INNOVATE 2 INNOVATION

An Assessment of California's Innovation Ecosystem

Phase II Report

RECOMMENDATIONS

EXECUTIVE SUMMARY

Prepared for the California Legislature
August 2011

Prepared by
California Council on Science and Technology

ACKNOWLEDGEMENTS

We would like to thank the S.D. Bechtel, Jr. Foundation for their contributions to the underwriting of this project.

We would also like to thank the many people who provided input and feedback towards the completion of this report. Without the insightful feedback that these individuals generously provided, this report could not have been completed. This report was conducted with the oversight of the CCST Innovate 2 Innovation (i2i) Action Team co-chaired by Julie Meier Wright and Charles Kennel. Mohammed Qayoumi and Anne Marie Bergen led the Education Action Team and Jude Laspa led the Water Innovation Action Team. We express gratitude to CCST's members and colleagues for their many contributions to the report

Innovate 2 Innovation
An Assessment of California's
Innovation Ecosystem
Phase II Report
August 2011
ISBN-13: 978-1-930117-50-1

For questions or comments on this publication contact:
California Council on Science and Technology
1130 K Street, Suite 280
Sacramento, California 95814
(916) 492-0996
ccst@ccst.us

Contents

Innovate To Innovation

Global innovation leaders can never let up. California needs once again to take action because it is facing unprecedented challenges from other states and countries.

This assessment of California's innovation ecosystem has been requested by a bipartisan group of legislators. It is a timely reminder that we need to monitor our progress and do what we do best: "innovate our way to innovation."

Phase I of this assessment, based on a review of key trends and input from thought leaders and key stakeholders across the state, identified three specific opportunities for action:

A CALIFORNIA INNOVATION INITIATIVE to cultivate our entrepreneurial ecosystem and promote the translation of research into job-creating products and services.

In addition, by using our science, technology and human resources to meet critical challenges facing the state, we can enhance the competitiveness of California enterprise.

A CALIFORNIA EDUCATION INNOVATION CONSORTIUM to develop and deploy digitally enhanced tools and practices for K-16 education.

A WATER INNOVATION ROAD MAP that engages a broad segment of the science and technology community in finding innovative solutions to the water issues facing California in the next 50 years.

Action Teams for each of these three areas have identified the following recommendations. These recommendations can be implemented through public-private partnerships primarily with private investment.

California Innovation initiative

Establish a nonprofit Innovation Corporation to oversee the development of a comprehensive California innovation strategy and track its implementation.

California's reputation for innovation in science and engineering (S&E) is well founded. By most activity measures, including employment in technology sectors, S&E degrees awarded, Small Business Innovation Research (SBIR) funding, and patents issued, California exceeds all other states by a factor of 50% or more. Venture capital investments in California are more than four times larger than the second most active state, Massachusetts, and we continue to catalyze the creation of companies and industries that are recognized around the globe for their creativity and innovative technology.

However, measures of sheer volume do not tell the full story, for California is not among the top states when S&E activity is measured as a ratio to the state's size, an important indicator of the job-creating impact of an innovation economy:

- California ranks 41st in the number of S&E bachelor degrees awarded, measured as a ratio to the population of 18-24 year olds in the state.
- California ranks between 7th and 13th, in high technology employment, life science employment, SBIR funding, patents issued, and employed S&E doctorates, when measured relative to population or economic activity.
- Even with respect to venture capital investments, California is second to Massachusetts as a ratio to the state's gross domestic product.

California trails other states in rates of growth, an alarming trend. In 2004, Texas, Virginia and Washington, with a combined population of 39 million, collectively employed 213,000 engineers; by 2008, their engineering employment had grown 20% to 256,000. These states combined surpassed California, population 37 million, whose engineering employment only grew from 220,000 to 241,000 engineers.

California's future competitiveness depends on addressing four fundamental challenges:

- Educating, retaining, and attracting enough scientists and engineers to grow our innovation economy.
- Ensuring that our educational institutions, research labs, and industries work collaboratively to translate the state's research into products that generate jobs for Californians.
- Supporting entrepreneurial leadership, in particular by generating and attracting capital investments that grow innovation industries.
- Creating a statewide business climate that supports the formation, growth and retention of innovation industries.

To address these challenges we recommend that the state establish a California Innovation Corporation with the following characteristics:

CHARGE: To encourage collaboration among academia and industry, promote the commercialization of innovative products and practices, and support talent development. Recruit and retain innovative researchers, entrepreneurs and enterprises to grow innovation clusters and promote economic growth throughout the state.

COMPOSITION: 15 members appointed by the Governor and the Legislature based on recommendations from CCST.

ORGANIZATION: Established as a nonprofit, 501(c)(3) corporation.

SOURCE OF FUNDING: Private sector funding: corporations and foundations.

INNOVATION STRATEGY: The CIC will develop an innovation road map that includes the following components:

TALENT GENERATION: The CIC shall recommend actions that make California the most attractive destination in America and the world for science and technology innovators. Actions shall include support and advocacy for the award of work visas, creation of practical training and internship opportunities, university strategies to attract and retain out-of-state and foreign students, and marketing California as a place that is supportive of S&T immigrants.

