had full-time employment six months after graduation, compared to 62 percent University-wide. Furthermore, 88 percent of accounting students had full-time employment.

According to LinkedIn statistics, almost 9,000 SCU graduates in business-related fields work in the Bay Area. Top employers include Cisco, with more than 200 graduates, and Apple Computer, Oracle, and Google, with about 100 graduates at each. These top firms further prove the point that the business services cluster contributes to other industries in the Bay Area economy, notably the IT cluster, and that SCU's geographic location in the heart of Silicon Valley provides a critical opportunity for its business school graduates to take advantage of the University's strong relationships with regional firms.

> **What employers are saying…**
>
> "Santa Clara continuously provides high quality students ready to go into the workforce. The accounting background they gain at SCU gives them a solid foundation to start their career in public accounting. The accounting knowledge combined with their enthusiasm and preparation for the process makes them stand out."
>
> *Deloitte LLP*

Legal Services

This cluster has nearly 51,000 workers in the Bay Area; the majority—nearly 27,000—is lawyers. The industry's growth rate is relatively static, but legal services contribute significantly to other industries across the economy, including, and notably in the Bay Area, the information technology and life sciences clusters.

Santa Clara University School of Law is an important contributor of regional lawyers, graduating 218 lawyers in 2016, of which the vast majority has remained in the Bay Area to work. According to regional education completion data, Santa Clara Law graduates comprise 20 percent of regional law graduates. Moreover, SCU graduates are well prepared for the regional workforce. According to the National Association of Law Placement (NALP) Summary Report for the Class of 2014, more than 65 percent of the class had full-time employment upon graduation. Nearly 50 percent is working at law firms, 36 percent at regional businesses, and nearly 9 percent in the government sector.

One reason Santa Clara Law graduates are so employable is that the school's fields of study closely track regional trends, both commercially and in government and public interest. In today's economy, the latter equates to IT-related legal services. Santa Clara Law has developed partnerships with companies like Adobe and Cisco to support a pipeline of highly qualified talent with a clear understanding of the broad range of legal services needed by IT companies. Santa Clara Law also provides students the opportunity to engage in internships with regional firms. In any given academic year, about half of law students engage in an internship. Opportunities exist across a broad range of areas, including industry, law firms, government, and public interest/nonprofit.

SCU aims to train its graduates to serve the institutions and companies in the region. Thus it is often referred to as the Law School of Silicon Valley, both internally and by local law firms. SCU is nationally recognized as having a top-ranked intellectual property law program (No. 3 in the country in 2013, per *U.S. News & World Report*). This specialty becomes apparent when looking at where Santa Clara Law students were employed during the summer of 2014. According to the summer employment survey, nearly 31 percent worked in the technology sector (focusing largely on patent prosecution, IP transactions, commercial agreements, and privacy), 15 percent worked in criminal law (prosecution and defense), and 8 percent worked in general civil litigation. Public interest and environmental, land use, and real estate services each had about 3 percent of the summer employment.

Scott Shipman '99

The Silicon Valley startup was 70 employees strong—and growing—when Scott Shipman was an intern at eBay in the summer of 1998. Shipman, interning for credit through Santa Clara Law, found himself dividing up the legal baskets with the company's one lawyer, from user agreements and domain names to privacy policy, Internet advertising, and commercial agreements. That fall the company went public—the eBay explosion was underway. Shipman went back to classes but also kept his job, and after law school signed on with eBay as a full attorney. During his years at eBay, Shipman rose through the ranks of its legal department, ultimately serving as associate general counsel and global privacy leader.

About 5,500 Santa Clara Law graduates work in the Bay Area, across the regional economy in law firms, in the technology sector, and in government and public interest/nonprofit. Many Santa Clara Law graduates work at top-tier regional law firms, such as Cooley Godward Kronish, and Wilson Sonsini Goodrich & Rosati, which are the two biggest employers of Santa Clara Law alumni. Santa Clara Law graduates also populate the top ranks of Silicon Valley legal departments. Hundreds of SCU alumni work in-house at many of the top corporations in the region, including eBay, Cisco, and Facebook. Among the lawyers at Apple, SCU is the most represented school, with more alumni than any other regionally or nationally known law school, according to a 2015 article in *The Recorder*. And many alumni have become judges and district attorneys in the Bay Area. About one-third of judges in Santa Clara County are SCU alumni.

Driving Innovation

For this report, the term "innovation" is used broadly to refer to a process that brings together various novel ideas in a way that has a positive impact on society through the development of new technologies and solutions. In recent years, use of the term innovation has been extended considerably beyond traditional areas of economic development and business to the domain of social impact. As such, this chapter highlights SCU activities that support both traditional technology/commercial innovation (i.e., typically aimed at profit) and innovations targeting social impact (i.e., focused on developing novel solutions to social challenges.)

At a simplistic level, innovation is able to reach the marketplace and be diffused through society by passing through three phases: research, then development, then commercialization.

The research phase can include both basic research (which has no practical end goal in mind) and applied research, which is the application of scientific research methods to solve practical real-world problems. The development phase involves taking new research discoveries and developing new products or technologies, often through a process of iterative prototyping. The commercialization phase introduces the new product into the market and involves a range of activities including legally protecting the product's underlying intellectual property, identifying target markets, and marketing the product to consumers.

While there are many ways that SCU contributes to innovation in the region, this report highlights some University programs, labs, and departments that have a particularly direct impact on each of these three phases: applied research, product development and prototyping, and technology commercialization.

Applied Research

SCU's School of Engineering is the campus center of applied research, with several departments, research centers, and labs serving as dynamic drivers of technology innovation and corporate collaboration. In addition to providing skilled engineering graduates that work in the region's technology industry, SCU strengthens the region's capabilities in applied research through:

- **New Technology Development:** SCU faculty are at the forefront of research and technology development in areas ranging from 3-D video coding to robotics systems development to nanotechnology.

- **Research Collaboration with Regional Industry:** SCU has forged a strong network of collaborative relationships with important regional firms and industries. Corporate-sponsored applied research projects are currently ongoing with Applied Materials, Campus Systems US, Dew Software, Huawei Technologies, Intel Corporation, and Wyle/NASA.

- **Creation of New Technology Firms:** SCU engineering graduates have launched a number of startups in the region. (See box on Page 12 about Chris Malachowsky '86.)

- **Strengthening Network Linkages:** SCU strengthens broader network linkages among actors in the region's technology industries by convening events and symposia, establishing industry advisory boards, and engaging regional tech professionals in scholarship and teaching. A number of graduate engineering faculty members are currently working in Silicon Valley. This ensures that the School of Engineering programs maintain a strong industry connection, provide a real-world business perspective, and help Bay Area companies connect with qualified interns and graduate employees.

