Benchmarking Hawaii's Emerging Industries

FULL REPORT

Department of Business, Economic Development and Tourism

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I. INTRODUCTION

For years, the State and counties have sought to balance their economic reliance on a few large economic activities like tourism, defense jobs, and plantation agriculture (sugar and pineapple), by providing support for the growth and development of numerous smaller economic activities and industries. In the 1970s garment manufacturing, film, and diversified agriculture were seen as potential growth industries, among others. More recently, development interest has focused on biotechnology, digital media and creative industries.

These activities have been variously referred to as *emerging, growth* or *targeted* industries. They have been pursued because they were thought to have potential as significant, long-run contributors to economic growth and skilled jobs.

But while a few of these activities have been measured and their performance tracked over the years, there has not been a consistent effort to define, measure and assess their performance. Nor is there a clear notion of what defines an emerging or targeted industry.

Purpose & Objectives

The purpose of this report is to begin filling this information gap by inventorying and measuring Hawaii's portfolio of targeted growth activities and developing a framework for identifying and assessing Hawaii's emerging growth activity.

Specifically, the report has three objectives.

1) Identify Hawaii's targeted industry portfolio; that is, the range of actual and potential growth activities outside of mainstream tourism, defense, and development activity, which have been of some development interest by state, county and other organizations over the years, however intense or marginal that interest.

2) Review or establish definitions for the targeted activities in the portfolio in terms of the standard industry classification code (NAICS) if possible and measure the activities using the rich sources of employment and earnings data available for most NAICS industries in Hawaii and the U.S. If definition under NAICS is not practical, other sources of data will be investigated.

3) Develop performance metrics and an evaluation framework for the activities in the portfolio to determine how they have performed in recent years. This framework will help define and identify *emerging industries* as well as other major classes of industries.

This benchmarking effort will form the basis for more detailed analysis in future research reports to better understand the portfolio industries, the reasons behind their performance, their workforce and other input needs, and how their performance and economic contribution to the state might be improved.

The study builds on a number of earlier efforts that have focused on how Hawaii's economy can be strengthened through the development of new and emerging industry. In particular the work of the Hawaii Institute for Public Affairs (HIPA), Enterprise Honolulu and more recently, the Hawaii Science and Technology Council, have set important strategic and methodological directions for research.

Data Sources

The data for this study are primarily jobs and labor earnings, because they are available annually for very detailed industries.[1] Other measures such as sales, output and gross product are not available as frequently or in as much detail.

The industry data are available for the period 2002 to 2008. While a much longer historical period would be preferred, changes in major statistical classification systems for data made earlier this decade limit the availability of comparable data before this period Therefore, the period for benchmarking performance is based on 2002 to 2008 data, which closely corresponds to the most recent economic expansion period for both Hawaii and the U.S. As more data become available in future years, information over more than a business cycle can be analyzed and eventually more reliable, long-term growth trends will emerge.

Defining Key Terms

There have been a number of terms used in economic development to describe economic activity, particularly those thought to have economic development potential. The most frequently encountered terms include*, targeted-, emerging-, new-*, and *growth*-industries. There are no authoritative definitions for these terms, such as might come from Federal statistical agencies. However, they are used frequently in the economic development literature and some consistent usages have emerged. This study does not attempt to propose standard definitions. However, since these are popular and important terms they will be defined for the purposes of this report.

Industries, Industry Groups and Sectors

An ***industry*** usually refers to an economic activity producing goods and services in a particular category, although there is no clear formula for how broad or narrow those categories should be. The North American Industrial Classification System (NAICS) provides a workable classification of industries, industry groups and industry sectors. At the highest level, NAICS identifies major economic ***sectors*** and assigns them two-digit code numbers. The sectors are then broken down into 3-digit ***subsectors,*** 4 digit ***industry groups*** and then 5-and 6-digit ***industries.***[2] This report will attempt follow the NAICS terminology for industries, with the modification that any custom combinations of five- or six-digit industries will also be labeled as *industry groups*. Also the broader term, *sector,* will also be used to describe custom combinations of industry groups that form more extensive areas of the economy like the range of industries focused on technology and creative activities.

Growth and High Growth Industries. The term *growth* in this report will apply to any industry that is showing positive increase in jobs over time. The term *growth* is sometimes used to describe an activity that is growing faster than the economy as a whole and therefore, helping to raise the overall growth rate. The latter reference is an important distinction to make. For clarity, this report will use the term *growth* to refer to activity that is simply showing positive growth over a period of time and the term *high growth* to point out those industries and activities that are exceeding the average overall growth rate.

[1] The basic data are compiled by Economic Modeling Specialists, Inc. (EMSI) and processed by DBEDT. EMSI supplements data from the Federal Departments of Labor and Commerce by including estimates of proprietors and self employed jobs, and by estimating data for very small industries that are not reported by the Federal agencies due to disclosure issues.

[2] For instance 72 is the Accommodations and Food Services Sector in NAICS. This sector is successively broken down into finer parts. The three-digit, 722 activity is the Food Services subsector; 7223 is the Specialty Food Services industry group; 72232 is the NAICS industry, Caterers; and 722320, the last level, identifies variations or more detailed distinctions for the industry that were desired by the statistical agencies of the U.S., Mexico or Canada.

Targeted Industries and Activities. The terms *Targeted industries* or *activities* are sometimes used to describe activities that have been provided development assistance such as subsidies, tax preferences and other incentives. However, in a broader context the term can also refer to the range of industries and activities that have been the subject of development *interest* by government, development organizations and stakeholders, regardless of the amount of assistance directed at them. This broader notion of the term is helpful in this report as a label for that range of generally small activities that have been proposed for development over the years. As a starting point for identifying emerging growth industry, a comprehensive list of *targets* will serve as a *portfolio* of activities to better define, measure and assess for performance.

Emerging Industries. The term *emerging industries* is obviously a focal term for this report. At the national level the term has most often been used to describe young industries that are producing important new products for entirely new markets. Historically, the classic examples of emerging industries in their era were automobiles, airplanes, television and personal computers.

However, at the regional, state and local levels the term is most often used to describe any economic activity that is relatively new or underrepresented in the local economy but which is demonstrating above average potential for the area. Regions usually focus on nurturing emerging activities that can add to the region's export base. But a region might also nurture an emerging activity that is servicing local markets in a way that reduces imports and keeps jobs and income in the region, such as agriculture for local consumption and alternate energy.

These are reasonable notions of emerging industries. The problem however, is that it is not clear what defines an emerging industry. It is also not clear when an activity has moved beyond the emerging stage or what that next stage might be.

A helpful solution to that problem is found in regional economic literature, where the term emerging is used to describe one of the stages in a typical industry's life cycle.[3] The industry life cycle model has four stages or phases which include; emergence and rapid growth, maturity to a major economic driver, a slowing or transitioning phase, and finally a declining phase.

Each phase has characteristics and challenges that suggest different approaches and policies to help industries maximize their economic contribution. Hawaii's sugar and pineapple industries have gone through such phases and it can be argued that tourism has probably reached a transitioning phase. In the real world not all industries will go through each phase of the life-cycle and some industries may reinvent themselves and jump back to an emergence phase.

The useful feature of the industry life cycle model is that it offers some objective criteria for identifying what stage an industry is in, based on some fairly straight forward performance metrics. This report will follow the spirit of the popular notion of emerging economic activity, but will utilize the framework and criteria from regional economics to group the industries in the targeted industries portfolio into emerging or other stages of development.

[3] For instance, see Blakely, Edward J., *Planning Local Economic Development: Theory and Practice*, Sage Publications, Thousand Oaks, CA., fourth edition, 2010.

II. HAWAII'S TARGETED INDUSTRY PORTFOLIO

Over the years the Legislature, State administrations, counties and industry groups have identified a range of industries and activities they felt held promise for development. A comprehensive list of economic activities that have been the target of interest or actual development effort in Hawaii in recent years was prepared as a starting point for this report (Figure 1). As a group, these activities compose Hawaii's targeted industry portfolio.

The sources for these potential growth activities range from the Hawaii State Plan, of the 1970s, to assessments of the technology and creative sectors conducted just over the last year.[4] The activities vary greatly in terms of their justification and the precision with which they have been defined for measurement purposes. Targeted activities that have undergone more recent study have been fairly well defined for measurement purposes. Others, especially those from older policy documents like the Hawaii State Plan remain somewhat vague in meaning and undefined for measurement purposes.

The table of targeted industries in Figure 1 has been organized into several major groups that appear to best encompass the targets, such as technology, the creative sector, agriculture, tourism and all others. Many of the source documents use slightly different terminology for the targets. Therefore, the activities listed in the left column represent close approximations for the slight variations in terms. Also, due to the way that they were previously defined, there is some overlap among the major groups. For instance both the technology and creative sectors have elements of computer services and engineering.

Challenge of Identifying Targeted and Emerging Industries

The first challenge in assessing these targeted activities is to define them in such a way that they can be measured, hopefully using standard data collected by federal and state statistical programs. Without standard data, we are faced with the need to do special surveys and compilations, which are costly and usually not comparable with similar activity elsewhere because of differences in methods and definitions.

As indicated earlier, the gold standard for classifying and measuring economic activity is the North American Industrial Classification System, or NAICS. Used by all major Federal statistical agencies, NAICS is a *supply side,* production-oriented classification system for economic activity that focuses on firms and industries. Not only do NAICS categories provide a rich data source, but they can readily be compared with similar activities nationally and with specific regions of the country. This is a powerful tool for determining if an activity in Hawaii is performing better or worse than elsewhere, which essentially tells us Hawaii's competitiveness in the activity.

[4] Certainly a number of other studies and references than listed on page 10 have contained references to industries Hawaii should target. However, these documents probably represent the most authoritative references.

FIGURE 1. TARGETED INDUSTRY ACTIVITY, BY SOURCES OF ENDORSEMENT

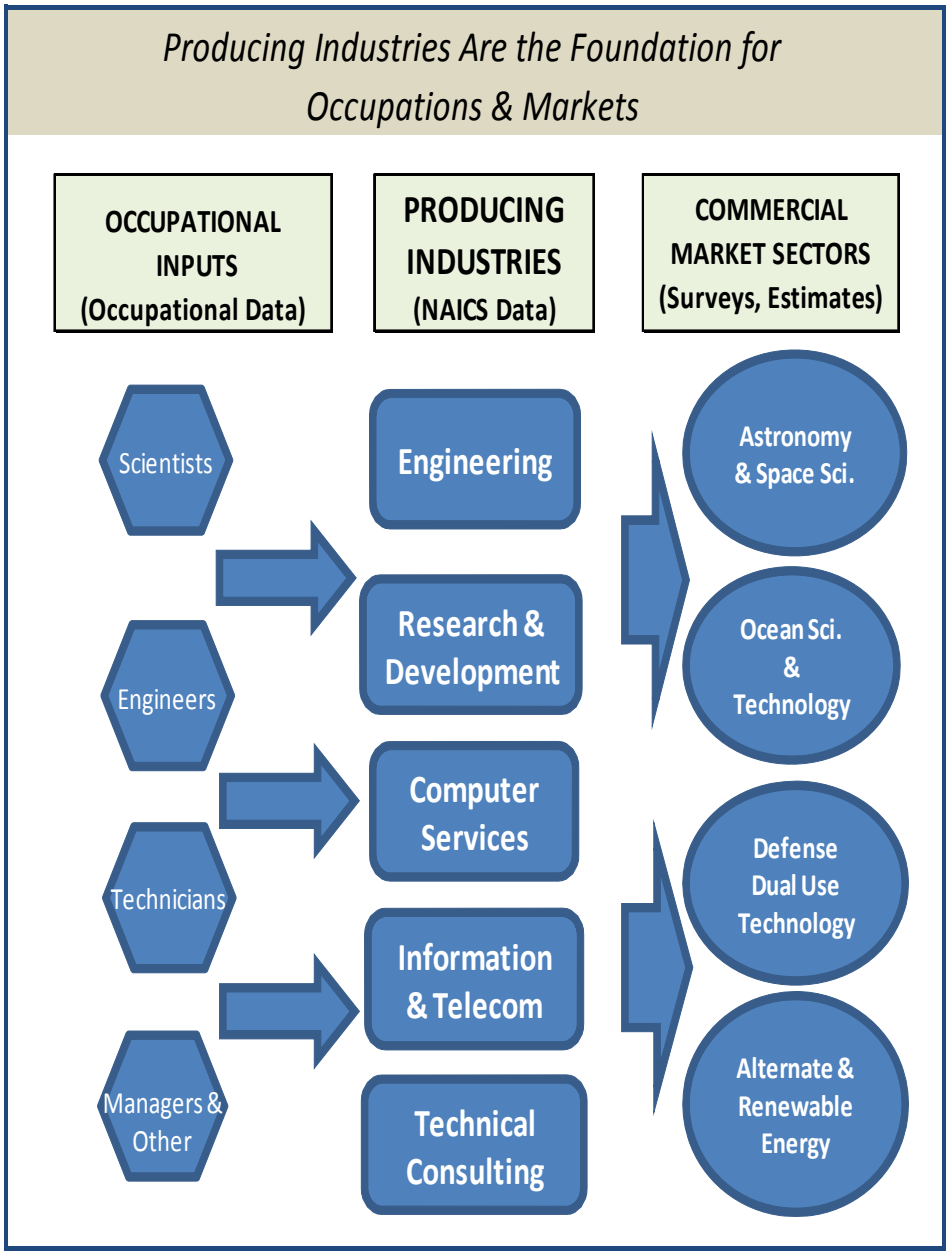
TARGETED ACTIVITY / Source of Endorsement	Hawaii State Plan/ HRS 226	Status of Targeted Indys, DBEDT Rpt 1988	Act 178 (1999)	Act 148 (2007)/ HRS 201-19	Statewide 2005 CEDS*	Enterprise Hon. Target Sectors 2009	Kauai Econ Devel Plan 2005	Maui County 2005 CEDS*	Hawaii County 2005 CEDS*	Hawaii 2050 Report 2007	HiSciTech** report 2008	DBEDT (Various citings 1998 to 2009)
Technology		X		X	X			X	X	X		X
Astronomy/Space Science		X	X	X	X	X					X	X
Biotechnology			X	X	X	X				X	X	X
Computer Services	X		X								X	X
Engineering and Related Serivces			X								X	
Technical Consulting Services						X					X	
Research & Development Services		X				X					X	X
Info and Telecom Tech Serv	X	X	X	X	X	X					X	X
Medical and Diagnostic Testing											X	
Technology Equipment Distribution											X	
Technology Device Manufacturing											X	
Chemicals & Pharmeceuticals											X	
Alternate Energy	X	X			X	X	x		X		X	X
Energy Technology Services		X										
Technology Support Services		X										
Miscellaneous Technology Mfg											X	
Ocean Science & Technology	X	X	X	X	X		x					X
Environmental Tech Mkt Sector											X	
Creative Industries					X		x					X
Performing and Creative Arts												X
Engineering/R&D												X
Computer and Digital Media				X	X	X				X	X	X
Advertising, Marketing & Related												X
Business Consulting												X
Publishing & Information												X
Cultural Activities												X
Architecture												X
Design Services												X
Film, Television, Video Production	X	X		X	X	X		X				X
Radio and television Broadcasting												X
Music												X
Agriculture	X	X		X	X	X	x	X	X	X		X
Specialty Foods		X										
Aquaculture Production	X			X						X		X
Agricultural Technology Services		X										
Fishing										X		
Forestry & Hunting					X							
Other Targets												
Defense Dual Use					X	X				X	X	X
Stock Exchange		X										
Federal Contracting		X										
Education	X	X			X				X			X
Regional HQ Location		X										
Call Centers	X											
Health & Wellness		X	X		X		x		X	X		
Recycling/remanufacturing		X										
Captive Insurance												X
manufactured Housing		X										
Apparel	X											
Specialty Tourism		X		X	X		X	X	X			X

Producing Side vs. Market Side Targets

Unfortunately NAICS has some major weakness for economic developers. First, it is slow to add new categories as the relative importance of industries change and new industries emerge. For instance, only recently has NAICS established a biotechnology research industry. It has yet to account adequately for the production of alternate or renewable energy.

Secondly, and probably more significant, NAICS' production oriented framework is of limited help in understanding the major commercial markets for industry products. Unlike the NAICS statistical program, economic development programs tend to look for market opportunities first and production opportunities that could serve those markets second. For instance, numerous organizations have become very interested in how Hawaii can play a role in the emerging markets for *digital media*, ranging from computer animation to software games for cell phones. But NAICS does not provide data by market opportunities, only production activity. NAICS can only measure the likely industries that produce digital media products, such as computer programming, engineering and perhaps film and video production. Nevertheless, the extent to which Hawaii's targeted industries can be measured in NAICS terms will provide a rich source of data to determine which have apparently found growth markets. Then, efforts can be made to better understand those markets and Hawaii's competitiveness in serving them.

FIGURE 2



The relationship between producing activities and commercial market sectors is illustrated in Figure 2. Commercial market sectors usually need special surveys or estimating procedures to develop data. On the other hand, major data generating programs usually produce employ-ment and occupational data that are well tied to NAICS producing industries.

As Figure 2 suggests, the revenues and jobs devoted to particular market-side activities are already contained somewhere in existing NAICS industries. Products in the commercial market sectors may be generated by several producing industries. In this example five primary industries ranging from engineering to technical consulting are shown making the major contributions to the markets for Astronomy, Ocean Science Dual Use and Renewable Energy. The difficulty in relating produc-

ing industries to the market sectors is in determining what proportion of each producing industry contributed to that particular market.

It would certainly be valuable to have data by the important market opportunity areas and activities not well defined in NAICS. Some ongoing survey programs do exist for gathering limited data on astronomy activity. Also, DBEDT has periodically conducted surveys of Ocean Science and Technology. However, funds to conduct surveys will likely be scarce over the next few years. In a recent joint study to define and measure the technology sector by the Hawaii Science and Technology Council, DBEDT and several other stakeholders faced the problem of accounting for both NAICS-measurable production activity and less measurable market opportunities in technology. The project was very successful at defining and measuring the basic production side industries that underlie the technology sector. However, efforts to measure technology markets such as digital media and dual use technology were more problematic. The good news is that all of the market sector activities are generated by some combination of the producing industries on which we do have data.

Each of the targeted activities in Figure 1 was reviewed to determine if it was a production side concept or a market concept. As shown in Table 1 (which also includes the resulting employment for each industry group), the result was that roughly 80% of the groups were production-side concepts with the possibility of being measured through NAICS data. The remaining 20 percent were judged to be either market-based concepts or activities not currently accounted for specifically in NAICS, such as astronomy and renewable energy, among others.

TABLE 1. TARGET INDUSTRIES PRODUCTION VS. MARKET SIDE ORIENTATION

PRODUCTION SIDE TARGET GROUPS				MAKET SIDE ACTIVITIES	
TECHNOLOGY	2008 Jobs	Design Services	1,453	TECHNOLOGY	Jobs
Computer Services	6,583	Radio and TV Broadcasting	1,361	Astronomy/Space Science	279*
Engineering and Related Services	4,842	Film, TV & Video Production	1,231	Alternate Energy	na
Biotechnology	3,927	Music	1,106	Agricultural Bio-Tech	na
Technical Consulting Services	3,760	AGRIBUSINESS	2008 Jobs	Ocean Science & Tech.	1348*
Research & Development Services	3,604	Farm Production	12,235	Environmental Tech	na
Info and Telecom Tech Services	2,196	Agric. Processing	6,462	Defense Dual Use	na
Medical and Diagnostic Testing	1,695	Fishing	1,497	Other Targets	Jobs
Technology Equipment Distrib.	871	Agric. Support Services	1,248	Captive Insurance	na
Technoogy Manufacturing	716	Agric. Inputs	414	Specialty Tourism	na
CREATIVE INDUSTRIES	2008 Jobs	Aquaculture Production	221		
Performing and Creative Arts	8,531	Agric. Packaging & Warehsg	197		
Engineering/R&D	7,336	Forestry & Hunting	101		
Computer and Digital Media	6,657	OTHER TARGETS	2008 Jobs		
Marketing & Related	4,918	Health & Wellness	51,346		
Business Consulting	4,291	Education	7,581		
Publishing & Information	2,887	Apparel	1,165		
Cultural Activities	2,311	Call Centers	435		
Architecture	2,280				

*Survey results. Data for 2007

Criteria for Defining and Measuring Targeted Activities

Fortunately, some recent studies have already provided definitions and measurements for most targeted industries/activities in terms of NAICS producing industries. The HiSciTech study, referred to earlier, has defined the major producing industry groups in the technology sector. A forthcoming study by the DBEDT Research Division in collaboration with the department's Creative Industries Division identifies the major producing components of the Creative Industries Sector.

For agribusiness, DBEDT Research, in consultation with staff of the State Department of Agriculture adapted with some modifications the US Department of Agriculture's definition of Agribusiness. For other targeted activities, such as education, call centers, health and wellness and apparel, DBEDT Research reviewed the related NAICS code definitions and combined the most relevant industries. This process utilized similar research prepared by Three-Point Consulting for the 2005 Comprehensive Economic Development Strategy (CEDS) process.

For targeted activities on the commercial market side, information is less structured since they cannot be readily abstracted from the NAICS producing industry data. The study has, therefore, relied on previous research and ongoing survey efforts. Astronomy and Ocean Science & Technology have been surveyed within the past several years. Information on other market targets is presented as is available at this time.

