



University of Hawai'i Innovation Council

Recommendations



UNIVERSITY of HAWAII®
SYSTEM

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OBJECTIVE

In February 2010, University of Hawai'i President M.R.C. Greenwood was the first UH president to deliver a State of the University address to both the House and Senate. She announced three objectives: focusing on increasing the number of educated citizens in Hawai'i, contributing to the workforce and the economy, and advancing the university's reputation for excellence and its ability to build the state's capacity. She embarked on three initiatives:

- Increase the number of educated citizens by creating the Hawai'i Graduation Initiative. The objective of this initiative is to increase the number of college graduates by 25 percent by the year 2015. It will focus on access, affordability, and student success, therefore increasing Hawai'i's educational capital.
- Continue to contribute positively to the workforce and the economy by appointing a presidential Advisory Council of experts to study the successes, challenges, and opportunities for a high value economy in Hawai'i. This council will advise on the steps the university should take to create a 21st century capability for innovation and technology transfer to support a multi-billion dollar industry for Hawai'i research spin off and related services.
- Advance the university's national reputation for excellence and its ability to build the state's capacity. Project Renovate to Innovate is the initiative that addresses this objective. This effort will focus on rebuilding infrastructure, bringing indirect cost rates in line with peer institutions, and increasing the creation of small businesses based on UH technology developments.

This report is the outcome of the second initiative stated above. The purpose of the Advisory Council on Hawai'i Innovation and Technology Advancement is first, to be aware of the current research and technology capabilities of the University of Hawai'i and secondly in the context of the university's current capabilities, provide advice and recommendations on how the university may position itself to concurrently enhance the university's research programs and collaborate in the creation of an environment within the state of Hawai'i that promotes research and technology development and transfer thus enabling the university to contribute to the satisfaction of the needs of the state and the state's overall economic development.

MEMBERS OF THE COUNCIL

In an April 5, 2010 announcement, President Greenwood named an eight-person council. The members (Table 1) were chosen based on their extensive experiences and distinguished accomplishments in conceptualizing, designing, and implementing research systems and enterprises.

TABLE 1: MEMBERS OF THE ADVISORY COUNCIL ON HAWAII' I INNOVATION AND TECHNOLOGY ADVANCEMENT

Member	Title, Affiliation
Dr. Carl Bonham	Executive Director, University of Hawai'i Economic Research Organization and Associate Professor of Economics, University of Hawai'i at Mānoa
Daniel Goldin	Chairman; President and CEO of The Intellisis Corp. and 9th NASA Administrator (retired)
Katharine Ku	Director, Office of Technology Licensing, Stanford University
Jim Lally	Partner Emeritus, Kleiner Perkins Caufield & Byers
Dr. Brian Taylor	Dean, School of Ocean and Earth Science and Technology, UH Mānoa
Barry Weinman	Managing Director and Co-Founding Partner Emeritus, Allegis Capital
Dr. Mary Walshok	Associate Vice Chancellor of Public Programs and Dean of Extended Studies, University of California, San Diego
Dr. Hank Wuh	Founder and CEO, Cellular Bioengineering Inc. and Skai Ventures
Advisors to Council	
Dr. James Gaines	Vice President for Research, UH System
Dr. Virginia Hinshaw	Chancellor, UH Mānoa

INNOVATION IS A NATIONAL PRIORITY

Innovation is an essential driver of economic growth and future competitiveness. A thriving innovation economy promotes economic growth, fosters new technologies, creates jobs and keeps the U.S. leading the global marketplace. States across the nation and the Obama Administration have committed to renewing the country's focus on innovation as a means of fostering economic growth and creating high-wage jobs throughout the nation.

In September 2009, the Obama Administration published an Innovation Plan¹ outlining the goals and the steps it plans to take to promote the innovation economy of the future. Figure 1 graphically represents the administration's innovation strategy that emphasizes three central commitments that lay the foundation for innovation that leads to quality jobs and economic prosperity.