> **Industry Partnership and Patents Related to 3-D Video Coding**
>
> **Nam Ling**, chair and professor of computer engineering, was named Outstanding Overseas Scholar by Shanghai University of Electric Power (SUEP) in both 2014 and 2015.
>
> The IEEE Fellow was appointed due to his contributions to video coding algorithms and architectures, research impact, publications (more than 185 publications in top-tier journals, books, and conferences), and because of the contributions he and his team of researchers from Santa Clara University and Huawei/Hisilicon are making in the field of 3-D video coding— elements of which have been adopted as industry standard parts.
>
> Prof. Ling has a long-standing research collaboration with the technology company Huawei that has led to his team securing four U.S. patents. They have also filed about 20 U.S., European, China, and Patent Cooperation Treaty patents, which are pending.

Computer Engineering

SCU's computer engineering program is particularly well established and has strong ties to Silicon Valley through internship programs, corporate sponsorships, and a robust network of alumni who have launched startups or joined established tech firms in the region. The program has a particularly strong relationship with Cisco; SCU is its second largest provider of Cisco employees.

SCU's computer engineering program has contributed significantly to the region's capacity to develop new technology and generate patents, through both independent faculty research and through industry research collaborations. (See box on 3-D video coding on Page 20.)

Robotics Systems Laboratory

SCU's strong mechanical engineering program has robust connections to the valley's aerospace, robotics, and technology industries.

A particularly innovative program is the School of Engineering's Robotics Systems Laboratory (RSL), an aggressive field robotics program specializing in the design, control, and teleoperation of highly capable robotic systems for scientific discovery, technology validation, and engineering education. These systems include underwater vehicles, clusters of land rovers, autonomous aircraft, and micro-spacecraft.

RSL has received several million dollars in external funding over the past five years from collaborators and sponsors such as NSF, NASA, National Oceanic and Atmospheric Administration (NOAA), the U.S. Air Force, the U.S. Navy, BMW, Lockheed Martin, Nike, and Intel. Highlights of the program include robotics-based scientific discoveries, such as evidence of ancient tsunami waves in Lake Tahoe, and unique engineering accomplishments, such as controlling a series of NASA spacecraft for advanced space biological research. Students also use the robots to learn how to provide cost-effective engineering services in the region, such as monitoring the health of local wineries, inspecting solar panel installations, and performing environmental surveys.

RSL has a long history of collaboration with local and national leaders in industry, including:

- NASA, under which Santa Clara undergraduates, master's, and Ph.D. students run satellite missions for the NASA Ames and Marshall Centers
- Major corporations, such as Lockheed Martin, BMW, and NVIDIA
- The Monterey Bay Aquarium Research Institute

Center for Nanostructures

Nanoscale science and technology is a new frontier in engineering and science dealing with the creation of functional materials, devices, and systems at a length scale of less than ten-thousandth of a millimeter, or about 100,000 times thinner than a human hair. Research in this burgeoning field focuses on understanding the novel properties—physical, chemical, biological, electrical, magnetic, mechanical, and optical—of various nanomaterials and how those properties can be exploited for a wide variety of applications. Nanotechnology can help enhance performance and increase reliability in electronic systems, spur advancements in bioengineering, and lead to development of functionally novel materials.

The SCU School of Engineering's Center for Nanostructures (CNS) has positioned the University as a national center of innovation in nanostructures research by pursuing interdisciplinary research and education through partnerships with other universities, industry, and government. CNS brings together engineering and science faculty and students from across the University to collaborate on innovative research. CNS has a history of externally funded projects and has contributed to the advancement of science with recognized scholarly publications. CNS supports a growing number of projects, including studies of the following:

- Thermal interface materials for improved heat dissipation
- Novel electrical interconnect materials for enhanced performance
- Polymer nanocomposites for tissue engineering and regenerative medicine
- Stability and structure of polymer-based solar cells
- Sensitive biosensors for pathogen detection
- Human health and environmental implications of nanoparticles

CNS has developed partnerships and internship programs with several advanced materials firms and institutions, including Radiance Technologies, Hitachi, GT Advanced Technologies, and Scifiniti.

Latimer Energy Laboratory

SCU's School of Engineering has a long history of involvement in sustainable energy studies. Nearly 50 years ago, SCU led the installation of solar panels on Santa Clara city buildings; in the 1960s, it initiated research on electric power; and in the '70s, faculty and students researched the use of methanol as a fuel supplement for automobiles. SCU's success in the 2007 and 2009 U.S. Department of Energy's Solar Decathlon competitions—third-place finishes in both international contests—has spurred school activity in this burgeoning field, including a number of new courses being offered in alternative energies, power electronics, and photovoltaic cells.

In partnership with industry and government collaborators, the School of Engineering's Latimer Energy Laboratory (LEL) is now conducting cutting-edge research on sustainable energy technologies, including the economics of solar photovoltaics in the residential market, the development of a carbon credit meter to create revenue streams from the carbon market established by California's landmark legislation AB32, and the viability of new plug-and-play energy technologies.

The LEL is equipped with instrumentation for the study of solar radiation, solar cell and panel characterization, spectrometry, lighting, fuel cells, power electronics, and other areas related to sustainable energy. The Latimer Energy Lab Scholars Program produces graduates who understand the new trends in renewable energy generation and distribution and can innovate in technology while promoting environmental sustainability.

Leavey School of Business

The Leavey School of Business also materially contributes to applied research at SCU, as exemplified by the initiatives of these professors:

- Graduate business students led by finance's Professor Sanjiv Das worked with United Way Silicon Valley to gain insights through data analytics research into community needs. This way of researching problems is common with big corporations, but Professor Das' idea to use this research tool with a nonprofit combines innovation with Jesuit values.

- Professor Kirthi Kalyanam designed and delivered the first Retail University program at Google and is working with the company to develop the third generation of the program. Retail University trains big online-only retailers to use data analytics when pricing, promoting, and optimizing selection.

- Professor Kumar Sarangee's work centers on how innovation can dramatically improve the quality, speed, and profitability of new products while driving down the risk of failure. His cutting-edge research ties together entrepreneurship with big data analytics.

Product Development and Prototyping

Innovation isn't simply about new ideas; it's about creating new things that are useful to people. SCU's School of Engineering places a strong emphasis on helping students learn how to move concepts from the discovery phase into development, commercialization, and implementation. And, more important, students learn how to harness raw technical innovation toward solving real problems for real people. The school works to instill a mindset in its students that combines a curiosity about the world, the ability to make connections from many sources of information to gain insight, and the savvy to identify and capitalize on opportunities to create value.

Several labs and programs are devoted to channeling innovations toward product development. In SCU's EDVenture Lab, Maker Lab, and Frugal Innovation Hub, students and faculty collaborate to experiment, make and prototype their designs, and turn innovative ideas into new products and technologies. These labs provide students hands-on opportunities to design and develop products that not only benefit their learning but also help strengthen the innovation system within the region.