FACILITATED UNIVERSITY, LABORATORY, INDUSTRY AND STATE AGENCY COLLABORATION: The CIC shall facilitate the adoption of uniform contracting principles that expedite the award of research agreements and technology licenses. The CIC shall promote these principles to industry to demonstrate California's commitment to the transfer of technology to commercial work with partners. The CIC will work with our public universities to review and propose the elimination of barriers to industry/university partnerships and promote other ways to improve them.

STREAMLINE SUPPORT OF INNOVATIVE COMPANIES: The CIC shall review and propose regulations and taxation policies that stimulate the formation and growth of innovation industries in California. It shall identify and propose eliminating those regulations and taxation policies that hinder growth. Areas of focus may include tax credits or tax forgiveness to support company formation; statewide regulations that affect the cost of doing business; and local regulations, such as building codes, that affect operating costs. Recognizing that many regulatory challenges are a combination of state and local actions, the CIC will launch an initiative to create a "can-do" culture in regulatory agencies at all levels of government.

COMMUNITIES OF INNOVATION: The CIC shall work to catalyze communities of innovation that link universities, federal laboratories, and industries within each of the diverse regions of the state. Examples of emerging communities of innovation include; Livermore Valley Open Campus (a partnership effort of Lawrence Livermore and Sandia National Laboratories), NASA Ames Research Park (University of California partnered effort), Mojave Space Port, and the Monterey Bay Research Crescent. The CIC will use the Innovation Index described below to track state and regional progress.

CALIFORNIA INNOVATION EXTENSION SERVICES: The CIC shall work to establish a California Innovation Extension Service. Today's innovation climate calls for active engagement of people and programs – much more than simply negotiating intellectual property deals – to move knowledge to the marketplace. Like the agricultural extension programs that incubated California's world-leading agricultural and wine industries, the Innovation Extension Service will use extension agents to communicate research results and new techniques to those who translate them into the marketplace. This will be a call to service for California's universities and federal laboratories.

INNOVATION BENCHMARKING: The CIC shall provide an annual California Innovation Index to the State Legislature. As described in detail in the Appendices, the Innovation Index will document California's accomplishments in training, research, workforce and job creation, company formation, product commercialization, and other measures. To truly understand and stimulate the growth of new jobs, it is also critical to understand the motivations and incentives for the creation and retention of startups. Also as an appendix is a current snapshot of high growth, small business startup experiences in Los Angeles, illustrating the need to benchmark progress.

Through these actions, the CIC will help California regain its place among the top states and countries by all major measures of innovation activity. An effective program will remove all doubt about California's reputation as the world's leader in catalyzing innovation and welcoming top innovators from around the world. The CIC will work to ensure that innovations made create jobs.

California Education Innovation Consortium

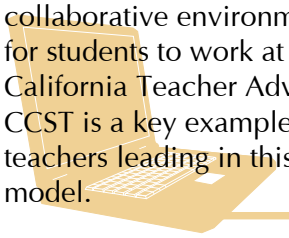
Establish a California Education Innovation Consortium comprised of stakeholders from K-16 education, business, government, NGOs, and others to promote digitally enhanced K-16 education.

We propose that California's 21st century learning environment be grounded in digital learning. Schools will be transformed into "incubators of learning and innovation." The skills and competencies gained in these learning environments are directly applicable to the workplace. Specific characteristics for these incubators of learning and innovation are presented in the detailed report and include: student access; personalized learning; on-line content; assessment and accountability; and the overall learning environment.

Transformation to incubators of learning and innovation will be based on four foundational pillars:

THE CLASSROOM ENVIRONMENT: California must redefine the classroom as a mobile learning environment (access any time, any place) and create an environment in which students have an active role in their learning experience—resulting in more student engagement. The islands of best practices emerging throughout the state need to be fostered and replicated.

THE TEACHER: California must foster an innovative learning environment where teachers are working alongside instead of in front of their students in a collaborative environment with more opportunities for students to work at their own rate. The California Teacher Advisory Council (Cal TAC) of CCST is a key example of the best and brightest teachers leading in this new learning environment model.



THE INSTITUTIONAL INFRASTRUCTURE: California must ensure that the infrastructure in these learning environments keeps pace with the digital world by ensuring that students and teachers have ubiquitous access to and training in digital learning tools and policies that support their effective use. California State University is positioned as an exemplar in connecting digital learning infrastructure to teacher training and development.

THE PARTNERSHIPS: California must encourage private investment and enhance public-private partnerships since they are a critical component for the development and sustainability of the envisioned 21st century learning ecosystems. TechNet, California STEM Learning Network (CSL-Net), the K-20 California Educational Technology Collaborative, and the California Emerging Technology Fund are among the many organizations leading this charge for communities of innovative learning through digital learning.

California's progress in creating and sustaining a 21st century learning environment for its students and teachers with the four foundational pillars noted above will require deliberate and persistent elimination of three fundamental barriers. The Education Innovation Consortium will address:

ACCESS

Every child in the state of California should have access to broadband capability. This initiative could be designed and implemented through an innovation partnership with leadership from the California Emerging Technology Fund, California's Broadband Council and industry, government,

academia, and non-profit organizations. The California Education Innovation Consortium could serve as the convener and catalyst to bring the various stakeholders together to develop an implementation plan and agree to a timeline

Every student should be permitted and encouraged to use personal digital tools in the classroom to complement his or her education.

