February 3, 2016

MEMORANDUM

TO: Eugene Bal, Chairperson
   BOR Committee on Research and Innovation

VIA: David Lassner
     President

FROM: Vassilis L. Symos
      Vice President for Research and Innovation

SUBJECT: BOR COMMITTEE ON RESEARCH AND INNOVATION AGENDA MATERIALS FOR FEBRUARY 2016 MEETING

Please find attached the following materials that will be discussed at the February 2016 BOR Committee on Research and Innovation meeting:

- Report on Systemwide long range plans and goals for the UH Strategic Directions, Hawai‘i Innovation Initiative.
- Strategy and plan of action to maximize the F&A cost rate.

Attachments
Research and Innovation Long Range Plan
UNIVERSITY OF HAWAI’I (UH)

PREFACE

The University of Hawai’i (UH) is recognized for its distinctive strengths in ocean sciences, astronomy, energy research, sustainable agriculture and its growing strength in cybersecurity and health sciences. UH brings in hundreds of millions in research dollars in these areas creating opportunities to generate cutting edge discoveries and intellectual property that have great potential, economic value and significant societal benefits, including workforce development training, job creation and improving the quality of life in Hawai’i.

Hawai’i Innovation Initiative

Through the Hawai’i Innovation Initiative, UH has recently taken on a greater role to help diversify the state’s economy by building a thriving innovation, research, education and training enterprise. The economy of Hawai’i is highly dependent on the tourism sector and military spending. To help diversify the state’s economic portfolio, the business community has identified research and innovation as a third economic sector to be developed. As the largest research enterprise in the state, UH is essential to achieving this goal and plays a critical role in the education and training of the state’s workforce in this vital sector. The goal of this bold and proactive initiative is to build a thriving research enterprise that will be driven by the growth of new industries in Hawai’i -- fueled by UH’s plans to aggressively commercialize its research and to employ and retain top researchers in several focus areas over the next decade.

As a potential result from this initiative, UH students will benefit from employment opportunities related to job creation and workforce demand and be exposed to the entrepreneurial skills necessary to be successful in all fields. The increase in research activity and funding, as well as the related increase in workforce development and training, will greatly contribute to UH’s key role in helping to boost the state’s innovation economy.

Goal

As stated in the UH Strategic Directions, 2015-2021, the goal of the Hawai’i Innovation Initiative is to:

“Create more high-quality jobs and diversify Hawai’i’s economy by leading the development of a $1 billion innovation, research, education and training enterprise that addresses the challenges and opportunities faced by Hawai’i and the world.”

To help grow a third economic sector around innovation, UH is laying the foundation for an innovation culture through three action strategies.

First, UH must sustain its momentum in growing its research enterprise during a period of declining state investment in universities and especially in university based research. UH has already begun to identify and remove administrative and policy barriers that impede research efficiencies and
effectiveness. In addition, it has begun to examine how to craft internal incentives and rewards for stimulating growth, as it has become more complex and competitive to apply for extramural funding.

Second, UH will continue to explore new avenues to better leverage its location and existing talent in ocean sciences, astronomy, energy, sustainable agriculture, health sciences, digital/creative media, data intensive sciences and engineering – in order to aggressively pursue funding opportunities to address challenges faced by Hawai‘i, the nation and the world such as health, sustainability and food security; global climate change, cybersecurity and big data. These areas were identified as national science and technology funding priorities and are where the extramural funding growth is occurring. In some cases, strategic hires will be necessary to address critical gaps to participate in these areas.

Third, the University continues to introduce new approaches to UH commercialization (e.g., OTTED reorganization) and technology acceleration (e.g., XLR8UH). In addition, the University has begun integrating innovation and entrepreneurship into the curriculum and extra-curricular activities.

One of the perceived barriers to technology transfer at UH is its outdated and rigid patent policy that was largely drafted in the 1980s. As stated in the Hawai‘i Innovation Initiative tactics, UH may benefit from more flexible licensing. Currently, UH is working with the legislature and the local business community to loosen current conflict of interest laws that hinder timely and efficient commercialization of research generated on its campuses.

A Harvard Business School study found that innovation is not an innate skill, but can be taught. However, as Jim Clifton, Chairman and CEO of Gallup, states “An innovation has no value until an ambitious entrepreneur builds a business model around it and turn it into a product or service that customers will buy.” Thus, entrepreneurship is another skill that is necessary for economic development.

Innovation and entrepreneurship are not exclusive to high technology. As demonstrated in Enterprise Honolulu’s The Innovation Framework Forward, these skills can be applied to and benefit other industries in Hawai‘i. The report used fashion design as an example where a shared-use facility is able to bring high-end manufacturing capability to local designers who would not be able to get large factories to make their orders. In addition, the facility allows a designer to rapidly produce small runs of new designs to test the market and obtain instant feedback that can be incorporated into the next round of designs.

These action strategies are necessary to proactively address the innovation and commercialization gap in the UH research ecosystem, as well as provide UH students the opportunity to gain valuable skills to compete globally and in Hawai‘i.

**Long Range Plans**

Although increasing annual extramural funding levels is a goal, attainment of such a goal is not possible without the talent or infrastructure necessary to pursue certain grants. UH’s long range goals are focused on making investments in infrastructure by leveraging grants and other resources so that existing researchers can add to their capabilities, to develop student capabilities that can help increase our talent pool for research and innovation, to improve research administrative services, and to find ways to stimulate and reward growth. In the end, UH’s annual extramural funding levels and the
development of Hawai’i’s innovation sector can be lagging indicators of the success of its investments and efforts.

**Action Strategy**

*Leverage UH’s location, strengths and intellectual diversity*

<table>
<thead>
<tr>
<th>Tactics</th>
<th>Invest internal resources and seek external resources for strategic infrastructure requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Make strategic hires to leverage strengths and enhance capabilities</td>
</tr>
<tr>
<td>Assessment</td>
<td>Number and dollar value of new award commitments</td>
</tr>
<tr>
<td></td>
<td>New infrastructure acquired</td>
</tr>
<tr>
<td></td>
<td>Number of strategic hires</td>
</tr>
<tr>
<td>System Partners</td>
<td>All campuses, colleges/schools and research units</td>
</tr>
</tbody>
</table>

The following examples show how UH is engaging in research, Science Technology Engineering and Math (STEM) education, and workforce development to advance the UH research enterprise and address Hawai’i community priorities. UH is focusing on the following research/innovation hubs, but remains committed to supporting faculty research in other disciplines.

**Ocean and Climate Sciences**

Whether man made or not, climate change is occurring and the increasing global population is straining our natural resources. UH Mānoa, through schools and research units such as the Social Sciences Research Institute, Pacific Biosciences Research Center, and the many centers and research units in the School of Ocean, Earth Science and Technology, is investigating the causes of and searching for solutions for problems such as coral bleaching, coastal erosion, sea level rise, rainfall prediction and fisheries management. As an island community that depends on its climate for tourism and the ocean for food and recreation, these are important research priorities.