EDVenture Lab

A grant from the Kern Family Foundation enabled SCU to develop a new EDVenture Lab in 2015. The vision of the lab is to host and incubate a rotating set of real-world engineering enterprise projects focused on providing real products/services to real customers. The name "EDVenture" is a blend of three critical components of the SCU approach to innovation and entrepreneurship: The E stands for engineering, the D stands for design thinking, and the word "venture" represents the creation of value, technical feasibility, economic viability, and customer desirability. In its first year of existence, EDVenture was supported by 10 corporate partners eager to support SCU in strengthening its innovation and product development capabilities.

Maker Lab and Maker Trailer

The Maker Lab is a hands-on prototyping space that offers all SCU students access to a wide range of tools (laser cutters, rapid prototyping machines, 3-D scanning system, circuit board cutters, and traditional hand and power tools) and training in how to use them. The Maker Lab helps students turn their creative ideas into new products. The lab's 600 certified users have created everything from prototypes for drones to custom picture frames for their parents. The lab is also open to the community.

SCU has also developed a Mobile Maker Trailer—a 28-foot towed trailer housing a mini Maker Lab—that can be transported to various locations to further support innovation, prototyping, and product development across the region.

Frugal Innovation Hub (FIH)

Frugal innovation is a process of problem solving in which the needs and contexts of emerging-market consumers come first. This shifted focus redefines the usual engineering process. Design solutions for the U.S., Western Europe, or Japan all assume access to abundant energy and tech-savvy users, which invites complicated designs. But FIH engineers approach design for emerging African, Asian, and Latin American markets in novel ways that solve more basic human problems.

The Frugal Innovation Hub focuses on developing innovative solutions and products for lower-income, "base of the economic pyramid" customers and underserved communities around the world. Students in the lab work to develop accessible, affordable, appropriate, and adaptable technologies, products, and solutions to meet human needs, both in emerging markets and in the Silicon Valley region. The FIH focuses on three enabling technology areas—mobile devices, cloud platforms, and 3-D printing—and targets three areas of critical human need: clean water, global public health, and clean energy.

FIH is a collaborative space for students and faculty to work with industry partners and NGOs to research and implement new technologies for consumers in emerging markets. The lab environment, along with expert faculty guidance, facilitates the critical transition from theoretical learning to practical skill application. The FIH has active partnerships with a number of Silicon Valley firms, including Cisco, HP, Vodaphone, Samsung, and Ricoh, as well as a wide range of social enterprises and nonprofits.

The FIH also houses a dedicated "lab within a lab" focused on mobile computing for social benefit. The Mobile Computing Lab spearheads SCU's participation in the explosive field of mobile health, providing an environment for students to evaluate technology solutions used in the field and enabling the development of a comprehensive set of mobile applications for underserved communities.

An FIH chief focus is on mobile computing for social benefit. Working with San Jose's Community Technology Alliance, computer engineering students developed Street Connect, a mobile-based notification tool that informs people of one-time or sporadic services via SMS. For instance, local shelters may use the tool to announce available beds on cold nights.

Taken together, SCU has a robust suite of programs that focus on innovative product development for social benefit. These programs impact the region both through the products and services that are created, and through strengthening the skills and passion of SCU graduates, many of whom go on to work, innovate, and contribute in the region.

Santa Clara Law Supports Technology Commercialization

Many innovations, particularly in the commercial sphere, would never reach maturity without the support of professional services related to finance, entrepreneurial development, and legal protection. This section focuses on the significant impact that SCU's intellectual property (IP) law program and High Tech Law Institute (HTLI) have on the region by strengthening the capacity of technology innovators to sustainably gain economic benefit from bringing their new ideas to the marketplace.

SCU's highly regarded, nationally recognized IP law program produces lawyers who work to strengthen the legal protection of intellectual property rights through patent prosecution and litigation, thereby enabling the creation of economic value from innovation and, in turn, incentivizing further innovation-based economic development across the region. And SCU's broader high tech law program works closely with local technology firms to ensure that they have access to the full range of legal skills that are essential to their business. While IP law is the school's historic strength, today Santa Clara Law's high tech offerings extend also to courses in venture capital, Internet law, biotechnology, antitrust, and privacy.

Santa Clara Law contributes to the region's ability to commercialize innovations through its:

- Strong linkages with the technology industry
- Intellectual leadership and scholarship
- Skilled graduates who create economic value

Linkages with Regional Technology Industry

The School of Law is literally surrounded by the region's top technology firms, and over the years, it has built strong collaborative relationships with the tech industry. A key mechanism for strengthening linkages between Santa Clara Law and local technology firms was the 1990 creation of the High Tech Advisory Board (HTAB), a collection of academic and legal leaders that became a vital interface between industry and school (see Advisory Board box on Page 26).

The establishment of the HTAB helped make the school a centerpiece of valley tech life with conferences and seminars; brought company concerns into the classroom; shaped new courses; and opened up top firms to Santa Clara graduates and interns.

The HTAB has helped Santa Clara graduates make connections and be considered for jobs once reserved for graduates of more traditional top-tier law schools. It has also helped recruit top attorneys as adjunct faculty whose real-world experience provided immediacy, relevance, and excitement for Santa Clara Law students.

Intellectual Leadership and Scholarship

SCU's location in the heart of Silicon Valley has given it a clear advantage in achieving success in its high tech law program. The school's strong network of alumni working at regional firms has helped link it tightly to the tech industry.

The Santa Clara Law faculty are nationally recognized leaders on intellectual property and high tech law issues. Notable faculty include:

- **Professor Colleen Chien,** who was selected to serve in the White House Office of Science and Technology Policy (OSTP) as senior advisor for intellectual property and innovation to Todd Park, the U.S. chief technology officer during the 2013–14 academic year. Chien advised Park on issues related to intellectual property and innovation, privacy, open government, and civil liberties.
- **HTLI Co-Director Eric Goldman,** one of the most prolific voices from the school's high tech faculty. Since 2005, he has been widely quoted in the mainstream media on Internet and IP legal matters. His technology and marketing law blog is required reading for some tech reporters looking for new ideas. In 2015, his site, ericgoldman.org, received more than 352,000 visits.

In addition to its many full-time faculty members with expertise in every aspect of intellectual property and high tech law, Santa Clara Law has dozens of part-time faculty working on the front lines of IP and high tech law at leading Silicon Valley law firms and corporations. These adjunct faculty share their real-world experience with students, ensuring that the curriculum remains relevant to the diverse needs of the industry.

SCU's High Tech Law Institute is an academic hub on campus for intellectual leadership, and it coordinates Santa Clara Law's many programs, initiatives, and events that foster strong ties among faculty, students, alumni, and the region's thriving high tech and IP community.

The orientation and flexible design of the Santa Clara Law program have enabled it to draw from and contribute to the region's talent pool. A significant number of students come to the program having worked as engineers or technologists in the valley. The school's popular evening program, which enables working professionals to attend law school at night, has resulted in a student body with deep experience in a wide range of technology fields.