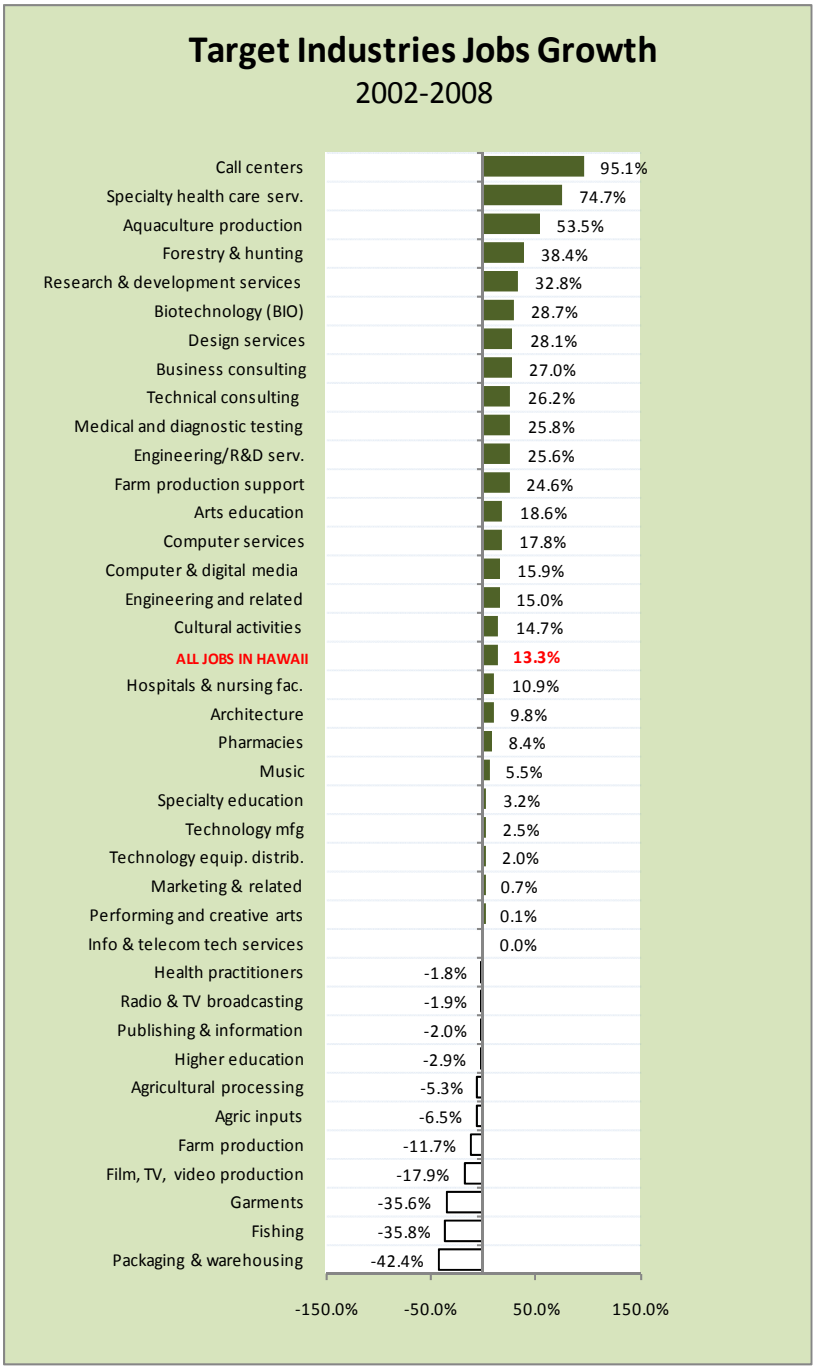
As indicated in the introduction, data for the NAICS-based industries are mostly employment measures and average job earnings. The data include estimates for self-employed and sole proprietors. The data are supplied on a subscription basis by the Research firm, Economic Modeling Services, Inc. (EMSI) and are based on U.S. and Hawaii Labor department job counts by industry supplemented with earnings data from the U.S. Department of Commerce. These are the only types of detailed data available annually for state and county industries. Data such as gross state product are available annually, but only for larger sectors of the economy. There is a rich array of information available through the Census Bureau's periodic Economic Census program. However, these detailed surveys are conducted at five-year intervals and are not completely compatible with the annual Labor department data. The most recent economic census was conducted for the year 2007 and data for Hawaii will be released in stages during 2010 and 2011.

For those target industry groups definable in NAICS terms, data were compiled at the six-digit NAICS level for each industry group in order to apply various performance measures. The Appendix to this report provides very detailed data for each of these groups and their six-digit industries. Discussion of the individual target group industries and their performance data are presented in Section IV of this report.

III. PERFORMANCE MEASURES & FRAMEWORK FOR TARGETED INDUSTRY PORTFOLIO ASSESSMENT

Defining and measuring the industries in the targeted industry portfolio of is the first step towards understanding the role of these activities in the economy. In addition, we would like to develop measures of performance for these activities and establish a framework to combine those measures into a meaningful performance assessment.

FIGURE 3



Industry Group Performance Measures

Over the years, regional economic analysis has developed some helpful industry performance measures for industry performance. This report will use three primary performance measures to assess the targeted industry portfolio along with a couple of secondary measures.

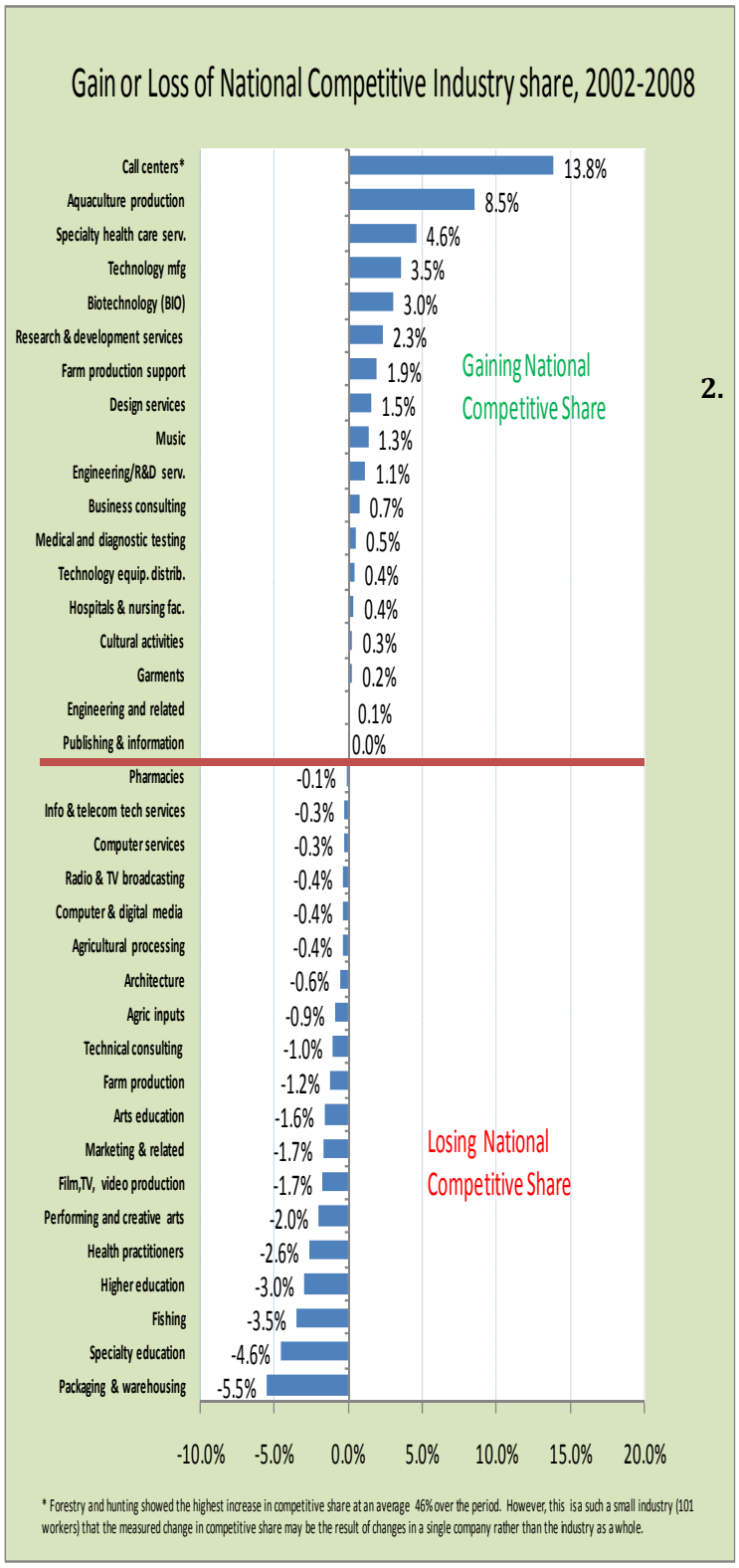
1. Job Growth: This is an obvious performance measure that will help differentiate the industries of the portfolio.[5] In addition to determining if an industry has expanded or contracted over the years, it will also be useful to tify *high* growth industries (those that have expanded faster than average).

Just in terms of jobs growth, the portfolio seems to have performed well. Fully 26 of the 38 NAICS-based, target industry groups showed net job growth over the period (Figure 3).

[5] Growth in income, sales, investment and other financial metrics for the industries would also be useful, but are available infrequently. The next opportunity for examining financial metrics will be the release of 2007 Economic Census data beginning in 2010.

Of the targets, 17 registered as *high growth* industry groups by outperforming the overall state jobs growth rate of 13%. Call centers topped the list in terms of job growth. Ten of the 17 high-growth target groups were in either the technology or creative sectors.

FIGURE 4



Of the 11 industry groups losing jobs over the period nearly half were in the agribusiness sector. Jobs were also lost in several information industries, film/TV production activity and among health practitioners.

2. Change in Competitive National Share: A second key industry performance metric measures whether the target industry has been expanding faster or slower (in terms of jobs) than the same activity nationally (Figure 4). If the industry is growing faster in Hawaii it is effectively increasing its share of the national industry. If the activity is growing more slowly in Hawaii than nationally, it's national share is declining.

For instance, over the 2002 to 2008 period jobs in the Accommodations and Food Service sector in Hawaii grew a respectable 8%. However, the same sector nationally grew jobs by 11%. Therefore, even though the sector grew in Hawaii, it did not keep up with national growth and consequently lost a small portion of competitive national industry share.[6] For a mature market such as Hawaii tourism, this result should not be too surprising. On the other hand, we would expect a portfolio of smaller growth industries to be gaining competitive national industry share over time

Not surprisingly, most of the industry groups that did well in terms of growth also tended to show gains in competitive national industry share.

Call centers grew on average nearly 14% faster per year than the same indus-

[6] Researchers may recognize this measure as a component of the shift-share method of decomposing an industry's growth rate.

try nationally over the 2002 to 2008 period, but mainly due to exceptional growth in 2002 to 2004. Also among industry groups increasing competitive national industry share were several technology industries including biotechnology, research and development, medical testing and engineering. A number of high growth industry groups lost competitive national share, however. Computer services, technical consulting and arts education all grew faster than the state's economy in terms of jobs, but not as fast as the same industries nationally.

Finally, two industry groups, garments and publishing & information, gained competitive national share even though they lost jobs in the 2002 to 2008 period. This occurred because the local industries lost fewer jobs than nationally, thus gaining competitive national industry share by default.

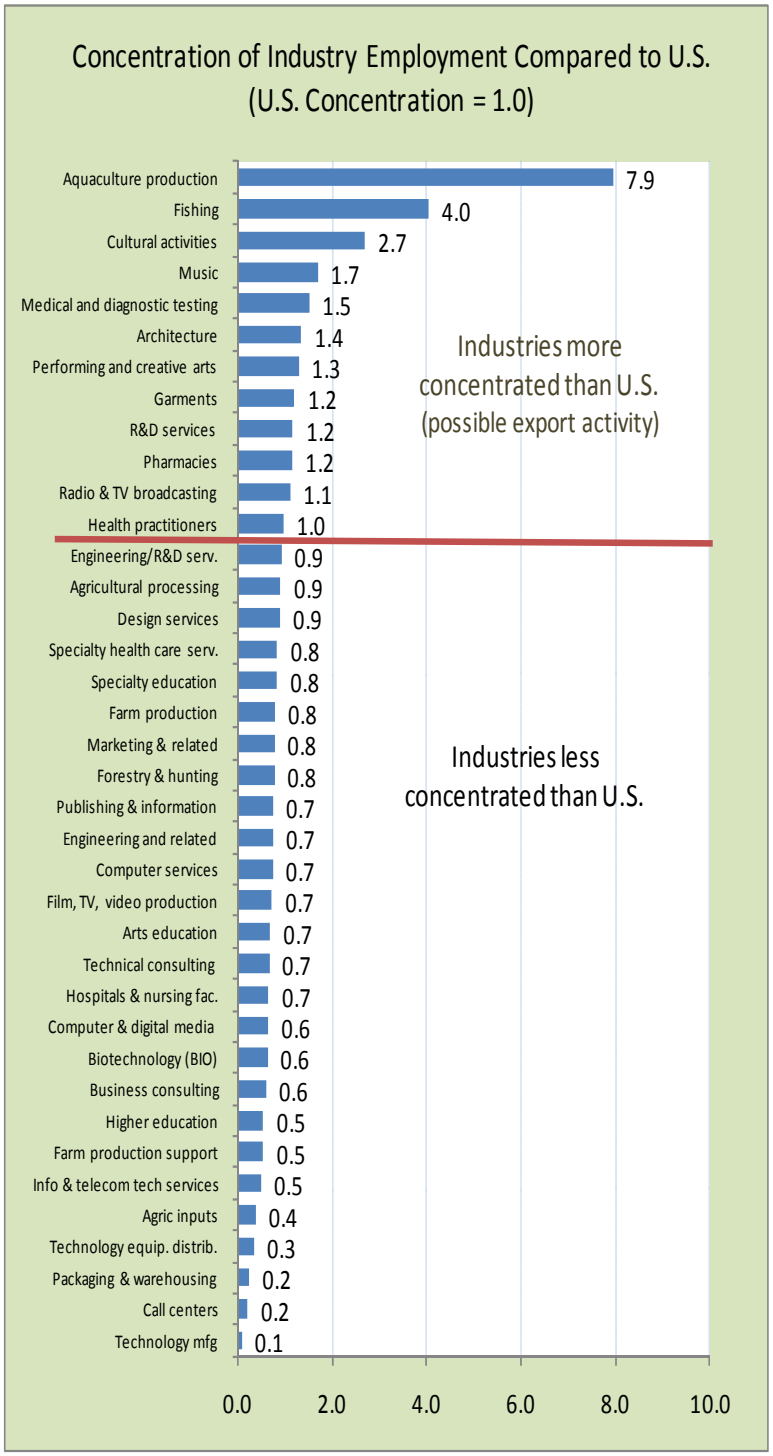
3. Industry Concentration: A third performance metric that helps in the evaluation of the targeted industry portfolio is industry job concentration, which sheds light on the industries' export orientation (Figure 5).

Export activity brings new money into the state and is a basis for long-term industry growth. Unfortunately, estimates of industry exports are not part of standard industry data programs. Thus, it is not clear how much of its output in a given target industry is exporting, if any.

However, it is possible to identify a *likely* export industry by measuring the concentration of its employment in the state's economy. An industry that employs a significantly higher proportion of jobs in Hawaii than does the same industry nationally is relatively more concentrated and is likely to be exporting at least some of its output.

Concentration is measured by a metric call the Location Quotient, or LQ for short. The LQ for an industry at the U.S. level is fixed at 1.0. Hawaii industries with an LQ measure more than 1.0 are more concentrated than the same U.S. industry and those below 1.0 are less concentrated. For instance, the measure for aquaculture production in Figure 5, means that employment in Ha-

FIGURE 5.



waii's aquaculture industry is 7.9 times more concentrated than for the U.S. as a whole. This suggests that the aquaculture industry is relatively more important to Hawaii and may be exporting a significant amount of its output. On the other hand, technology manufacturing in Hawaii with an LQ of just 0.1 has only one-tenth the employment concentration of the same U.S. industry group. It is possible that technology manufacturing may be exporting some of its output. But it has a long way to go to demonstrate the strong comparative advantage shown by the more concentrated industries above the 1.0 level.

Additional Performance Measures. The three key measure set out above will provide a basic picture of an industry's overall performance. However, two additional metrics will help flesh out that performance evaluation further.

Average Annual Earnings: The measure of average annual earnings does not change the assessment of growth performance in an industry. However, it does provide an indicator of overall job quality in the targeted activity. The higher the average earnings, especially if they exceed the state average, the more likely the industry is to be providing high quality, high skill jobs that help raise the standard of living.

Change in Industry Concentration: Whether the LQ concentration measure is higher or lower than the industry nationally, it is helpful to know how this concentration has been changing over time. If concentration is increasing, the industry is likely to be experiencing continued comparative advantages in Hawaii's economy. If the concentration has been declining, the industry may be experiencing a decline in comparative advantage.

The Performance Map Framework: Identifying Emerging Industries

A framework to better understand the overall implications of these key performance measures would be very helpful, especially one that can clarify the notion of emerging industries and how they can be measured. A closely related framework in the economic development research tool box is the industry life cycle model. This model breaks industries in the economy into four generalized stages of life that can be represented by a quadrant map as shown in Figure 6.

Figure 6. Industry Life Cycle Model

The first stage of the life cycle map, in the lower right corner, is usually called the *emerging* stage of an industry. This characterizes newer, fast growing activities that are usually serving new markets inside or outside the local economy. The second stage, in the upper right quadrant identifies *base-growth* industries that have passed through the emerging stage and have become strong, competitive sources of economic growth in the economy. These are often (but not always) export oriented industries.

As base-growth industries mature they reach their full market potential and growth slows. This represents the *transition* stage in the upper left quadrant. These are mostly relatively healthy economic activities, but have slowed and becoming less competitive over time. Finally, in the lower left quadrant are *declining* industries that losing

jobs over time and shrinking as a proportion of the economy. If the industry is unable to reinvent itself with new products and markets, it will continue to wither away.

Of course this model is a generalization. Not all industries or their evolution will fit nicely into the model, especially over short periods of time. Some industries may emerge but never rise to the level of a driving, base-growth industry. Instead they main remain at a low concentration in the economy, moving from weakly emerging to the transitioning or declining quadrant, or move back and forth among the quadrants over a period of time. Likewise, an industry that has slowed from a base-growth to a transitioning industry may have a revival and move back to base growth status. The ups and downs of the local and national business cycles have a lot to do with such forward and backward movement of industries on the life cycle map. However, over a long period of time, perhaps one to two business cycles, the model should provide a fairly accurate picture of the performance status of industries.

Targeted Industry Portfolio Mapping

With some qualifications, the industry life cycle model can help us evaluate the status of the targeted industry portfolio on a similar performance map. The notions of an *emerging* industry as being in a competitive growth phase and a *base-growth* industry as having reached a more mature, concentrated phase, work well in profiling the performance of the target industries. However, we would not necessarily assess targets as being in the later or final stages of their industry life cycle if they fall into the *transitioning* or *declining* quadrants of the performance map. Rather, we would tend to view target industries in these quadrants as facing barriers that currently limit their contribution to a strong, diversified, economy. Careful analysis of those barriers may suggest where improvements could be made to strengthen the industry and help move it to the right side of performance map.

The targeted industries can be placed into one of four the life-cycle quadrants using selected performance metrics discussed above. The specific criteria for placing industries on the performance map are summarized in table 2 and presented in detail afterward. Three performance measures, job growth, concentration and change in competitive national industry share are the primary criteria for placement onto the map. Other performance measures including high growth, average earnings and change in concentration levels will also play a part once the industries are allocated to the quadrants of the map.

TABLE 2. PERFORMANCE MAP CRITERIA

TRANSITIONING	BASE-GROWTH
• **Positive job growth** • **Losing competitive national market share.**	• **Positive job growth** • **Highly concentrated in the economy** • **Increasing competitive national market share**
DECLINING	**EMERGING**
• **Losing jobs over period**	• **Positive job growth** • **Current low concentration in the economy** • **Increasing competitive national market share**

Emerging Industry Criteria

In addition to showing job growth, activities in the emerging quadrant must also show an **increase in competitive share** of the national industry. That is, growth in the local emerging industry must exceed growth of that same industry nationally for the period under study.

What separates the emerging from the base-growth target industries is the **concentration** level. Emerging industries are below the national concentration, while base-growth industries have achieved or surpassed the national concentration. An *emerging* industry is one that has

found a competitive niche in the economy and is gaining in competitive national market share. At some point, if the process continues, the industry's concentration will exceed the national level and the emerging industry will graduate to a base-growth industry in the state's economy

Base-Growth Criteria

As the star growth divers of the economy, base-growth industries combine **high specialization (concentration)** with an **increasing competitive national industry share** and, of course, growth in jobs. Some of Hawaii's targeted industries have achieved this level of performance. The higher is the measure of concentration (the LQ) the more likely it is that a base-growth industry is exporting a significant proportion of its output.

Transitioning Industries Criteria

In the life cycle model, a transitioning industry is a former base-growth industry that has lost its national competitive edge. In the absence of a turn around, the industry would be expected to transition to a declining industry. With respect to our targeted industries, the direction of the transition is not that clear. Due to the limited period for data and the volatility of smaller activity, an industry in the transitioning quadrant may remain there, or move in either direction in the future.

Transitioning target industries are still maintaining or growing their workforce. However, they are losing competitive national industry share. In other words the Hawaii industry is growing more slowly that the same industry nationally. In the life cycle model, transitioning industries have a relatively high concentration in the economy and are former base-growth industries. However, transitioning target industries may show a high or low concentration and may have been either a former base-growth industry or emerging industry that moved directly to the transitioning stage.

Because they are still generating job growth, some even high growth (over the state average) it is important to diagnose the barriers that are causing the decline in competitive share and if there are ways to reinvigorate the industry.

Declining Industry Criteria

The declining quadrant is reserved for industries showing the poorest performance. All of these industry groups have lost jobs to some extent over the 2002-2008 period. Industries that are losing jobs also tend to be losing competitive national industry share.

However, unlike the industry life cycle model's characterization of these being dying industries, a number of temporary circumstances may have put some of Hawaii's targeted industries into the declining quadrant. For instance, some of the declining targets may be showing losses over the period because they were impacted faster and more severely by the recent recession. Others may be very volatile from year to year due to the nature of their markets. In any case, we should certainly not be writing these industries off. Their appearance in the declining quadrant warrants more careful analysis to understand the problem.

It should be reemphasized that this performance map framework is more of a guide to analysis rather than a conclusion about the value of a target industry to the state. It provides a starting point for understanding the strengths and weaknesses of the industries in the portfolio. It identifies those industries that have shown the most promise in diversifying the economy and helps us diagnose the problems in industries that have not. Within industries that are experiencing mixed or poor performance may be pockets of very successful firms.

IV. TARGET INDUSTRY PORTFOLIO PERFORMANCE OVERVIEW

Figure 7_ shows how the individual, NAICS-measurable targeted industry groups fell on the performance map based on 2002 to 2008 performance measures. Combined, and accounting for the overlap among the groups, the NAICS-measureable targeted industry groups accounted for nearly 132,000 jobs in Hawaii's economy during 2008.

FIGURE 7

Target Industry Groups Mapped by Performance , 2002-2008

Total Jobs in Targeted Industry Groups, 2008*: 131,684
Average Annual Earnings All Groups, 2008: $49,100
Net Change in Jobs 2002-2008: 4.8%

Transitioning Groups: 24% of jobs

Groups	Chg in Jobs	Ave. Earnings
Technical consulting services	26%	$52,159
Arts education	19%	$13,190
Computer services (technology)	18%	$67,965
Computer & digital media (creative)	16%	$68,244
Architecture	10%	$64,145
Pharmacies	8%	$39,330
Specialty education	3%	$30,107
Marketing, & related	1%	$40,027
Performing & creative arts	0%	$14,393
Information/telecom tech serv.	0%	$61,301
Ave. change in jobs 2002-2008:	**6%**	
Average 2008 Earnings for Group:		**$41,200**

Base-Growth Groups: 5% of jobs

Groups	Chg in Jobs	Ave. Earnings
Aquaculture production	54%	$39,882
Research & development services	33%	$70,946
Medical labs and imaging centers	26%	$55,240
Cultural activities	15%	$43,557
Music	6%	$26,229
Ave change in jobs 2002-2008:	**42%**	
Average 2008 Earnings for Group:		**$51,400**

Declining Groups: 39% of jobs

Groups	Chg in Jobs	Ave. Earnings
Health practitioners	(2%)	$63,921
Radio and television broadcasting	(2%)	$58,442
Publishing & information	(2%)	$63,183
Higher education (Pvt)	(3%)	$33,626
Agricultural processing	(5%)	$43,727
Agricultural input materials & serv.	(7%)	$48,878
Farm production	(12%)	$26,227
Film, TV, video production/distrib.	(18%)	$33,793
Garment mfg	(36%)	$23,798
Fishing	(36%)	$21,955
Agric. packaging & warehousing	(42%)	$78,231
Ave. change in jobs 2002-2008:	**(9%)**	
Average 2008 Earnings for Group:		**$46,200**

Emerging Groups: 32% of jobs

Groups	Chg in Jobs	Ave. Earnings
Call centers	95%	$16,726
Specialty health care services	75%	$43,803
Forestry & hunting	38%	$36,784
Biotechnology (BIO)	29%	$55,288
Design services	28%	$42,135
Business consulting	27%	$52,948
Engineering/R&D serv. (creative)	26%	$79,672
Farm production & support serv.	25%	$33,569
Engineering & related serv. (tech.)	15%	$71,649
Hospitals & nursing facilities	11%	$60,295
Technology Mfg	3%	$64,493
Ave. change in jobs 2002-2008:	**21%**	
Average 2008 Earnings for Group:		**$58,200**

*After eliminating duplication from overlapping target sectors.