Here are a few examples of the many programs and activities throughout the UH System that are making significant contributions to this research area.

*Simons Collaboration on Ocean Processes and Ecology*

The Daniel K. Inouye Center for Microbial Oceanography Research and Education (C-MORE) is collaborating with MIT, UC Santa Cruz, University of Washington and Woods Hole Oceanographic Institution to study how microbes control the flow of energy and material in the open sea. Microbes capture solar energy, catalyze transformation of important elements, produce and consume greenhouse gases, and compose the base of the marine food web. This study funded by the Simons Foundation will enhance humankind’s understanding of relevant microbes and their role in ecosystem processes. UH’s first strategic hire is a co-director on the project.

*Centers for Research Excellence in Science and Technology (CReST)*

The Tropical Conservation Biology and Environmental Sciences (TCBES) program at UH Hilo was awarded a second $5 million grant from the National Science Foundation to continue its research to understand how environmental changes affects the development of animals, plants and microbes. TCBES hopes to leverage the Hawai’i island tropical ecosystem to develop a deeper understanding of the impacts climate change have on the social and symbiotic interactions of species in Hawai’i and the
broader Pacific region. The CREST project is also expected to attract students from traditionally under-represented groups in the sciences, especially Native Hawaiians and Pacific Islanders. By combining inter-disciplinary teams, emerging scientific tools such as bioacoustics, and applying indigenous knowledge to study the short and long-term responses of organisms to environmental stressors, the program hopes to provide future generations with the understanding necessary to effectively manage our fragile natural resources.

**Hawai'i Coral Reef Initiative**

Hawai'i Coral Reef Initiative (HCRI) research program provides management driven research and monitoring and educational support to build capacity to better manage Hawai'i's coral reef ecosystems. National Oceanic and Atmospheric Administration (NOAA) grants, reef damage compensation, and private funding through the Department of Land and Natural Resources (DLNR) support HCRI’s research and monitoring activities such as projects to identify, quantify, categorize and map marine debris accumulations along the shore to more effectively manage the problem; assessment of the day use mooring buoys and assistance with updating a plan for that program; development of an assessment tool for rapid response to catastrophic events on coral reefs; management of the Makai Watch program that facilitates citizen involvement and non-governmental organizations (NGOs) in promoting compliance with regulations and monitoring of marine resources; evaluation and revision of regulations for DLNR's Division of Boating and Ocean Recreation; and many other projects. The HCRI program also works with teachers in the public schools with implementation of the Reef Pulse Hawaii curriculum materials developed by the program.

**Astronomy**

Due to its location and nearly perfect year-round weather conditions, Hawai'i is an ideal site for astronomical research and has contributed to UH's excellence in the field. UH is already planning for its future and working to elevate its standing in the astronomical community by obtaining new tools to help aid discovery, as well as providing local workforce development opportunities. The following are examples of projects UH is undertaking in this area of research excellence.

**Daniel K. Inouye Solar Telescope**

The sun is said to be the most important star in the solar system. Nothing will live on this planet without the light the sun emanates. The sun also impacts our lives because phenomenon such as solar flares, which are ejected from the sun’s atmosphere (a.k.a. corona), affect the Earth’s magnetic field. A large solar flare could disrupt the magnetic field and blow out transformers in power grids and disrupt satellites, which could affect cell phones, airplane navigation systems, and financial systems that rely on extremely accurate geo-synchronized clocks. Thus, understanding more about this “space weather” is important for learning to predict and utilize precautions to protect from and prevent catastrophes.

The UH Mānoa Institute for Astronomy (IFA) is a co-principal investigator on a National Science Foundation project to construct a new solar telescope on the summit of Haleakala on the island of Maui. Once completed, this advanced instrument will allow researchers at UH and the other collaborating institutions to conduct further studies into the sun’s corona. Participation in the project gives UH telescope time for IFA and other UH astronomers to conduct research.
Astronomy-Related Workforce Development

The UH population is aging and recruiting and retaining the next generation of astronomers and technicians is important to maintaining UH's excellence in astronomy. One way of accomplishing this is to stimulate interest in local residents and students in the UH System to prepare to enter the technology workforce. Here are examples of programs that may lead to jobs in Hawai'i's astronomy.

Bachelor of Applied Sciences: Engineering Technology; Electronic & Computer Engineering Technology

Effective Fall 2015, UH Maui College offers two degree paths that prepare students for careers in astronomy and in industries such as telescope operations and electro/electro-optics. These programs demonstrate the efforts and commitment of UH community colleges to workforce development in an essential technology hub for Hawai'i.

Teaching and Training Telescope

UH Hilo is in the process of constructing a teaching and training telescope located at ground level in order to provide students in its Physics and Astronomy program the opportunity for conducting research and learning telescope operations. UH Hilo is also committed to working with the existing telescopes to provide opportunities for their students to work alongside researchers. These initiatives demonstrate UH Hilo's commitment to workforce development, in particular the Hawai'i island workforce, in an essential technology hub.

Health and Wellness

UH is committed to research and service towards the improvement of the health and wellness of the Hawai'i community — especially in Native Hawaiians, Pacific Islanders, the rural community and our multi-ethnic population. The following are examples of grants and collaborations that could result in new therapies or diagnostic tests, improve healthcare delivery and health outcomes, and address healthcare workforce issues that benefit Hawai'i and the Pacific Region.

Health Pipeline

Compared to mainland residents, Hawai'i residents are half as likely to find physicians they need, such as surgeons and infectious disease specialists, based on an updated John A. Burns School of Medicine (JABSOM) report on the doctor shortage presented to the 2015 Hawai'i State Legislature. In addition to physicians, other healthcare professions such as ultrasound technicians, community health workers and biomedical scientists are needed to provide state of the art medical services to our population. To help meet this need, JABSOM’s Area Health Education Center (AHEC) conducts outreach activities. AHEC received $5.1 million from the U.S. Department of Health and Human Services to fund programs to increase interest in health careers among middle school and high school students in Hawai'i.

For example, through the Hawai'i Pacific Basin Health Career Opportunity Program, students interested in health careers get experience with research, shadowing a doctor or other healthcare professional, test preparation and application support. By providing programs like these, UH hopes to create a pipeline for students to enter the healthcare workforce in Hawai'i and address an urgent community need.
UH Cancer Center

Cancer Epidemiology Program

The research goal of the Cancer Epidemiology Program in the UH Cancer Center is to understand the reasons underlying the marked ethnic/racial differences in cancer incidence and mortality it has documented over the past four decades in Hawai‘i. The program conducts studies related to the role of lifestyle, genetics and infectious agents in order to identify risk factors that can lead to interventions aimed at reducing the burden of cancer in the state.