INVEST IN THE BUILDING BLOCKS OF AMERICAN INNOVATION

As a foundation, America needs to restore leadership in fundamental research which will catalyze new discoveries and technologies that will improve our lives and create the industries of the future, educate the next generation with 21st century knowledge and skills while creating a world-class workforce, build a leading physical infrastructure, and develop an advanced information technology ecosystem.

PROMOTE COMPETITIVE MARKETS THAT SPUR PRODUCT ENTREPRENEURSHIP

It is imperative to create a national environment ripe for entrepreneurship and risk taking that allows U.S. companies to be internationally competitive in a global exchange of ideas and

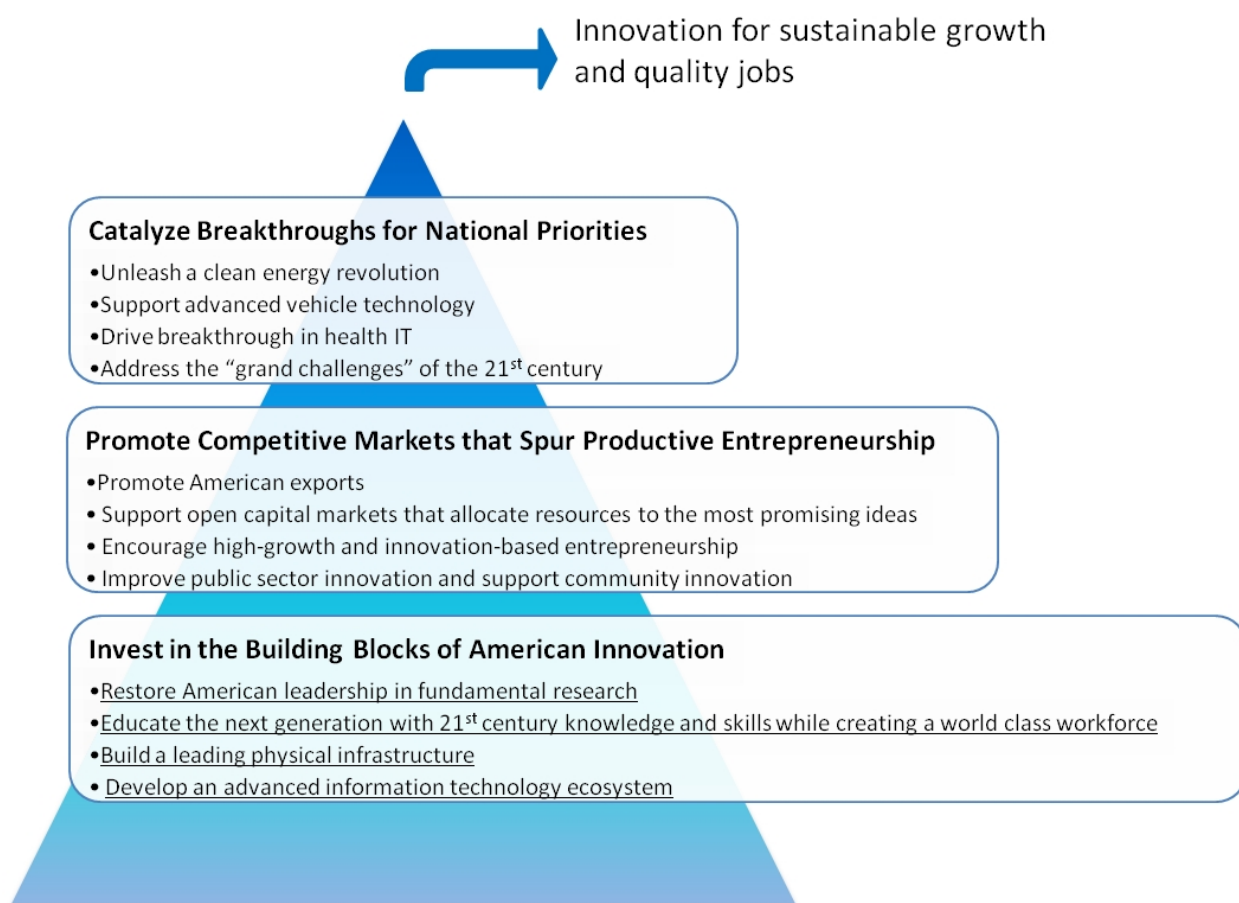
¹ http://www.whitehouse.gov/the_press_office/president-obama-lays-out-strategy-for-american-innovation/

innovation. Through competitive markets, innovations diffuse and scale appropriately across industries and globally.