Overall, the targeted industry groups added about 6,300 jobs to the state's economy between 2002 and 2008. This amounted to a 4.8 percent increase in jobs, well under the vigorous, 13.3 percent growth in Hawaii's civilian economy as a whole for the period. Much of the underperformance by the portfolio can be traced to overall declines in the agri-business sector and health practitioner sectors.

Despite of its underperformance in job growth, the earnings average of the the targeted industry portfolio of $49,100 in 2008 was well above the statewide average of $43,900.

Target Industry Groups on the Performance Map

About 37% of all jobs in the portfolio fell in the emerging and base growth quadrants, which identify the best performing industries. Another 24% of jobs were classified as Transitioning while the largest group of firms, 39% fell into the declining industry quadrant.

Emerging Industry Groups

Eleven targeted activities fell into the *emerging industry* quadrant for the 2002-2008 period, and accounted for about 32% of jobs among the targeted industry groups. By definition, an emerging industry has a lower concentration in the state's economy than the same industry nationally, but is showing positive growth and gaining in its competitive share of the national market. Most of the activities were also showing an increase in concentration over the 2002 to 2008 period.

The average growth in jobs for these industries was 21%, about half as fast as growth among the base-growth target industries, but much greater than the average growth for the economy of 13%. Perhaps the most impressive characteristic of this group was its average earnings of over $58,000 in 2008. This was the highest among all the quadrants. Industries dominating the emerging industries quadrant are in the technology and creative sectors.

Base-Growth Industry Groups

Six of the targeted industry groups, accounting for 5% of jobs among all targeted activities, rose to the level of *base-growth industries* for the 2002-2008 period. All but one of these industries were *high-growth* activities for the period, in that jobs grew faster than the state average. Placement in the base-growth quadrant suggests that these target groups have achieved a level of concentration and competitiveness in the economy that is permitting them to act as economic drivers. The higher concentration suggests that they may be engaged in some amount of direct or indirect exporting. Each of these target industry groups also increased its competitive share of the same national industry, implying that they were performing better than their national counterparts.

Average annual earnings for the base-growth target industry groups were more than $51,000 in 2008, above the state average of $44,000. Overall job growth from 2002 to 2008 for the six-industry groups was 42%, more than three times the state average of 13%.

Specialty health care and Scientific Research & Development led the targets in this quadrant in terms of average earnings. Aquaculture showed the highest concentration among the base-growth target groups, although at $39,900, average earnings for this activity were below the state average.

Transitioning Industry Groups

Ten targeted industry groups registered as transitioning industries. The group accounts for about 24% of jobs in the targeted industry portfolio and many slipped into the mixed performer category because of difficulties in 2008, the first year of the current recession. While all industries in this group showed an increase in jobs over the 2002 to 2008 period, average growth was only 6% for the period, less than half the statewide average rate.

Several of the transitioning targeted industry groups like technical consulting, arts education, and computer services showed job growth above the state average. However, in spite of that growth, they have shown a decline in national competitive share, meaning that nationally, the same industry expanded even faster over the period. In some cases this was only a very slight loss of competitive share.

Declining Industry Groups

The remaining 39 percent of targeted industry portfolio jobs were in the declining industry category. These groups have all lost jobs over the 2002 period, although in some cases those losses were very modest. Overall jobs declined 9 percent among these industry groups over the 2002-2008 period.

Most of the declining industries have lost competitive national market share over the period. The few cases in which these industry groups actually increased their national competitive industry shares were interesting. Those industries gained competitive national industry share by losing jobs slower than the same industry nationally. This was the case for garment manufacturing, publishing and information and some small manufacturing industries.

The status of the declining industry groups is of concern. These activities have the third highest average annual earnings at about $46,200 in 2007. Moreover, they accounted for more than 50,000 jobs in the economy in 2008. In some cases the poor performance over the period is not overly alarming. An industry group such as, film and TV production tends to be volatile from year to year. Thus, while the 2002-2008 period shows an 18% decline for film and TV production jobs, using a slightly different period, such as 2003-2007, would actually show an increase in jobs.

For the high-paying industries of health practitioners and higher education, which together account for half the jobs among the declining target industries, the reasons for the decline are not clear. More study will be needed to understand why these two large and high-paying activities were in decline. The comparable national industries for health practitioners and higher education grew by 13% and 16% respectively for the same period.

The 2002-2008 period of time includes most of the growth phase of the current business cycle and the first year of the contraction phase. Thus, the results above reflect how the targets performed in mostly favorable economic conditions and the first year of the current recession. Ideally, it would be best to have data from at least one complete business cycle so that performance over both the growth and contraction phase can be measured. That would provide more of a long-term trend for industry-group performance. Consequently, we must use the current results of the performance mapping cautiously.

Also, within industry groups some individual industries may be performing better or worse than the industry group's overall performance. The range of performance within the industry groups will be pointed out in the following section that focuses on performance by the major sectors and targets.

It is important to note that the independence of these targeted groups is not yet clear. The performance of some groups may reflect strong markets driving other industries for which the target is simply a supplier. For instance the high performance of cultural activities in the performance map may reflect the overall growth of tourism demand over the period, rather than a specific local or export market for cultural products. Likewise, some targets may perform poorly because they are tied to another industry that has experienced difficulties.

Performance of Targeted Industries Not definable in NAICS

As discussed earlier, a number of targeted activities that are primarily markets for the producing industries cannot be easily or meaningfully defined in the NAICS industry system. In these cases other sources of measurement and performance have been utilized. Ocean Science and Technology has been measured through a DBEDT survey of firms and agencies engaged in the many activities of that sector. Some information on astronomy is compiled by the UH Institute for Astronomy. Efforts are also underway to define and measure aspects of emerging energy ranging from the production of wind and solar energy to efficiency efforts.

In Section VI the available information for the market sectors will be presented to the extent available. However, as indicated earlier, most if not all of the employment engaged in these market activities is already captured in one or more of the producing industries that we are able to define and measure. The goal will be to eventually parse the producing industry employment into the important

market sectors they support.

Non-Targeted Activities to Monitor

While the previously identified targeted industries have been fairly well accounted for in the analysis so far, a question arises as to whether any other small, high-growth activities apart from these targets may have been overlooked. Of primary interest would be other activities outside of the well established tourism and construction sectors and not already accounted for in the targeted industry portfolio. Also of interest would be activities that are somewhat related to tourism and construction, but which are supplying goods and services that would have otherwise been imported.

In order to identify any such high performing, small activities the study reviewed the performance of all industry groups at the 4-digit NAICS level that had over 100 paid and self employed jobs in the economy over the 2002 to 2008 period. Those activities registering as base-growth or emerging industries in terms of growth, change in national competitive share and concentration were further refined to remove those that were directly related to tourism or construction, or that were substantially accounted for in the targeted industry portfolio.

After the screening, very few of the remaining industry groups registered as either a base-growth or emerging activity for the period. The most significant activity (about 730 jobs) was ship building/repair, which increased its job count by about 30% over the period. This activity was likely linked to the increase in cruise and ferry activity during the period. Other areas of small industry group growth included electronic shopping/mail order activity, soaps & fragrances and a range of small structural building components and cabinet manufacturing industries. The export activity among these industries was probably very limited if any and their import replacement potential appears to be tied mainly to growth in tourism and construction activity. The performance of the activities will be tracked over time to better monitor their impact on the economy. More detail on these other industries is provided near the end of Section VI.

V. TARGETED INDUSTRY PERFORMANCE BY COUNTY

Examining the performance of the targeted industry portfolio at the county level adds an additional layer of performance comparisons. At the county level, industry performance can be measured against not only national but also against state industry performance. These two levels of benchmark comparison provide additional insight into the depth of specialization and degree of industrial competitiveness among target industries in the counties. Both state and national markets can present opportunities for county economic development and growth.

The national performance benchmarks measure how the states targeted sectors in the different counties stacked up against the larger, national reference economy. These performance measures help identify in which counties the state's targeted industries are able to compete directly and effectively in national markets. Assessing the targeted industries in the counties against their statewide counterparts helps identify county industries that are competitive in serving statewide markets as the Hawaii economy grows.

The following pages summarize the county performance of the statewide targeted industries with 100 or more jobs[7] (paid employment and self-employed/sole proprietors) in the county.

City & County of Honolulu

Industry Performance relative to the Nation

As shown in Table 3, 36 of the 46 industry groups in the statewide targeted industry portfolio had 100 or more jobs in Honolulu County. Fourteen of the statewide targeted industries (organized by growth rate) performed exceptionally well in Honolulu, registering as either base-growth or emerging activity in the 2002 to 2008 period. Industries in the best performing group not only grew jobs during the period but also increased their competitive share of the activity by exceeding national growth for the industry.

The top 12 industries among the 14 best performers exceeded the overall national growth rate in jobs of 8.5% for the period. Call centers had the highest job growth in the County although the annual earnings average, at $17,000, was far below the national 2008 average earnings of around $50,000. Also, as discussed in Section VI, call center growth has been marginal after an initial surge in 2003.

Besides call centers, the top performing emerging industries included specialty health care services, medical devices, research and development services, and farm production support. Again, emerging industries are defined as those showing increased job growth and gaining in national competitive share, but have yet to reach a level of concentration in the County comparable to the national level.

[7] The performance of industry groups below this number of jobs tends to be volatile and affected by statistical factors, such as a single firm changing its NAICS reporting category.

TABLE 3

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO NATION, HONOLULU							
Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	Nation Job Growth	Nation Ave. Earnings
Best Performing Targets							
Call Centers	Call Centers	Emerging	387	115%	$17,002	14%	$31,634
Specialty Health Care Services	Health & Wellness	Emerging	5,419	94%	$43,870	39%	$36,648
Medical Device Manufacturing	Technology	Emerging	434	68%	$39,435	4%	$96,628
Research & Development Services	Technology	Emerging	2,101	34%	$75,505	16%	$106,626
Farm Production Support Services	Agriculture	Emerging	780	31%	$32,341	12%	$44,244
Medical and Diagnostic Testing	Technology/H&W	Base-Growth	1,335	31%	$57,745	23%	$62,530
Business Consulting	Creative	Emerging	3,436	31%	$58,142	24%	$75,186
Engineering and R&D	Creative	Emerging	5,117	23%	$80,946	17%	$93,373
Design Services	Creative	Emerging	994	22%	$40,256	17%	$48,143
Cultural Activities	Creative	Base-Growth	1,795	17%	$47,160	13%	$40,194
Hospitals & Nursing Facilities	Health & Wellness	Emerging	16,374	12%	$61,851	9%	$51,252
Packaging & Warehousing	Agriculture	Emerging	342	6%	$88,057	-1%	$50,839
Agricultural Processing	Agriculture	Emerging	4,623	3%	$40,844	-3%	$56,635
Other Targeted Industry Performance							
Technical Consulting Services	Technology	Transitioning	2,955	31%	$57,587	36%	$74,280
Computer Services	Technology	Transitioning	5,931	16%	$69,817	20%	$88,821
Computer and Digital Media Products	Creative	Transitioning	5,989	14%	$70,065	19%	$94,662
Engineering and Related Serivces	Technology	Transitioning	4,053	13%	$74,921	16%	$78,549
Pharmacies	Health & Wellness	Transitioning	2,873	8%	$39,611	9%	$39,205
Architecture	Creative	Transitioning	1,809	7%	$68,627	14%	$66,960
Arts Education	Creative	Transitioning	214	6%	$12,894	31%	$14,898
Information and Telecom Tech Serv.	Technology	Transitioning	1,665	1%	$59,654	2%	$96,902
Technology Equipment Distribution	Technology	Transitioning	833	0%	$78,679	0%	$103,788
Higher Education	Education	Declining	5,024	-4%	$33,820	17%	$42,148
Publishing & Information	Creative	Declining	2,202	-4%	$66,606	-2%	$68,948
Performing and Creative Arts	Creative	Declining	4,620	-4%	$14,157	13%	$18,680
Health Practitioners	Health & Wellness	Declining	14,161	-4%	$65,323	15%	$67,262
Marketing & Related	Creative	Declining	3,685	-5%	$43,991	12%	$63,537
Radio and television Broadcasting	Creative	Declining	1,099	-7%	$63,574	0%	$76,455
Specialty Education	Education	Declining	1,858	-7%	$29,292	36%	$30,147
Film, TV, Video Production	Creative	Declining	1,161	-10%	$33,135	2%	$81,256
Agricultural Input Materials & Services	Agriculture	Declining	165	-27%	$61,787	-1%	$60,594
Farm Production	Agriculture	Declining	2,334	-35%	$27,355	-5%	$19,808
Music	Creative	Declining	518	-37%	$26,281	-2%	$37,505
Garment Manufacturing	Apparel	Declining	1,047	-38%	$23,625	-36%	$42,088
Fishing	Agriculture	Declining	689	-39%	$29,961	-20%	$22,970

NOTE: Excludes industries with fewer than 100 jobs in 2008

Among the best performing industries in Honolulu for 2008, packaging and warehousing had the highest average earnings of about $88,100. Most industries in the best performing category had average earnings above the roughly $47,000 state average.

Medical labs and imaging centers, medical & diagnostic testing, and cultural activities performed as base-growth industries over the period. This means that these industries not only gained competitive national market share, but also enjoyed more concentrated activity in the Honolulu County than nationally. These industries may also be exporting at least a portion of their outputs to markets that cater to visitors or the military.

The bottom section of Table 3 lists industries that showed either mixed or poor performance results for the 2002 to 2008 period. These include transitioning and declining industries. Transitioning industries maintained or grew jobs over the period but lost competitive national industry share because the same industry at the national level grew jobs faster. Declining industries all lost jobs and in most cases competitive market share, mainly because the same national industries either grew jobs (or lost fewer jobs) than the same industries on Oahu.

While they were not among the best performing industries, several of the transitioning industries grew jobs at an impressive rate in Honolulu over the 2002 to2008 period, including technical consulting services (31%) and computer services (16%). A number of other industries provided positive growth in jobs, even though not as vigorous as did the state economy as a whole (13%).

Among the weakest performing industries; fishing, garments, music, and farm production showed the sharpest declines. Film and TV production also showed job declines. As discussed in the section on the Creative Sector, film & TV production can be a volatile industry from year to year. Also, many jobs in the industry may be located in other NAICS industries such as artists, performers, and food services among others.

Statewide Performance

When the targeted industry portfolio in Honolulu is assessed relative to same industries statewide, performance is much higher (Table 4). Twelve of the fourteen best performing industries on a statewide basis ranked as base-growth industries. All but four of the best performers registered job growth exceeding the statewide average job growth of 13% for the period of 2002-08.

Call centers moved up from emerging status in a national context to a base-growth industry at the state level, due to the industry's strong statewide competitive share in Honolulu. Similarly, specialty health care services and medical devices, the second and third best performers respectively in terms of job growth, when stacked up against its statewide counterparts, moved up to a base-growth industry at the state level. Research & development services and farm production support maintained their emerging industry status when compared to statewide performance benchmark.

TABLE 4.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO STATE, HONOLULU							
Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	State Job Growth	State Ave. Earnings
Best Performing Targets							
Call Centers	Call Centers	Base-Growth	387	115%	$17,002	95%	$16,726
Specialty Health Care Services	Health & Wellness	Base-Growth	5,419	94%	$43,870	75%	$43,803
Medical Device Manufacturing	Technology	Base-Growth	434	68%	$39,435	64%	$58,761
Research & Development Services	Technology	Emerging	2,101	34%	$75,505	33%	$70,946
Farm Production Support Services	Agriculture	Emerging	780	31%	$32,341	25%	$33,569
Technical Consulting Services	Technology	Base-Growth	2,955	31%	$57,587	26%	$52,146
Medical and Diagnostic Testing	Technology/H&W	Base-Growth	1,335	31%	$57,745	26%	$55,240
Business Consulting	Creative	Base-Growth	3,436	31%	$58,142	27%	$52,948
Cultural Activities	Creative	Base-Growth	1,795	17%	$47,160	15%	$43,557
Hospitals & Nursing Facilities	Health & Wellness	Base-Growth	16,374	12%	$61,851	11%	$60,295
Packaging & Warehousing	Agriculture	Base-Growth	342	6%	$88,057	8%	$78,231
Agricultural Processing	Agriculture	Base-Growth	4,623	3%	$40,844	-6%	$43,727
Information and Telecom Tech Serv.	Technology	Base-Growth	1,665	1%	$59,654	0%	$61,301
Other Targeted Industry Performance							
Engineering and R & D	Creative	Transitioning	5,117	23%	$80,946	28%	$79,672
Design Services	Creative	Transitioning	994	22%	$40,256	28%	$42,135
Computer Services	Technology	Transitioning	5,931	16%	$69,817	18%	$67,965
Computer and Digital Media Products	Creative	Transitioning	5,989	14%	$70,065	16%	$68,244
Engineering and Related Serivces	Technology	Transitioning	4,053	13%	$74,921	15%	$71,649
Pharmacies	Health & Wellness	Transitioning	2,873	8%	$39,611	10%	$39,330
Architecture	Creative	Transitioning	1,809	7%	$68,627	10%	$64,145
Arts Education	Creative	Transitioning	214	6%	$12,894	19%	$13,190
Technology Equipment Distribution	Technology	Declining	833	-0.2%	$78,679	2%	$77,263
Higher Education	Education	Declining	5,024	-4%	$33,820	-3%	$33,626
Publishing & Information	Creative	Declining	2,202	-4%	$66,606	-2%	$63,183
Performing and Creative Arts	Creative	Declining	4,620	-4%	$14,157	1%	$14,393
Health Practitioners	Health & Wellness	Declining	14,161	-4%	$65,323	-2%	$63,921
Marketing & Related	Creative	Declining	3,685	-5%	$43,991	1%	$40,027
Radio and television Broadcasting	Creative	Declining	1,099	-7%	$63,574	-2%	$58,442
Specialty Education	Education	Declining	1,858	-7%	$29,292	3%	$30,107
Film, TV, Video Production	Creative	Declining	1,161	-10%	$33,135	-18%	$33,793
Agricultural Input Materials/Serv.	Agriculture	Declining	165	-27%	$61,787	-4%	$48,878
Farm Production	Agriculture	Declining	2,334	-35%	$27,355	-12%	$26,227
Music	Creative	Declining	518	-37%	$26,281	5%	$26,229
Garment Manufacturing	Apparel	Declining	1,047	-38%	$23,625	-35%	$23,798
Fishing	Agriculture	Declining	689	-39%	$29,961	-36%	$21,955

NOTE: Excludes industries with fewer than 100 jobs in 2008

Majority of the industries that have lost jobs and competitiveness during the period of 2002-08 relative to the nation indicated the same weak performance at the state level.

Maui County

Industry Performance Relative to the Nation

Twenty five of the industry groups in the statewide targeted portfolio had more than 100 jobs in Maui County. Table 5 shows how those groups performed in Maui County over the 2002 to 2008 period when compared with the same industries nationally.

TABLE 5.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO NATION, MAUI COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	Nation Job Growth	Nation Ave. Earnings
Best Performing Targets							
Music	Creative	Base-Growth	430	400%	$29,555	-2%	$37,505
Design Services	Creative	Base-Growth	251	52%	$28,697	17%	$48,143
Radio and television Broadcasting	Creative	Emerging	133	45%	$22,107	0%	$76,455
Research & Development Services	Technology	Base-Growth	769	42%	$55,204	16%	$106,626
Specialty Health Care Services	Health & Wellness	Emerging	487	38%	$11,791	39%	$36,648
Farm Production Support Services	Agriculture	Emerging	169	36%	$32,234	12%	$44,244
Engineering and R & D	Creative	Emerging	463	36%	$73,176	17%	$93,373
Computer and Digital Media Products	Creative	Emerging	269	27%	$51,591	19%	$94,662
Pharmacies	Health & Wellness	Emerging	545	26%	$36,825	9%	$39,205
Computer Services	Technology	Emerging	258	25%	$53,790	20%	$88,821
Engineering and Related Services	Technology	Emerging	358	17%	$55,373	16%	$78,549
Information and Telecom Tech Serv.	Technology	Emerging	309	9%	$77,816	2%	$96,902
Publishing & Information	Creative	Emerging	323	3%	$42,816	-2%	$68,948
Other Targeted Industry Performance							
Specialty Education	Education	Transitioning	246	32%	$18,395	36%	$30,147
Marketing & Related	Creative	Transitioning	629	11%	$27,842	14%	$63,537
Performing and Creative Arts	Creative	Transitioning	2,226	6%	$16,202	13%	$18,680
Architecture	Creative	Transitioning	216	4%	$47,488	14%	$66,960
Health Practitioners	Health & Wellness	Transitioning	2,483	1%	$59,116	15%	$67,262
Cultural Activities	Creative	Declining	172	-2%	$25,413	13%	$40,194
Farm Production	Agriculture	Declining	2,849	-5%	$36,898	-5%	$19,808
Hospitals & Nursing Facilities	Health & Wellness	Declining	637	-8%	$40,441	9%	$51,252
Business Consulting	Creative	Declining	279	-17%	$27,005	24%	$75,186
Technical Consulting Services	Technology	Declining	264	-21%	$28,539	36%	$74,740
Fishing	Agriculture	Declining	211	-30%	$13,165	-20%	$22,970
Agricultural Processing	Agriculture	Declining	715	-35%	$61,738	-3%	$56,635

NOTE: Excludes industries with fewer than 100 jobs in 2008

Thirteen of the industry groups performed as base-growth or emerging industries. All but two of these groups grew faster than the state's economy as a whole. The music industry group in Maui outperformed all other targeted industries in terms of robust job growth and a strong increase competitive share. However, average earnings in music were relatively modest at around $29,600 per year. This probably reflects the part-time nature of this industry.

Also among the best performing industry groups, information and telecommunications technology services had the highest average earnings of more than $78,000 per year. Outside of the high performing groups, specialty education showed the best growth at 32% for the period. It is not in the highest performing groups only because it lost some competitive share to the U.S. industry which grew even faster. Other industries which experienced job growth but lost competitive share to the national industries were marketing, performing & creative arts, architecture and health practitioners. Four of the targeted industry groups lost jobs in Maui County. Besides farm production, jobs losses were also posted in hospitals, business consulting and technical consulting services.