Health Disparities Research

The UH Cancer Center, in partnership with the University of Guam, received a $5.5 million grant from the National Cancer Institute to address cancer health disparities among Pacific Islanders in Hawai‘i, Guam, and the neighboring U.S. Associated Pacific Islands. The award supports research to prevent cervical cancer, oral cancer and other cancers of regional significance. Projects include a health communications study designed to increase cervical cancer screening among Micronesian women in Hawai‘i and Guam and a study to identify molecular components of the betel nut that promote chronic inflammation in the immune system. Chronic inflammation plays an important role in the development of cancer (carcinogenesis). Because chewing betel nut can cause oral lesions that can lead to esophageal and oral cancer, an adult betel nut cessation intervention will be conducted as another project – the first of its kind.

Clinical Trials

As a result of clinical trials conducted at the UH Cancer Center, a new bladder cancer drug known as ALT-803 is moving closer to FDA approval. Developed to treat non-muscle invasive bladder cancer, the most common type with very high recurrence rates – the first phase of this national clinical trial was launched in Hawai‘i by a partnership between the UH Cancer Center and the Queen’s Medical Center in 2014. This trial was among the first to highlight Hawai‘i as a growing healthcare center and focal point between Asia and the U.S. in the fight against cancer. The second phase, which began in October 2015, expands on the number of participants in the trial and will use the recommended dose obtained from the earlier phase in hopes of improved outcomes for cancer patients.

Studies, programs and clinical trials like these can contribute to greater understanding of cancer as well as add to the growing body of culturally appropriate and sensitive approaches to health interventions that will benefit Hawai‘i and other Pacific island communities.

Health Care Cost and Quality

The UH Telecommunications and Social Informatics (TASI) research program in the Social Science Research Institute is collaborating with the State of Hawaii and the Commonwealth of the Northern Mariana Islands (CNMI) to develop databases for health insurance claims information from all health care payers and to conduct studies that monitor health care costs, health care conditions, and health care use; inform consumers of the cost and quality of health care services; monitor health care expenditures and services by conditions; identify health disparities; enable oversight over health insurance Medical Loss Ratios; and identify gaps in health care delivery. In the CNMI, the claims database will be linked with a clinical data warehouse, thereby enabling studies on the effectiveness of care with patient outcomes. UH TASI is also working with the CNMI on the Center for Medicare & Medicaid Services State Innovation Model grant that seeks to improve the health care experience, improve population health, and reduce cost of care. In Guam, UH TASI is working with the Government
and community health centers on implementation of Guam’s electronic health records system. UH TASI also serves as the Pacific Basin Telehealth Resource Center under an agreement with the U.S. Health Resources and Services Administration.

Daniel K. Inouye College of Pharmacy

The Daniel K. Inouye College of Pharmacy (DKICP) is the only college of pharmacy in the UH System and the central pacific. In addition to providing Hawai‘i students with instruction towards a degree in pharmacy, DKICP has been mindful of its commitment to community healthcare needs.

Its Pharm2Pharm project has incorporated community pharmacists into a patient’s healthcare team to help improve rural health care delivery. The program pairs a pharmacist with an at-risk patient after discharge from a hospital so that the pharmacist can follow up with and answer patient questions, which helps reduce readmissions to the hospital. It is hoped that the lessons learned through this program will become a best practice and adopted by Medicare.

Potential Therapies and Diagnostics

UH schools, centers and research units such as the Department of Chemistry in the UH Mānoa College of Natural Sciences, UH Cancer Center, UH Hilo College of Pharmacy and Windward Community College have committed to researching the use of natural products towards the development of therapies for various diseases or afflictions. Although natural products research generally focuses on identifying chemical compounds in organisms or micro-organisms that have potential as therapies, UH researchers are not necessarily limited by this definition.

Study of Novel Ions, Molecules and Nanoparticles as Anti-Cancer/Anti-Infecive Agents

Researchers at the UH Hilo College of Pharmacy are studying the use of chemical compounds found in fungi and the golden shower tree, as well as the use of novel molecules and nanoparticles as anti-infective or anti-cancer agents. Faculty members are also studying novel ions for use in treating afflictions such as Alzheimer’s disease.

Compounds that Show Potential in Fighting Brain and Breast Cancers

Researchers at the UH Cancer Center Natural Products and Experimental Therapeutics Program have developed two chemical compounds that show promise in fighting brain and breast cancer. Breast cancer is the most common cancer among American women and brain tumor patients do not currently have effective treatment options other than surgery.

The compounds work by blocking certain functions of a protein called Stat3 to stop cancer cells from growing. With more study, researchers hope to turn the compounds into new anti-cancer drugs to help patients increase their changes for surviving cancer.

Heart Failure Therapy Patent

Heart failure is the fastest growing clinical cardiac disease in the U.S. Many diseases ultimately affect the heart by making it work harder, which cause the heart muscle to enlarge. The enlarged heart becomes stiffer and less functional until it eventually fails.

A medical researcher in Cell and Molecular Biology at the John A. Burns School of Medicine has developed and patented a novel therapy utilizing an active component of chili pepper to treat and prevent heart failure. The therapy allows the heart to compensate for the extra work it needs to perform with losing function and failing.
Obtaining the patent represents a step towards clinical trials with the ultimate goal of making the treatment available as soon as possible.

Potential Pre-Diabetes Test
Researchers at the UH Cancer Center, in collaboration with the Shanghai Jiao Tong University, has discovered a panel of markers that helps identify if people are pre-diabetic by measuring the fatty acids in patients’ blood. This could lead to testing during physical exams in the future and allow physicians to employ early intervention to potentially avoid this chronic disease. The researchers aim to continue studying the blood test technology with the goal of eventually having it available for physicians.

Digital/Creative Media
The Hawai‘i Innovation Assets Report identified the creative sector as an area of priority for the state of Hawai‘i. “Areas based on emerging technology that can generate valuable exports and high paying jobs” include film & TV, music, digital media products, and animation. The following are examples of UH efforts to meet the state’s critical need for skilled workers in the creative media industry.

Academy for Creative Media
What started as an idea to create a film school at UH, the Academy for Creative Media (ACM) has evolved into an effort involving all ten campuses to give students the opportunity to gain skills and degrees in digital/creative media.

Students with an interest in graphic design, media production, mobile/web application development, photographic arts, animation and video game design have a choice of campus to pursue their passion. The table below shows the area and the participating campuses.

<table>
<thead>
<tr>
<th>Interest</th>
<th>Mānoa</th>
<th>Hilo</th>
<th>West O‘ahu</th>
<th>Hawai‘i</th>
<th>Honolulu</th>
<th>Kapl‘olani</th>
<th>Kaua‘i</th>
<th>Leeward</th>
<th>Maui College</th>
<th>Windward</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphic design</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Media production</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Mobile/web</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Photography</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Animation</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Video game design</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

ACM also operates the Henry Ku‘ualhoa Giugni Moving Image Archive of Hawai‘i at UH West O‘ahu, which is dedicated to the care, preservation and digitization of film and videotape related to the history and culture of Hawai‘i. Aside from providing a valuable historical resource, it also provides an opportunity for students to learn the art of film preservation.