CATALYZE BREAKTHROUGHS FOR NATIONAL PRIORITIES

There are certain sectors of exceptional national importance where the market is unlikely to produce the desirable outcomes on its own. These include developing alternative energy sources, reducing costs and improving lives with health IT and manufacturing advanced vehicles. In these industries where markets may fail on their own, government can be part of the solution.

FIGURE 1: PRESIDENT OBAMA’S INNOVATION PLAN



INNOVATION IS A STATE PRIORITY

During his campaign, Governor Neil Abercrombie prepared a roadmap for Hawai‘i called A New Day in Hawai‘i.² The plan was developed based on his values and priorities, and communicating with the people of Hawai‘i.

² http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf

The executive summary in his roadmap outlines the following priorities in regards to innovation and priority areas for Hawai'i:

- *Economy: Increase self reliance and protect our resources; produce our own energy; grow our own food; advance sustainable tourism and development³*
- *Education–University of Hawai`i System: Support the entrepreneurial professor; facilitate innovation and technology transfer; support premier education and research projects⁴*
- *Energy: Research, expand and deploy renewables with clear community benefits⁵*
- *Environment and Natural Resources: Advance our clean energy future; increase local food production and consumption; improve prevention, management and response system for invasive species; prepare for the impacts of climate change⁶*
- *Food and Agriculture: Raise the supply of local food; support agricultural exporting⁷*
- *Health: Expand the use of information technology in healthcare; support patient-centered models of care that focus on prevention and address social determinants of health⁸*
- *Technology and Innovation: Create a Governor's Technology Council; support science, technology and innovation in schools; integrate our university system with local business to drive economic diversity and prosperity; build technology development and commercialization centers; appoint a chief information officer for the state.⁹*

FEEDBACK

In January 2011, in collaboration with the National Academy of Sciences' Board on Science, Technology, and Economic Policy (STEP), President Greenwood convened a two day conference on Hawai'i's innovation economy, entitled *E Kamakani Noi'i: The Wind That Seeks Knowledge*. The goal of the conference was to engage Hawai'i business and political leaders with high-level U.S. government officials and others positioned to help drive innovation, business formation, and growth in Hawai'i. The conference also provided an opportunity to discuss a series of proposed initiatives to strengthen Hawai'i's innovation and technology infrastructure and identify areas where federal, state, and foundation contributions could generate positive synergies.

During the conference, President Greenwood announced the draft report recommendations from the Innovation Council. Feedback was solicited during the conference and open for public comment for two weeks after the conference.

³ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 3)

⁴ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 4)

⁵ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 4)

⁶ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 4)

⁷ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 4)

⁸ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 5)

⁹ http://www.neilabercrombie.com/images/uploads/AFG_ANewDayinHawaii.pdf (page 6)

The Council received 43 feedback comments from University of Hawaii Affiliates, the Business Community, and University of Hawaii Staff and Faculty. In keeping with the spirit of sustainability, copies of the submitted feedback received will be provided upon request.

The Council very much appreciated receiving the feedback. The Council concluded that while the feedback was rich in information and suggestions (albeit at times very technical and specific) it generally supported the Council's four recommendations. Additionally the Council urges the University to take into consideration not only the Council Recommendations but the contextual information that the feedback received provides as the University embarks in its efforts to develop an implementation plan of the Council's recommendations.

CONSIDERATION OF COMMENTS AND FINAL RECOMMENDATIONS

The Council recognizes that all four recommendations have to be implemented concurrently. Without integrating the recommendations in concert, the overall goal will not be achieved. The Council also recognizes that implementation will take time and that measureable results will not be achieved for five years. Another key point is that the Council highly cautions on over-promising results.