EDUCATION CODE

The existing Education Code in California contains a number of provisions that are conducive to digitally enhanced education efforts, and these provisions should be implemented to the fullest extent possible in a timely and deliberate manner. Unfortunately, few of the programs that are helpful are currently funded and those that are funded have received significant budget reductions. The legislative infrastructure is nonetheless in place to catalyze the vision captured in these respective codes.

California's Department of Education in partnership with the California Education Innovation Consortium should identify near- and long-term actions and implementation plans in consultation with the Legislature to fully leverage existing provisions of the code. Some challenges they should address are which sections to:

- implement in the near term,
- revise or delete so as to not pose barriers to the envisioned 21st century digitally enhanced learning environment

STANDARDS

Full and immediate adoption of the 2010 California state standards for Mathematics, English Language Arts, and Literacy in Social Science and Science should be completed. These standards have not been fully implemented, as the state has a moratorium on the development of instructional materials until at least 2015, with full implementation not scheduled to take place until 2017. Instructional materials include the development of a framework for each subject that goes into great detail on what and how standards are to be taught, textbook adoption and assessment creation. Key steps include:

- The Legislature should move forward with immediate adoption of AB250 (Brownley), which would lift this moratorium so these new standards, based on the national wide Common Core standards, could be fully implemented by 2014. These new standards are focused on college and career readiness. The common core movement also released nationwide science standards in July 2011.
- The Legislature should convene another Standards Commission to review and adopt updated science standards.

The A-G entrance requirements for admission into CSU and UC campuses should be aligned to the 21st century workplace (academia, government, industry, non-profits).

- The CSU and UC leadership teams should revisit and update these entrance requirements to reflect changes in how students learn and how schools operate.
- The Department of Education in collaboration with CSU and UC leadership should incorporate P21 skills to create a more wholly educated student body. These skills were developed by companies and are meant to guide schools and government on what skills are important in a globally competitive work environment. These skills should become part of the state standards and/or A-G entrance requirements.

In all three categories, opportunities are present for immediate action today through the engagement of key stakeholders and champions in implementing existing resources and policies.

NEXT STEPS

Work with State agencies, the Legislature and private sponsors to agree on terms of reference for an implementation plan and to secure a mandate from state to proceed.

Water Innovation Road map

Develop a California Water Future (CWF) Science and Technology Innovation Road Map - a 10/25/50-year plan that identifies where science and technology plays an important role and covers a range of future scenarios from surplus to drought.

The Phase I roundtables and the Phase II Water Action Team identified the following primary challenges facing long-term management of California's water systems.

AGRICULTURAL ISSUES

Quantifying agricultural water use and efficiency has presented policy makers with a host of challenges including contradictory reports and data on demand and supply. There is a critical need for science and technology to provide objective information to form the basis for good policy. Terms need to be clearly defined, bad or misleading data should be vetted, and an emphasis on educating policy makers should be undertaken.

URBAN ISSUES

Whereas agricultural water consumption is expected to decline in future years, urban consumption is expected to increase, driven largely by growth in California's population. Significant improvements in efficiency, aided by major efforts to assure water quality, reuse, reclamation, and storm water capture will be needed to meet the expected growth in demand and to reduce per-capita water use where possible. To address both urban and agricultural needs we will also need to know much more about groundwater usage and to pursue more and better ways to achieve groundwater recharge.

THE CONNECTION BETWEEN WATER, ENERGY, AND AIR QUALITY

The nexus between water and energy has emerged in the past decade as a significant challenge and opportunity in California. The California Energy Commission (CEC) has estimated the 19% of California's electricity and about a third of non-power plant natural gas is used for various parts of the water systems. Energy use, in turn, affects emissions and consequently air quality. Water, on the other hand, is a significant input to many, energy systems. The CEC and the California Public Utilities Commission, along with universities, federal labs, NGOs, and others, have followed up with studies on various aspects of the water-energy relationship – these studies will be integrated into future work.

REMOTE SENSING AND MODELING

Satellite monitoring, geographical information systems, and numerical modeling have been critical tools for the characterization of land use and land cover change for many years. These and similar tools have dramatically strengthened the capacity to monitor water resources and use, by means of measurements made from satellites and aircraft of such things as soil moisture, snow area, underground aquifer content, and crop health. They are also technologies in which California is a world leader in both creation and deployment. Other technologies need to also be evaluated for their application to the management of our integrated water system if we are to achieve our long-term goal of a sustainable water supply.

SUSTAINABILITY, ENVIRONMENTAL BALANCE AND THE IMPACT OF CLIMATE AND POPULATION PRESSURES

Climate change is likely to increase both the length and temperature extremes of weather cycles, demanding additional energy and water. Likewise, by 2050, California's population is projected to increase by almost 48 percent from 2005 levels, impacting water use, energy use, and greenhouse gas emissions.

CCST proposes to work, at the Legislature's request, with the Department of Water Resources, the State Water Resources Control Board, the

California Energy Commission, the Public Utilities Commission, the California Air Resources Board, California Department of Food and Agriculture and other agencies and constituencies to develop a California Water Future (CWF) Innovation Road Map, a 10/25/50-year plan and integrate it with the State's ongoing long-term planning.