Music & Entertainment Learning Experience
Honolulu Community College’s Music & Entertainment Learning Experience (MELE) offers students two degree paths: Associate of Science in Music Business & Production and Associate of Science in Audio Engineering Technology. The MELE program offers a rounded curriculum providing
students with grounding in the basics of the music industry, sound recording and the business of music, which meets the requirements for entry-level jobs in the music industry.

Creative Media Concentration

UH West O’ahu, in coordination with ACM, is home to a new bachelor degree with a concentration in creative media. Students can learn digital video production, game design and development, and application development for the web and mobile devices.

Plans are to seek funding for its own creative media building and to connect with a Kapolei film studio for its academic programming. Through the facility and partnerships with local film and TV projects, UH West O’ahu seeks to provide students with hands-on experience for workforce development.

Cybersecurity

Information security is very important now that much of Hawai’i and the world’s business is conducted electronically. In addition to conducting research in preventing and mitigating cyberattacks, UH has taken a proactive role to help stimulate interest among students in secondary and post-secondary education toward pursuing careers in cybersecurity -- whether in defense, hospitality, health or banking industries. Here are a few examples of programs and activities being undertaken by UH to advance cybersecurity.

National Center of Academic Excellence in Information Assurance (Honolulu Community College); National Center of Academic Excellence in Cyber Defense Research

The Department of Homeland Security and National Security Agency have designated Honolulu Community College (HCC) as a National Center of Academic Excellence in Information Assurance (CAE2Y) and UH Mānoa as a National Center of Academic Excellence in Cyber Defense Research (CAE-R). The designation recognizes the quality and substance of the education UH has to offer in the fields of information assurance and cybersecurity. Although designation does not carry a commitment of funding, students are eligible for federal scholarships and the campuses are eligible to apply for funding opportunities that may arise under the National Academic Centers of Excellence program.

Information Security and Assurance Degree Program; Electronic & Computer Engineering Technology

UH West O’ahu, in partnership with Honolulu Community College, offers a Bachelor of Applied Science Degree with a concentration in Information Security and Assurance to respond to state and national demand for information security graduates. Students are able to take course in digital forensics, modern cyber conflicts and proactive system security using curriculum endorsed by the Department of Homeland Security, National Security Agency and National Institute for CyberSecurity Education. The emphasis is to give students hands-on technical skills and training and give students clear exit points to enter the workforce or move on to further their education.

Effective Fall 2015, UH Maui College offers an applied science degree with a concentration in cybersecurity, which gives students another option for gaining the technical skills to enter the cybersecurity field.

GenCyber Hawai’i Camps

The Pacific Center for Advanced Technology Training (PCATT) has partnered with the National Science Foundation, UH Information Technology Services, Honolulu Community College and the
University of Alaska to host GenCyber camps for high school students and their teachers. The goal is to stimulate interest in high school students in the principles of cybersecurity so that they will be encouraged to pursue studies in their post-secondary education. For teachers, the goal is to increase cybersecurity expertise, facilitate integration of cybersecurity into their curriculum and to help teachers guide students in cybersecurity and educational career choices.

**Data Intensive Science and Engineering**

The ability to manage, manipulate, analyze, and interpret large data sets (a.k.a. "big data") is increasingly important for research universities to make advancements in the fields of study. In order to remain competitive, universities are investing in human capital and tools necessary for working with big data. The following are examples of UH efforts to make resources and tools available to the research community through the use of grants, business models and open source software in a cost effective manner and towards workforce development.

**Cyber-enabled Collaboration Analysis Navigation and Observation Environment**

Data visualization is a significant tool in big data analysis and draws a lot of interest due to its impact. Instead of tables and charts, three-dimensional, fully immersive environments can be created in which data can be viewed, analyzed and manipulated.

Through UH's second strategic hire, the Department of Information and Computer Sciences in the College of Natural Sciences is bringing a data visualization system to UH Manoa. The goal is to provide the best data visualization in the U.S., to enable researchers and their students the ability to view their data in cyberspace and better manage the increased scale and complexity of analyzing the data. Many disciplines such as oceanography, astrobiology, mathematics, computer science, electrical engineering, biomedical research, archaeology, economics and computational media are poised to use the Cyber-enabled Collaboration Analysis Navigation and Observation Environment (CyberCANOE) for their large-scale data visualization needs. A $850,000 National Science Foundation grant and UH matching funds are being used to bring the CyberCANOE to the UH System.

**High Performance Computing**

Although data visualization is the "rock star" in big data, the ability to manage, store and manipulate large data sets is the "workhorse." Because data sets are growing beyond the capability of departmental resources, research universities like UH are investing in shared high performance computing resources. Rather than relying on individual CPUs and data storage, an entire network array (a.k.a. cluster) of CPUs and data storage can be called on to handle data analysis needs. In the past, a supercomputer facility was necessary to do such computations.

Information Technology Services (ITS) made an initial investment of $1.8 million in its current cluster. The research community contributes back to this resource by purchasing nodes that are added to the cluster and become available to the community when not used by the "owner." This system enables UH to create an efficient and stable computing resource for the UH System.

**Digital Labs**

ITS has partnered with the Texas Advanced Computing Center at the University of Texas at Austin on a $4 million National Science Foundation grant to create an open cloud platform for reproducible science. Through participation in this program, ITS will be able to provide UH access to
open source tools developed using the NSF Agave Platform that will allow researchers to create digital
labs to manage data, conduct experiments, and publish and share results from anywhere at any time.

Bachelor of Applied Sciences: Engineering Technology

Effective Fall 2015, UH Maui College offers a degree path that prepares students to work as
engineering technologists in industries such as high performance computing centers for scientific and
engineering applications.

Sustainable Agriculture

Food security is very important, especially in an island community that relies on imported food.
Schools and research units including the UH Mānoa College of Tropical Agriculture and Human
Resources and the UH Hilo College of Agriculture, Forestry and Natural Resource Management have
done research on sustainability options such as hydroponics, aquaculture and aquaponics and have
shared these methods with local farmers through outreach efforts. Here is an example of these types of
research efforts, as well as another UH campus effort to develop a sustainable agriculture workforce.

Statewide Agricultural Survey

Hawaii’s hasn’t had a statewide geographic assessment of agricultural activity since the 1980’s.
The UH Hilo Spatial Data Analysis and Visualization Laboratory is collaborating with the Hawaii’s
Department of Agriculture on a statewide agricultural survey to provide an updated agricultural
footprint of the state, including water systems and irrigation options available to farmers and ranchers.
The end product is intended as a baseline of current agricultural use and will help measure progress in
the expansion of agriculture, including local food production across the state. It is anticipated that the
data will aid decision makers and farmers as they consider how to move Hawaiian agriculture forward.