RECOMMENDATION 1: IDENTIFY RESEARCH AS AN INDUSTRY IN HAWAII

The council recommends that UH put forth a strong recruiting effort to attract world class researchers in special opportunity areas in which Hawai'i has a strategic advantage over anywhere else in the world. By attracting and recruiting the top research scientists and engineers in areas in which UH has a significant strategic advantage, such as astronomy, oceanography, and volcanology, UH has the potential to grow its research capacity.

A top research scientist typically attracts \$15M per year in research dollars. If UH were to grow its research base by 50% in five years, it would grow at an annual rate of 8.5% and would need to recruit fourteen new world class scientists during this time. This is a very conservative goal because currently UH grows organically at a much higher rate. Despite the fact that the nation is doubling its research dollars, this is a fair goal because of the current economic and political landscape facing Hawai'i today.

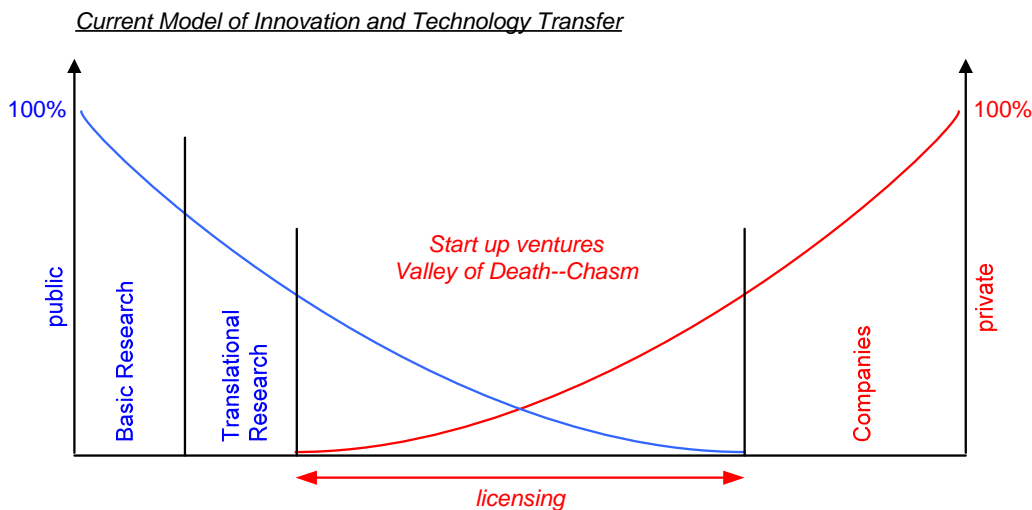
The Council also recommends that UH formalize relationships to encourage collaborations similar to consortiums. The Council recognizes that UH is the economic R&D engine of Hawai'i, however, leveraging efforts with other research institutions will increase Hawai'i's research capacity, increase the probability to receive competitive grants, and make it easier for scientists, graduate students, post-doctoral students, and entrepreneurs to cross-pollinate ideas.