Industry Performance relative to the State

As shown in Table 6, nearly all of the targeted industries in Maui that performed well in a national context also performed well in a statewide context.

TABLE 6

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO STATE, MAUI COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	State Job Growth	State Ave. Earnings
Best Performing Targets							
Music	Creative	Base-Growth	430	400%	$29,555	5%	$26,229
Design Services	Creative	Base-Growth	251	52%	$28,697	28%	$42,135
Radio and television Broadcasting	Creative	Emerging	133	45%	$22,107	-2%	$58,442
Research & Development Services	Technology	Base-Growth	769	42%	$55,204	33%	$70,946
Engineering and R & D	Creative	Emerging	463	36%	$73,176	28%	$79,672
Farm Production Support Services	Agriculture	Base-Growth	169	36%	$32,234	-12%	$33,569
Specialty Education	Education	Emerging	246	32%	$18,395	3%	$30,107
Computer and Digital Media Products	Creative	Emerging	269	27%	$51,591	16%	$68,244
Computer Services	Technology	Emerging	258	25%	$53,790	18%	$67,965
Engineering and Related Serivces	Technology	Emerging	358	17%	$55,373	15%	$71,649
Marketing & Related	Creative	Base-Growth	629	11%	$27,842	1%	$40,027
Information and Telecom Tech Serv.	Technology	Base-Growth	309	9%	$77,816	0%	$61,301
Performing and Creative Arts	Creative	Base-Growth	2,226	6%	$16,202	1%	$14,393
Publishing & Information	Creative	Emerging	323	3%	$42,816	-2%	$63,183
Other Targeted Industry Performance							
Specialty Health Care Services	Health & Wellness	Transitioning	487	38%	$11,791	75%	$43,803
Pharmacies	Health & Wellness	Transitioning	545	26%	$36,825	10%	$39,330
Architecture	Creative	Transitioning	216	4%	$47,488	10%	$64,145
Health Practitioners	Health & Wellness	Transitioning	2,483	1%	$59,116	-2%	$63,921
Cultural Activities	Creative	Declining	172	-2%	$25,413	15%	$43,557
Farm Production	Agriculture	Declining	2,849	-5%	$36,898	-12%	$26,227
Hospitals & Nursing Facilities	Health & Wellness	Declining	637	-8%	$40,441	11%	$60,295
Business Consulting	Creative	Declining	279	-17%	$27,005	27%	$52,948
Technical Consulting Services	Technology	Declining	264	-21%	$28,539	26%	$52,146
Fishing	Agriculture	Declining	211	-30%	$13,165	-36%	$21,955
Agricultural Processing	Agriculture	Declining	715	-35%	$61,738	-6%	$43,727

NOTE: Excludes industries with fewer than 100 jobs in 2008

Fourteen industry groups gained state competitive share over the 2002 to 2008 period, with half of them showing higher concentration than the same industries statewide (base-growth). Maui registered half of its 14 best performing industries as base-growth in relation to the state performance benchmark. The same top four performers in the national context maintained their performance class and ranking in terms of jobs gained at the state level during the period of 2002-08.

Relative to the state, the industry groups of advertising, marketing; information & telecommunications, farm production support services, and the performing & creative arts moved up to become new base-growth members from the classification of emerging and transitioning industries under the national performance context. Likewise, industry groups that were outside of the best performing groups in the national context were generally outside with respect to statewide performance.

KAUAI COUNTY

Industry Performance relative to the Nation

Nineteen statewide targeted industry groups had employment of 100 or better on Kauai in 2008 (Table 7). Ten of those groups were high performing; that is, they grew jobs over the 2002 to 2008 period and increase their competitive share relative to the same industry groups nationally.

Encouragingly, half of the best performing industries on Kauai were in technology or in the overlap of technology and the creative sector. These include research and development, computer services and engineering services. All but one of the best performing industry groups exceeded statewide job growth for the period. Average earnings tended to be well below the national average however.

TABLE 7.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO NATION, KAUAI COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	Nation Job Growth	Nation Ave. Earnings
Best Performing Targets							
Engineering and R & D	Creative	Emerging	340	258%	$68,787	17%	$93,373
Specialty Education	Education	Emerging	103	243%	$0	36%	$30,147
Computer Services	Technology	Emerging	154	79%	$32,331	20%	$88,821
Computer and Digital Media Products	Creative	Emerging	159	75%	$31,315	19%	$94,662
Research & Development Services	Technology	Emerging	363	52%	$62,482	16%	$106,626
Engineering and Related Services	Technology	Emerging	155	48%	$51,803	16%	$78,549
Marketing & Related	Creative	Emerging	202	46%	$20,874	12%	$63,537
Specialty Health Care Services	Health & Wellness	Emerging	279	40%	$30,611	39%	$36,648
Business Consulting	Creative	Emerging	155	27%	$22,126	24%	$75,186
Hospitals & Nursing Facilities	Health & Wellness	Emerging	726	10%	$54,520	9%	$51,252
Other Targeted Industry Performance							
Technical Consulting Services	Technology	Transitioning	140	25%	$24,497	36%	$74,740
Performing and Creative Arts	Creative	Transitioning	633	8%	$9,545	13%	$18,680
Cultural Activities	Creative	Transitioning	174	5%	$33,858	13%	$40,194
Farm Production	Agriculture	Declining	1,287	-1%	$32,015	-5%	$19,808
Pharmacies	Health & Wellness	Declining	203	-11%	$37,980	9%	$39,205
Health Practitioners	Health & Wellness	Declining	744	-13%	$73,426	15%	$67,262
Agricultural Processing	Agriculture	Declining	214	-16%	$19,110	-3%	$56,635
Publishing & Information	Creative	Declining	107	-24%	$49,539	-2%	$68,948
Fishing	Agriculture	Declining	143	-33%	$10,299	-20%	$23,970

NOTE: Excludes industries with fewer than 100 jobs in 2008

Among the other industries, technical consulting did well in terms of job growth (25% over the period), but lost some competitive industry share because of higher growth nationally. Performing and creative arts as well as cultural activities grew slightly while five of the statewide targets showed net job declines over the period.

Industry Performance relative to the State

As shown in Table 8, most of the nationally competitive and growing target industries on Kauai also performed well on a statewide basis. Performing and creative arts registered as the only base growth industry (more concentrated than the same industry statewide).

TABLE 8.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO STATE, KAUAI COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	State Job Growth	State Ave. Earnings
Best Performing Targets							
Engineering and R & D	Creative	Emerging	340	258%	$68,787	28%	$ 79,672
Specialty Education	Education	Emerging	103	243%	$0	3%	$ 30,107
Computer Services	Technology	Emerging	154	79%	$32,331	18%	$ 67,965
Computer and Digital Media Products	Creative	Emerging	159	75%	$31,315	16%	$ 68,244
Research & Development Services	Technology	Emerging	363	52%	$62,482	33%	$ 70,946
Engineering and Related Services	Technology	Emerging	155	48%	$51,803	15%	$ 71,649
Marketing & Related	Creative	Emerging	202	46%	$20,874	1%	$ 40,027
Hospitals & Nursing Facilities	Health & Wellness	Emerging	726	10%	$54,520	11%	$ 60,295
Performing and Creative Arts	Creative	Base-Growth	633	8%	$9,545	1%	$ 14,393
Other Targeted Industry Performance							
Specialty Health Care Services	Health & Wellness	Transitioning	279	40%	$30,611	75%	$ 43,803
Business Consulting	Creative	Transitioning	155	27%	$22,126	27%	$ 52,948
Technical Consulting Services	Technology	Transitioning	140	25%	$24,497	26%	$ 52,146
Cultural Activities	Creative	Transitioning	174	5%	$33,858	15%	$ 43,557
Farm Production	Agriculture	Declining	1,287	-1%	$32,015	-12%	$ 26,227
Pharmacies	Health & Wellness	Declining	203	-11%	$37,980	10%	$ 39,330
Health Practitioners	Health & Wellness	Declining	744	-13%	$73,426	-2%	$ 63,921
Agricultural Processing	Agriculture	Declining	214	-16%	$19,110	-6%	$ 43,727
Publishing & Information	Creative	Declining	107	-24%	$49,539	-2%	$ 63,183
Fishing	Agriculture	Declining	143	-33%	$10,299	-36%	$ 21,955

NOTE: Excludes industries with fewer than 100 jobs in 2008

Hawaii County

Industry Performance relative to the Nation

Twenty eight of the statewide targeted industry groups employed 100 or more people in Hawaii County in 2008. Seventeen of those industry groups were high performing, registering as either base-growth or emerging industries for the 2002 to 2008 period (Table 9). The highest job growth was turned in by aquaculture, although at 125 jobs, it just barely made the cut as an industry for consideration. The average earnings in aquaculture were also somewhat low, at about $29,000 in 2008. Music also ranked high for growth, although it too is very small with average earnings even lower than aquaculture. Among the higher paying industry groups that performed best were engineering and R&D activity, hospitals, and architecture.

TABLE 9.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO NATION, HAWAII COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	Nation Job Growth	Nation Ave. Earnings
Best Performing Targets							
Aquaculture Production	Agriculture	Base-Growth	125	116%	$26,827	1%	$28,957
Music	Creative	Base-Growth	136	62%	$15,904	-2%	$37,505
Technical Consulting Services	Technology	Emerging	409	43%	$33,742	36%	$74,740
Business Consulting	Creative	Emerging	414	41%	$33,335	24%	$75,186
Marketing & Related	Creative	Emerging	411	40%	$17,696	12%	$63,537
Specialty Education	Education	Emerging	287	39%	$19,577	36%	$30,147
Architecture	Creative	Emerging	163	36%	$50,984	14%	$66,960
Design Services	Creative	Emerging	132	32%	$40,644	17%	$48,143
Engineering and Related Services	Technology	Emerging	283	29%	$53,055	16%	$78,549
Publishing & Information	Creative	Emerging	271	27%	$34,245	-2%	$68,948
Cultural Activities	Creative	Base-Growth	171	27%	$29,675	13%	$40,194
Computer Services	Technology	Emerging	245	24%	$39,690	20%	$88,821
Computer and Digital Media Products	Creative	Emerging	250	23%	$38,896	19%	$94,662
Pharmacies	Health & Wellness	Emerging	396	21%	$42,098	9%	$39,205
Engineering and R & D	Creative	Emerging	567	18%	$77,094	17%	$93,373
Agricultural Input Materials & Services	Agriculture	Base-Growth	131	16%	$43,364	-1%	$60,594
Hospitals & Nursing Facilities	Health & Wellness	Emerging	1,137	16%	$54,825	9%	$51,252
Other Targeted Industry Performance							
Specialty Health Care Services	Health & Wellness	Transitioning	620	17%	$20,929	39%	$36,648
Health Practitioners	Health & Wellness	Transitioning	2,519	15%	$54,514	15%	$67,262
Farm Production Support Services	Agriculture	Transitioning	232	10%	$35,564	12%	$44,244
Performing and Creative Arts	Creative	Transitioning	1,106	6%	$13,567	13%	$18,680
Research & Development Services	Technology	Transitioning	371	0%	$86,030	16%	$106,626
Farm Production	Agriculture	Declining	5,767	-4%	$10,524	-5%	$19,808
Information and Telecom Tech Serv.	Technology	Declining	167	-9%	$36,942	2%	$96,902
Agricultural Processing	Agriculture	Declining	882	-10%	$26,534	-3%	$56,635
Medical and Diagnostic Testing	Technology/H&W	Declining	208	-21%	$40,953	23%	$62,530
Fishing	Agriculture	Declining	449	-35%	$15,683	-20%	$22,970

NOTE: Excludes industries with fewer than 100 jobs in 2008

The best performing industry groups were gaining in competitive national share of the same industry group and ranked as base-growth or emerging industries. However, a number of transitioning industries did contribute to growth even though they were slipping in terms of national competitive share. Specialty health care grew jobs faster than the statewide average. Farm production support services and performing/creative arts also showed job growth over the period. Target industry groups with the poorest performance in a national context were fishing, medical labs, medical/diagnostic testing, information/telecommunications technology services and agricultural production and processing. All of these industry groups lost jobs over the period.

Industry Performance relative to the State

In relation to the state, most statewide targeted industries in Hawaii County that were best performing on a national basis also did well on a statewide basis (Table 10). Only Engineering and R&D services, which were competitive in the nation context, lost competitive industry share at the state level. On the other hand hospitals, health practitioners and performing & creative arts moved into the best performing industries in Hawaii County on a statewide basis.

TABLE 10.

TARGETED INDUSTRY PERFORMANCE WITH RESPECT TO STATE, HAWAII COUNTY

Industry Group Description	Sector	Performance Class	2008 Jobs	Job Growth 2002-08	County Ave. Earnings	State Job Growth	State Ave. Earnings
Best Performing Targets							
Aquaculture Production	Agriculture	Base-Growth	125	116%	$26,827	53%	$39,882
Music	Creative	Base-Growth	136	62%	$15,904	5%	$26,229
Technical Consulting Services	Technology	Emerging	409	43%	$33,742	26%	$52,146
Business Consulting	Creative	Emerging	414	41%	$33,335	27%	$52,948
Marketing & Related	Creative	Emerging	411	40%	$17,696	1%	$40,027
Specialty Education	Education	Emerging	287	39%	$19,577	3%	$30,107
Architecture	Creative	Emerging	163	36%	$50,984	10%	$64,145
Design Services	Creative	Emerging	132	32%	$40,644	28%	$42,135
Engineering and Related Services	Technology	Emerging	283	29%	$53,055	15%	$71,649
Publishing & Information	Creative	Emerging	271	27%	$34,245	-2%	$63,183
Cultural Activities	Creative	Emerging	171	27%	$29,675	15%	$43,557
Computer Services	Creative	Emerging	245	24%	$39,690	18%	$67,965
Computer and Digital Media Products	Creative	Emerging	250	23%	$38,896	16%	$68,244
Pharmacies	Health & Wellness	Emerging	396	21%	$42,098	10%	$39,330
Agricultural Input Materials & Services	Agriculture	Base-Growth	131	16%	$43,364	-4%	$48,878
Hospitals & Nursing Facilities	Health & Wellness	Emerging	1,137	16%	$54,825	11%	$60,295
Health Practitioners	Health & Wellness	Base-Growth	2,519	15%	$54,514	-2%	$63,921
Performing and Creative Arts	Creative	Base-Growth	1,106	6%	$13,567	1%	$14,393
Other Targeted Industry Performance							
Engineering and R & D	Creative	Transitioning	567	18%	$77,094	28%	$79,672
Specialty Health Care Services	Health & Wellness	Transitioning	620	17%	$20,929	75%	$43,803
Farm Production Support Services	Agriculture	Transitioning	232	10%	$35,564	25%	$33,569
Research & Development Services	Technology	Transitioning	371	0%	$86,030	33%	$70,946
Farm Production	Agriculture	Declining	5,767	-4%	$10,524	-12%	$26,227
Information and Telecom Tech Serv.	Technology	Declining	167	-9%	$36,942	0%	$61,301
Agricultural Processing	Agriculture	Declining	882	-10%	$26,534	-6%	$43,727
Medical and Diagnostic Testing	Technology/H&W	Declining	208	-21%	$40,953	26%	$55,240
Fishing	Agriculture	Declining	449	-35%	$15,683	-36%	$21,955

NOTE: Excludes industries with fewer than 100 jobs in 2008

VI. TARGET INDUSTRY GROUP PERFORMANCE BY MAJOR SECTOR

This section takes a closer look at the performance of the industry groups in the targeted industry portfolio. Science and Technology and Agribusiness have been sectors of interest for many years in Hawaii. More recently, work to better understand Hawaii's creative sector has found a set of interrelated industries that help drive innovation and cultural development as well as develop products for export markets. Very detailed data and performance metrics for all of the NAICS measurable industries is contained in the appendix to this report.

Science and Technology

Three fourths of the targeted activities indentified in this study were in Hawaii's private technology sector in 2008. During the first half of 2008 DBEDT research staff joined with the Hawaii Science and Technology Council (HiSciTech) and the consultant firm, Council for Community Economic Research (C2ER), to better define and profile Hawaii's technology sector. That collaboration resulted in the publication, *Innovation and Technology in Hawaii: An Economic and Workforce Profile*, published in October 2008. The report identified technology by both NAICS-defined, production side activities and selected commercial market sectors important to Hawaii's technology sector.

In the study, Hawaii's technology sector was redefined based mainly on a widely used national definition put forth by the U.S. Bureau of Labor Statistics (BLS). The BLS approach classifies industries as being in the technology sector based on the proportion of highly trained technical workers in the industries, such as scientists and engineers. The HiSciTech report identified a broad based private technology sector, which generated an estimated $3 billion of Hawaii's $61 billion GDP in 2007 (about 5%). The report measured and briefly discussed supply side, producing industries in technology.

The final HiSciTech report focused primarily on the major commercial market sectors in which these industries were involved. As a result, the producing industries in technology could not be fully explored.[8] In order to better understand the performance of the technology industry groups in a national as well as state context, we need to refocus on the producing side of the technology sector.

Figure 8 presents a visual perspective of performance among the eight major industry groups on the producing side of the Technology sector between 2002 and 2008. The chart shows the relative size of the industry groups, their growth in jobs and change in competitive national industry share over the period. The competitive industry share percent (horizontal from left to right) is the average amount of the industry group's percent change in jobs over the period that was due to the change in competitive share.

The highest performing industry groups are in the upper right of the chart, with the lower performing groups nearer to the lower left. Research and development services led the technology sector in terms of growth and competitive share. Biotechnology also performed exceptionally for the period. This measure of biotechnology, developed by the national industry association BIO, draws on elements of other industry groups in this chart, especially R&D. So the performance of biotech and R&D include many of the same activities.

Nearly all of the technology industry groups increased in terms of workforce over the period, some quite substantially. Some (in the upper left portion of the chart) slipped slightly in terms of national competitive market share. However, their job growth was, for the most part, substantial.

[8] Detailed industry data were presented in an appendix to the HiSciTech report and published on-line.

Information & Telecommunications technology activity was the weakest group in the technology sector, although it did manage to maintain jobs over the period.

Unfortunately, technology *market* sectors such as ocean science, digital media and defense technology, cannot be placed on this chart due to the absence of necessary data. However, as indicated earlier, most of the workforce and earnings in those market sectors are contained in the more measurable, producing side industry groups.

FIGURE 8.

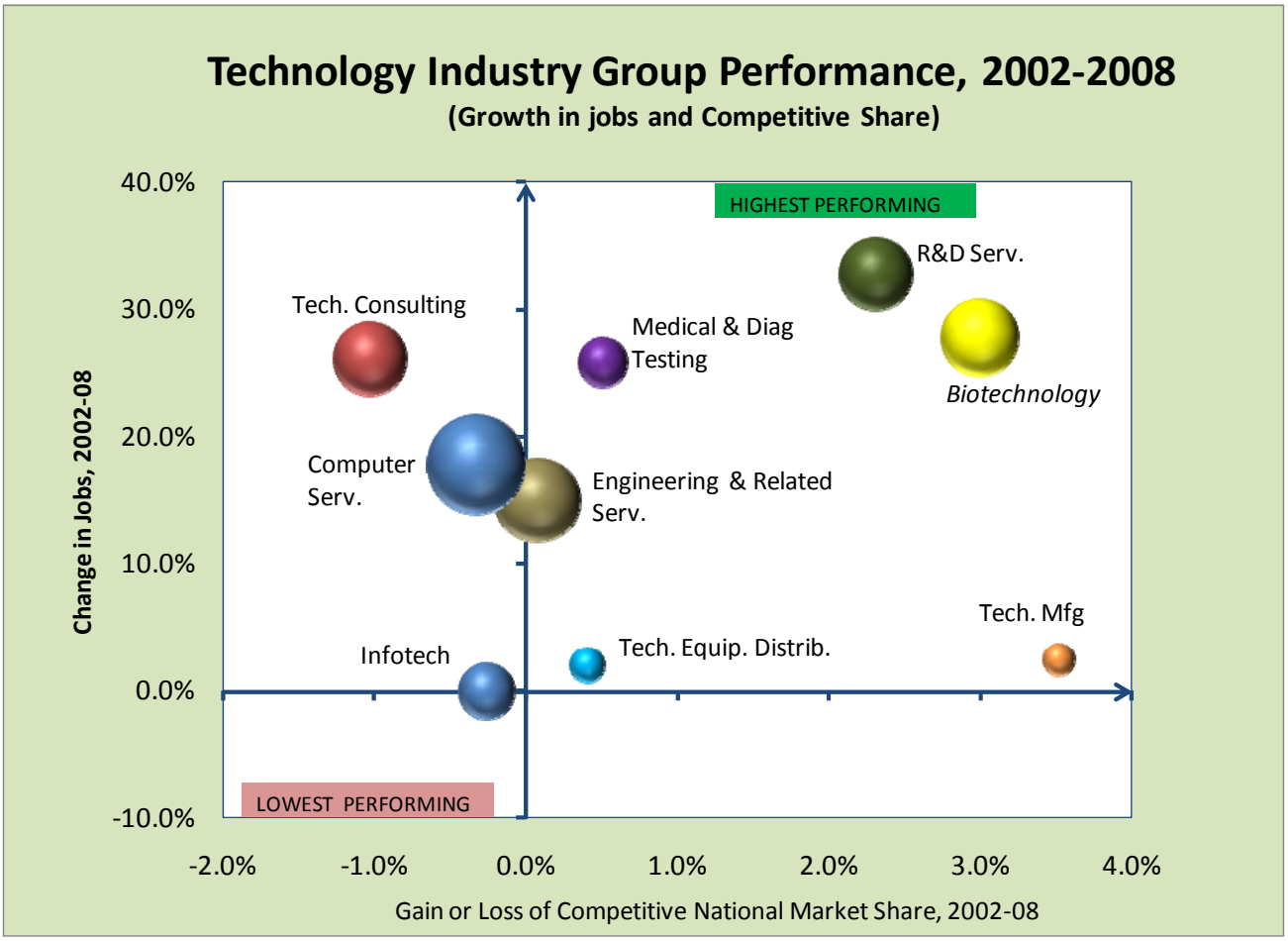


Table 11, shows the data behind the major technology producing industries charted in the previous Figure. The data have been updated from those in the 2008 HiSciTech report including minor refinements and data revisions by the BLS. The table also includes the concentration metric for the industry groups (location quotient), which measures how specialized the activity is in Hawaii compared to the same industry nationally.

The technology sector accounted for more than 24,000 jobs in 2008, about 3% of the civilian workforce. Estimated jobs in the sector, including proprietors and self-employed, grew by almost 18% from 2002 to 2008. This compares with a 12% increase for these industries nationally, and a 13% increase for overall job growth in Hawaii's civilian economy for the period. Annual earnings in Hawaii's private tech sector averaged more than $65,400 in 2008 compared to $43,900 for the economy as a whole. However, the same technology sector at the national level had average earnings of about $93,000 in 2008. In nearly all areas of technology, earnings in Hawaii were below U.S. averages for the same industries.