Bachelor of Science in Sustainable Community Food Systems

The Bachelor of Science in Sustainable Community Food Systems is a multidisciplinary program
combining sustainability, environmental science agriculture, and the politics of food. This partnership
between UH West O’ahu, Kamehameha Schools and MA’O Organic Farms, will train a new generation of
people to think critically and systematically about the food system and in what ways the food system
can be changed to increase its ecological sustainability and social equity. The goal is to develop a highly
skilled workforce that not only addresses Hawaii’s food security, but also minimizes the impact on the
rest of Hawaii’s fragile ecosystem.

Energy

Developing renewable sources of energy for power generation and transportation fuels is as
relevant today as it was over 40 years ago during the height of the of the Organization of Petroleum
Exporting Countries (OPEC) oil embargo. The following are examples of how UH campuses and research
units are advancing research and innovation in energy, smart design and workforce development.

Hawaii’s Natural Energy Institute

The Hawaii’s Natural Energy Institute (HNEI), in the School of Ocean, Earth Science & Technology,
is conducting research on alternative fuels, energy grid system analysis and optimization, fuel cell and
battery technology, renewable power generation, and energy efficiency and transportation.
It has leveraged the Applied Research Laboratory’s NAVSEA contract to support wave energy testing and to assist the Navy in upgrading its grid to integrate renewable energy. It has also installed a test hydrogen refueling station at Marine Corps Base Hawai‘i.

Utilizing an Office of Naval Research grant and funding from the UH Manoa Office of Planning and Facilities, HNEI is beginning construction on two 1,500 square foot, net zero energy classrooms on the UH Mānoa Campus for use by the College of Education.

Through studies like these, HNEI identifies alternatives and best practices to help Hawai‘i address its renewable energy goals and distribution needs, aging power grid infrastructure and energy consumption management.

Alternative Energy Research on Hawai‘i island
Alternative energy and alternative fuels, for both transportation and power generation, are an important component of Hawai‘i’s efforts to reduce its dependence on imported petroleum products. On Hawai‘i island, HNEI is currently conducting research on the development of ocean thermal energy conversion (OTEC) systems and transportation hydrogen at the Natural Energy Laboratory Hawai‘i Authority (NELHA) in Kona.

For OTEC systems, heat exchangers comprise one of the largest cost drivers and reductions in fabrication costs and improvements to performance are critical to successfully commercialize these sustainable energy power plants. Along these lines, HNEI is providing its technical expertise to long-term corrosion and bio-corrosion tests on aluminum exposed to seawater in heat exchangers.

The ultimate challenge for introducing hydrogen in the transportation sector is to reduce the cost of hydrogen dispensed at the nozzle. One method is to use electricity to split water into hydrogen and oxygen in process called electrolysis. The resulting hydrogen could then be used to stabilize a power grid comprised of larger portions of intermittent renewable energy sources, such as solar and wind power. The monetary value of the ancillary service for grid regulation could then be applied to offset the cost of hydrogen used for transportation. HNEI is currently testing the viability, durability and performance of an electrolyzer at NELHA.

UH Hilo has made a strategic hire to conduct studies on alternative energy under its new Energy Engineering program. The new researcher hopes to continue research on developing biomass based energy that will improve environmental quality and biomass-based economics. Plans are to develop a bioconversion lab to test whether cattle waste, and possibly from humans, can be used to create biofuel. In addition to research, the new hire will also be teaching topics such as how engineering impacts the island’s people and the future through design, water pollution and soil control technologies, and alternative energy options in a farm setting.

Bachelor of Applied Sciences: Engineering Technology: Electronic & Computer Engineering Technology
Effective Fall 2015, UH Maui College offers two degree paths that prepare students to work as engineering technologists in industries such as energy production and distribution including photovoltaic and wind turbines or as renewable energy technicians.

UH Cross-Cutting Programs
Consistent with research and training initiatives nationwide, UH seeks to facilitate large, team-based, multi-disciplinary collaborations that address complex, multifaceted scientific problems and
societal challenges. The UH National Disaster Preparedness Training Center (NDPTC) is an example of such large-scale initiatives.

**National Disaster Preparedness Training Center**

The UH National Disaster Preparedness Training Center (NDPTC) conducts research in support of the development of training courses for first responders and emergency managers and others involved in ensuring safety and security of communities throughout the U.S. The center receives $5 million annually under a cooperative agreement with the Department of Homeland Security and the Federal Emergency Management Agency. As a member of the U.S. National Domestic Preparedness Consortium, the NDPTC is focused on natural hazards, coastal communities, and islands and remote, at-risk, underserved populations. In addition to developing courses on geologic and hydro-meteorological hazards, the center integrates science and technologies related to building resilient communities. In addition to developing FEMA's first social media class, it has been designated as the lead institution in the U.S. consortium to develop training related to the use of unmanned aerial systems (drones) for disaster management. The NDPTC has trained more than 18,000 individuals nationwide.

**STEM Education**

In addition to the degree offerings that were highlighted under hubs such as astronomy, digital/creative media, cybersecurity, data intensive sciences and engineering, and energy, UH is committed to STEM education. Here are examples of programs that are part of an overall, coordinated effort to provide quality STEM education for Hawai‘i students.

**STEM Pathways**

UH has created three pathways for students to enter STEM education. In the early part of a student’s journey, a student can easily cross from one pathway to another to find the optimal fit for the student. As students mature academically, the pathway narrows to an endpoint in the workforce or graduate education. The three pathways are: Workforce Pathway, Community College Pathway and University Pathway.

The Workforce Pathway focuses on students who choose to receive a high school diploma and enter directly into the STEM workforce. This path relies heavily on career readiness skills found in the career and technical education (CTE) program and other courses that prepare students for entry-level jobs.

The Community College Pathway allows a student to enroll in one of the seven UH community colleges to strengthen their education and gain the skills necessary for middle-level STEM jobs. This path provides students a less costly alternative to the University Pathway for students who intend to get a STEM baccalaureate degree in Hawai‘i through the UH community colleges’ Associate of Science in Natural Science (ASNS) degree program. The ASNS degree prepares students to enter directly into one of four STEM majors at a UH 4-year university: biological science, engineering, information and communications technology and physical science.

The University Pathway represents the traditional model where high school graduates enroll in one of UH’s 4-year campuses. However, with improved coordination and partnership with Hawai‘i K-12 educators and schools, students interested in STEM careers are better prepared for entry through counseling and taking requisite STEM courses in high school.
**STEM Diversity**

UH is committed to encouraging underrepresented students, and in particular Native Hawaiians, to seek and further their education and careers in STEM. UH has a number of programs to stimulate interest in underrepresented students in STEM and research. Here are a couple of examples.

**Native Hawaiian Science & Engineering Mentorship Program**

UH Mānoa’s College of Engineering and School of Hawaiian Knowledge operate the Native Hawaiian Science & Engineering Mentorship Program (NHSEMP). Through NHSEMP’s Freshman Bridge Program, freshmen interested in natural sciences or engineering have the opportunity to live, study and work on the UH Mānoa campus. The 10-week summer program provides the opportunity to visit research sites, spend 15-20 hours a week in research labs, participate in cultural case studies and community projects, and culminates with student final presentations. In addition, students can earn 5+ credits of required university classwork. This program will help students transition from high school to college and to get comfort with participating and studying in a large university system.