Santa Clara Law's intellectual property and high tech curriculum is one of the largest in the country. Due to its breadth and depth, students can create a highly personalized course of study. The high tech/IP degree and certificate programs offered at Santa Clara Law include:

- **J.D. Degree:** A top-ranked J.D. degree program with an emphasis in intellectual property law, including patent law. Several degree options include a three-year, full-time J.D.; the popular four-year, part-time J.D.; and joint degree programs including J.D./MBA and J.D./MSIS.

- **LLM in Intellectual Property:** Helps attorneys with J.D.s from U.S. law schools deepen their understanding of IP law. Through its Center for Global Law and Policy, Santa Clara Law also offers foreign lawyers an LLM in U.S. law with a specialization in IP law.

- **High Tech Law Certificate:** Recognizes J.D. students who have pursued a high tech law curriculum. Students take 15 units of high tech law courses, meet minimum grade requirements, and write a high tech law paper.

- **Privacy Law Certificate:** Trains J.D. students to become privacy experts. Students take 15 units of privacy-related courses, meet minimum grade requirements, publish a paper on a privacy-related topic, obtain IAPP certification, and complete an internship (or other work experience) related to privacy issues.

In March 2015, Santa Clara Law announced a grant from Intel Corporation to expand and strengthen its growing privacy program. The grant supports creation of a new cross-disciplinary course on privacy that will cover topics such as privacy in the design process, drafting effective and accurate privacy policies, developing best-practice cybersecurity procedures, finding and responding to security vulnerabilities and data breaches, and handling privacy audits.

Santa Clara Law also supports a number of publications at the forefront of technology law, including the *High Tech Law Journal.* This student-run journal publishes four issues a year and hosts an annual symposium. It is regularly one of the five most frequently cited IP and technology journals in the Washington and Lee Law School citation database.

Santa Clara Law Graduates Enhance the Economic Value of Regional Technology

Santa Clara Law's hundreds of top-level graduates, who are highly prepared to support the region's tech industries, play a significant role in helping regional firms generate, protect, and sustain the economic value of their technological innovations.

Santa Clara Law graduates populate the ranks of Silicon Valley legal departments, with hundreds of alumni working in house at many of the top corporations in the region, including eBay, Cisco, and Facebook. Santa Clara Law graduates constitute a significant portion of Apple's in-house legal department in California. A 2015 analysis by *The Recorder* found that Santa Clara University School of Law had 26 alumni working for Apple, more than any other law school.

A sample of Santa Clara School of Law alumni holding prominent positions in Silicon Valley companies:

- **Mark Cochran J.D., MBA '88**, former general counsel and executive vice president, Mcafee

- **Dorian Daley '86**, senior vice president, general counsel, and secretary, Oracle

- **Mike Dillon '84**, executive vice president, general counsel, and corporate secretary, Adobe; former executive vice president, general counsel, and corporate secretary, Sun Microsystems

- **Don Eaton '64**, CEO and general manager, Seros Medical

- **Fred Gonzalez '77**, vice president, general counsel, and corporate secretary, Corsair Components

- **Tom Lavelle '76**, owner, Thomas R. Lavelle Law Offices; former senior vice president and general counsel, Rambus Inc.

- **Bonnie MacNaughton '82**, partner, Davis, Wright, Tremaine; former senior attorney, Microsoft

- **Frank Nguyen '94**, vice president of IP and Licensing, Intuitive Surgical, Inc.

- **Sam O'Rourke '99**, vice president and deputy general counsel, Facebook Inc.

- **Riley Russell '88**, chief legal officer, senior vice president of Corporate Development, and general counsel, Sony Entertainment

- **Scott Shipman '99**, general counsel and chief privacy officer, Sensity Systems

Santa Clara Law ultimately has a significant impact on the region's economy. By working to protect the intellectual property rights of inventors and technology-intensive businesses, SCU alumni help generate and sustain the economic value of innovations within the regional economy while also incentivizing further innovation-based economic development. And by working closely with local tech firms to understand and address the emerging legal issues that they face, Santa Clara Law provides critical support to ensure that the region's most dynamic industry will continue to thrive in the years to come.

Advancing Entrepreneurship

Entrepreneurship refers to the process of creating new firms, organizations, or ways of working to deliver needed products and services to the market. Its defining characteristic is taking action to bring ideas to fruition. As with innovation, entrepreneurship can take place for both commercial profit (e.g., launching a business startup) or for social impact (i.e., social entrepreneurship).

Scholarship on entrepreneurship usually focuses on the skills and characteristics that are needed to pursue entrepreneurial activities, sometimes referred to as the entrepreneurial mindset. While there are no specific traits that all entrepreneurs share, many studies have found that there are certain characteristics that most successful entrepreneurs possess, including creativity, strategic vision, leadership, collaboration, and a willingness to take risks.

Santa Clara University supports entrepreneurship in the region in multiple ways. First and foremost, SCU works to instill an entrepreneurial mindset in its students, across a range of disciplines. Several programs teach entrepreneurship, but more broadly, the University's approach to experiential learning, collaboration, and educating the whole person produces graduates with the creativity, problem-solving, and collaboration skills needed to be successful entrepreneurs. SCU also works to support entrepreneurship at regional, national, and global levels through its startup accelerators, online educational platforms, and direct service to regional startups.

There is a wide range of SCU activities that supports entrepreneurship and helps foster an entrepreneurial mindset among students. This section highlights activities in three areas—instilling an entrepreneurial mindset, support for regional startups and small businesses, and accelerating social entrepreneurship.

Instilling an Entrepreneurial Mindset

A number of SCU departments and centers work to advance scholarship and teaching related to entrepreneurship, for instance, the Center for Innovation and Entrepreneurship (CIE) within the Leavey School of Business, and the School of Engineering's KEEN program. Together, these programs significantly add to the entrepreneurial capacity of the region.

CIE: Teaching Entrepreneurship in the Leavey School of Business

The CIE provides intellectual leadership for commercially oriented entrepreneurship and helps guide the business school's entrepreneurship education. Offering entrepreneurship education at the undergraduate, graduate, and post-graduate levels, the CIE helps prepare students for entrepreneurial leadership through extensive network-building opportunities with an extensive alumni network, industry leaders, and other regional resources.

The undergraduate minor in entrepreneurship, open to all SCU undergrads, has become the business school's most popular minor. Students develop an understanding of the venture creation process, including how to generate and develop a new business concept, apply quantitative and qualitative methods and analytical tools to identify and evaluate entrepreneurial opportunities, use data and analysis to create and evaluate a business plan, and evaluate funding sources for a new venture.

SCU Leavey School of Business Alumni Entrepreneurs

A list of selected SCU School of Business alumni who have founded or co-founded firms.