The Road Map will feature an innovation strategy to help ensure an environmentally viable, economically sustainable water supply for California as its population grows and the climate changes. The road map will be similar in scope and intent to "California's Energy Future," generated by CCST for the California Energy Commission, which charted a course for the science and technology needed to accomplish the goals of California's Global Warming Solutions Act of 2006 (AB32) and Executive Order S-3-05.

This effort will require the development of realistic scenarios of supply and demand associated with a 10/25/50 year view; including a top down definition of what a sustainable water use budget could be by sector; establish rules of operation; identify job creation opportunities; and determine how market forces can be deployed. These scenarios should be founded on a quantified economic analysis that considers the range of expected real costs of infrastructure development, water, energy and efficiency implementation using a full-cost methodology.

CWF ROAD MAP FOCUS

A preliminary survey of California water issues has identified these areas below where science and technology plays an important role:

- Forecasting future water availability and demand
- Building resiliency to seasonal and multi-year changes in weather (hydrometeorological) cycle
- Reducing the water intensity of energy systems and the energy intensity of water systems
- Increasing the efficiency of water use
- Ensuring water quality
- Developing surface storage and ground water recharge options
- Assuring that groundwater use is monitored and reported
- Restoring watersheds, riparian systems, and habitats

Related to these issues is the following preliminary list of possible applications of science and technology that should be considered:

- Remote sensing and satellite monitoring
- Sensor technology, IT and smart system applications (smart meters, data management, control systems, etc.)
- Membrane and filtration technology
- Agriculture/water technology options
- Desalinization
- Information collection technologies
- Management and public policy interface technologies
- Weather and climate forecasting

NEXT STEPS

Work with the Legislature to secure a mandate for CCST to work with the Department of Water Resources, State Water Resources Control Board, California Energy Commission, the Public Utilities Commission, the California Air Resources Board, California Department of Food and Agriculture and other agencies and constituencies to develop the California Water Future Innovation Road Map.

Appendix A: The California Innovation Index: The Elements of A Vital State and Regional Innovation System

A vital innovation system is driven by a diverse mix of world-class economic actors in an environment which supports the flow of information between actors across different realms of activity such as businesses, researchers, consumers, investors, educators and policymakers. It is the open flow of interaction and generation of new ideas among these different actors that creates the vital feedback loops that speed adaptation and creation in the commercialization process which results in economic growth and prosperity.

The image on the next page illustrates the participants in an innovation system and the dynamics which generate added value beyond the sum of the individual elements. New investment in California's innovation system will stimulate the dynamics already in place, speed the broad deployment of technology already under development and result in gains in employment and prosperity in the state. Related to clean energy technology, the local deployment of products that conserve energy or leverage clean energy sources will also support environmental improvement as the state lowers its reliance on carbon-based energy. Further, as the speed of development and deployment quickens in California, the deployment of these important technologies will quicken nationally.