RECOMMENDATION 2: ESTABLISH HITEX (HAWAII INNOVATION TECHNOLOGY EXCHANGE) INSTITUTE

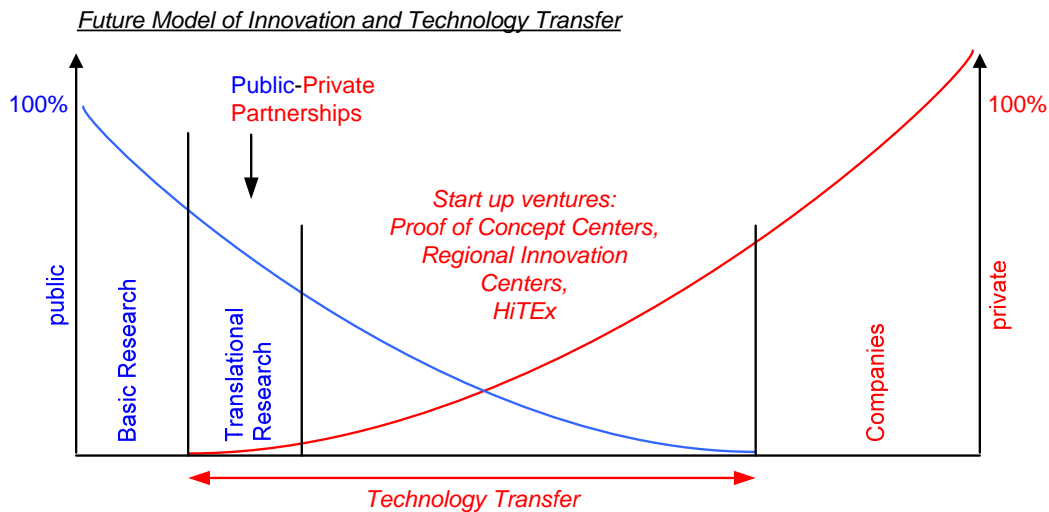
The current innovation continuum model (Figure 2) at the university may be improved by fostering a more productive innovation ecosystem. Potential investors and their companies become involved too late in the process and there is little market input before deciding which basic research to translate into innovations. UH's Office of Technology Transfer and Economic Development (OTTED) is viewed as a vehicle to return funds quickly to the university. The relationship between OTTED and industry is not viewed as a long term endeavor. It is costly to file for patents. However, there are no clear feedback loops to bring that investment back to sustain OTTED operations.

A new innovation model (Figure 3), providing public and private collaboration around translational research and offering assistance to start-ups from proof-of-concept centers and innovation centers, is being implemented around the nation. Universities are being viewed as partners by industry, leading to the advancement of more university innovations from basic research to commercialization. In turn, these partnerships improve the ability of industry to succeed and return funds to the universities, continuing the cycle.

FIGURE 2: CURRENT MODEL OF INNOVATION AND TECHNOLOGY TRANSFER¹⁰



¹⁰ Insights drawn from: http://ryanfamily.typepad.com/files/us_chs_medicaltourismstudy28329.pdf