ReadyPulse – Dennis O'Malley MBA '00, Srinivas Penumaka MBA '00

AncientFaces – Daniel Pinna '03

LifeCounts – Peter Murray '05, Nicholas Howell '05

The Better Man Project – Evan Sanders '12

WHISK – Maggie Spicer '07

WireLoad – Viktor Petersson '08

Publicize, 2MinuteGMAT, CampusWiki – Conrad Egusa '09

Cahoot – Abram Dawson '12

Open Home Pro – Andrew Machado '04

LeftLane Sports – Erik Fialho '12

Suntegrity – Tricia Trimble '91

YouLister, **Red Horn Design** – Chris Bull '09

Mobclix – Vishal Gurbuxani M.S. '03, Sunil Verma M.S. '03

Bronco Student Services – A. Prieto '12, A. Gallanter '12

Egnyte – Vineet Jain MBA '02

BuzzStream – Jeremy Bencken '97

FastPencil – Steve Wilson MBA '02

BookRenter.com – Colin Barceloux '03

BlueLight App – Preet Anand '10

Moments, OneRent – Rico Mok '15

The Leavey School of Business offers two MBA concentrations to deepen skills related to entrepreneurship and innovating organizations. One, Entrepreneurship and New Venture Creation, focuses on developing the tools to develop ideas into businesses and to stimulate entrepreneurial activities in existing mature businesses. The other, Leading Innovative Organizations, prepares graduates to create, organize, and sustain organizational systems and processes for success in rapidly changing and turbulent environments.

The School of Business and CIE also coordinate two important programs that enhance learning and strengthen real-world entrepreneurial experience:

- **Internship Program:** The CIE offers those enrolled in the undergraduate entrepreneurship program the opportunity to apply new entrepreneurial skills in emerging Silicon Valley for-profit startups or socially beneficial organizations. Paid and unpaid internships are available throughout the year. Typical projects include either developing a case study of the venture and founders or developing a formal business or growth plan.
- **SCU Annual Business Plan Competitions:** Open to both undergraduate and graduate students, these offer opportunities to refine business plans for startups, connect with industry mentors, attend field trips to Silicon Valley startups and technological giants, and find internships and jobs.

These programs provide SCU students with real-world experience working with entrepreneurs in the region and in developing their own ventures. A number of SCU business school graduates have founded startup companies in the region (see Alumni Entrepreneurs box on Page 31).

KEEN: Advancing an Entrepreneurial Mindset Among Student Engineers

To further its goal of promoting an innovative and entrepreneurial mindset among students, SCU is an active member of the national Kern Engineering Entrepreneurship Network (KEEN) program, a network of about 25 U.S. universities that collaborate to improve the ways innovation and entrepreneurship are taught to undergraduate engineering students.

KEEN's mission is to graduate engineers equipped with an entrepreneurial mindset who will contribute in new and creative ways to the economy. The long-term goal is for these new engineers to catalyze a transformation in the workforce and to build economic and technical commerce in their communities. KEEN's four cornerstones—business acumen, customer engagement, technical fundamentals, and societal values—are integrated in two ways: through the development of skills and by fostering an engineering entrepreneurial mindset.

Bolstered by grants of about $2.5 million from the Kern Family Foundation, SCU has provided many opportunities for students to stretch beyond their engineering disciplines to become creative thinkers, to identify the needs of customers, to understand the financial and logistic aspects of creating products and services, and to be aware of the societal impacts of their work.

Under the auspices of KEEN programming, the SCU School of Engineering:

- Offers courses that encourage interdisciplinary teamwork
- Organizes contests that pair engineering undergrads with business majors to develop a product or solve a problem (e.g., for BMW, NVIDIA, or NASA Ames)
- Sponsors co-ops, speaker series, mentoring, and club activities to encourage out-of-the-box thinking

The grant includes a mandate for Santa Clara to lead other KEEN schools in the area of developing real products and services for real customers through hands-on, interdisciplinary project development activities, an area in which Santa Clara is recognized by the Kern Family Foundation as being best-in-class. In the past, SCU graduates and undergraduates worked with their KEEN peers to install satellite equipment to operate a series of NASA spacecraft. Now they are leading KEEN partners (from Baylor, St Louis University, Villanova, Bucknell, and other universities) in using drones for such real-world projects.

Markkula Center for Applied Ethics: Shaping Ethical Entrepreneurship

The Ethics Center is the most active University-based ethics center in the world, providing a variety of innovative tools and means for ethical decision making. The center focuses on bioethics, business ethics, campus ethics, government ethics, and Internet ethics.

The Ethics Center is a national thought leader for business ethics, and works with regional firms to strengthen ethical business practices. Its work in this area has three main components:

- **Business Ethics Partnership:** Companies in sectors from information technology to health care join with distinguished academics and subject-matter experts to explore questions, challenges, and opportunities faced by organizations in managing their ethics and compliance programs.

- **Programs on Corporate Governance:** In collaboration with Morrison & Foerster, Wilson Sonsini Goodrich & Rosati, and the Silicon Valley Director's Exchange, the center offers programs of special interest to general counsels, corporate board members, and others responsible for corporate governance. An annual lecture by a justice of the Delaware Court explores recent decisions on governance from America's most important source of corporate law.

- **Consulting and Public Speaking:** Center Executive Director Kirk O. Hanson, a well-known commentator on business and organizational ethics, regularly addresses groups in such industries as financial services, health care, and corporate affairs. Director of Leadership Ethics Ann Skeet addresses and consults with leaders in the business and nonprofit sectors, including education. She focuses on the work of leadership to create ethical cultures, and is a resource for firms and organizations developing ethical business practices and programs.

Teaching Module on Software Ethics

SCU offers software ethics and other engineering ethics courses, but many universities do not. Recognizing the near absence of attention to ethical issues in most undergraduate software engineering and computer science programs, Irina Raicu at SCU's Markkula Center for Applied Ethics did something about it. She and philosophy professor Shannon Vallor devised the idea of a free-standing Intro to Software Engineering Ethics module.

"Many professors feel they don't have the time or expertise to address the ethical dimensions of software," says Vallor. "Our module requires no supporting instruction from the professor." Raicu adds, "We wanted to start the conversation: Software developers now have great responsibility—and what are the implications of that?"

The response has been positive: Twenty-two professors are currently using the free module on five continents. More important, the conversation about the ethics of software engineering has begun.

The Ethics Center responds to the needs of, and provides guidance to, firms in the region. As the regional economy has evolved toward a greater focus on Web-based technologies, the center has expanded its program on Internet ethics, which now includes a package of educational resources and curriculum materials related to privacy called *Your Privacy Online*; the IT, ethics, and law lecture series (co-sponsored by the SCU High Tech Law Institute); and a range of Web-based resources, including a video series in which Silicon Valley pioneers and entrepreneurs turn the spotlight on key issues in Internet ethics today.

Support for Regional Startups and Small Businesses

Startups and small businesses frequently need external guidance, expertise, and investment to help them navigate the precarious first years in the marketplace. Regions with dynamic entrepreneurial environments often support such fledgling businesses with incubators, accelerators, and business service programs to help them thrive and become more significant contributors to the region's economy. Key inputs typically include:

- Mentoring on general business strategy (e.g., business model, growth strategy, team development)
- Access to specialized expertise on key technical issues (e.g., legal issues, contracts, IP law, accounting, marketing)
- Networking with potential investors, partners, and/or customers

SCU has several important programs that extend the University's entrepreneurship education beyond the University campus and provide essential support services to startups and small businesses throughout the region and beyond:

- The Entrepreneurs' Law Clinic (ELC)
- The Neighborhood Prosperity Initiative (NPI)
- SCU's My Own Business Institute (MOBI)
- California Program for Entrepreneurship (CAPE)

With these programs, SCU has emerged as a key institution for supporting entrepreneurial thinking and enterprise formation in the region.