**Student Undergraduate Research Experience Program**

Kapiʻolani Community College offers opportunities for all students, including Native Hawaiians, to pursue faculty mentored, undergraduate research through its Student Undergraduate Research Experience (SURE) program. Recently a Native Hawaiian student won a top honor at the Society for Advancement of Chicanos/Hispanics and Native Americans in Science National Conference for studying the bacterial effects of nioi (beach cherry plant), which bridged what the ancient Hawaiians knew about medicine and modern science.

**Action Strategy**

*Advance innovation and entrepreneurship with UH and the community*

| Tactics | • Integrate entrepreneurship and innovation throughout the UH educational experience for students across system with strengthened credit and non-credit courses, internships and extra-curricular/co-curricular activities  
• Explore more flexible licensing options to commercialize UH technologies  
• Establish proof-of-concept/accelerator to nurture UH technologies  
• Conduct greater community outreach and institutional in-reach  
• Support the Hawaiʻi Business Roundtable and others, such as state agencies, incubators, and accelerators, to establish a Hawaiʻi version of “CONNECT” to provide access to resources that entrepreneurs and their companies need to grow |
| Assessment | • Number of new invention disclosures, patents and license/options  
• Number of new companies started utilizing a UH licensed technology  
• Number of new student or faculty companies incorporated in the state receiving assistance from UH such as training, mentoring, financial assistance, or incubation space  
• Number of students participating in innovation and/or business plan competitions  
• Number of projects developed by students utilizing lab space |
| System Partners | • All campuses, schools and research units |
UH schools, research units, campuses and central offices have engaged faculty and students community in advancing innovation and entrepreneurship. Here are some examples of programs and activities that fulfill this action strategy with a focus on “hands-on” experiences.

**XLR8UH**

To address the need for a proof-of-concept/accelerator, the Office of the Vice President for Research and Innovation established XLR8UH with the goal to educate, mentor and invest in UH’s world-class research and talent by providing students, faculty and alumni the opportunity to establish start-up companies. XLR8UH is one of the first university programs in the nation to take an equity stake in the companies it invests in – revolutionizing the way innovation is commercialized at universities.

XLR8UH operates a four-month program called a cohort twice a calendar year. Cohort members are selected through a competitive process and members attend workshops and lectures that teaches skills such as market research, business plan development, how to pitch ideas, and operating a lean startup. Cohort members also get access to partners and affiliates that are able to provide quick and direct feedback whether the members’ ideas are both innovative and desired by real customers. As of Fall 2015, 12 start-ups have gone through the first two cohorts.

In June 2015, Jun Innovations, a XLR8UH start-up company, presented its technology at a prestigious showcase called First Look LA at UCLA’s California NanoSystem Institute. Jun Innovations was created by a faculty member of UH Mānoa’s College of Tropical Agriculture and Human Resources in an effort to commercialize the researcher’s super cooling technology, which keeps perishable materials, including food, below freezing temperatures without ice crystallization.

In August 2015, XLR8UH was recognized as one of the nation’s most elite accelerators by the U.S. Small Business Administration (SBA) at the SBA’s annual Growth Accelerator Fund Competition. Although the program is still young, UH is encouraged by these recent developments and looks forward to the future success of XLR8UH.

**Pacific Asian Center for Entrepreneurship**

Since its inception in 2000, the Pacific Asian Center for Entrepreneurship (PACE), in the Shidler College of Business, has grown to encompass over 15 programs that encourage and promote entrepreneurship to UH students and faculty. Programs are open to all UH students and faculty, and are crafted to allow participants to achieve the same level of success, regardless of their discipline of study.

Aside from classroom teaching, PACE offers summer fellowships for graduate students who are interested in entrepreneurship to assist with feasibility studies and market research for academic departments across the UH System. Examples include a study on the tea market in Hawai‘i for the College of Tropical Agriculture and Human Resources and the café market specializing in vegetable root tea from Tokachi, Japan.

Another benefit to students is PACE’s menu of experiential programs. The programs are aimed at providing students and faculty with invaluable, hands-on entrepreneurial experiences, including the UH Business Plan Competition, Breakthrough Innovation Challenge and the Mānoa Club Challenge. Faculty from the Shidler College of Business, as well as the College of Engineering, College of Tropical
Agriculture and Human Resources, and the School of Law have participated as mentors in the Breakthrough Innovation Challenge.

PACE also operates its own accelerator called the Shidler Hatchery, which provides office space, mentorship and resources to new student companies that are developing a business idea.

Recently, PACE launched a five-year initiative to raise $2.5 million for new programs and a larger location within the Shidler College of Business. UH looks forward to the expansion of PACE, which will include a new proof of concept center to help launch business models for technology discovered in labs that could be commercialized.

**Innovation Lab or i-Lab**

Inspired by facilities like Stanford's D.School, Building 37 on the UH Mānoa Campus has been converted into an innovation lab or i-Lab where students are exposed to experiences that get them involved with innovation and entrepreneurship. The space is used for classes, workshops, lectures, and events such as start-up weeks and innovation challenges. The reconfigurable space is also equipped with rapid prototyping equipment like 3-D printers and laser cutters that allow students to turn design concepts into working models. Participating UH Mānoa schools/colleges include Architecture, Arts & Humanities, Business, Engineering, Natural Sciences, and Tropical Agriculture and Human Resources.

**Engaging the Community**

Although UH has taken a critical leadership role in Hawai’i Innovation Initiative, it was also vital to engage the local business community to achieve any measure of success. In its partnership with the Hawai’i Business Roundtable on this initiative, UH is able to collaborate with leaders of financial institutions, corporations, entrepreneurs and other key innovation stakeholders to help leverage its research to create and attract new companies, cultivate talent for a knowledge-based economy and to encourage the development of future technologies.

The following are other examples of UH’s commitment to advancing innovation and entrepreneurship in the community, which will assist in economic diversification and advancing other needs of Hawai’i’s community.

**Project ʻOlonā and ʻAhu Pā**

In October 2015, UH and Kamehameha Schools launched a three-year Science, Technology, Engineering and Mathematics (STEM) innovation and entrepreneurship partnership that includes two exciting collaborative efforts: Project ʻOlonā and ʻAhu Pā.

Project ʻOlonā’s goal is to engage Native Hawaiian community college students through a series of projects using 21st century scientific technology and tools to better investigate and understand what their kūpuna knew and practiced through centuries of lived experiences.