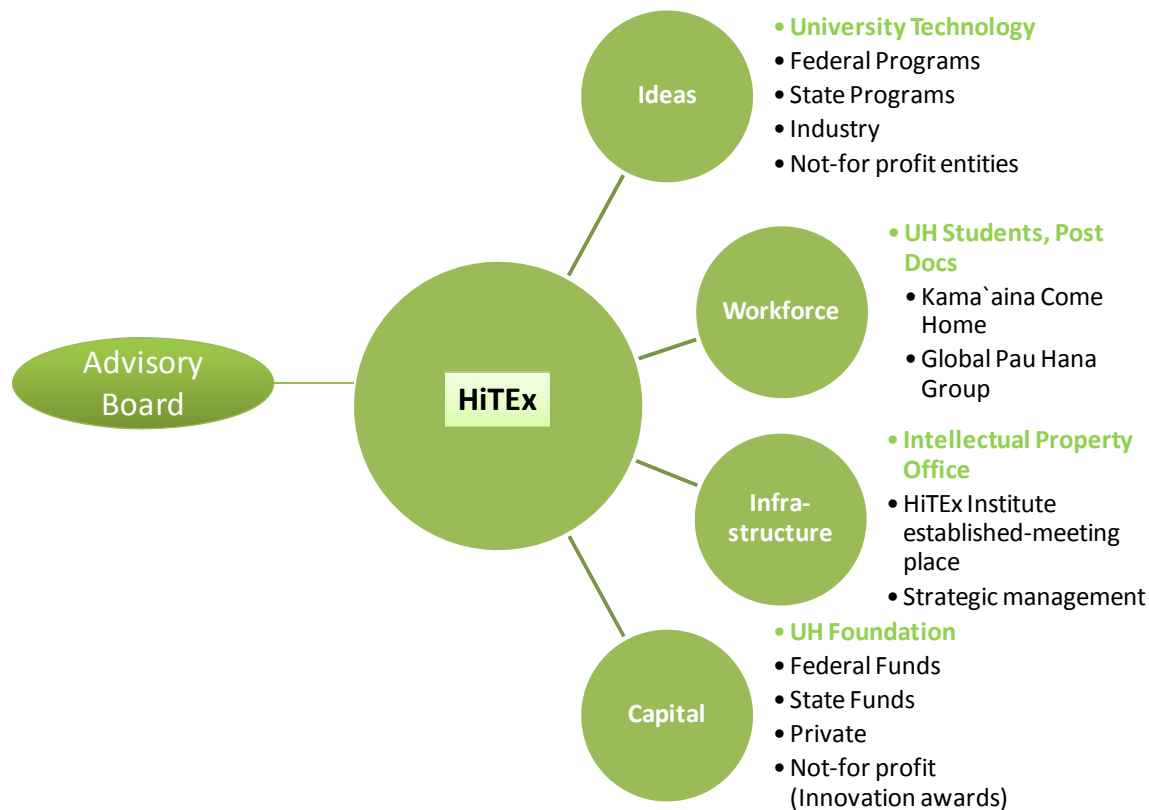
FIGURE 3: FUTURE MODEL OF INNOVATION AND TECHNOLOGY TRANSFER¹¹

The University needs to build business partnerships earlier in the development process as shown in Figure 3, which will increase the entrepreneurial activity. This will require a fundamental re-alignment toward entrepreneurship, commercialization and collaboration on the part of University. There needs to be a cultural shift at UH to establish a more entrepreneurial environment. This process will be generational; it will not occur overnight. The university must become a place that fosters entrepreneurial activity that can catalyze the effort.

The Council recommends that Hawai'i Innovation Technology Exchange (HiTEx) Institute be established immediately. HiTEx will accelerate commercialization of university innovations through earlier collaborations and partnerships with other entities. HiTEx will stimulate, facilitate, and foster the exchange of ideas between industry and university innovators and provide the much needed seed funding, which is novel to early stage development, but is difficult to obtain through conventional mechanisms. The structure of HiTEx is graphically represented in Figure 4; it will be the node in the innovation ecosystem connecting ideas, workforce, infrastructure, and capital. It will be an opportunity for the community to come together and collaborate and be a part of the innovation ecosystem. The Advisory Board will include representation from the Council, Governor's office, and industry.

¹¹ Insights drawn from: http://ryanfamily.typepad.com/files/us_chs_medicaltourismstudy28329.pdf

FIGURE 4: STRUCTURE OF HITEX



HITEX SHOULD RESIDE SEPARATE FROM UH AS A 501(c)(3) ORGANIZATION

The Council recommends that HiTeX should be a not-for-profit entity separated from the University. The General Counsel’s office should consider this option and consult with not-for-profit expertise to properly structure HiTeX’s relationship with the University.

There are many successful examples of privatizing technology transfer at universities; most common are State-funded universities. Wisconsin Alumni Research Foundation (WARF) is the oldest university technology transfer office in the country, and their leadership in expanding technology transfer to industry is known as an example of a not-for-profit entity that has proven successful. Most recently the University of Arizona has formed a 501(c)(3) organization under the umbrella of the University of Arizona Foundation. The entity was formed to separate its technology transfer efforts into a separate not-for-profit corporation, in hopes to bring in more research dollars, create more local jobs, and create a better working relationship with the business community.

ESTABLISH LEADERSHIP

After establishing the HiTeX Institute, UH will need to commence in an extensive search for an executive director. Qualifications should include, but not be limited to the following: extensive experience in technology transfer office, commercialization, higher education, venture capital

or business law; a background in education, science, engineering, business or law; a risk taker but analytical; and a personal leader with extensive people skills.