The Entrepreneurs' Law Clinic

Launched in 2013 by Santa Clara Law, ELC helps support the region's entrepreneurial ecosystem by providing high quality, pro-bono legal services to Silicon Valley startups. Its dual purpose is to expose law students to real-life issues that confront Silicon Valley companies and to give startups much-needed legal help. At a typical hourly rate of $300 to $500 for such services, this represents a significant contribution made by SCU to the local entrepreneurial economy.

Second- and third-year Santa Clara Law students can work on a variety of transactions crucial to startup companies, such as business entity formation, financing, operational contracts, company policy, website terms of service, and intellectual property licensing.

Clients are at various stages of the startup life cycle. Some are new entrepreneurs, seeking advice on issues such as choice of business entity or founder equity compensation. Others are more established startups seeking help with business transactions, such as distributor agreements, leases, employee policies, and contractor agreements.

In its first two years of operation, ELC worked with more than 50 startup clients for a total of 3,400 hours in legal services, which at the going rate of $400 per hour for a Silicon Valley startup attorney, would be worth more than $1.3 million.

What ELC alumni are saying…

Lila Milford J.D. **'14** works at CPA Global®, an intellectual property (IP) management and IP software specialist, and an international provider of outsourced legal services, Just Business, a for-benefit venture capital firm based in San Francisco. "Almost everything I've been required to consider at work was in some way covered in clinic seminars and workshops," she says.

Austin Black J.D., **MBA '15**, who was hired by a local startup and is now a securities analyst at Wunderlich Securities, says, "ELC let me show how I can meet the industry's demand for attorneys trained in counseling the most avant-garde businesses in the Bay Area and ultimately the world."

Neighborhood Prosperity Initiative (NPI)

Launched in January 2012, NPI provides opportunities for students to learn about issues of economic prosperity from businesses, individuals, and organizations in low-income neighborhoods in the San Jose area. Funded by and housed in the Leavey School of Business, NPI is part of SCU's larger Place-Based Initiative and contributes significantly to local economic development efforts. NPI goals are to provide:

- **Learning Opportunities:** With hands-on, community-based learning opportunities for business school undergraduates to contribute to prosperity in low-income neighborhoods and to gain perspectives on incorporating social justice and community engagement into their lives during and after SCU.

- **Service to Local Businesses:** With community partners, contribute time, energy, knowledge and creativity to activities that foster economic prosperity for individuals, organizations, and businesses in low-income San Jose neighborhoods.

NPI has helped conduct a wide range of regional economic development analyses and has provided entrepreneurship assistance to local businesses. Accomplishments and impacts range from résumé-writing workshops for mothers at Washington Elementary School to students working with businesses selected for participation in the Wells Fargo Small Business Renovation Grant Program.

In 2015, NPI partnered SCU students with students from the San Jose Center for Employment Training to help three small businesses in the Washington-Alma neighborhood meet goals that brought them success. With the support of Wells Fargo Bank, NPI students were able to help the businesses with marketing, point-of-sale systems, and other small-business ideas. The relationships built in the community, coupled with the knowledge shared, made for a strong partnership—one that NPI will duplicate with new small businesses in the future.

NPI accomplishments are direct, concrete impacts that SCU is making to spur entrepreneurial activity and support economic development in the region.

My Own Business Institute (MOBI)

SCU's Leavey School of Business significantly extended its entrepreneurship education activities through a $17.5 million gift from Phil and Peggy Holland, as well as assuming custodianship of the couple's popular online platform for entrepreneurship training.

The Hollands, who had founded the free entrepreneurship education website My Own Business, Inc., transferred the organization to the School of Business, which created My Own Business Institute (MOBI) as part of its Center for Innovation and Entrepreneurship. Plans to expand the Hollands' pioneering work include development of the MOBI fellows, a hands-on learning experience incorporating the principles of entrepreneurship, and an extension of the My Own Business curriculum around the world.

Since 2000, when MOBI became the world's first organization to offer a free, comprehensive, and graded online course on starting a business, more than 40 million people have accessed the website. MOBI offers two core courses:

- **Starting a Business:** Popular 15-session course designed for the entrepreneur who wants to start a business; focuses on how to write a business plan.
- **Business Expansion:** For established business owners to help strengthen operations, seize opportunities, and plan for the future.

These courses are available in more than 50 countries and 14 languages through partnerships with the World Bank/International Finance Corporation and a license to Cisco Systems' Entrepreneurship Institute. SCU plans to use the MOBI platform to extend the reach and amplify the impact of its existing NPI program to strengthen entrepreneurship in the region and beyond.

California Program for Entrepreneurship (CAPE)

An initiative of the Leavey School of Business, CAPE educates and mentors emerging entrepreneurs to help them develop and implement business plans that will contribute to the growth and well-being of the California economy. CAPE annually supports 25 to 35 emerging entrepreneurs selected from candidates nominated by University affiliates, financial institutions including microlenders, and other organizations that support entrepreneurship. Free to participants and taking no equity interest in the businesses it helps launch, CAPE has been referred to as Silicon Valley's most egalitarian startup accelerator. For budding entrepreneurs, the seven-week, six-month program is part accelerator, part incubator, and part mini-MBA boot camp.

The curriculum is designed to remove the barriers facing emerging entrepreneurs. Faculty use a combination of virtual exercises, classroom instruction, case studies, group work, and experiential learning to develop conceptual skills and build a mutually supportive community. Participants develop functional expertise in marketing, finance, and operations as well as skills in organizational dynamics, strategic management, and communication. Participants prepare a business-plan pitch for a competition to be reviewed by a panel of judges including venture capitalists and angel investors, with $5,000 awarded to the best presentation.

Since its inception in 2010, CAPE has graduated more than 150 successful ventures and 185 entrepreneurs.

Accelerating Social Entrepreneurship

The social entrepreneurship movement is an emerging social-change strategy that draws from the creativity and drive of entrepreneurship. Social entrepreneurs apply business tools and strategies to solve social problems, especially the suffering of the poor. They start and lead entrepreneurial organizations that engage in direct action to address social needs.

Social entrepreneurs are motivated by solving social problems rather than accumulating private wealth. They share the same opportunity-seeking orientation, imagination, and determination as conventional entrepreneurs. But they measure success differently—by assessing social impact. Social entrepreneurs use success metrics such as the number of households with routine access to clean water, the net increase in household income and improvement in children's respiratory health as a result of the transition from kerosene to solar energy, or the number of women employed for the first time and the subsequent benefit to household finances.