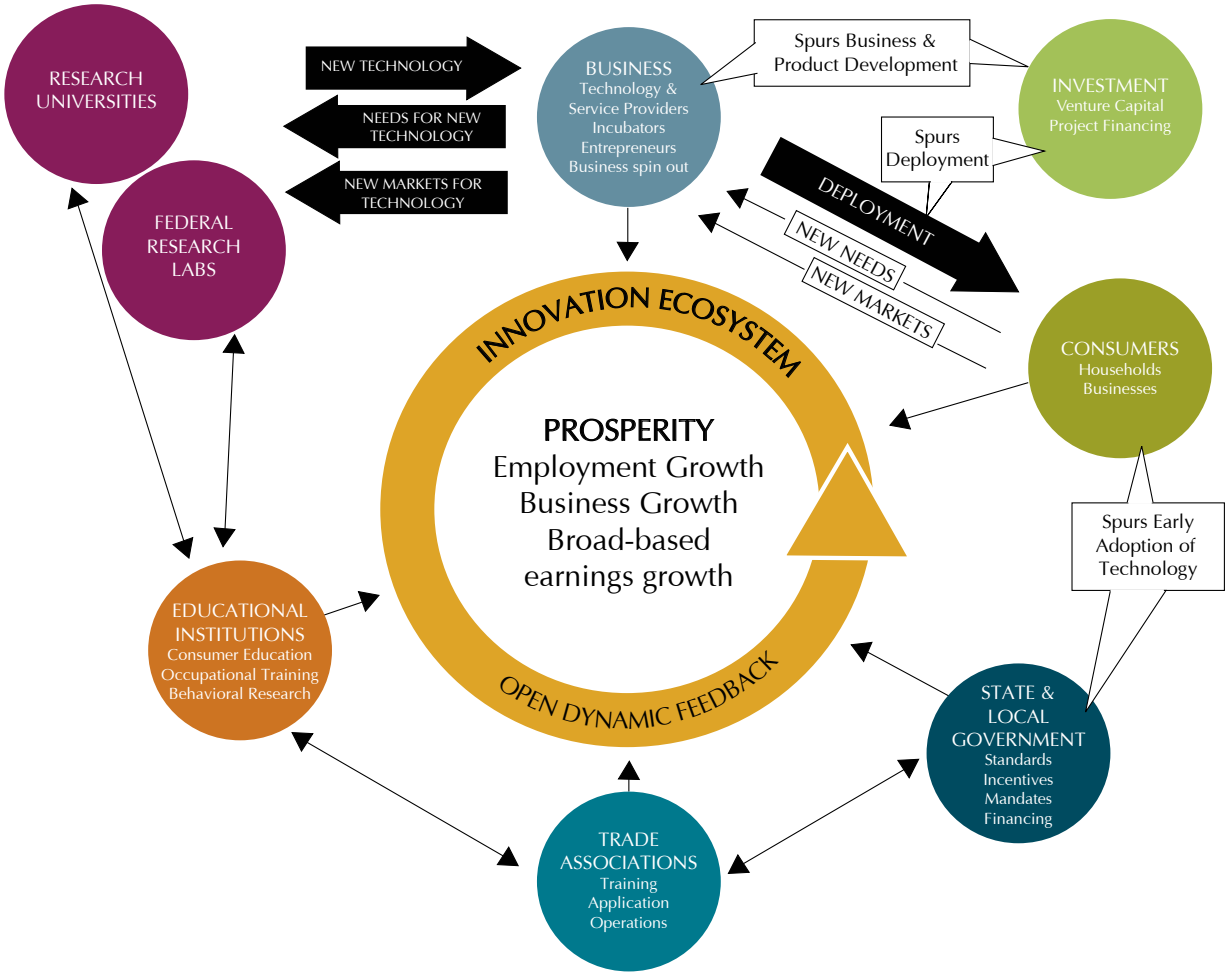
While California's economy benefits from its world-class universities and federal labs, an innovation system is primarily driven by the information flowing through the many feedback loops of the system. While much valuable technology and intellectual property originates in the labs and other research centers, an open dynamic model spurs the flow of information about new market needs to help drive research and development. This means that with these flows, more complete information about the needs of consumers reaches businesses (e.g. the product and service providers) and labs (scientific and technical researchers). This also means that where rich communication flows exist, dollars spent on research and development can go further and result in a broader impact in the community. Venture capital investment of cash and business development assistance serves to accelerate the commercialization of viable technology.

Innovative public policy can support the growth of new markets and new technology. For example, standards, incentives, public procurement mandates and creative financing options help stimulate the development and adoption of new technology. A state or region that can develop a culture of early technology adoption creates rich feedback loops which speed the forward advancement of technology.

Trade and industry associations play a critical role in generating feedback in the system regarding training needs, the application of new technology, and the changing economic context. For technology related to clean energy in particular, trade associations play an important role in the application and operations of clean energy generation systems and building efficiency products as well as in the related training activities.

California's educational institutions including universities, community colleges and other occupational training centers contribute meaningfully to the state's highly skilled talent pool. When effectively networked with other elements of the system, educational institutions contribute to the development of technology, business, public policy and consumer education in addition to occupational and professional training.

A VITAL INNOVATION ECOSYSTEM



A healthy innovation ecosystem is composed of diverse elements that interact in an open, dynamic environment. Each element depends on the success of the other elements.

Appendix B: Proposed Framework For the California Innovation Index

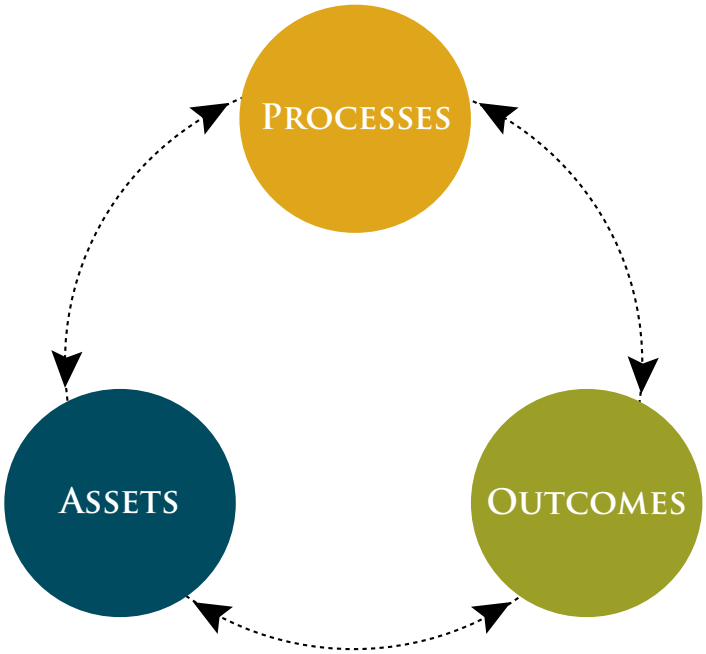
California should invest in a California Innovation Index. The purpose will be to provide an assessment and tool for tracking the state's progress in growing its assets, improving its processes of innovation, and producing better outcomes for its communities. The index will provide the ability to benchmark California against other competitive regions as well as California's progress over time. The index will examine California's science and technology infrastructure and base for innovation. This framework will provide important information required for the development of an innovation-based economic strategy. In addition, it will offer valuable information to policy makers, administrators and the business community for making informed decisions regarding investment, training and program development. Further, the index will provide residents with accessible information about California's strengths and areas for development as well as how the state's economy is evolving.