Table 11. Producing Industries in the Private Technology Sector, 2002 and 2008[1]

Group/Industry	Jobs: Hawaii 2002	Jobs: Hawaii 2008	Jobs: Percent change Hawaii 2002-08	Jobs: Percent change U.S. 2002-08	Ave Earnings 2008: Hawaii	Ave Earnings 2008: U.S.	Performance Metrics: Compet Share 2002-08	Performance Metrics: Industry Concentration (Loc Quotient) 2008	Performance Metrics: Industry Concentration (Loc Quotient) Change 2002-08
TECHNOLOGY SECTOR	**20,588**	**24,267**	**17.9%**	**12.4%**	**$ 65,433**	**$ 92,984**	**0.8%**	**0.59**	**0.00**
Computer Services	5,587	6,583	17.8%	20.2%	$ 67,965	$ 88,821	-0.3%	0.74	-0.05
Engineering and Related Serivces	4,212	4,842	15.0%	14.5%	$ 71,649	$ 78,549	0.1%	0.75	-0.03
Technical Consulting Services	2,980	3,760	26.2%	36.0%	$ 52,159	$ 74,280	-1.0%	0.66	-0.08
Research & Development Services	2,714	3,604	32.8%	16.4%	$ 70,946	$ 106,626	2.3%	1.17	0.10
Information and Telecomm Tech Services	2,196	2,196	0.0%	2.4%	$ 61,301	$ 96,902	-0.3%	0.49	-0.03
Medical and Diagnostic Testing	1,347	1,695	25.8%	22.5%	$ 55,240	$ 62,530	0.5%	1.52	-0.02
Technology Equipment Distribution	854	871	2.0%	0.4%	$ 77,263	$ 103,788	0.4%	0.34	-0.01
Technology Manufacturing	699	716	2.5%	-0.5%	$ 64,493	$ 113,986	3.5%	0.08	0.00
Biotechnology Breakout	3,050	3,927	28.7%	8.3%	$ 55,288	$ 98,501	3.0%	0.63	0.08

Taken as a whole, private sector technology in Hawaii was an emerging activity in Hawaii's economy between 2002 and 2008, showing strong growth and an increase in national competitive market share. In terms of concentration, Hawaii's technology sector was a smaller proportion of the state's economy in terms of jobs than the nationally. However, the lower concentration was partly due to Hawaii's much smaller technology manufacturing sector.

Two activities, research & development, and medical/diagnostic testing not only performed well in terms of job growth and competitive share, but also exceeded the national concentration for these industries. Thus, they are ranked with the base-growth industries for the period. This is a significant achievement. Hawaii's overall concentration of technology industry is difficult to increase due to the absence of major technology manufacturing activity. However, the success in raising the concentration levels of these two industries shows that Hawaii can become competitive and nationally significant in selected areas of technology.

The only lagging area of technology was information and telecom technology services. This industry group remained flat in terms of jobs over the period.

Profile of Major Production Side Technology Industry Groups

The following sub sections present data currently available for the major industries and activities in Hawaii's technology sector defined on the producing side. After that, information available for technology commercial market sectors (technology activities not readily definable by producing side data) will be will be presented.

Computer services

As Table 11 shows, the computer services industry group is the largest component of the technology sector, with nearly 6,600 jobs including proprietors and self-employed in 2008. The group is made up primarily of custom computer programming, systems design and computer facilities management. The 2008 average annual earnings per worker in this industry group amounted to about $68,000, about 4% higher than the technology sector as a whole and much higher than the economy-wide average of $43,900.

As Figure 8 indicates, the computer services group turned in good growth performance in the 2002 to 2008 period, but slipped a bit in terms of national competitive market share. The number of jobs in the indus-

try group expanded by nearly 18% between 2002 and 2008, about the same rate as Hawaii's technology jobs as a whole

Overall performance in computer services was held back by declines in computer facilities management and miscellaneous computer services. However, the two other major industries in the group, systems design and custom computer programming, outperformed their national counterparts and gained competitive national market share over the period.

Systems design activity: This industry accounted for nearly 2,700 jobs in 2008. Nationwide, jobs in this industry increased about 35%. However, in Hawaii the industry was up 60% from 2002 or about 1,000 jobs. Average earnings for systems design activity was $73,600 in 2008, well above the technology sector average.

Custom computer programming: Accounting for about 1,800 jobs in 2008, custom programming registered a 20% increase in jobs over the 2002-2008 period, slightly higher than the same industry nationally. With average annual earnings at 79,500 this is among the highest paying industries in the technology sector.

Engineering & Related Services

In the HiSciTech study, engineering and related services were adjusted from the BLS definition to exclude civil engineering firms from the industry group. While civil engineering certainly uses state of the art technology, its focus and growth are tied much more closely to infrastructure construction and investment markets than to technology markets. This would not be a serious problem if civil engineering were a relatively small proportion of all engineering activity. In fact, at the national level that proportion is modest -- about 18%. However, in Hawaii, civil engineers are 43% of the total engineering profession. By excluding civil engineering firms at both the state and national levels, the data for this industry group are less likely to reflect the ups and downs of the construction cycle.

Related services in this industry group include activities such as architectural services, which are also related to construction. However, architectural services play a significant role in transferring new building technology, especially green energy technology, into the economy. Therefore, it was thought that more could be gained in including these related services than excluding them.

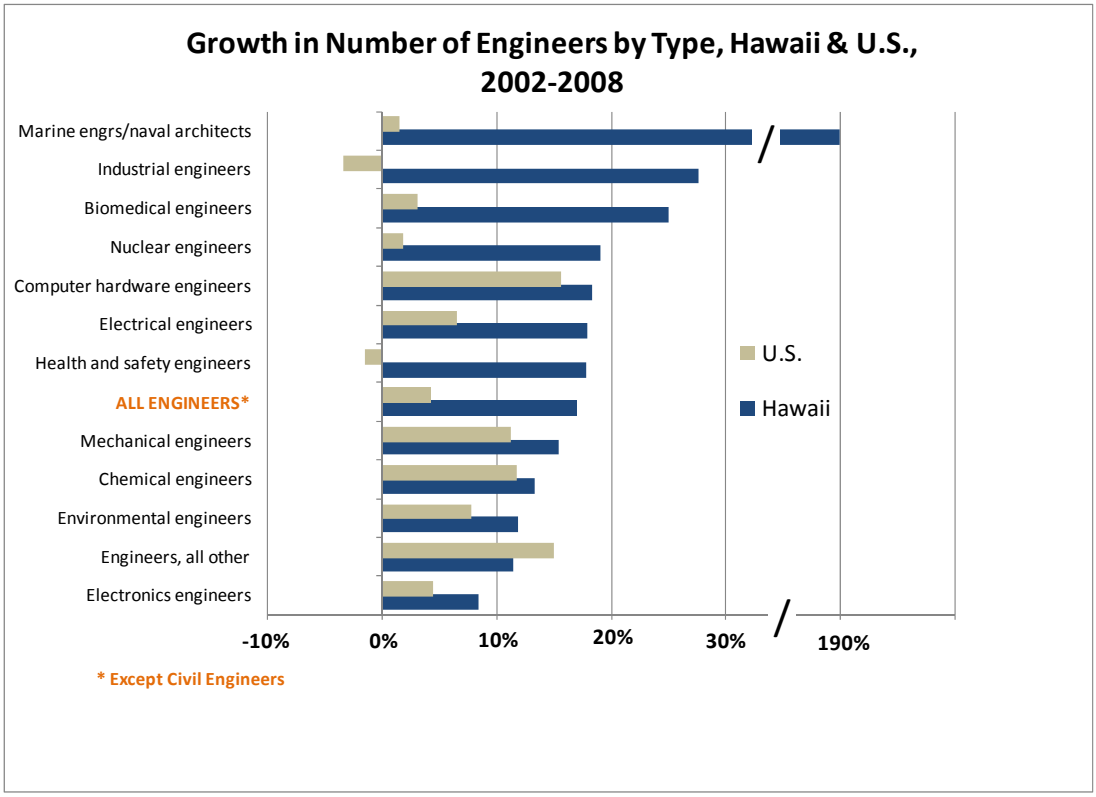
Overall, engineering and related activities accounted for about 4,800 jobs in 2008, a 15% increase from 2002. this was faster growth than for the economy as a whole and slightly faster than the same engineering group nationally. As indicated in Figure 8, this faster growth help engineering and related services post an increase in competitive national market share. In terms of concentration, the engineering industry group is about 75% of the national industry's proportion of total jobs.

Unfortunately, the NAICS system does not break down engineering firms by specialty. However, from occupational information on the number of engineers by professional specialty it is possible to gain some insight into the mix and performance of engineering specialties in Hawaii.

Excluding civil engineers, Hawaii significantly outperformed the U.S. in the growth of engineering occupations, expanding by 17% from 2002 to 2008, compared to just 4% nationally. There were about 3,400 non-civil engineers in Hawaii practice in 2008, including both the public and private sectors. Nearly 55% of these engineers were three specialties. The largest group was electrical engineers at 21% of the total, followed by electronics engineers at 18% and mechanical engineers at 16%. Reflecting the more industrial environment, the largest specialties nationally were mechanical at 18%, industrial, 16% and electrical, 12%.

Figure 9 compares the growth of most engineering specialties (excluding civil engineering) for Hawaii and the U.S. The relatively small Marine/naval engineers category showed spectacular growth in Hawaii over the 2002 to 2008 period, although it is still less than 4% of the total engineers in number. More relevant to the technology sector, growth in biomedical, computer and electronics engineers was higher in Hawaii than nationally.

FIGURE 9.



Despite the growth, Hawaii is still well behind the mainland in the concentration of most engineering specialties outside of civil engineering. Only the proportions of Marine/Naval and health/safety engineers exceed national concentrations. However, Electrical and electronics engineering specialties are close to national concentrations and gained during the 2002 to 2008 period.

Technical Consulting

The technical and consulting services industry group comprises five industries ranging from Management consulting at 43% of total jobs in the group, to computer training representing just under 1%. The group accounted for about 3,800 jobs in the technology sector in 2008.

As Table 11 shows, Technical consulting showed healthy job growth in the 2002 to 2008 period, with a 26% increase but still lost some ground to the nation in terms of competitive industry share. This occurred because of stronger national growth of 36% in jobs among industries in this group.

The average annual earnings in technical consulting were about $52,200 in 2008 compared to $74,300 nationally. Management analysts represented the largest occupation in technical consulting at about 34% of the total workforce.

Technical consulting has less of a concentration in Hawaii's economy than nationally and despite the healthy growth over the period that concentration declined slightly.

Research & Development Services

Hawaii's private research and development industry group was the fourth largest and fastest growing technology area in Hawaii in the 2002 to 2008 period. As Table 11 indicates, the R&D services industries group was the best performing group in technology in terms of growth and high performing in terms of gain in competitive national industry share.

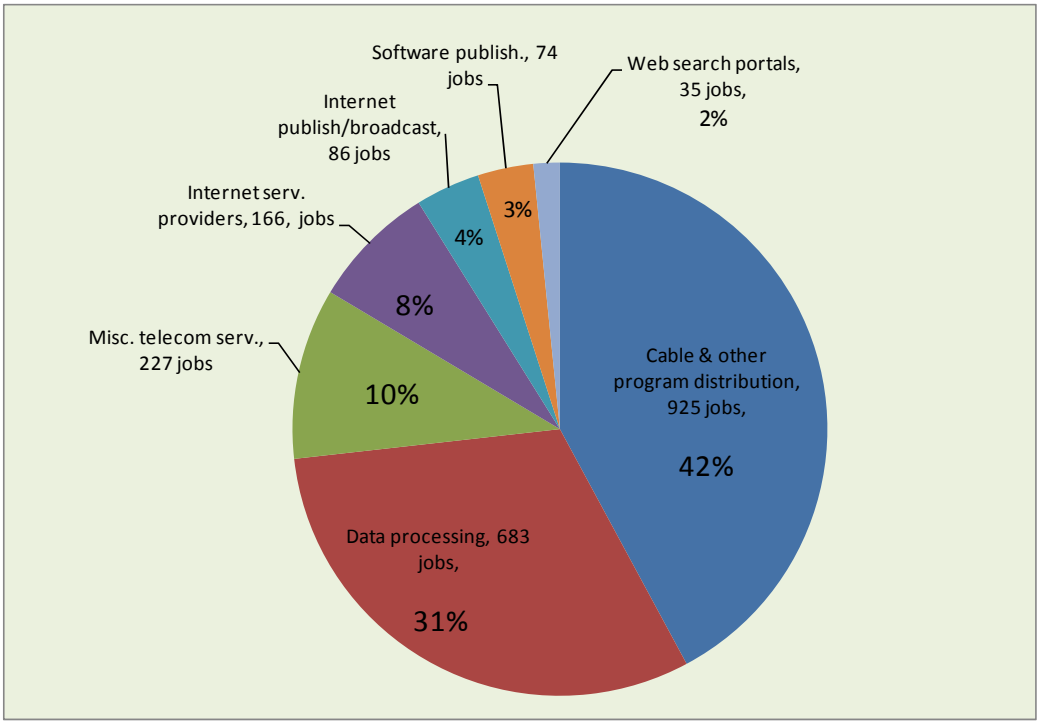
R&D services include about 3,600 jobs in the physical, engineering and other life science research and development (including biotech research), as well as social science and humanities research. As a group, the R&D industries increased the number of jobs by 33% over the 2002-2008 period, compared with 16% increase nationally. Biotech R&D, in particular, showed 56% increase in jobs. (The biotech R&D activity within the R&D services is one part of the more comprehensive biotechnology industry group.)

The R&D services group is also one of only two technology industry groups to have achieved higher than national concentration in Hawaii (medical and diagnostic testing was the other). The industry group in Hawaii is 17% more concentrated in Hawaii than nationally.

Information & Telecommunications Technology Services

Figure 10 shows the specific industries that comprise the infotech/telecom technology industry group. Information and telecommunications services have been among the most dynamic and evolving activities in the technology arena.

FIGURE 10. JOBS AND SHARE OF TOTAL INFOTECH/TELECOM GROUP JOBS BY ACTIVITY



Mobile phone and internet technology have separately driven information technology over the last two decades. More recently those technologies have virtually merged in the form of portable devices and support services providing voice, data and entertainment products. The revolutionary changes in information technology have seen companies like on-line access provider America Online rise to become giants in the media industry, only to implode as the technology matured and offered alternative points of access to consumers. At the local levels, services such as cable and internet phone service have threatened to make tradi-

tional telephone companies obsolete. The changes in this sector have been so rapid and extensive that even defining the sector is a moving target.

In general, the producing side industries in the information technology and telecommunication services group focus on the delivery of communications through new and emerging technologies. Table 12 shows the change in jobs for the seven industries in the infotech/telecom group over the 2002 to 2008 period.

TABLE 12. CHANGE IN INFORMATION & TELECOMMUNICATION TECHNOLOGY INDUSTRY JOBS, 2002 TO 2008

Software publishers	-53%	Internet service providers	-56%	Misc. Telecommunications	15%
Internet publishing/broadcast	153%	Web search portals	13%		
Cable & other program Distribution	29%	Data processing & related	0%		

As a whole, the information & telecommunications technology services industry group in Hawaii showed no net growth in jobs over the 2002 to 2008 period. Nationally, this industry group managed a 2% growth in jobs, well below the average rate of growth in the overall economy. However, the lack of growth in Hawaii was entirely due to losses in two specific industries during the period that countered an equal number of jobs created in the other areas of the industry group.

The job losses were in software publishing and internet service providers. Both industries were reduced to roughly half their 2002 size over the six year period. In the case of internet service providers, there probably has been considerable consolidation of services among fewer providers, particularly national providers that have absorbed market share from local providers. There may be significant economies of scale in internet services, meaning that larger operations have much lower costs per customer served than small operations. Reasons behind the decline in software publishing are not as clear, but may also be related to both consolidations and changes in the markets and delivery methods for software. In addition to the decline in these industries, data processing services showed no net growth over the period.

Apart from these three industries, the information and telecommunications industry group showed healthy growth. Internet publishing and broadcasting showed spectacular growth (153%), although the base of employment is fairly small. Jobs in cable programming, the largest industry in the group, grew 29%, well above the average for technology as a whole and faster than the same U.S. industry.

The average earnings per worker for the sector were $61,300 in 2008. However, this ranged from $38,000 in web search portals to $109,000 for miscellaneous (other) telecomm services. As with other groups in technology, the earnings average for the groups was well below the national level, which was just over $96,900.

Medical & Diagnostic Testing

This technology industry group has shown healthy growth at both the state and national levels in recent years. The group consists of two industries, medical laboratories which accounts for about 96% of jobs in the group and the small but fast-growing diagnostic imaging industry. The medical and diagnostic testing group provided about 1,700 jobs in 2008, up 26% from 2002. By growing faster than its national counterpart, the Hawaii industry group managed to increase its national industry share over the period. It is also one of the only two industry groups in technology (along with R&D services) to show a concentration greater than the U.S. as a whole, more than 50% greater concentration than nationally. This is due to the medical laboratories component. The reason for the high concentration is not clear and warrants further research.

The average earnings for the medical diagnostic testing group exceeded $55,200 in 2008, compared to an average $62,500 for the U.S. as a whole.

Technology Manufacturing

Except for sugar and pineapple, manufacturing has had a very low concentration in Hawaii due to competition for space, energy costs, transportation costs and limited natural resources. Moreover, foreign competition has steadily reduced the size of manufacturing nationally.

Technology manufacturing is a very small activity in Hawaii, representing about 3% of jobs in the technology sector compared with 21% nationally. Still, more than 700 jobs are accounted for by technology manufacturing in the state and thanks to a surge in medical device manufacturing over the 2002-2008 period, the industry group has performed well compared with the national industry group.

Table 13 provides some details of the components and performance of Hawaii's technology manufacturing activity in recent years.

TABLE 13. TECHNOLOGY MANUFACTURING PERFORMANCE IN HAWAII, 2002 TO 2008

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Share	(Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
Technology Manufacturing	**699**	**716**	**2.4%**	**-0.5%**	**$ 65,433**	**$ 113,986**	**3.5%**	**0.08**	**0.00**
Medical Device Mfg	282	461	63.5%	4.4%	$ 68,333	$ 96,628	9.6%	0.15	0.05
Alternate Power Generation	153	96	-37.3%	-16.6%	$ 98,102	$ 186,622	20.3%	0.20	-0.08
Chemicals & Pharmeceutical Mfg	120	89	-25.8%	-2.8%	$ 69,361	$ 133,033	-3.3%	0.05	-0.02
Other Technology Mfg	144	70	-51.4%	-0.5%	$ 49,974	$ 109,040	4.4%	0.02	-0.02

As the table indicates, medical device manufacturing is the largest activity in the group and has been the growth driver, while other tech manufacturing activities have shown some decline. While dental laboratories account for the majority of jobs, in device manufacturing (about 50%), it has been primarily growth in electromedical apparatus manufacturing that has helped this small niche group show growth and slight gain in competitive industry share over the period.

Biotechnology Breakout

Table 14 presents a measure of biotechnology activity for Hawaii based on the definition established by the national biotechnology industry association, BIO. It is a production-side, NAICS measure. The group includes the biotech research component from the R&D industry group above as well as some related production activity such as pharmaceutical, chemical and selected medical device manufacturing. This compilation is referred to as a biotechnology "breakout" because the specific industries that make up the BIO definition are already included among the various industry groups of the technology sector. They are reassembled here to show how biotechnology is performing based on a widely used national definition.

TABLE 14. BIOTECHNOLOGY INDUSTRY GROUP

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
Biotechnology Breakout	**3,050**	**3,927**	**28.7%**	**8.3%**	**$55,288**	**$ 98,501**	**3.0%**	**0.63**	**0.08**
Research,Testing & Medical Labs	2,531	3,468	37.0%	20.1%	$54,588	$ 81,156	2.3%	1.37	0.12
Med Devices & Equipment	282	346	22.7%	4.0%	$64,616	$ 85,494	4.5%	0.18	0.02
Agricultural Chemicals	216	73	-66.2%	-2.3%	$32,149	$ 106,093	-9.7%	0.14	-0.28
Drugs & Pharmaceuticals	21	40	90.5%	-0.5%	$77,495	$ 151,501	14.9%	0.03	0.01

As indicated earlier in Table 11, biotechnology is the third largest industry group in the technology sector and has been one of the fastest growing, with jobs increasing nearly 26 percent from 2002 to 2008. The growth was more than three times the rate for these activities nationally. Table 14 shows that much of this growth was due to an even larger growth in biotech research and development activity. In turn, seed corn research was a significant driver in the biotech research area.

Biotechnology in Hawaii is below national concentration measures, but is gaining ground and ranks solidly as an emerging industry over the 2002 to 2007 period. Earnings in Hawaii's biotech industry group averaged nearly $55,300 in 2008. This is below the average for Hawaii's technology sector as a whole and significantly below the national average. The lower earnings average is at least partly due to the large number of field workers needed in the seed corn research industry.

Profile of Market-Based Technology Activities

There are important areas of technology that are not directly accessible with the production side data provided under the NAICS framework. Chief among these are astronomy, ocean science and technology, and dual use technologies. For lack of a better term we have referred to these as market-based activates to distinguish them from production-side activities for which NAICS data can be compiled. For the most part, jobs in the market side activities are accounted for in the compiled production side data. It is just not clear without further research and probably special surveys exactly where in the NAICS data those market sector jobs are accounted for. Until that work can be done, we must rely on limited survey programs that have been conducted to develop various kinds of information on the firms and activity in those market-based activities. This section summarizes what is currently known about these activities.

Astronomy & Space Science

Astronomy activity has found Hawaii attractive because of the exceptionally clear viewing conditions atop its highest peak of Mauna Kea on the Big Island of Hawaii and Haleakala on Maui. Hawaii has capitalized on those assets through the development of a strong graduate program in Astronomy at UH Manoa and development of the UH Institute for Astronomy (IfA). In addition, the State and County have protected the quality of viewing conditions through management of the summit of Mauna Kea and careful monitoring of land use changes that could that could affect viewing, such as urban lighting practices.

Astronomers and scientific organizations throughout the world have responded by investing hundreds of millions of dollars in observatories on the summit of Mauna Kea and Haleakala. As a result, astronomy has become a significant activity and generator of income and employment in the Islands.

Table 15 provides an overview of employment and earnings in Hawaii's astronomy sector developed in the HiSciTech study of the technology sector. It shows that

TABLE 15. HAWAII'S ASTRONOMY MARKET SECTOR

Astronomy Market Segment	Hawaii	US
Employment 2007 (all astronomy jobs)	885	n/a
Employment 2007 (private-sector astronomy jobs)	342	222,685
% of all private-sector employment	0.0%	1%
Annual private-sector employment growth rate ('02-'07)	7.3%	1.2%
Avg. earnings 2007	$70,951	n/a
Avg. earnings 2007 – private-sector only	$83,654	$106,567
Establishments 2007	28	n/a

Source: The Hawaii Science & Technology Institute, *Innovation and Technology in Hawaii: An Economic and Workforce Profile*, October, 2008

The workforce in astronomy includes astronomers, a wide range of engineers and engineering technicians (mechanical, electrical, and electronic), software programmers, staff able to maintain and

direct equipment under the difficult conditions of the mountain summits, and administrative personnel. In addition, the observatories attract visiting astronomers. A few are on rotation in Hawaii for months or a few years. Most are in Hawaii to conduct observations for a few days.