Miller Center for Social Entrepreneurship

One of three Centers of Distinction at Santa Clara University, Miller Center accelerates global, innovation-based social entrepreneurship in service to humanity. Its strategic focus is on eradicating poverty through its three areas of work: education and action research; an impact investing program; and its flagship Global Social Benefit Institute (GSBI).

While Miller Center and GSBI have a global orientation and benefits, they also have important local impacts on both SCU students and Silicon Valley executives, including:

- Student fellows gain valuable experience and skills in social entrepreneurship.

- Silicon Valley executives who serve as mentors or coaches to social enterprises gain a deep understanding of how to work in emerging markets and with underserved populations.

- The shared experience and collaboration between entrepreneurs, fellows, and mentors strengthens a wide range of linkages between the University, regional firms, and the Silicon Valley community, focused around entrepreneurship for social benefit.

- Some GSBI alumni have significant impacts in the region.

Global Social Benefit Institute (GSBI)

Founded in 2003, GSBI serves social entrepreneurs around the world who are developing innovative solutions for a sustainable path out of poverty, supporting them at every stage of their organizational lifecycle.

Although GSBI has a global orientation, participating entrepreneurs are supported by SCU student fellows and Silicon Valley executive mentors. The 18 junior-year students admitted to the Global Social Benefit Fellowship each year gain a deeply educational and rewarding experience by conducting action research in interdisciplinary teams with one of the social enterprises. The fellowship imparts entrepreneurship skills and emphasizes leadership development, personal growth in self-awareness, and vocation reflection. These abilities develop in the fellows the creativity, risk-taking orientation, and collaborativeness to make them impactful employees or entrepreneurs when they go on to work in the region.

GSBI's more than 100 mentors are successful Silicon Valley executives—leaders of NASDAQ companies; CEOs and founders of startups; venture capitalists; and domain experts, such as CFOs; sales, marketing, and business development leaders; and lawyers with merger and acquisition experience. Most mentors return year after year, because they find the process fulfilling and a great opportunity to give back. The experience also deepens their understanding of living and running a business in a developing country context, and strengthens their companies' ability to operate in emerging markets.

As of January 2016, GSBI had worked with more than 570 social enterprises around the world. Ninety percent of GSBI alumni are still in business, and 40 percent are scaling and financially stable (three times the standard rate of for-profit ventures). These enterprises have raised more than $178 million and have directly benefitted the lives of more than 151 million people.

One impactful 2006 GSBI alum is the organization Kiva, based in San Francisco and the world's first and largest person-to-person microlending website. Kiva empowers individuals to lend to unique entrepreneurs around the globe. It has enabled more than 1 million loans to more than 1.9 million entrepreneurs, totaling more than $842 million.

In 2011, Kiva expanded its local impact by launching a zero-interest lending program for entrepreneurs across the San Francisco Bay Area and the U.S., with individual loans up to $10,000. To accelerate the awareness and expansion, Kiva launched Kiva San Francisco in October 2015 and Kiva Oakland in March 2016. During the launch of Kiva San Francisco, Capital One matched every dollar lent to small businesses in San Francisco on Kiva up to $75,000. During the launch of Kiva Oakland, the city of Oakland, OBDC Small Business Finance, Capital One, and the Miller Family Foundation matched every dollar that individuals lent to an Oakland borrower, up to $225,000. Capital One recently pledged an additional $50,000 in matching funds for entrepreneurs in Oakland.

More than 560 Bay Area small-business owners have benefitted from Kiva's crowdfunded capital.

Conclusion

Santa Clara University has a measurable impact on the Bay Area because of its students, employees, investments, and the thousands of alumni it has prepared for the workforce. The University's Jesuit philosophy of education—experiential learning, focus on collaboration, and education of the whole person—has produced graduates with the creativity, independence, problem-solving skills, and ethical grounding to be successful employees across all industries.

As the regional economy has evolved toward high tech, SCU has evolved its approach to meet the needs of the region's critical industries. Contributing to innovation and entrepreneurship is now central to SCU's identity and vision for the future.

Methodology for SCU's Economic Impact on the Region

The economic impact of Santa Clara University on 11 counties of the San Francisco Bay Area was calculated by ICF International, using IMPLAN. Source material also includes SCU data for fiscal years 2012 through 2015. ICF's assessment of alumni earnings and direct impacts represents a conservative approach that relies on national averages for wages by age and degree type and assumes the national average age of retirement.

IMPLAN was created and is maintained by the Minnesota IMPLAN Group (MIG). Widely used throughout the U.S. and considered the industry standard, the IMPLAN model is a static input-output framework used to analyze the effects of an economic stimulus on prespecified economic regions—in this case, 11 counties in the Bay Area.[1]

The IMPLAN model is based on the input-output data from the U.S. National Income and Product Accounts (NIPA) from the Bureau of Economic Analysis. It has three types of impact outputs:

- **Direct Impacts:** impacts in the primary industries where spending by the University, visitors, and students is focused, such as institutional operations, construction-related expenses, local student housing, visitor lodging, and restaurant and food purchases.

- **Indirect Impacts:** impacts in the industries that supply or interact with the primary industries, for example, when University capital projects require buying construction-related building materials.

- **Induced Impacts:** represent increased spending by workers, such as when faculty and staff use wages to purchase goods locally.

The total impact is the sum of the multiple rounds of secondary indirect and induced impacts that remain in the region (as opposed to "leak out" to other regions or states). IMPLAN then uses this total impact to calculate subsequent impacts, such as total jobs created and tax impacts.

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[1] For this analysis, the San Francisco Bay Area consists of these counties: Alameda, San Mateo, San Francisco, Santa Clara, Sonoma, Contra Costa, Marin, Napa, Lake, Santa Cruz, and Solano.

Model Inputs

The total economic impact of SCU is driven by these spending categories:

- University operational, capital, and auxiliary expenditures
- Visitor spending
- Student spending
- Alumni earnings

The relative significance of direct spending by each spending category:

Direct Spending in Inputs by Spending Category ($ Millions)

- SCU operational expenditures* $278.30
- Student spending   99.34
- Capital costs   41.07
- Visitor spending   35.21
- Auxiliary revenue   20.09

Includes Jesuit School of Theology

University Operational, Capital, and Auxiliary Expenditures

This study used financial statements provided by SCU to estimate the total annual operational expenditures of $278,302,000 (2013–2014). Capital expenditures vary significantly from year to year, so four years of statements were used to calculate an average annual capital expenditure of $41,073,000.

Information regarding the impact of auxiliary organizations also came from internal financial reports. Auxiliary revenue is estimated at $20,090,637, which includes bookstore and dining services revenue. Bookstore revenue accounts for approximately $5 million of the total auxiliary expenditures. Dining services accounts for the remaining $15 million.

Visitor Expenditures

Using data provided by the University and assumptions made in the 2003 analysis by Economics Research Associates, ICF estimates that, each year, SCU visitors spend more than $35 million in the region, a conservative approach to defining visitors who would not otherwise be spending in the region. It did not include day visitors, who may be local or primarily spending on campus (i.e., staying with students), since in neither of these situations would they create additive spending in the region, and on-campus spending is captured elsewhere in the analysis.