The index will be organized into three parts: Innovation Assets, Innovation Processes, and Innovation Outcomes. Each part will include multiple facets, and each part will include a global element which reflects the great importance of California's global connections in the state's innovation system.

ASSETS: California has many strengths and assets. Assets, however, are a necessary but an insufficient condition for success. Assets, such as a talented workforce, research and development (R&D) capacity, and investment capital, contribute to a fundamental foundation for innovation. These assets fuel the innovation process and create economic opportunities in the global economy.

PROCESSES: While examining California's assets provides a measure of its innovation capacity, observing the state's innovation processes provides a measure of how well assets are translating into innovations and economic benefits. Processes will include the generation of new products and ideas, the commercialization of these, and the propensity of both entrepreneurship and business innovation.

OUTCOMES: Valuing and investing in California's science and technology assets and facilitating the innovation processes in the state will yield positive results for California's economy and the prosperity of its communities. Measuring outcomes from innovation, such as competitiveness, business performance, and economic opportunity will capture California's economic benefits that result from translating assets into innovations.



	FRAMEWORK	INDICATORS	DATA SOURCES
ASSETS	TALENT BASE	Educational Attainment: CA, US, Tops States	U.S. Census Bureau, American Community Survey
		Science & Engineering Workforce: CA, US, Top States	Census PUMS
		Science & Engineering Workforce by Discipline	Census PUMS
		Science & Engineering Workforce by Industry	Census PUMS
	TALENT DEVELOPMENT	Science & Engineering Degrees Conferred	National Science Foundation
		Academic Rankings of CA Universities	National Science Foundation
		SAT scores: CA, US, Top states	National Center for Education Statistics
		High School Graduation Rates	CA Department of Education
		"K-12 achievement levels in STEM fields: CA, US, Top States CST Math & Science Achievement by Grade & Proficiency (CA, 2002-2010) National Assessment of Educational Progress in Math & Science by Grade (4, 8, 12), by state and US (1992, 1996, 2000, 2003, 2005, 2007, 2009)"	CA Department of Education
	TALENT ATTRACTION	Science & Engineering Degrees Conferred to Foreign Students	National Science Foundation, National Center for Education Statistics
		S&E Talent by Place of Birth	Census PUMS
		S&E Talent Flows to and from CA	Census PUMS
	TECHNOLOGY R&D	Federal R&D Funding: CA, US, top states	NSF 03-303, 303-303 and Science Indicators
		Private Sector R&D Funding: CA, US, top states	NSF 03-303, 303-303 and Science Indicators
		Academic R&D Funding: CA, US, top states	NSF 03-303, 303-303 and Science Indicators
	INVESTMENT CAPITAL	Venture Capital by Industry	PWC MoneyTree
		Cleantech Venture Capital by Industry	Cleantech Group
PROCESSES	IDEA GENERATION	Patent Registrations: CA, US, Top States	USPTO
		Patents by Technology Area	USPTO
		Patents by Entity: University, Lab, Private Company	USPTO
		Global Co-Patenting	USPTO
	COMMERCIALIZATION Technology Licensing Activity	University Technology Licensing	AUTM
		Pre-market approvals and pre-market notifications	US Food and Drug Administration
		FDA Approvals of biotechnology drugs, Biotechnology Industry Organization	Biotechnology Industry Organization
	ENTREPRENEURSHIP	Business Churn: annual in- and out-migration, openings and closings: S&E, Non-S&E	NETS
		Entrepreneurial Activity	Kauffman
	BUSINESS INNOVATION	Small Business Innovation Research (SBIR) Awards	SBA, NSF
		SBIR Funding per $1 million GDP	SBA or NSF; Economy.com
OUTCOMES	COMPETITIVENESS	State Value Added	2007 Economic Census or Economy.com
		Value Added by Industry	2008 Economic Census or Economy.com
		Energy Productivity	EIA, BEA, Economy.com
	BUSINESS PERFORMANCE	Employment Growth by Industry	BLS QCEW or NETS
		Business Growth by Industry	BLS QCEW or NETS
		Revenue Trends per Employee, by Industry	NETS
		"Foreign Direct Investment Percentage of Employment in Foreign-Owned Companies"	BEA
		Total Foreign Exports as Percentage of State GDP	International Trade Administration, BEA
	OPPORTUNITY	Earnings Trends by Industry: S&E, Non-S&E	BLS QCEW
		California Tax Revenues, Firms and Employees	California Franchise Tax Board

Appendix C: Creating Jobs Through Nurturing High Growth Startups: A View From Los Angeles

Local and regional governments pay a great deal of attention to attracting large firms and existing business, but pay less attention to new businesses. To truly understand and stimulate the growth of new jobs, however, it is critical to understand the motivations and incentives for the creation of startups.

Over the last 5 years, the University of Southern California (USC) has focused strategically on being a world leader for nurturing innovative people, technologies, and companies. The university launched the USC Stevens Institute for Innovation in 2007 to help faculty and students make maximum impact with their ideas, and it has since created a diverse network of resources designed to support the creation of new ventures. A recent project to track the successes of USC spinout companies has raised some surprising questions and observations.