MAJOR COMPONENTS OF ASTRONOMY ACTIVITY

The primary invested assets in Hawaii's Astronomy sector include:

- *Telescopes*: These vary greatly in size and in the type of light the capture.
- *Instrumentation*: Lenses and similar equipment used to gather the light collected in the telescopes.
- *Summit buildings and infrastructure*: *S*olid, sophisticated housings that protect equipment and minimize changes in wind, heat and other conditions that could disrupt viewing.
- *Facilities in Hilo and Waimea*: Several observatories have headquarters with much office space, machine shops, and computing resources which allow astronomers to analyze great amounts of data away from their institutions.

Mauna Kea is widely accepted as among the handful of world's best site for astronomical observations, including optical, infrared, and millimeter/submillimeter wavelengths. As detailed in Table 16, there are currently twelve telescope facilities in operation on Mauna Kea.

TABLE 16. HAWAII ISLAND'S ASTRONOMY ASSETS, 2005

Facility	Annual Operating Cost ($ million)	(a) Capital Cost ($ million)	County of Hawaii Based Staff	Operational
University of Hawaii (0.6m – Optical)	(b)	0.3	(b)	1968
University of Hawaii (2.2m – Optical/Infrared)	1.2	5	7	1970
Canada-France-Hawaii (3.6m – Optical/Infrared)	6.7	30	52	1979
NASA IRTF (3.0m – Infrared)	3.3	10	18	1979
United Kingdom Infrared (3.8 – Infrared)	3.3	5	28	1979
James Clerk Maxwell UK, Canada, Netherlands (15m – Sumillimeter)	4.6	32	35	1986
Caltech/NSF (10.4m – Sumillimeter)	2.6	10	11	1986
W.M Keck I & II Caltech, U. of California (10m x2 – Optical/Infrared)	11.0	170	115	1992/1996
Very Long Baseline Array NRAO, AUI, NSF (25m – Radio)	0,25	7	2	19992
Submillimeter Array Smithsonian, Taiwan (8x6m – Submillimeter)	6.0	80	36	2003
Subaru (Japan) (8.2m – Optical/Infrared)	15.0	170	70	1999
Gemini Northern U.S., U.K., Canada, Argentina, Australia, Brazil, Chile (8m – Optical/Infrared)	8.0	92	87	1999
Mauna Kea Observatories Support Services	Not Applicable	(c) 3.4	28	N/A
Total	611.3	61.95	489	-

Source: IfA Fact Sheet 2004-05. a: Historical cost, not adjusted for inflation. b: Combined budget and staffing with UH 2.2-m Telescope. c: Not included in the total since derived from facility operating costs.

In addition, Mauna Kea has been chosen as the site for one of the three new super telescopes to be built in various locations around the world over the next decade. The new telescope will be a giant, 30 meter instrument called the TMT (for Thirty Meter Telescope). It will be built by a consortium in-

cluding an association of Canadian Universities, California Institute of Technology and the University of California.[9]

Haleakala on Maui is also among the best astronomical sites in the world. As Table 17 shows, The Haleakala complex includes five major assets and support facilities. The focus of these assets are mostly national defense, NASA missions support and educational (Faulkes and UH Mees).

TABLE 17. MAUI'S ASTRONOMY ASSETS, 2005

Facility	Capital Cost ($ million)	Annual Operating Cost ($ million)	County of Hawaii Based Staff	Operational
Mees Solar Observatory (UH)	0.5	0.1	2	1968
Maui Space Surveillance Site (MSSS) Air Force	200.0	16.0	120	1979
Advanced Electro-Optical System 3.7-m Telescope (AEOS) Dept of Defense	50.0	15.0	55	1997
MAGNUM 2-m Telescope (Japan/Australia) @LURE Observatory (NASA/UH)	5.0	0.25	1	2000
Faulkes 2-m Telescope (private sector)	5.0	0.4	1	2003
Haleakala Observatories Projects	n/a	0.5	4	1979
Haleakala Support Facilities	n/a	0.13	6	n/a
Total	260.5	32.38	189	-

Source: IfA Fact Sheet 2004-05. a: Historical cost, not adjusted for inflation

UH INSTITUTE FOR ASTRONOMY (IFA)

Hawaii's lead agency for astronomy development is the UH Institute for Astronomy or IfA. Founded in 1967, IfA is responsible for carrying out research in astrophysics and planetary science, development related to astronomical facilities, and for programs in the Mauna Kea Science Reserve and the Haleakala High Altitude Observatory Site. It operates solar observing facilities on Haleakala as well as several observatories on Mauna Kea that are used for studies of planets, stars, and galaxies. IfA staff also makes extensive use of spacecraft for astronomical research and planetary exploration. Through its service organization, Mauna Kea Observatories Support Services (MKSS), the IfA provides the common services required by all the astronomy facilities on Mauna Kea.

TABLE 18. OVERVIEW INFORMATION ON INSTITUTE FOR ASTRONOMY OPERATIONS.

UH IfA State General Funds Budget FY 2004-05	$5.0 million
Direct Extramural Federal Grants and Contracts to IfA FY 2004-05	$20-23 million
Scholarly Research Publications (2003)	206
Articles in Refereed Journals	121
Invited Review Articles, Books Chapters, and Conference Proceedings	85
Educational Impact	Approximately 900 undergraduates and 30 graduate students.
Employment	279
Faculty/Staff Positions on State Funds	66
Faculty/Staff Positions on Federal Funds (includes Student Employees)	213

Source: IfA Fact Sheet 2004-05

[9] The other telescopes are the Giant Magellan Telescope (GMT), 24.5 meters; and the European Extremely Large Telescope (E-ELT) 42 meters. The GMT will be sited in Las Campanas, Chile. A site has not yet been chosen for the E-ELT, however Hawaii is not under consideration.

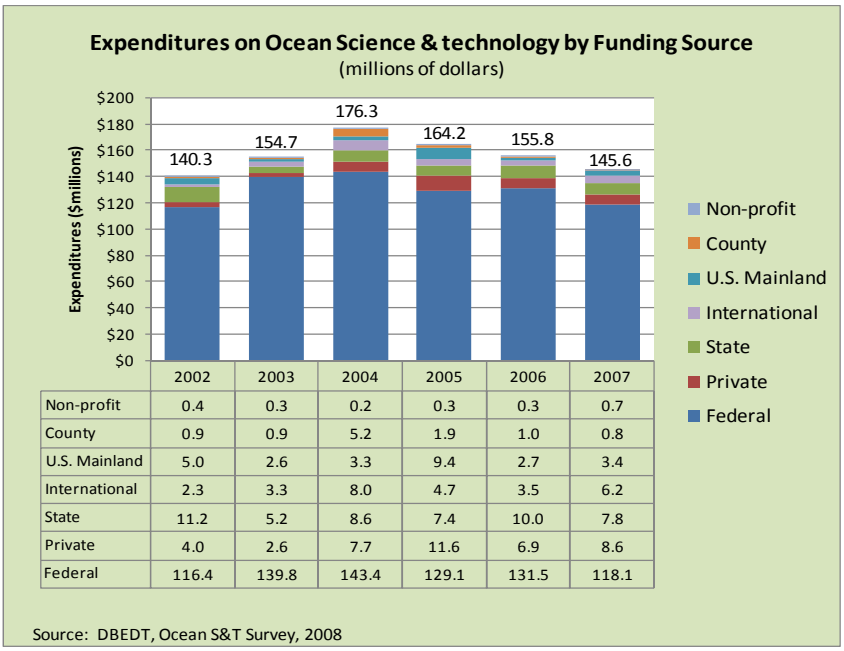
Facilities related to space science and research are also playing an increasing role in the state's economy. For instance, The Pacific Missile Range Facility (PMRF) on Kauai is world's largest instrumented, multi-dimensional testing & training range. PMRF is the only range in the world where subsurface, surface, air and space vehicles can operate and be tracked simultaneously. The facility is also launches target missiles in connection with missile defense research and development. The recently designated State Office of Aerospace Development is developing additional aerospace related opportunities that build on Hawaii's defense and astronomy assets.

Ocean Science and Technology

Ocean science and technology includes a mix of different fields including biology, chemistry, geology, physics, engineering and others. In Hawaii, the ocean science and technology sector encompasses both the public and private sectors. The majority of activities in this sector are in research and technical development projects funded by the government, non-profit organizations and some private sources.

Data on ocean science and technology activity have been gathered over the last several decades though a periodic survey by DBEDT of companies and agencies engaged in the sector. This survey has enjoyed a very high response rate. The primary focus of the surveys has been expenditures on ocean S&T rather than jobs and earnings. The survey has been adjusted periodically to add additional categories of activity as they emerge. The most recent survey was conducted in 2008 covering the years 2006 and 2007. The survey was funded by resources from Act 148 (SLH 2007). The report on that survey including historical data may be accessed at http://hawaii.gov/dbedt/info/economic/data_reports/OceanScTechReport2007.pdf.

FIGURE 11.



	2002	2003	2004	2005	2006	2007
Non-profit	0.4	0.3	0.2	0.3	0.3	0.7
County	0.9	0.9	5.2	1.9	1.0	0.8
U.S. Mainland	5.0	2.6	3.3	9.4	2.7	3.4
International	2.3	3.3	8.0	4.7	3.5	6.2
State	11.2	5.2	8.6	7.4	10.0	7.8
Private	4.0	2.6	7.7	11.6	6.9	8.6
Federal	116.4	139.8	143.4	129.1	131.5	118.1

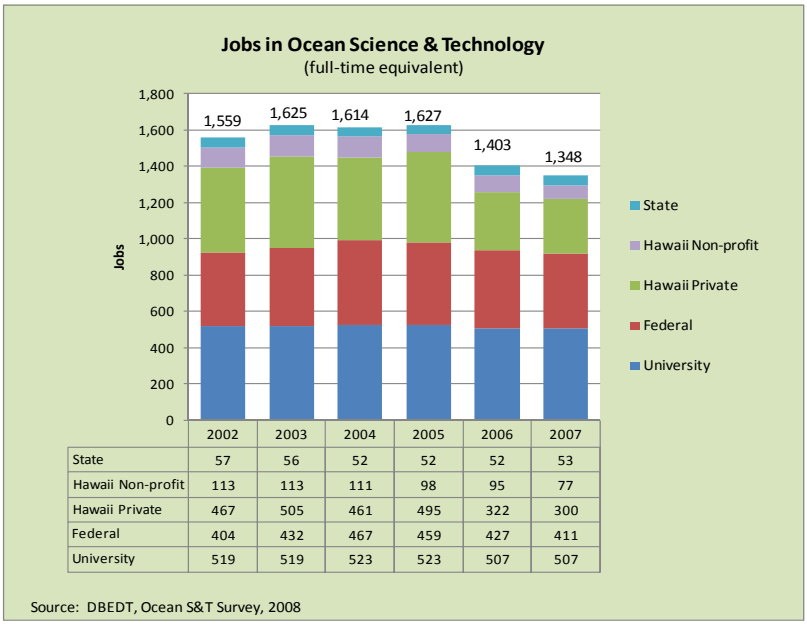
Source: DBEDT, Ocean S&T Survey, 2008

Figure 11 provides and over view of total expenditures for ocean science and technology in Hawaii from 2002 to 2007.

Total expenditures rose sharply from 2002 to 2004, before slipping back nearly to their beginning level by 2007. Federal spending for ocean research and development dominates the source of funding for ocean S&T. The two bright spots are international and private sources of funding. While small compared with Federal funding, both of these sources have shown exceptional overall growth over the 2002 to 2007 period. In 2007 private funding overtook State funding as the second largest source.

Figure 12 charts the trend in jobs associated with Ocean S&T activity from 2002 to 2007 by performing sector, which include the firms and agencies that received funding for projects. The trend is similar to the expenditures trend with total jobs (in terms of full-time equivalents) rising in the first part of the period and declining in the last couple of years. The survey does not cover wage and earnings for employees, so that information is not available at this time for the Ocean S&T sector. However, it could be expected to be at or above the annual average for the technology sector of $65,400.

FIGURE 12.



	2002	2003	2004	2005	2006	2007
State	57	56	52	52	52	53
Hawaii Non-profit	113	113	111	98	95	77
Hawaii Private	467	505	461	495	322	300
Federal	404	432	467	459	427	411
University	519	519	523	523	507	507

Source: DBEDT, Ocean S&T Survey, 2008

The reasons for the decline in total Ocean S&T funding and expenditures after 2004 are not clear. According to data from the Office of Management and Budget, Overall Federal expenditures on Ocean and Coastal related projects slowed over the period, but did not decline until 2008. In particular, Ocean related expenditures by the National Science Foundation (NSF) increased 61% from 2000 to 2006 and NSF budget requests were growing through 2008.

Energy Technology

Energy technology targets a number of emerging markets by engaging a multitude of traditional industries.

Those industries have allocated some of their activity to focus on the replacement or conservation of fossil fuels. While the NAICS system for industry classification does contain a classification for *other power generation*, it captures only a small part of the emerging field of emerging energy activity.

There are two major subsectors in energy technology. *Energy efficiency* is focused on reducing the use of energy in the economy, particularly buildings. Renewable or alternate energy in focused on replacing fossil fuel with alternative, preferably renewable sources like solar, wind, and other types.

Energy efficiency and energy replacement involve numerous traditional industries ranging from heating and plumping to engineering and architecture. For instance, solar panels may be installed by a number of different contracting specialties. This complicates the process of measuring the market sector.

The adjacent Table 19 lists 20 industries that have firms engaged in some aspect or support for renewable energy and conservation.

TABLE 19

Establishments with Association to the Energy Sector by NAICS code*

NAICS	Sector/Industry Title
Power Generation	
221112	Fossil Fuel Electric Power Generation
221119	Other Electric Power Generation
Construction	
237110	Water and Sewer Line and Related Structures Construction
238221	Residential plumbing and HVAC contractors
238222	Nonresidential plumbing and HVAC contractors
238912	Nonresidential site preparation contractors
Wholesale & Retail	
	Medical, Dental, and Hospital Equipment and Supplies
423450	Merchant Wholesalers
444190	Other Building Material Dealers
447110	Gasoline Stations with Convenience Stores
Professional, Scientific & Technical Services	
541110	Offices of Lawyers
541330	Engineering Services
541611	Administrative Management and General Management Consulting Services
541690	Other Scientific and Technical Consulting Services
541711	Research and Development in Biotechnology
541712	Reseach and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
541720	Research and Development in the Social Sciences and Humanities
Management of Companies	
551112	Offices of Other Holding Companies
Administrative Support, Waste Mgt & Remediation Services	
561110	Office Administrative Services
562910	Remediation Services
Repair & Maintenance Services	
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance

*Partial List. Represents those firms contained in alternate energy directories and lists maintained by DBEDT Strategic Engery Division that could be traced by NAICS code. This data base includes only Hawaii firms with paid employees in the given year.

Indentifying the proportion of relevant firms in these industries will be a challenge. Moreover, companies may be engaged in energy projects as a sideline rather than a principal activity.

Dual Use Technology (The Military Technology Market)

Dual use technology has presented a market opportunity for Hawaii companies to leverage investment in technology developed for military applications into products to serve commercial markets. For instance, a company developing corneal regeneration technology to treat battlefield eye injuries may find a ready market for that technology in the commercial medical sector.

However, commercial applications for technology developed for the military are not always feasible or an interest to companies serving this market. In fact, there are indications that reverse dual use is occurring. With even military spending feeling the pinch of tighter budgets, military technology procurement may be shifting its focusing towards adapting existing and emerging commercial technologies to satisfy military needs, rather than funding expensive research for custom products. Whatever the case, Hawaii's technology industry has a tremendous potential competitive advantage by having a huge military presence with increasingly more sophisticated needs on its door step.

Like other market-based targets, such asocean science, digital media and astronomy, data and information firms serving the military technology market are difficult to develop. The most structured effort to gather data on the dual use sector was by the State Department of Labor and Industrial Relations (DLIR) in 2005. In support of the Workforce Development Council and Enterprise Honolulu, the Research and Statistics (R&S) Office of DLIR surveyed 132 companies in the dual use sector. The R&S survey estimated employment in the dual-use technology industry to be 1,204 workers in 2005 with an additional 108 positions vacant and needing to be filled.

R&S identified five specialties in the dual use technology sector.

1. Optics & Photonics (inadequate data to estimate number of positions)
   R&D in communication technologies including fiber optics and cables, optical communications, and ocean acoustics. Detection/Surveillance systems R&D conducted in hyperspectral imaging, laser and electro-optic systems, and optical and mechanical design and fabrication.

2. Modeling, Simulation & Training [MST] (555 filled positions/84 unfilled)
   R&D of simulations and modeling systems to represent abstractions of reality. Sector includes establishments engaged in engineering services and computer services.

3. Unmanned Vehicles (inadequate data to estimate number of positions)
   R&D in vehicles and weapon technologies. Includes unmanned aerial vehicles, underwater vehicles and missile defense technologies.

4. Sustainability Technologies (607 filled positions/13 unfilled)
   Renewable (Alternate) Energy (R&D in solar, wind, and hydroelectric power generation)
   Environmental Technologies (R&D in environmental products and services such as coastal zone management and waste management
   Disaster Mitigation, and Management & Humanitarian Relief (R&D of products and services in disaster preparedness and management, and disaster relief services.

5. Life Sciences (42 filled positions/11 unfilled)
   Biotechnology, pharmaceuticals, biomedical technologies, biomedical devices, environmental, food processing, cosmeceuticals and nutraceuticals research and development.

The Hawaii Technology Development Venture (HTDV), a project of the Pacific International Center For High Technology Research(PICHTR), sponsored development of a strategic plan for development of the dual use technology sector which is being updated. HTDV estimates that the dual use sector has attracted $4 billion in revenues and $1 billion in R&D funding over the past 10 years.

HTDV's strategic plan for dual use development establishes priorities for the private dual use sector, the public sector and collaboration between the private/public sector. One of those priorities is improving the collection of data on dual use activity.

CREATIVE SECTOR

States have increasingly come to realize in recent years that solely promoting technology does not necessarily generate the creative innovation upon which technology depends. It is that creativity that helps focus the commercial development and application technology, as well as provide content, such as digital entertainment, that is delivered by technology. Beyond technology, creative activity generates major export products and services in its own right.

The diversity of creative activity has made the sector a difficult one to define for measurement purposes. In an effort to establish an improved definition the DBEDT Research Division worked with the Creative Industries Division in 2009 to better measure the creative sector in light of similar efforts in other states. Based on that collaboration an updated measurement for the sector was developed, using as a model a similar creative sector definition established in Massachusetts.[10] Table 20 shows the results of that effort.

TABLE 20.__ EMPLOYMENT AND GROWTH IN HAWAII'S CREATIVE SECTOR

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
CREATIVE SECTOR	**40,718**	**44,649**	**9.7%**	**14.1%**	**$ 49,947**	**$ 70,179**	**-0.7%**	**0.89**	**-0.08**
Performing and Creative Arts	8,523	8,531	0.1%	13.1%	$ 14,393	$ 18,680	-2.0%	1.29	-0.23
Engineering, Research & Devel	5,842	7,336	25.6%	17.5%	$ 79,672	$ 93,373	1.1%	0.92	0.02
Computer & Digital Media	5,744	6,657	15.9%	18.6%	$ 68,244	$ 94,662	-0.4%	0.65	-0.04
Marketing & Related Serv.	4,882	4,918	0.7%	11.8%	$ 40,027	$ 63,537	-1.7%	0.78	-0.12
Business Consulting	3,379	4,291	27.0%	24.4%	$ 52,948	$ 75,186	0.7%	0.60	-0.01
Publishing & Information	2,946	2,887	-2.0%	-1.9%	$ 63,183	$ 68,948	0.0%	0.75	-0.03
Cultural Activities	2,014	2,311	14.7%	13.2%	$ 43,557	$ 40,194	0.3%	2.69	-0.08
Architecture	2,077	2,280	9.8%	13.8%	$ 64,145	$ 66,960	-0.6%	1.35	-0.11
Design Services	1,134	1,453	28.1%	17.5%	$ 42,135	$ 48,143	1.5%	0.89	0.04
Radio/TV Broadcasting	1,387	1,361	-1.9%	0.4%	$ 58,442	$ 76,455	-0.4%	1.11	-0.07
Film, TV & Video Prod	1,500	1,231	-17.9%	2.0%	$ 33,793	$ 81,256	-1.7%	0.73	-0.22
Music	1,048	1,106	5.5%	-2.5%	$ 26,229	$ 37,505	1.3%	1.69	0.06
Arts Education	242	287	18.6%	30.9%	$ 13,190	$ 14,898	-1.6%	0.69	-0.10

Source: DBEDT compilation based on EMSI data.

The Massachusetts definition of the creative sector is meant to identify the range of activities in the economy in which art and creative thinking, often partner with new technology, to result in original cultural and commercial products. The definition uses production side data, meaning that it can be well measured over time and related to other production data such as occupational statistics.

In Hawaii the creative sector supports a range of commercial activity from tourism to technology. The sector includes 13 industry groups. Collectively, employment in the sector grew nearly 10 percent from 2002 to 2008, compared to 14 percent nationally. The average earnings in the sector in 2007 were nearly $50,000.