Visitors come to SCU for many reasons, including for a conference or sporting event, to visit students, or for graduation. There are also more than 9,600 prospective students who visit each year and more than 1,000 visitor days spent attending alumni events. These visitors impact the economy by spending during their visit—at local hotels or restaurants—thus spurring the regional economy and creating secondary impacts.

Student Expenditures

Significant student expenditures occur at bookstores and campus food services, which are incorporated in the auxiliary spending portion of University operational expenditures, above. The analysis assumes that off-campus students spend more on transportation and personal expenses than on-campus students. A subset of off-campus students lives with their families. It is assumed they do not have housing costs.

Student Spending Inputs by Student Type ($ Millions)

- Undergraduates $54.10 (54%)
- Graduate students* 30.41 (31%)
- Law students 14.83 (15%)

Includes Jesuit School of Theology

Alumni Earnings

This direct-impact assessment represents a conservative approach. It relied on national averages for wages by age and degree type (the Bay Area has a significant wage premium) and assumed the national average age of retirement, while many alumni 63+ are likely to be contributing to the economy.

Economic Impact Reporting

Analysis results are reported using four commonly used metrics, consistent with best practices for economic impact analyses:

- **Industry Activity**: The total value of industry activity generated by direct spending.
- **Employment**: The jobs created by industry, based on the output per worker and output impacts per industry.
- **Labor Income**: Includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income.
- **Tax Impact**: Breakdown of taxes collected by the federal, state, and local governments, including corporate taxes, household income taxes, and other business taxes.

Additional Economic Impact Analysis Details

ICF reviewed the 2003 analysis of SCU conducted by Economics Research Associates. The general approach to estimate direct impact, using University spending records, visitor counts and spending, and student spending is consistent with the 2003 assessment and the output metrics that are presented. The methodology of the two reports is consistent, but there are two distinctions:

- ICF's use of the industry-standard IMPLAN model
- ICF's analysis evaluates the University's impact on the county and broader Bay Area. (The 2003 assessment focused more narrowly on Santa Clara city and county.)

Calculating Total Economic Impacts

The total economic impacts (spending, job, and tax impacts) were calculated with IMPLAN economic impact software. Within a defined study region (San Francisco Bay Area), IMPLAN uses average expenditure data from the industries that originate the impact on supplier industries to trace and calculate the multiple rounds of secondary indirect and induced impacts that remain in the region (rather than "leak" to other areas). IMPLAN uses this total impact to calculate total job and tax impacts.

The IMPLAN model allows for assessing regional interaction, so it can account for the impact that spending in one region has on surrounding regions. Thus ICF calculated the regional impact, calibrating the model to take into account only those dollars spent locally, as well as the impact on other regions and the state as a whole.

Operational and Capital Expenditures

SCU financial data was used to estimate annual expenditures for both the main campus and the Jesuit School of Theology campus. Campus capital expenditures vary significantly from year to year, so four years of data were used to calculate an average annual capital expenditure for each campus.

Auxiliary Expenditures

Data for the impact of auxiliary organizations also came from SCU financial reports. In total, the analysis accounted for $20,090,637 of spending at auxiliary organizations, which includes about $5 million in the bookstore and $15 million in dining services.

Visitor Expenditures

This analysis used the visitor categories and the number of visitor days for each category from the 2003 analysis to estimate the amount that visitors to the University spend each year. In addition, the University provided information to fill in data gaps and make updates to estimates, where available. ICF contacted the Santa Clara Chamber of Commerce and Visitors Bureau for average hotel costs for visitors to the county. Due to lack of data availability, ICF used a more conservative approach to estimating visitor impact than was employed in the 2003 analysis.

Student Expenditures

All student expenditures were estimated to account for impacts associated with student spending. Both in-region and out-of-region students were included in the analysis, because it was assumed that students from the Bay Area would have left the region to attend college elsewhere if they were not attending SCU (and would have taken their spending out of the region). This approach is consistent with the 2003 assessment.

It was necessary to account for on- and off-campus students separately, as they have different spending profiles. ICF used information provided by SCU on student expenditures and residence status as well as relevant assumptions from the 2003 analysis to estimate the spending patterns by students in each residence type and degree program.

This sum of all spending by students became the total direct impact of student expenditures and was provided as input into IMPLAN like the other direct spending impacts of SCU. The analysis assumptions used to generate the additional student spending were conservative; they are believed to significantly understate the total additional student spending impact.

Alumni Impacts

The method to assess the direct impact of alumni consisted of these steps:

- Data about SCU degrees by degree type were collected from 1918 for undergraduates and from 1947 for law students, with most graduate program data dating to 1962. National average for retirement age is 62. It was assumed that graduates from 1974 (undergraduates) or 1979 (graduate students) and later years who were still residents of the state would still be in the labor force. Only students assumed to still be in the labor force were counted in calculations.

- It was assumed that SCU undergraduates were 22 years old at graduation, and higher-degree holders were an average of 27 years old at graduation. This was assumed in order to determine the age of each year's graduating class and the number of graduates who remained in the Bay Area in each of several age cohorts: 18–24, 25–34, 35–44, 45–54, and 55–64.

- According to alumni records, about 60 percent of all alumni are currently living in the Bay Area, with 35 percent in Santa Clara County. ICF found that 76 percent of all SCU graduates are still living in California, thus having an impact on the state's economy.

- Data from the U.S. Census Bureau's Current Population Survey (CPS) were used to estimate the average salary of Santa Clara bachelor's and master's degree-level alumni based on their age.[2] The data provide average salary by age for Americans with different education levels, including high school graduates, individuals with some college education but not holding degrees, bachelor's degree recipients, and master's degree recipients. Because these data are available only at the national level, it should be noted that Bay Area salaries are on-average higher than the national average. Thus, this approach leads to an undercounting of the alumni impact.

- For each graduation year, the total earnings of SCU alumni were calculated by multiplying the total number of bachelor's degree recipients of each age cohort by the percent of alumni in the Bay Area, and multiplying this result by the average bachelor's degree salary for that age cohort. The calculation was repeated for master's degree holders, and the two totals were summed. This total provides an estimate of the total annual earnings of SCU alumni living in the Bay Area.

The total earnings attributable to the alumni's SCU degree is the difference between the average salary associated with their final educational level and the average salary associated with their previous educational level. For example, for individuals with a master's degree, the amount of earnings attributable to the alumni's degree is the average master's degree salary minus the average bachelor's degree salary. For bachelor's degree holders, the amount of earnings attributable to the alumni's degree is the average bachelor's degree salary minus the average salary for a high school graduate.

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[2] Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, Table PINC-04, Educational Attainment—People 18 Years Old and Over, by Total Money Earnings in 2013, Work Experience in 2013, Age, Race, Hispanic Origin, and Sex.