Not all startups are created equal. University spinouts, defined as start-ups that depend on the intellectual property resulting from university research, are particularly high growth – sometimes referred to as gazelles in the literature.

The USC Stevens Institute learned that in the depths of the most recent recession (2008-2009), USC spinouts raised more than $150M in capital; further, more recent analysis indicates that this number is likely much, much higher (data being validated now). These numbers paint a very promising picture indeed, because capital raised by high-growth ventures gets invested into product development, marketing, and sales – leading not only to innovative products and services that improve quality of life, but the creation of new jobs.

However, the data also show a troubling fact: half of the jobs created by USC spinoffs have left the region, many even leaving the country. This is especially disconcerting in comparison to the 2001 Licensing Survey by AUTM (Association of University technology Managers), which determined that 80% of university spinouts in the US stay in the same state as the university they came from. So what is going wrong in Los Angeles? Even if some startups are relocating elsewhere within California, meaning no loss of state tax revenues, we should still be concerned.

What scares business away? Many contend taxes or regulatory issues are to blame for a stagnant business climate in California. However, we should test these assumptions for high-growth small businesses, because they likely have very different needs than incumbent ones. We have an opportunity to learn more through further study of our database of USC spinouts.

A recent survey of USC Alumni may provide further clues. The survey found, remarkably, that 19% of USC Alumni have started at least one firm. However, 63% of these entrepreneurial USC Alumni started their business outside of LA County. We asked motivations for picking the location; 50% decided to locate their business where they did because of proximity to family or because it was their hometown. The second most popular deciding factor was proximity to customers (35%), followed by lifestyle and culture (31%), and proximity to a network of business contacts (28%). The only other significant factors were availability of workforce talent (14%) and weather (15%). Surprisingly insignificant factors were government incentives (2%), low taxes (6%), and regulatory issues (4%).

This initial survey indicates a significant departure from the traditional motivations of large corporations. This means that founders may be more concerned with the community in which they live and work than oft-referenced determinants of profits such as a friendly regulatory environment or tax incentives.

In addition to the factors influencing the initial location of a startup, it would also be useful to explore what influences the growth and employment of startups, and how the factors might depend on the region or industry. Each community has different needs in creating a robust innovation ecosystem; what works in Silicon Valley may not work in Los Angeles or Sacramento or the Central Valley, nor does a digital media company need the same infrastructure as a company in the energy industry. The key elements of several innovation ecosystems are already present in Southern California in one form or another, but just like the region itself it is highly decentralized and needs a concerted effort to pull them together.

Because new ventures drive all net job growth, economic development efforts must not take for granted California's entrepreneurial engine. Initial signs indicate that Southern California has a great deal of untapped potential. To create jobs, policies must take into consideration factors that stimulate the creation of new firms rather than only focusing on luring legacy businesses. It's the difference between transplanting a mature tree and planting thousands of seeds.

Source: Krisztina Holly, Vice Provost for Innovation - University of Southern California

Appendix D: phase II i2i action teams

Innovate 2 innovation Members

Charles F. Kennel, i2i Co-chair
Distinguished Professor of Atmospheric Science
Scripps Institution of Oceanography

Julie Meier Wright, i2i Co-chair
Retired President and CEO
San Diego Regional Economic Development Corporation

Randolph Hall
Vice President of Research
University of Southern California

Doug Henton
Chairman and CEO
Collaborative Economics

William F. Miller
Herbert Hoover Professor of Public
& Private Management, Emeritus
Graduate School of Business
Stanford University

Robert S. Sullivan
Dean
Rady School of Management
University of California, San Diego

Samuel J. Traina
Vice Chancellor for Research and Graduate Dean
University of California, Merced

Steven F. Zornetzer
Associate Center Director
NASA Ames Research Center

Overall Support and Assistance Provided By

CCST Staff
Susan Hackwood, CCST Executive Director
Lora Lee Martin, Director, Strategic Policy Initiatives
Donna King, Senior Project Coordinator and Accountant
Sandra Vargas-De La Torre, Project Coordinator and Report Layout
and Collaborative Economics

Education Action Team Members

Anne Marie Bergen, Co-chair
Cal TAC Chair and
Teacher in Residence, Biological Sciences
Cal Poly, San Luis Obispo

Mohammad Qayoumi, Co-chair
President
San Jose Sate University

Dede Alpert
Former State Senator
California State Senate

Stacey Kyle
Education Specialist
CCST Consultant

Angela Phillips Diaz
CCST Consultant

Stephen D. Rockwood
Retired Executive Vice President and Director
Science Applications International Corporation (SAIC)

Brian Shay
Cal TAC Vice-chair and
Secondary Mathematics Teacher
Canyon Crest Academy, San Diego

Water Action Team Members

Jude Laspa, Chair
Retired Executive Vice President and Director
Bechtel Group, Inc.