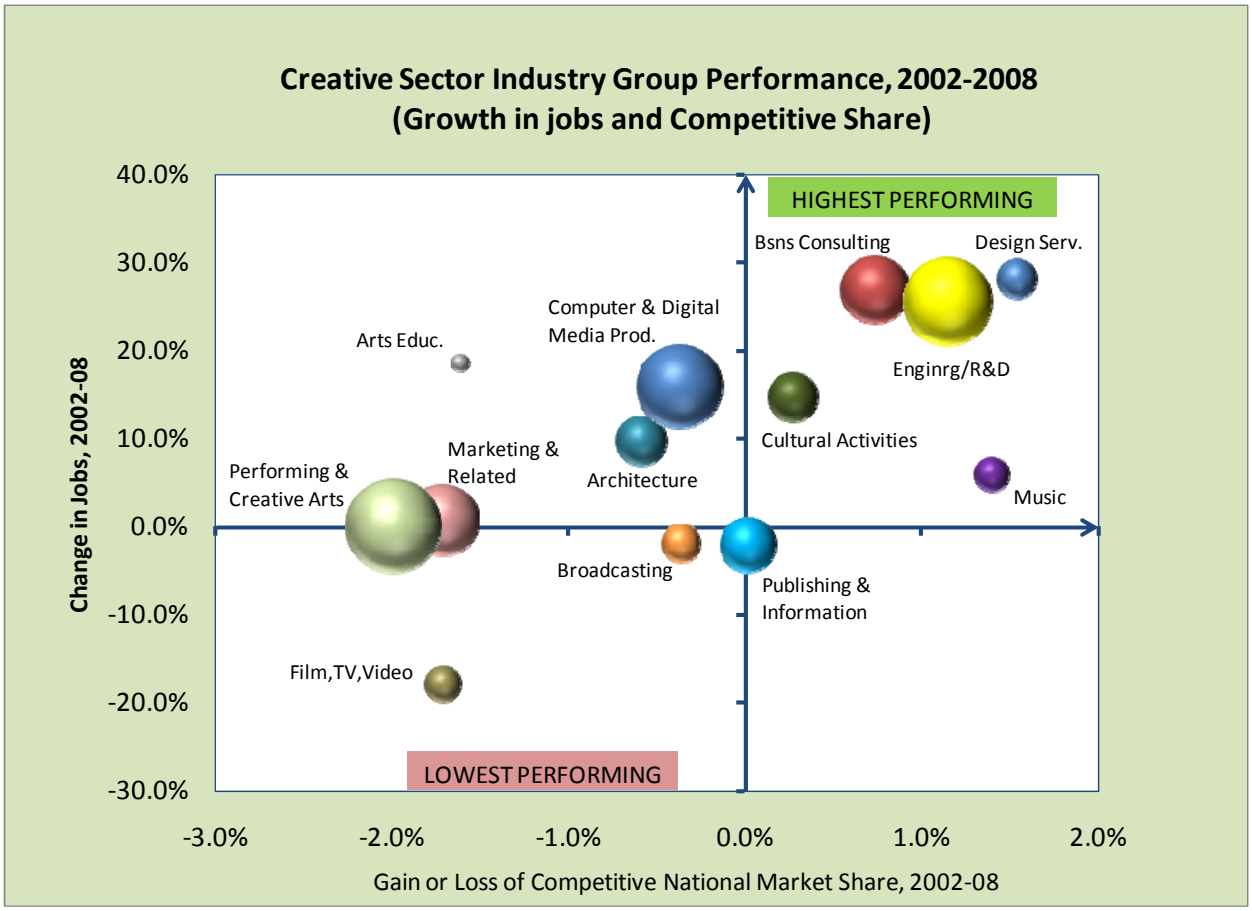
Accounting for more than 44,600 jobs, Hawaii's cultural and creative sector includes wide spectrum of commercial businesses, individuals, cultural enterprises and non-profit institutions. Creative enterprises produce, directly or indirectly, a range of goods services that are the product of artistry, design, aesthetic value or cultural enterprise.

[10] ConsultEcon, Inc., *North Shore Creative Economy Market Analysis and Action Plan*, April 2008

There is moderate overlap between the creative and technology sectors, partly because of their mutually dependent relationship. In particular, engineering and computer services are integral to both the technology and creative sectors in the 21st century.

Figure 13 provides a visual perspective of performance among the major producing side industry groups of the creative sector between 2002 and 2008. The size of the bubbles reflects the relative size of the industry groups. Each industry group's percent change in jobs is show vertically with the increase or decrease in competitive share shown horizontally as a percent of jobs.

FIGURE 13. CREATIVE INDUSTRIES SECTOR PERFORMANCE MAP



The performance map shows that most of the creative sector industry groups increased in terms of jobs over the period, some quite impressively. However, low growth or decline in several larger groups brought the average for the sector down to a 10% net growth over the period, less than experienced in the economy as a whole.

Large industry groups that declined in terms of competitive national market share also impacted the sector. Overall the Creative industry sector experienced a slight, 0.7% annual loss of growth competitively, compared same sector nationally.

Performing an Creative Arts

This group is composed of several areas of the arts including selected performing arts, creative arts (visual and literary), and supporting industries such as promoters, agents, managers and art dealers.

The group does not include musicians, who are included with the music industry group and museums, which are included in cultural activities, both of which are discussed later on.

Performing and creative arts is the largest single industry group in the creative sector with about 8,500 employees and self employed in 2008. The group saw nearly not net growth from 2002 to 2008. From 2002 to 2005 the group grew by nearly 1000, jobs but lost nearly all of that gain by 2008. Declines in jobs were centered among agents and managers, art dealers and theater groups. Gains in jobs over the period were made in dance companies, promoters and independent artists, writes and performers. However these gains were anemic compared to the economy as a whole, with the best gain being 3.0% for the period among dance companies.

The earnings average for workers in the performing and creative arts group was on $14,400 in 2008. Many of the jobs in this group are part time, so the average earnings do not represent a fulltime labor force.

The performing and creative arts group is very concentrated in Hawaii, with about 30% more jobs proportionately than for the industry nationally. This probably reflects the interdependence between Hawaii's rich artistic and cultural resources and the tourism sector. That interdependence probably also explains part of the under-performance of the industry group in the last several years during which the tourism cycle peaked and began to decline. Beyond tourism, this sector also provides a channel for the input of artistic creativity to a range of other innovation activity, including film, various forms of digital media, architecture and applied design.

Engineering/Research and Development

The second largest component of Hawaii's creative sector is engineering and scientific research and development, with 7,300 jobs. This group overlaps the technology and the creative sectors. It is included in the creative sector because innovation and creativity are major drivers in the application of engineering and in transforming emerging technologies into commercial products and services. As in technology, social science research is also an activity in creative R&D. The creative group for engineering and R&D does not exclude civil engineering activity, but does exclude related activities, such as architecture which is a major group in the creative sector in its own right.

As in the technology sector, Engineering/R&D as a creative group performed very well over the 2002 to 2008 period. Jobs increased by nearly 27% and the group gained in competitive national market share. The only lagging activity in the industry group was social science and humanities research, in which jobs declined about 9% for the period.

Computer and Digital Media

The computer and digital media industry group also includes many of the same activities as in the computer services group in the technology sector. However, in addition to the core computer technology services, the creative sector places heavy emphasis on the rapidly developing and evolving marriage of digital technology with traditional entertainment, cultural and artistic content. This marriage is variously referred to as *digital media*, *creative media* and sometimes *new media.* Evolving digital technology not only revolutionizes the delivery of traditional content such as music and movies. It also pushes the bounds of possible content well beyond those traditional formats into animation, games and a myriad of internet based services. This in turn creates new commercial opportunities for programmers, artists, designers, musicians and authors.

As Table 21 shows, the computer and digital media sector overlaps the similar group in the technology sector, varying by only the inclusion of software publishers. The group includes both programming and software activities and support activities such as systems design and computer facilities.

Table 21. Computer and Digital Media Industry Group Employment

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
Computer & Digital Media	**5,744**	**6,657**	**15.9%**	**18.6%**	**$ 68,244**	**$ 94,662**	**-0.4%**	**0.65**	**-0.04**
Computer systems design services	1,662	2,661	**60.1%**	**34.9%**	$ 73,599	$ 88,751	3.4%	0.67	**0.08**
Computer facilities management services	2,151	2,050	**-4.7%**	**-4.5%**	$ 50,563	$ 71,469	0.0%	5.66	**-0.26**
Custom computer programming services	1,521	1,828	**20.2%**	**19.9%**	$ 79,523	$ 92,596	0.1%	0.47	**-0.02**
Software publishers	157	74	**-52.9%**	**8.8%**	$ 93,039	$ 132,901	-9.5%	0.05	**-0.08**
Other computer related services	253	44	**-82.6%**	**-18.8%**	$ 57,806	$ 76,666	-16.5%	0.07	**-0.25**

As a whole, the sector grew 16% over the 2002 to 2008 period, about 3 percentage points faster than Hawaii's economy as a whole. Overall the group slipped very slightly in terms of competitive national market share. However, declines in computer facilities management and other computer related jobs were the main reason. Both computer programming and systems design showed exceptional strength in job growth throughout the period.

The average earnings in the sector were relatively high, at $68,200 in 2008. The lowest paying activity, computer facilities management, averaged $50,600, while the highest, software publishing, averaged $93,000.

While not a measurable activity within this industry group, digital media is a direct and indirect product of computer activity. Directly, computer programming and support activities integrate content from various sources into entertainment and information packages. Indirectly computer activity provides specialized input into other products like film and sound recordings.

As will be noted in the music industry group section, evolving digital technology is an opportunity for artists and small programming and content developers to compete in a market that has been dominated by large firms. With digital technology; film, music, speech, literature, historical documentation, games, educational instruction, as well as computer programs and data can share a similar, digitized format and be distributed and consumed on common platforms. These platforms are quickly evolving beyond computers and iPods to multipurpose cell phones and direct internet broadcasts. New products for this market are evolving as fast as new platforms are developed. Examples of such products are shown in Table 22.

TABLE 22.

Examples of Digital Media Products	
Video games and interactive virtual worlds	Blogs and social websites
Multimedia CD-ROM publishing	Email and attachments
Digital music publishing and distribution	Podcasting New media
Mobile devices and content	Internet Art
Software for the various devices and content	Interactive television
Web sites including 'brochureware'	Hypertext fiction
Electronic kiosks	Mashups (combining bits and pieces of existing digital content into original content.)

Measuring digital media is similar in difficulty to measuring emerging energy activity. There are a multitude of firms in numerous industries that dedicate some fraction of their work to that particular market. It is likely that the NAICS computer services industry will contain more of these firms than other industries. But there are probably firms serving this market in other NAICS industries such as the music, film production, and information industries. Work is needed to better identify and measure the mix and scope of these firms across industries and digital markets.

Marketing and Related Activities

Marketing and related activities in Hawaii play an important role in bringing Hawaii's goods and services to the attention of national and international markets. Marketing, advertising, public relations and media specialists account for 60% of this sector's workforce of about 4,900. This represented about a 1% increase from 2002 and compares to a 12% increasing in the national workforce of this industry group. Jobs in some areas such as public relations firms, display advertising and media specialists grew faster than their national counter parts and faster than Hawaii's economy as a whole. However, losses of jobs in Advertising, (especially direct mail) marketing research/polling and commercial photography brought the overall growth rate down.

The slower growth for Hawaii's marketing and related activities compared with the same activities nationally resulted in a decline in overall competitive national market share. However, thanks to their higher growth, public relations, media specialists and display advertising showed gains in national industry share.

The annual earnings average for the sector is just over $40,000, slightly below the state average. Earnings ranged from an average $79, 300 in public relations to $25,300 in studio photography. Both of these activities were growth areas in the 2002 to 2008 period. Among other growth areas; marketing consulting averaged $42,200, media specialty firms averaged $56,700 and display advertising averaged $61,900.

The marketing and related activities group is a very competitive business from both a creative and business development perspective. Since geography is less of an advantage in these activities, Hawaii companies in the marketing and related group must continuously show that their creativity and knowledge of the Hawaii product outweighs the greater reach and possible economies held by nationwide advertising and related firms.

Business consulting

Business consulting was a thriving activity over the 2002 to 2008 period with 4,300 jobs in 2008, up 27% from 2002. This was more than twice the growth rate of Hawaii's overall job count and exceeded the growth rate for business consulting nationally. As a result, the industry group absorbed competitive national industry share.

Management and Environmental consulting are the two largest components of the business consulting industry group, accounting for about two-thirds of the group's jobs. Management consulting was also the fastest growing activity in the group, with a jobs growth of nearly 98% for the period. Technical consulting services, grew 36% in jobs over the period while process and logistical consulting showed the only decline, losing nearly 54% of its workforce over the period. The reason for this decline is not clear and it is possible that the decline may have resulted from some companies changing their NAICS classification over the period to another consulting specialty.

The annual earnings average for business consulting was more than $52,900. This ranged from $62,700 among management consulting firms to $40,000 for technical consulting firms.

Publishing and Information

As a whole, publishing and information showed a 2% decline in jobs from 2002 to 2008, about the same as for the nation as a whole. The industry group is dominated by newspaper publishing, which accounted for two-thirds of the industry group's jobs in 2008. Newspaper publishing showed a 6% decline in jobs over the period, but this was considerably below the 11% decline nationally. The rise of the internet as a source of information is certainly a major factor in the decline of traditional publishing. In Hawaii internet publishing and broadcasting increased jobs by more than 150% from 2002 to 2008. However, this is fewer than half of the jobs than were *lost* in newspaper publishing.

Some traditional publishing activities showed healthy growth during the period. Directory and mailing list publishers, periodical publishers and book publishers in Hawaii all added jobs at a rate faster than the economy as a whole and even faster than the same activities nationally.

The annual earnings average for publishing and information in Hawaii was $63,200 in 2008. This ranged from an exceptionally high $172,300 for directory and mailing list publishing firms, to $38,800 for jobs among web search portal firms. The newspaper publishing earnings average was $57,300 in 2008, while the average for internet broadcasting was $50,700.

Cultural Activities

The cultural activities industry group accounted for 2,300 jobs in 2008 and included museums, historical sites, zoos, botanical gardens and grant making foundations. As a group, cultural activities registered a 15% increase in jobs over the 2002 to 2008 period, slightly better than the state's economy as a whole and faster than the same set of activities nationally. As a result the cultural industry group gained some competitive national industry share.

The annual earnings average for the cultural activities group was $45,600 in 2008. This ranged from $67,500 for grant making establishments to $24,000 for historical sites.

Architecture

Architecture is one of the more visible examples of the creative sector. In particular, a unique style of Hawaiian architecture has developed over the last several decades, weaving themes from old and new Hawaii into designs suited for the state's climate and life style. More recently, architecture has become a leading source of creativity in addressing the need to conserve energy and provide for alternate energy sources in Hawaii's residential and commercial structures.

Architecture employed an estimate 2,300 people in 2008, up about 10 percent from 2002. This is below the average growth for the state's workforce as a whole and below the growth rate for the architecture industry nationally. Most of the industry group jobs, about 83%, were among structural architectural services, while the remainder of the jobs were in landscape architecture. Landscape architecture registered very strong growth in the 2002 to 2008 period, with a 41% increase in jobs.

The annual earnings average in architecture was $64,100 in 2008 with structural architecture at $67,300 and landscape architecture averaging $49,200; both activities over the statewide average.

Design Services

Design Services employed about 1,500 people in 2008.. About 59% of these jobs were among graphic design firms, while another 38% were in interior design. Specialty design service activity accounted for a tiny 4% of the group's total jobs, but was the fastest growing of the three activities in the group.

Overall jobs grew by 28% in the design industry group. Interior design jobs grew 31% while graphic design jobs grew 20%. Specialty design jobs increased by 400% over the period but amounts to fewer than 60 jobs and the growth may reflect some reporting changes. Still this will be an activity to watch in the coming years to see if forward growth is sustained.

The annual earnings average for the design group was $42,100 in 2008. Graphic design had the lowest average at $31,200 followed by interior design at an average of $51,500. The highest paying were the small specialty design activities, registering a high, $113,600 average.

Radio & TV Broadcasting

Like publishing, broadcasting has been impacted by the rise of the internet as an information and entertainment alternative. Radio and TV broadcasting shrank by 2% to about 1,360 jobs over the 2002 to 2008 period. Nationally, the industry group did only marginally better, managing a one-half percent growth in jobs. Television broadcasting lost nearly 4% of its workforce over the period to just under 690 jobs in 2008. Radio stations stayed about the same over the period with about 510 jobs. Radio networks, the only other activity in the industry group also stayed the same at just under 170 jobs.

The annual earnings average for broadcasting was $52,400 in 2008. This ranged from $69,200 for television to $43,400 for radio stations.

Film, TV, and Video Production

Film and television production in Hawaii has been an important contributor to both jobs and income in the state, as well as to the visitor industry, through the worldwide exposure these productions have enjoyed. As Table 23 shows, the film industry generated $146 million in Hawaii-based production expenditures for 2008 by preliminary estimate. This was down from the exceptionally high total of $229 million for 2008 and about the same as the beginning of the base period in 2002.

TABLE 23.

Film, TV and Video Production Employment and Expenditures, 2002-2008							
	2002	2003	2004	2005	2006	2007	2008
Employment	1,500	1,188	1,635	1,605	1,227	1,233	1,231
Expenditures in Hawaii	$147 mil	$84 mil	$164 mil	$117 mil	$140 mil	$229 mil	$146 mil

Sources: Expenditures; Hawaii Film Office. Employment; DBEDT Research & Economic Analysis Division.

Unfortunately, the NAICS industries for film and TV production do not include creative and business services beyond the direct production jobs and certain production support services. As a result the employment data represent only the core jobs in an industry. According to the State film office the industry as a whole may include up to 4,000 to 5,000 jobs in the state. Other sources of industry

jobs such as actors, musicians, writers, food service and other specialties are compiled in statistics for other NAICS industries, which do not differentiate film/TV projects from other activity.

The jobs in film and TV production that can be readily counted are shown in Table 24.

TABLE_24. FILM & TV PRODUCTION INDUSTRY PERFORMANCE, 2002 TO 2008

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
Film, TV, Video Production	**1,500**	**1,231**	**-17.9%**	**2.0%**	**$ 33,793**	**$ 81,256**	**-1.7%**	**0.73**	**-0.22**
Motion picture and video production	1,447	1,155	**-20.2%**	**11.5%**	$ 33,138	$ 79,808	-3.6%	1.09	**-0.50**
Teleproduction and postproduction services	8	33	**312.5%**	**7.3%**	$ 48,624	$ 94,251	41.3%	0.39	**0.28**
Cable and other subscription programming	21	32	**52.4%**	**-5.5%**	$ 45,207	$ 85,340	8.3%	0.07	**0.03**
Motion picture and video distribution	24	11	**-54.2%**	**-22.5%**	$ 24,863	$ 116,169	-6.1%	0.27	**-0.21**

These represent jobs among Hawaii companies and enterprises involved in the direct production of Hawaii film and TV products. Direct film and TV production activity involved about 1,200 jobs in 2008, down about 18% from 2002. Some gains were made over the period in the development of programming for cable and subscription distribution and in teleproductions and post production services. But these gains could not counter the more than 20% decline in motion picture and video production jobs. Nationally, this group showed a 2% increase in jobs over the period, with motion picture and TV production showing a nearly 12% gain in jobs.

However, volatility in year to year film production employment is a major factor clouding the long term trend. For instance, if 2003 were used as a base for measurement when the industry had just 1,188 jobs, the industry group would show and overall gain in jobs by 2008. Likewise, the high point for employment in the 2002 to 2008 period was 1,635 jobs in 2004, more than 30% over the 2008 count. Thus, the combination of limited data and exceptional volatility from year to year make this a very difficult industry to assess over a short period of time.

The production side of film and TV activity is also on the lower end of the earnings scale compared to other creative industries. The annual earnings average for the group as a whole was $33,800 in 2008, more than $10,000 under the state average and less than the national average for the industry group. The highest earnings average was in teleproductions and post production services at $48,600. The lowest earnings were in film production at an average $33,100 for 2008. This low average may reflect less than full time employment among jobs in the industry.

Music

Hawaii has always had a unique music arts culture based on Hawaiian heritage, but it has expanded to embrace trends in music worldwide. The range of talented musicians in Hawaii has been an important attraction for visitors as well as a staple of the island's culture. Until the digital age, the problem of taking Hawaii's unique music to the world at large had been the difficulties of breaking into a national recording industry that was mainstream oriented and the high investment cost of producing and distributing recorded music without the backing of major music labels. The dynamics changed with the digital age, which has made production of high quality recording affordable to individual artists and a new distribution system that allows artists to promote their music through the internet and music downloading services. A major breakthrough in promoting Hawaiian music was made several years ago with the establishment of a special Grammy Awards category devoted to the genre.

There were about 1,100 employed and self employed workers in Hawaii's music industry in 2008, most of them performers. As Table 25 shows, employment in Hawaii's music industry showed modest growth over the 2002 to 2008 period, increasing nearly 6% overall. By contrast, jobs in this industry group nationally shrank by 3%.

TABLE_25. EMPLOYMENT IN HAWAII'S MUSIC INDUSTRY GROUP

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
Music	**1,048**	**1,106**	**5.5%**	**-2.5%**	**$ 26,229**	**$ 37,505**	**1.3%**	**1.69**	**0.06**
Musical groups and artists	793	848	**6.9%**	**2.3%**	$ 27,473	$ 38,184	0.7%	3.03	**0.00**
Musical instrument and supplies stores	158	143	**-9.5%**	**-5.3%**	$ 26,389	$ 29,341	-0.4%	0.71	**-0.07**
Sound recording studios	40	49	**22.5%**	**-8.4%**	$ 14,559	$ 28,942	6.8%	0.83	**0.18**
Integrated record production and distribution	43	42	**-2.3%**	**-13.2%**	$ 18,831	$ 72,763	2.8%	1.49	**0.11**
Record production	3	12	**300.0%**	**7.3%**	$ 20,429	$ 78,209	29.3%	0.69	**0.50**
Other sound recording industries	8	10	**25.0%**	**-30.9%**	$ 13,934	$ 33,009	12.7%	0.36	**0.15**
Music publishers	3	2	**-33.3%**	**30.8%**	$ 24,863	$ 47,152	-7.5%	0.05	**-0.05**

The centerpiece of this industry group, musical groups and artists grew by about 7%. Sound recording studios also showed some increase, although the small size of the activity makes the changes in that and the other activities difficult to interpret. Retail activity devoted to musical instruments and supplies showed a small decline in jobs.

Annual earnings in the music industry reflect generally part-time professions. The average for the industry group as a whole was $26,200 in 2008. Earnings for the same industry groups nationally are higher than in Hawaii, but generally below the average for the economy, except for record production.

Arts Education

Arts education -- music, theater, dance, visual and literary – are pervasive in public and private elementary and secondary schools, and in institutions of higher education. Within the public sector the size and trends in arts are difficult to discern due to a lack of information. However, in the private sector there are more than 40 small establishments and numerous self employed educators in the state specializing in various forms of arts education. The total number of persons engaged in this small industry was nearly 290 in 2008, up about 19% from 2002. These activities grew faster (31%) at the national level for the period. Average annual earnings amounted to only $13,190 for Hawaii in 2008 and just $15,000 at the national level. This suggests that part time work is the norm in the industry.

Until more can be learned about the extent and trends in education serving the arts and other creative disciplines, this small industry may serve as a barometer for interest in education supporting the creative sector.

AGRICULTURE SECTOR

In an effort to establish a measure of agriculture for this study, DBEDT consulted with staff in the State Department of Agriculture and the UH College of Tropical Agriculture (CTAHR).[11] Based on a NAICS-definition of agribusiness developed by the US department of Agriculture, the updated definition includes three major components; direct agricultural production, closely related industries such as food processing and peripherally related industries such as wholesale and retail grocery activity. Some related sectors in food retailing and food service will also be part of the updated definition of this sector. However, those related activities are not within the scope of the target industry portfolio so were not included for this analysis.

Table 26 shows that farming and closely related activities accounted for almost 22,400 jobs in 2008. Production of crops and livestock on farms and food processing accounted for 83% of these jobs. The 2008 job total was down 11% or 2,600 jobs from the 2002 total.