ʻAhu Pā’s goal is to create and innovation hub in the heart of Moʻiliʻili for Native Hawaiian students to pursue research, product development and prototyping. Students will have access to design space and equipment. Kapiʻolani Community College, Windward Community College, and UH Mānoa’s John A. Burns School of Medicine will help coordinate student research and prototyping and XLR8UH will assist the students in entrepreneurship.
Through this partnership, UH will assist the Native Hawaiian community document the scientific understanding of Hawaiian herbal medicine and cultivate commercially viable products or services.

Maui Food Innovation Center

Nearly 25 years ago, no one heard of Hawai‘i Regional Cuisine. In 1991, 12 Hawai‘i chefs started a culinary movement. Today, Hawai‘i Regional Cuisine is world-renowned. There is still room for innovation, particularly in the specialty foods industry.

The Maui Food Innovation Center (MFIC) provides business and technological expertise to farmers, food manufacturers and entrepreneurs to help develop new value-added food products with the goal of reducing dependence on imports and contributing to the sustainability of island-based agriculture. The MFIC is funded in part by a US Department of Labor grant.

In January 2016, MFIC is expected to begin the first food industry accelerator program in the state of Hawai‘i called the Maui Accelerator Program (MAP). In August 2015, MFIC was one of the winners of the U.S. Small Business Administration Growth Accelerator Fund Competition and received a $50,000 award, which will be used to help support MAP.

As part of MFIC’s long range plan, the former campus cafeteria on the UH Maui College campus in Kahului will be converted into a state-of-the-art, shared-use food processing facility. This will enable participants to design, test and produce foods such as sauces, soups, jams, jellies, entrees, bakery products, dehydrated snacks, refrigerated fresh-cut produce, and raw or uncooked meat, poultry and seafood products.

MAP and the shared-use food processing facility enable the UH community colleges to provide opportunities for the local community to innovate. Planning is already underway with Kapi‘olani Community College, Kaua‘i Community College, and possibly Leeward Community for food innovation centers in their communities and linked to the culinary education programs at these colleges.

Action Strategy

*Sustain and advance the UH research enterprise*

<table>
<thead>
<tr>
<th>Tactics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Empower faculty by identifying and removing administrative and policy barriers that impede research efficiencies and effectiveness</td>
</tr>
<tr>
<td>o Utilize advisory committees and task forces to identify, study and propose solutions to long standing problems</td>
</tr>
<tr>
<td>o Utilize technology and best practices, where possible, to generate efficiencies</td>
</tr>
<tr>
<td>• Recruit and retain talented faculty in key strategic areas</td>
</tr>
<tr>
<td>• Achieve financial stability for research under declining state investment</td>
</tr>
<tr>
<td>o Streamline and eliminate redundancy in research administration services</td>
</tr>
<tr>
<td>o Make better use of existing resources through shared instrumentation/core facilities and space management</td>
</tr>
<tr>
<td>• Craft internal incentives and rewards for growth</td>
</tr>
<tr>
<td>o Encourage multi-disciplinary/multi-campus collaboration through sharing of return of overhead</td>
</tr>
<tr>
<td>o Institutionalize sharing of return of overhead with principal</td>
</tr>
</tbody>
</table>

17
The following are examples of central office initiatives to enhance efficiency and effectiveness of research services and commercialization through the use of advisory committees, task forces, technology and reorganization.

**Office of the Vice President for Research & Innovation (OVPRI)**

The Vice President for Research & Innovation (VPRI) established a Research Advisory Board (RAB) comprised of senior faculty. One of the RAB’s accomplishments is the Research Compliance Task Force (RCTF) report that surveyed faculty regarding issues with complying with federal and state regulations in varied areas such as protection of human subjects, animal welfare, biosafety and export controls. The recommendations will be used to formulate corrective action plans with the goals of improving service, training and compliance. One of the RCTF report recommendations is to reorganize the Office of Research Compliance under the OVPRI so that all research administration services are under one UH organization to provide consistent and efficient communication, improved coordination and collaboration among UH research administration units, shared technology and training.

The VPRI also established a Research Policy Task Force to review, update and simplify the University’s research policies and procedures. A related task force has been established to review both UH and RCUH policies and procedures for service ordered projects. In addition to updating the policies for the new federal regulations, it will be an opportunity to identify ineffective or burdensome policies and correct them.

Finally, the VPRI established Office of Export Controls to ensure UH compliance with U.S. export control laws as well as absorb the duties and responsibilities of the UH Office of Industrial Security Services (classified research) to eliminate redundancy and consolidate similar services related to non-disclosure and confidentiality.

Through these actions, the OVPRI hopes to tackle the issues of administrative and organizational inefficiencies and make better use of its resources to provide effective research administrative services to the UH community.

**Strategic Research Development Office**

Research funding of the Hawai’i Innovation Initiative by the Legislature will increase UH’s ability to successfully stimulate research activity, develop its innovation-base entrepreneurial ecosystem and help increase the potential for the creation of high quality jobs within the state. A Strategic Research Development Office will have an important role in analyzing, developing and implementing a multitude
of strategies to advance research and increase extramural funding for research, innovation, and training at UH. The SRDO will also seek and identify potential funding opportunities and collaborations, and will be actively involved from the planning to submissions stages of major and multi-investigator research and training grants. The office will also work with faculty start-ups to identify Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funds.

Center for Commercialization

The Center for Commercialization is a virtual center designed to establish an ecosystem at UH to help stimulate the translation of research and collaboration between academia and industry. Legislative funding of the Hawai‘i Innovation Initiative will greatly help incentivize current and potential entrepreneurs to take the next step in a capital efficient manner utilizing the Lean Startup Method and catalyze the commercialization of IP out of academia and into the real world to benefit local and international communities. The Center will: 1) engage its world-class researchers in STEM related fields including biology, agriculture, engineering and astronomy to provide additional commercialization pathways; 2) draw upon and expand, the existing network of partners including: alumni, industry experts, campus-based entrepreneurship resources, and state agencies and businesses to offer tailored advice for science-based ventures; 3) tailor an extensive entrepreneurship training and mentoring program for faculty and students teams from across the UH System; 4) provide legal and financial guidance for startups; and 5) provide office space, access to laboratory equipment; and incorporate new and existing activities for networking and community engagement.

Strategic Faculty Hires

To help promote research and innovation in the areas of data intensive systems and engineering and sustainable water resources, both of significant interest to the University of Hawai‘i and the state of Hawai‘i, UH is requesting ten faculty positions in these two strategic areas from the Legislature. UH System will coordinate the faculty hiring across campuses in these areas by also leveraging existing resources and federal opportunities, including funding through the National Science Foundation’s Experimental Program to Stimulate Competitive Research (EPSCoR) program.

As described earlier in this report, UH’s first two strategic faculty hires are already making substantial progress resulting in recent grants of $40 million for microbial oceanography research and $850,000 to create the best data visualization system in the country. UH plans to augment these initial hires with other superstar researchers with track records of attracting funds and that whole programs can be built around – in an effort to create a cutting-edge, entrepreneurial research and innovation ecosystem throughout the UH System.