Soroosh Sorooshian
Distinguished Professor and
Director, Center for Hydrometeorology & Remote Sensing (CHRS)
University of California, Irvine

Robert Wilkinson
Director, Water Policy Program
University of California, Santa Barbara

David F. Zoldoske
Executive Director
Water Resources and Policy Initiatives
California State University

Appendix E: California Council on Science and Technology Board and Council

2011 Board Members

Karl S. Pister, Board Chair; Chancellor Emeritus, University of California, Santa Cruz; and Dean and Roy W. Carlson Professor of Engineering Emeritus, University of California, Berkeley

Bruce M. Alberts, Editor in Chief, Science Magazine and Professor, Department of Biochemistry & Biophysics, UC San Francisco

Ann Arvin, Vice Provost and Dean of Research, Lucile Salter Packard Professor of Pediatrics and Professor of Microbiology and Immunology, Stanford University

Warren J. Baker, President Emeritus, California Polytechnic State University, San Luis Obispo

Peter Cowhey, Council Vice-Chair and Dean, School of International Relations and Pacific Studies, University of California, San Diego

Bruce B. Darling, Executive Vice President, University of California

Susan Hackwood, Executive Director, California Council on Science and Technology

Randolph Hall, Vice Provost for Research Advancement, University of Southern California

Charles E. Harper, Executive Chairman, Sierra Monolithics, Inc.

Paul Jennings, Professor, Civil Engineering and Applied Mechanics, Emeritus and Former Vice Provost, California Institute of Technology

Miriam E. John, Council Chair and Emeritus Vice President, Sandia National Laboratories, California

Bruce Margon, Vice Chancellor of Research, University of California, Santa Cruz

Tina Nova, President, CEO, and Director, Genoptix, Inc.

Lawrence T. Papay, CEO and Principal, PQR, LLC

Patrick Perry, Vice Chancellor of Technology, Research and Information Systems, California Community Colleges

Rollin Richmond, President, Humboldt State University

Sam Traina, Vice Chancellor of Research, University of California, Merced

2011 Council Members

Miriam E. John, Council Chair and Emeritus Vice President, Sandia National Laboratories, California

Peter Cowhey, Council Vice Chair and Dean, School of International Relations and Pacific Studies, University of California, San Diego

Wanda Austin, President and CEO, The Aerospace Corporation

Sally Benson, Director, Global Climate and Energy Project, Stanford University

Julian Betts, Professor of Economics, University of California, San Diego

George Blumenthal, Chancellor, University of California, Santa Cruz

Susan Bryant, Former Vice Chancellor for Research, University of California, Irvine

Charles Elachi, Director, Jet Propulsion Laboratory

David Gollaher, President and CEO, California Healthcare Institute

Corey Goodman, Former President, Biotherapeutics and Bioinnovation Center, Pfizer

Susan Hackwood, Executive Director, California Council on Science and Technology

Bryan Hannegan, Vice President of Environment and Renewables, Electric Power Research Institute

Sung-Mo "Steve" Kang, Chancellor, University of California, Merced

Charles Kennedy, Vice President for Health Information Technology, WellPoint, Inc.

Jude Laspa, Retired Deputy Chief Operating Officer, Bechtel Group, Inc.

Richard Levy, Chairman of the Board, Varian Medical Systems

William Madia, Former Senior Executive Vice President of Laboratory Operations, Battelle

David W. Martin, Jr., M.D., Chairman & CEO, AvidBiotics Corporation

Fariborz Maseeh, Founder and Managing Principal, Picoco LLC

George H. Miller, Director, Lawrence Livermore National Laboratory

Michael Nacht, Professor, Goldman School of Public Policy, University of California, Berkeley

Stephen D. Rockwood, Retired Executive Vice President, Science Applications International Corporation

Jeffrey Rudolph, President and CEO, California Science Center

Shankar Sastry, Dean, College of Engineering, University of California, Berkeley

Soroosh Sorooshian, Distinguished Professor and Director, Center for Hydrometeorology & Remote Sensing (CHRS), University of California, Irvine

James L. Sweeney, Director, Precourt Institute for Energy Efficiency, and Professor of Management Science and Engineering, Stanford University

S. Pete Worden, Director, NASA Ames Research Center

Julie Meier Wright, Retired President and CEO, San Diego Economic Development Corporation

Kathy Yelick, Director, National Energy Research Scientific Computing Center (NERSC), Lawrence Berkeley National Laboratory

Appendix F: California Teacher Advisory Council

Anne Marie Bergen, Chair
Teacher in Residence, College of Science and Math
Cal Poly, San Luis Obispo

Jeffery Bradbury
Chemistry Professor
Cerritos Community College

Peg Cagle *
Mathematics Teacher
Lawrence Middle School & Gifted Magnet

Lewis Chappelear *
Engineering Teacher
James Monroe High School

Caleb Cheung *
Manager of Science
Oakland Unified School District

Jeffrey Foote
6th Grade All Subject Teacher
Kermit McKenzie Jr. High

Heidi Haugen *
Agricultural Science Teacher
Florin High School

Diana Herrington
Mathematics Teacher
Clovis High School

Jennifer Howard
Kindergarten Teacher
Miraloma Elementary School

Susan Pritchard, Ph.D. *
Science Teacher
Washington Middle School

Brian Shay, Vice Chair
Mathematics Teacher
Canyon Crest Academy

Katrina Williams
Elementary School Teacher
Harvest Elementary School

* National Board Certified Teacher