REALLOCATE RESOURCES

The executive director will need to staff HiTEX with people who have experience in technology transfer. This will require a reallocation and/or repurposing of existing OTTED resources. For example, a key position in any technology transfer office is a commercialization officer. The commercialization officer will be responsible for commercializing the portfolio of university innovations. The commercialization officer will assess the technology and or product market through research, build financial models, identify partnerships and structure deals. This person should have a technical background in science or engineering with an advanced degree (MBA, PhD or JD) with experience in technology commercialization and product development.

It is also recommended that a dedicated contracting and fiscal officer be assigned to HiTEX so that revenue and expenses can be tracked with absolute transparency without having to migrate between different departments at the university. This will allow HiTEX to establish fiscal metrics.

DEVELOP PROGRAMS

Various programs will need to be established around HiTEX that foster entrepreneurship. Some programs already exist within UH (Pacific Asian Center for Entrepreneurship and OTTED's Technology Showcase) and should be integrated with any new programs at HiTEX.

Also, there are several not-for-profit groups in the community centered on assisting companies in entrepreneurial activities. An inventory of such programs should be taken and a coordinated effort made to not duplicate efforts. University of California, San Diego's Connect has an incredible model for outreach programs; these should be looked at as best practices.

ESTABLISH METRICS FOR HiTEX

Metrics to measure the effectiveness of HiTEX will need to be established. It is recommended that HiTEX evaluate other similar entities' best practices to determine the proper metrics. Several categories could be monitored, including number of partnerships, number of licenses (executed and started), number of spin-offs completed, amount of sponsored research, return on investment, expenses and revenue.

RECOMMENDATION 3: IDENTIFY KEY AREAS FOR COMMERCIALIZATION OPPORTUNITIES

The Council has identified three key areas that have the potential to capitalize on commercialization opportunities for UH—1) Security and Sustainability: Energy and Agriculture, 2) Smart Software and Computation, and 3) Asian-Pacific health.

Security and sustainability: energy and agriculture: Hawai'i is the most oil dependent state in the nation. Over 95% of Hawai'i's energy is provided by imported fossil fuels. This dependency exposes Hawai'i's economy to the fluctuation of the world energy market. The state has

established an aggressive goal to increase Hawai'i's energy security within a generation. The potential to develop innovative initiatives that will assist the state in meeting its goals is overwhelming. Hawai'i also imports 85% of its food,¹² making Hawai'i vulnerable to supply disruptions and pathogens. Food security and sufficiency is a priority for the state. UH is the state's Land Grant university and it has a long history in agricultural innovation. The area of security and sustainability: energy and agriculture crosses many disciplines, including but not limited to engineering, science, medicine, business, and architecture.

Smart software and computation: A deluge of data permeates nearly every sector of human advancement today. The next generation of telescopes will be producing terabytes of data per day to help us understand the universe around us. Diverse ocean, earth and atmospheric observing systems integrate massive global datasets to help us comprehend environmental change and other phenomena critical to our future. Information about trends in human populations and genomic databanks are used to advance health care. These and other data collections are used in simulations, models and visualizations that help us understand ourselves and the world around us. Successful research in these areas, as well as in physics, public health, medicine, agriculture, education and more, all rely on advanced cyber infrastructure involving large datasets, high performance computing, visualization, and interdisciplinary real-time collaboration with experts around the globe. These capabilities are also essential to our national defense, including Hawai'i's large defense sector, and can support large and small businesses throughout Hawai'i.

Hawai'i's economy can be advanced through an emphasis on smart software and computation that supports the State's selected areas of research excellence, advances the health and welfare of the Hawai'i's citizens, and supports new businesses that leverage these capabilities. Such activities are a natural for Hawai'i since they do not require a physical supply chain and depend on workers who value a high-quality of life, such as Hawai'i's.

An element of critical infrastructure for advancing in these and other information- and communication-based endeavors is advanced broadband connectivity. For Hawai'i, this will require not only the development of a globally competitive advanced broadband capability connecting within the State, but also increased fiber-optic connectivity to the rest of the world.