Office of Research Services (ORS)

The Office of Research Services (ORS) embraced electronic research administration by adopting Kuali COEUS and rebranding it as myGRANT. Although it was a step forward, there were issues about the user interface (UI). ORS worked with its Faculty Advisory Committee on the UI issues and shared their ideas with the Kuali Foundation. In November 2015, ORS rolled out a new version of Kuali COEUS 6.0 with a redesigned UI that will hopefully make it easier for faculty to prepare and submit grant proposals electronically.
As part of further roll-out of Kuali COEUS capabilities, ORS may pursue research subject compliance protocol modules for humans and vertebrate animals and conflicts of interest module. This might help streamline and integrate research compliance information systems.

Studies like the Federal Demonstration Partnership faculty administrative burden survey found that a large part of faculty administrative burden is at the post-award stage, which is also affected by an institution’s own policies and procedures. ORS also recognized this burden and worked with research fiscal administrators to find ways to streamline *myGRANT* processes.

**Office of Technology Transfer and Economic Development (OTTED)**

The Office of Technology Transfer and Economic Development (OTTED) appointed a new director in December 2014 and is in the process of making substantial changes to create a more vibrant entrepreneurial ecosystem through the aggressive commercialization of UH intellectual property. OTTED is working closely with the XLR8UH proof-of-concept center to not only market, license and protect UH intellectual property, but to create new opportunities for collaboration between UH faculty and industry partners. The following are examples of strategies it is employing to reposition itself to commercialize UH technology.

- Encourage filing of invention disclosures and providing information about commercialization support at OTTED and other UH organizations by speaking frequently with faculty and researchers and maintaining relationships with UH administrators system-wide.
- Encourage faculty and researchers to apply for Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) grants and provide assistance.
- Hold events such as “tech showcases” to connect researchers to the business community and investors and invite business leaders to UH technology or entrepreneurship related events.
- Revise standard operating procedures for handling invention disclosures, patent prosecution and marketing as well as focus on customer service.
- Develop a group of pro bono advisors who are willing to provide patentability and commercialization advice to OTTED on an occasional basis.
- Partner with UH Foundation to establish and seek funding for an innovation fund for grant making and for a venture fund to support inventions that are ready for investment.

**Office of Export Controls (OEC)**

The Office of Export Controls (OEC) is tasked with the administrative processes related to restricted research. OEC serves as the main resource for UH System administrators, researchers, faculty and staff who are involved in projects and business matters involving export-controlled and/or classified research that are subject to U.S. laws and regulations on national security. The following are examples of strategies it is employing to increase awareness and provide support to UH faculty and staff on export controls and classified research.

- Create new UH policies and procedures as well as standard operating procedures for export controls and classified research.
- Hold training events, provide outreach services and strong customer service for researchers, faculty and administrators to ensure compliance with export controls and classified research policies and procedures.
• Coordinate with other UH offices to address matters of mutual interest (e.g., OEC will work with Information Technology Services, Applied Research Laboratory, etc., on cybersecurity matters).

Office of Research Compliance (ORC)

The Office of Research Compliance (ORC) assures the public that research at UH is performed responsibly by working closely with faculty, central office and departmental research administrators to help reduce the administrative burden associated with research compliance to federal, state and university policies. The following are examples of strategies it is utilizing to increase consultation and awareness to streamline processes and improve service.

• Establish a committee with faculty, departmental research administrators, and other central research administrators for the purposes of selecting among existing commercial compliance software or Kuali COEUS to handle compliance protocols for areas such as human participants, vertebrate animals and biosafety.
  o Regardless of which compliance software package is selected, work on providing robust online help.

• Review and update policies and procedures as well as other written documents such as decision trees and frequently asked questions to streamline and clarify what needs to be done to get through the protocol review and renewal process. Provide additional tools to aid researchers in knowing compliance requirements and developing protocols that answer questions likely to be asked by compliance committees.

• Review the CITI online training courses to reduce the number of CITI modules used and substitute them with instruction that has greater relevancy to UH constituents.

• Implement a seminar program consisting of ten, 50-minute courses, which can be offered through distance learning to other UH campuses; those who attend at least eight seminars can receive a certificate that can be used as evidence that they met the educational requirements for NSF or other funding agencies. Explore getting seminars accredited so that they can be used to meet continuing education requirements such as Continuing Medical Education (CME).
  o Work one-on-one with at least four new faculty members or postdoctoral scholars to help them establish and run their research programs responsibly.
  o Create at least one flow chart of software assisted decision tree to help UH personnel determine what educational requirements they must meet.
  o Provide individualized face-to-face and online instruction as faculty, students or staff are doing something for the first time, such as using the Animals Resource Center.

• Establish a committee or focus groups to make ORC web site more organized and accessible to meet ORC constituent needs. Consider enhancements such as:
  o An applet for constituents to enroll and easily document their classroom and online instruction/certifications, including a personalized decision tree to help determine instruction/certification requirements;
  o Use of story-driven visualizations to increase interactivity; and
  o Use of a blog or social media to stimulate discussion or generate interest in upcoming events.
• Obtain institution-wide support to pursue and receive Assessment and Accreditation for Laboratory Care, International (AALAC) accreditation, which will allow UH researchers access to funding opportunities from pharmaceutical companies that require this accreditation.

• Obtain institution-wide support to establish a research quality assurance/control team that enables researchers to conform to the Good Laboratory Practices Act, which could increase funding opportunities from pharmaceutical companies, Food and Drug Administration (FDA) and Environmental Protection Agency (EPA).

• Create resources that will enable researchers to avoid having their teaching or research programs closed due to noncompliance. For example, continuing the work of the Fish Advisory Committee that provides biennial inspections of aquatic animal facilities and provides recommendations for low cost solutions to compliance related issues (e.g., use of toilet tank floats to control water levels in fish tanks).

SUMMARY

The University of Hawai‘i is in a unique position to help diversify and stabilize an economy that is highly dependent on tourism and military spending. As the state’s largest research enterprise, and with research and innovation identified as the third economic sector of growth by the business community, UH plays a vital role in achieving economic diversification.

To help grow its research enterprise, UH has begun efforts to identify and remove cumbersome administrative policies that have affected research efficiencies and effectiveness. While maintaining its commitment to supporting faculty research in all disciplines, UH is actively exploring new avenues to leverage its existing strengths in ocean sciences, astronomy, energy, sustainable agriculture, health sciences, digital/creative media, data intensive sciences and engineering – areas identified as national science and technology funding priorities where growth in extramural funding is occurring. UH will also continue to introduce new approaches in technology transfer and acceleration, and proactively seek new avenues to incorporate innovation/entrepreneurship into its curriculum and extra-curricular activities.

The University of Hawai‘i Research and Innovation Long Range Plan is not an administrative directive. Its primary purpose is to serve as a “roadmap” to help guide UH into the next century of successes involving cutting-edge discoveries in research that will not only strengthen the Hawai‘i economy, but at the same time -- make the world a better place to live.