In addition, to develop the educational and research capacity for this 21st-century sector, the University cannot rely on traditional heavily siloed discipline-specific departments and programs. A new academic initiative is needed to better integrate and align education and research at all levels as well as reach out to other scientific and research disciplines and engage with industry. Clearly, the new culture of innovation and entrepreneurship as described herein must permeate this initiative.

Asian-Pacific health: Last spring, the University of Hawai'i Cancer Center announced the formation of a statewide alliance with the largest healthcare partners in Hawai'i: The Queen's Medical Center, Hawai'i Pacific Health and Kuakini Medical Center. These strategic partnerships

¹² http://www.kohalacenter.org/pdf/hi_wsp_2.pdf

will support the drug development cycle by providing a clear path here in Hawai'i from discovery to clinical trials that will benefit the patient, in particular Native Hawaiians and other Asian Pacific populations because of the focus of the research.

Hawai'i also has a very diverse population, making it an ideal location for clinical trials. According to the Clinicaltrials.gov, a service provided by the National Institutes of Health,¹³ Hawai'i has 268 trials in the recruiting phase, 244 in the active but not currently recruiting phase, and 598 trials listed as completed.

Medical tourism is a growing market. According to two independent studies completed in 2008 by McKinsey & Company¹⁴ and Deloitte Center for Health Solutions,¹⁵ 60,000 to 85,000 inpatients per year come to the United States seeking medical care. Hawai'i could capture some of that market by partnering with our very strong tourism industry. Inbound patients are seeking high quality, faster service, and not necessarily lower cost.¹⁶

Another growing area that complements the data analytics area in Asian Pacific health is personalized medicine. The U.S. personalized medicine market is estimated at about \$232 billion and is projected to grow 11% annually.¹⁷ Personalized medicine is “products and services that leverage the science of genomics and proteomics (directly or indirectly) and capitalize on the trends toward wellness and consumerism to enable tailored approaches to prevention and care.” The science of personalized medicine has the potential to eliminate unnecessary treatments, reduce the incidence of adverse reactions to drugs, increase the efficacy of treatments and, ultimately, improve health outcomes. Due to its disruptive characteristic, the success of personalized medicine will need to include collaboration with pharmaceutical companies, providers and provider systems, payers and government and engage with academic medical centers and other research organizations with access to patient populations to accelerate recruitment for clinical trials. Hawai'i is poised to take advantage of this market.

RECOMMENDATION 4: INTEGRATE ENTREPRENEURSHIP INTO THE CURRICULUM

The Council recommends that entrepreneurship be integrated into the curriculum.

Creation of a Fundamental Entrepreneurial Curriculum: The first step in creating cross-disciplinary entrepreneurial courses is to assess the current programs to create a core that would be easily integrated across the UH System. A discussion between department chairs, faculty and staff would need to take place in order for this to be successful. Current course work specific to product and business development within the participating departments will be looked at in depth for consistent themes of study that can be easily aligned to the base entrepreneurial courses.

¹³ <http://www.clinicaltrials.gov/>

¹⁴ <https://www.mckinseyquarterly.com/PDFDownload.aspx?ar=2134>

¹⁵ http://ryanfamily.typepad.com/files/us_chs_medicaltourismstudy28329.pdf

¹⁶ <https://www.mckinseyquarterly.com/PDFDownload.aspx?ar=2134>

¹⁷ <http://pwchealth.com/cgi-local/hregister.cgi?link=reg/personalized-medicine.pdf>

Execution of New Curriculum: Once the proper assessments and teams have converged, the program needs to be executed. The HiTEC executive director along with staff will research current methods within other institutions and present their findings to all key stakeholders. There are many examples of how entrepreneurship is being integrated into the core curriculum, including cross-disciplinary classes and teams. Some universities utilize students to do market research on various disclosures or patent searches, therefore alleviating the burden on the office and integrating students into real life training.

Entrepreneurship Certification: There could be an entrepreneurship certificate offered in conjunction with engineering, science and other interested departments to demonstrate completion of a cross discipline curriculum that would include courses in business and law.