TABLE 26. AGRICULTURE PRODUCTION AND CLOSELY RELATED JOB GROWTH, 2002-2008

	Jobs				Ave Earnings 2008		Competitive Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
FARMING & CLOSELY RELATED ACTIVITIES	**25,021**	**22,375**	**-10.6%**	**-3.1%**	**$ 32,464**	**$ 34,050**	**-1.3%**	**0.82**	**-0.11**
Farm Production	13,861	12,235	-11.7%	-4.8%	$ 26,227	$ 19,808	-1.2%	0.79	-0.10
Agricultural Processing	6,825	6,462	-5.3%	-2.9%	$ 43,727	$ 56,635	-0.4%	0.92	-0.07
Fishing	2,331	1,497	-35.8%	-20.3%	$ 21,955	$ 22,970	-3.5%	4.03	-1.20
Farm Production & Support Serv.	1,002	1,248	24.6%	11.6%	$ 33,569	$ 44,244	1.9%	0.55	0.03
Agric Input Materials and Serv.	443	414	-6.5%	-0.8%	$ 48,878	$ 60,594	-0.9%	0.37	-0.04
Packaging & Warehousing	342	197	-42.4%	-0.6%	$ 78,231	$ 50,839	-5.5%	0.25	-0.20
Aquculture	144	221	53.5%	1.0%	$ 39,882	$ 28,957	8.5%	7.93	2.48
Forestry & hunting	73	101	38.4%	2.5%	$ 36,784	$ 37,474	46.3%	0.77	0.17

Source: DBEDT September 2009

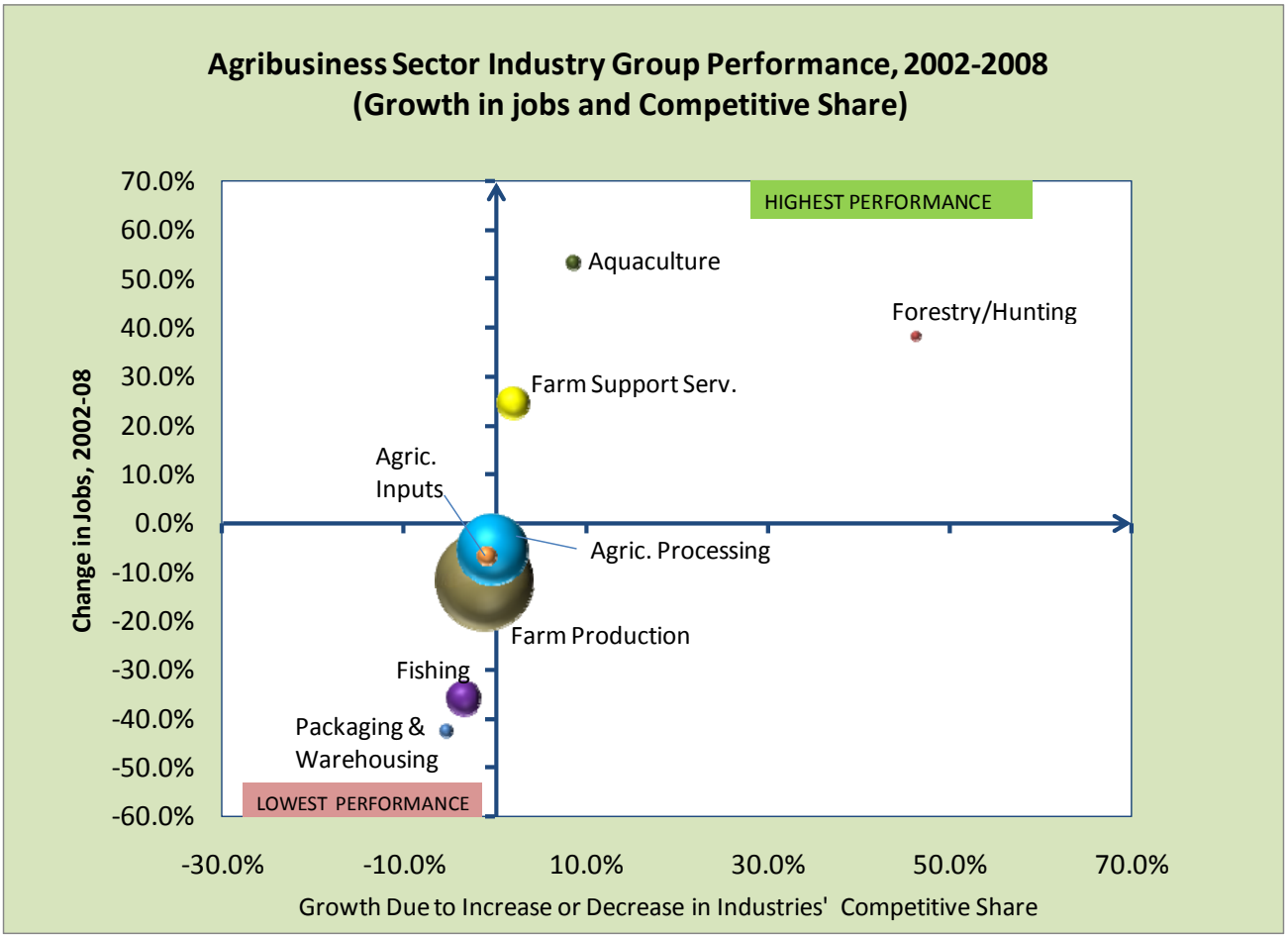
The comparable U.S. agricultural sector also experienced a decline over the period but at a less severe, 3.1% drop. Of the major agricultural producing groups, fishing and farm production experienced the greatest declines in jobs, down 36% and 12% respectively. The ancillary services of packaging/warehousing and agricultural input materials also experienced a sharp decline during the period.

Agricultural production shows less concentration in Hawaii than nationally in most activities. This would indicate that on the whole, Hawaii depends on imports of agriculture to meet its needs. The clear exceptions are aquaculture and fishing which are significantly more concentrated in Hawaii. Average earnings in the agricultural sector were below the Hawaii average, but more than for the sector nationally.

Figure 14 shows the performance map for the agricultural activities in Table 26. Most of the major activities experienced declines in both jobs and competitive national market share in the 2002 to 2008 period. The brightest spots in the sector were aquaculture with jobs up 54% over the period, forestry and hunting up 38% and farm production/support services, up 25%.

[11] A previous definition of agribusiness had been developed by CTAHR based on the Standard Industrial Code (SIC) system, but made obsolete with the change to the NAICS system.

FIGURE 14.

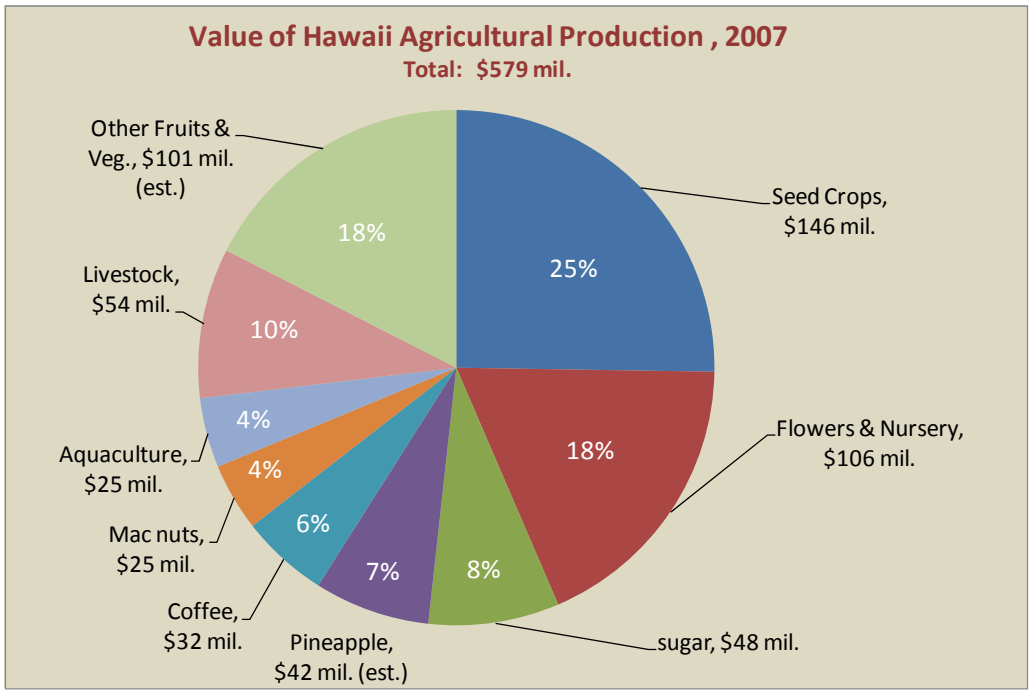


Farming and Aquaculture

Traditionally, Hawaii agriculture has been separated into two major components -- a larger plantation agricultural system (sugar and pineapple growing) and a diversified agricultural component. However, with the decline of sugar and pineapple activity to relatively modest proportions of the agricultural sector, this division is probably obsolete. Unfortunately, a breakdown of employment in farm production by the major products and specialties is not readily available. However, the Hawaii Department of Agriculture compiles data on the dollar value of output for crop and livestock specialties. This data provides some sense of the current proportions among Hawaii's major agricultural specialties.

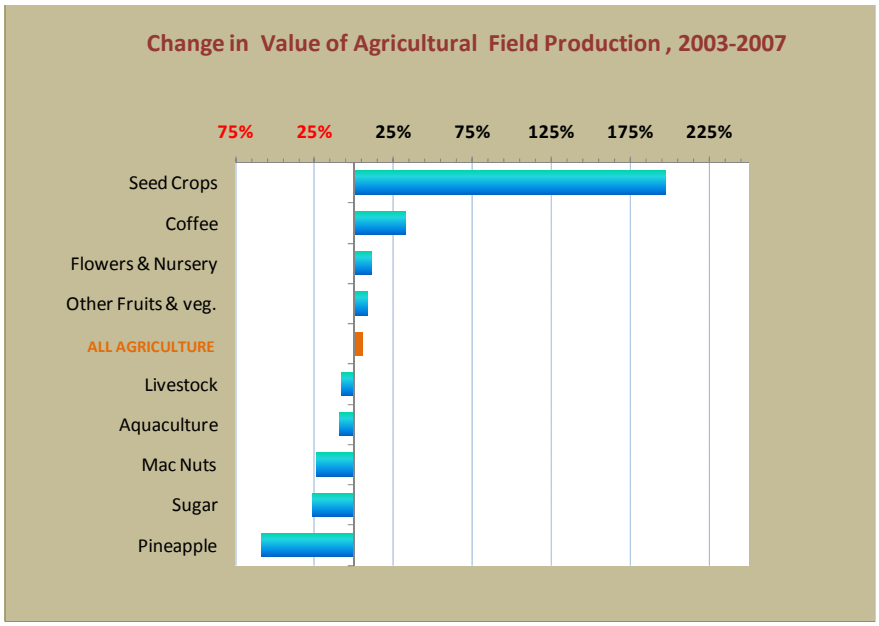
Figure 15 summarizes the value of activity by major activity in 2007 (the latest complete year for data). The total value of farming and aquaculture was nearly $580 million in 2007. The most prominent activity in agriculture in terms of value is now seed crop production (25% by value), followed by flowers and nursery products (18%). Combined sugar and pineapple production account for only 15% of agricultural production measured by field value.

FIGURE 15.



In contrast to the general decline in jobs, farm revenues from major agricultural products in Hawaii saw an overall 7% increase during the period of 2003 to 2007 in current dollar value (Figure 16).[12] The increase was primarily driven by higher value of output for seed crops, coffee, flowers and nursery products, and selected fruits and vegetables (excluding pineapples). Revenues from pineapple and unprocessed sugarcane have seen significant declines in recent years as both industries have continued their trend of long-term contraction.

FIGURE 16.



By contrast, the value of seed crops in Hawaii's agricultural sector experienced explosive growth in recent years. The latest data shows that the value of seed crops was nearly $177 million in the 2008-09 growing year just ended.

Agricultural Processing

Historically, food processing has been a large portion of the agricultural sector because of the canning of pineapple and processing of sugar cane into raw sugar for out shipment. As those two activities have contracted, so has the proportion of processing.

[12] If inflation were to be taken into account the real value of agricultural output would have likely shown a modest decline over the period.

As Table 27 shows, the number of food processing jobs shrunk by more than 5% over the 2002 to 2008 period. The most significant declines among major products were in fruit and vegetable canning, which reflects the decline of pineapple processing. Losses were also experienced among bakeries, soft drink bottling, milk processing, frozen deserts and of course, sugar cane processing.

TABLE 27. FOOD PROCESSING AND RELATED JOB GROWTH, 2002-2008

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
FOOD PROCESSING	**6,825**	**6,462**	**-5.3%**	**-2.9%**	**$ 43,727**	**$ 56,635**	**-0.4%**	**0.92**	**-0.06**
Perishable prepared food manufacturing	942	941	**-0.1%**	**43.2%**	$ 28,505	$ 35,517	-5.8%	5.53	**-2.74**
Commercial bakeries	928	780	**-15.9%**	**-7.5%**	$ 37,085	$ 48,490	-1.2%	1.26	**-0.19**
Fruit and vegetable canning	932	524	**-43.8%**	**-5.4%**	$ 34,385	$ 54,778	-7.8%	1.66	**-1.26**
Confectionery mfg. from purchased chocolate	413	458	**10.9%**	**-16.0%**	$ 35,661	$ 43,119	4.6%	2.83	**0.59**
Meat processed from carcasses	222	451	**103.2%**	**2.0%**	$ 37,320	$ 45,199	18.1%	0.87	**0.41**
Soft drink manufacturing	488	406	**-16.8%**	**-6.1%**	$ 81,330	$ 68,458	-1.4%	1.07	**-0.19**
Coffee and tea manufacturing	367	384	**4.6%**	**19.8%**	$ 43,650	$ 104,487	-2.2%	5.11	**-0.99**
Sugarcane mills	403	369	**-8.4%**	**-28.4%**	$ 93,226	$ 84,973	3.7%	23.55	**4.35**
Cookie and cracker manufacturing	135	339	**151.1%**	**-12.7%**	$ 28,745	$ 51,071	19.5%	2.25	**1.43**
Other snack food manufacturing	98	282	**187.8%**	**-5.2%**	$ 31,284	$ 57,921	58.4%	1.76	**1.15**
Bottled water manufacturing	141	248	**75.9%**	**-12.1%**	$ 48,559	$ 60,365	15.2%	3.30	**1.58**
Fluid milk manufacturing	257	211	**-17.9%**	**-2.6%**	$ 66,474	$ 69,409	-1.6%	0.83	**-0.20**
Ice manufacturing	36	196	**444.4%**	**7.9%**	$ 44,640	$ 37,498	51.6%	5.01	**3.97**
Ice cream and frozen dessert manufacturing	176	150	**-14.8%**	**-14.3%**	$ 75,584	$ 59,289	1.0%	1.62	**-0.08**
All other food manufacturing	1,287	723	**-43.8%**	**-2.2%**	$ 36,956	$ 58,231	-8.2%	0.18	**-0.15**

There were areas of job gain in food processing, including cookies and snacks, meats, coffee, bottled water, and confectionaries. Food processing in Hawaii showed strongest industry concentrations in sugar, prepared foods, coffee, bottled water, and confectionary products among others. Notable increases in Hawaii's competitive share of the national market for food processing were found in bottled water, cookies, meats, and confectionaries. Sugarcane showed a technical increase in competitive share due to the more rapid decline of the activity nationally. Ice manufacturing, which is mainly an input into food processing and storage, showed an increase in jobs, competitiveness and concentration but the reasons are unclear.

HEALTH & WELLNESS

The emergence of health-and-wellness related activities as an economic development prospect for Hawaii is rooted in the notion that the Islands have both cultural and technological advantages as a place for healing and improving health. The ideas for development have ranged from medical tourism such as for surgeries and sophisticated medical treatment, to rest and rejuvenation through spas and self improvement services. In 1995 the UH School of Travel Industry Management proposed that a health-related segment of tourism could be developed around medical care (treatment), fitness and wellness (preventative), and rehabilitation/recuperation services (post-treatment). The potential market was thought to be upper income individuals in the Asia-Pacific region and aging baby boomers in the U.S. It is not clear how many visitors come to Hawaii for medical, wellness or recuperative services, although visitors do utilize such services while in Hawaii.

Another potential market would be military service personnel, whose expenditures are highly subsidized by defense dollars. Of course, the military has its own array of health facilities and it is not clear how much outsourcing of military health-related services is done.

In order to track the potential growth of the health and wellness sector, DBEDT has utilized a definition of the sector developed by the County of Kauai for its 2005 Comprehensive Economic Development Strategy. This definition captures the major components of the health care delivery system from hospitals to home health care services.

As Table 28 shows, the sector had more than 51,000 workers in 2008, up 11% from 2002. This was slightly less growth than for the Hawaii job count as a whole and also below the U.S. increase of 14%. As a result, Hawaii showed a very slight decline in national competitive share. The sector was also slightly less concentrated in Hawaii than at the national level.

TABLE 28. HEALTH AND WELLNESS JOBS AND GROWTH, 2002-2008

	Jobs				Ave Earnings 2008		Performance Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
HEALTH & WELLNESS	**46,248**	**51,346**	**11.0%**	**14.4%**	**$ 57,697**	**$ 54,182**	**-0.5%**	**0.8**	**-0.1**
Health Practitioners	20,277	19,907	-1.8%	15.0%	$ 63,921	$ 67,262	-2.6%	1.0	-0.2
Hospitals & Nursing Facilities	17,015	18,874	10.9%	8.9%	$ 60,295	$ 51,252	0.4%	0.7	0.0
Specialty Health Care Services	3,954	6,909	74.7%	38.8%	$ 43,803	$ 36,648	4.6%	0.8	0.1
Pharmacies	3,655	3,961	8.4%	9.3%	$ 39,330	$ 39,205	-0.1%	1.2	-0.1
Medical Labs and Imaging Centers	1,347	1,482	25.8%	22.5%	$ 55,240	$ 62,530	0.5%	1.5	0.0

Health practitioners and health faculties accounted for nearly 80% of the total jobs in the sector. The fastest growing industry group was specialty health care, which posted a 75% increase in jobs for the period. Medical labs also grew well over the average for the economy as a whole. This activity also showed a higher concentration in Hawaii's economy than nationally.

The average earnings for the sector ranged from $39,300 for pharmacies to $63,900 for the offices of health practitioners. Average earnings exceeded the national average significantly for hospitals and nursing facilities, and specialty health care services.

EDUCATION

The potential export of educational services has also been of interest to the state and educational community over the years. Based on its mid-Pacific location Hawaii has been a proven magnet for Asian and Pacific educational activity including the prestigious East-West Center and Japan-America Institute of Management Science (JAIMS), among many others. In a recent survey, DBEDT found that international students and their dependents spent $160 million in Hawai'i during the 2008-2009 academic year.

Jobs in public sector colleges and universities are difficult to separate from other government employment. As a result, state-national comparisons of employment in public education are not readily available. The most readily available data for education activity reflects private sector colleges and specialty schools. Unfortunately, there is no information on the portion of these activities that represent educational exports. Thus, until better data can be compiled, private sector enrollment in post-secondary and specialty education will need to suffice as an indicator of educational services demand.

Table 29 shows the performance of private higher and specialty education over the 2002 to 2008 period. In Hawaii, education programs for sports, management training, arts and language ac-

count for about 60% of specialty education jobs. At the national level, higher and specialty education grew faster than the economy as a whole, particularly specialty education. Hawaii's private higher and specialty education performed well below the national level, with higher education employment contracting by about 3% and specialty education growing 3%. These two areas of education also showed lower concentration in Hawaii than nationally.

TABLE 29. PRIVATE EDUCATION JOBS AND GROWTH, 2002-2008

	Jobs				Ave Earnings 2008		Competitive Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
Group/Industry	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
EDUCATION (PVT)	**7,658**	**7,581**	**-1.0%**	**20.8%**	**$ 32,472**	**39,240**	**-3.3%**	**0.62**	**-0.17**
Higher Education	5,248	5,095	-2.9%	16.7%	$ 33,626	$ 42,148	-3.0%	0.55	-0.14
Specialty Education	2,410	2,486	3.2%	35.5%	$ 30,107	$ 30,147	-4.6%	0.84	-0.31

Source: DBEDT June 2009

Of course, since this data represent a significant proportion of resident students, the amount of exported education is not clear. Also, post secondary education is often a counter cyclical sector. That is, it tends to attract more students when the rest of the economy is doing poorly and jobs are scarce and shows more modest growth when other industries are expanding and workers are in demand. Clearly, major improvements in the collection of data on educational exports is needed before the performance of this targeted industry group can be properly evaluated.

OTHER TARGETS AND POTENTIAL HIGH GROWTH ACTIVITIES

A number of more specialized activities remain to be examined, beginning with the more measureable in terms of NAICS data and progressing to the least measurable such as captive insurance and regional headquarters.

Garments and Call Centers

Aloha/Hawaiian wear have been staples of visitor purchases since the tourism market began. In 2008 it is estimated that visitors spent nearly $704 million on clothing and accessories. Decades ago it was hoped that the visitor market for Aloha attire could sustain an ongoing garment manufacturing industry. Certainly, visitors prefer to see made-in-Hawaii labels on the Aloha shirts and dresses they purchase. Nevertheless, over the years more and more of the Aloha attire sold in Hawaii has been outsourced to lower cost production areas. The labels on many aloha garments state that they are designed in Hawaii, but show the manufacturing locations to be Korea, Singapore, Thailand, and Sri Lanka, among others. Still, some high-profile producers continue to manufacture exclusively in Hawaii while others locally manufacture a portion of their lines.

As Table 30 shows, garment manufacturing in Hawaii employed around 1,200 workers in 2008, down from 1,800 in 2002. Nevertheless, Hawaii's garment industry, while small compared to other industries in the local economy is actually more concentrated than the same industry nationally. This is probably the result of some strength in Hawaii's specialized garment market and the cost-driven decline in U.S. garment manufacturing over the years. Over the 2002 to 2008 period, both Hawaii and the U.S. sustained about a 36% decline in garment industry jobs over the period. However, the considerably lower level of average earnings in Hawaii ($23,800) compared the national industry ($42,100) suggest that Hawaii's manufacturing of garments involves more part-time and piece work jobs.

TABLE 30. GARMENT MANUFACTURING AND CALL CENTERS, JOBS AND GROWTH, 2002-2008

Group/Industry	Jobs				Ave Earnings 2008		Competitive Metrics		
	Hawaii		Percent change				Compet Share	Industry Concentration (Loc Quotient)	
	2002	2008	Hawaii 2002-08	U.S. 2002-08	Hawaii	U.S.	2002-08	2008	Change 2002-08
GARMENT MANUFACTURING	1,809	1,165	-35.6%	-36.3%	$ 23,798	42,088	0.2%	1.21	-0.04
CALL CENTERS	223	435	95.1%	14.3%	$ 16,726	$ 31,634	13.8%	0.21	0.08

Source: DBEDT June 2009

Table 30 also documents the sharp increase in the relatively small call center industry. The growth of this activity has centered on telemarketing which can involve either the selling and promotion of products, or assistance to customers such as product support. It is unclear which facet of the industry is responsible for the growth. It is also possible that some of this growth represents the outsourcing or divesting of call center and product support functions that were within some larger companies and not reported separately under the call center industry codes. This means that there may have been job declines of similar magnitudes in the divesting industries that matched the job gains in the call center industry.

Most of the growth in call centers was achieved in 2003 and 2004, reaching a peak of nearly 490 jobs. Since then, the activity has declined somewhat to its current level. The average earnings in the industry are only about half the average earnings nationally, at around $16,700. This suggests predominantly part-time employment. Even with the sharp increase in employment, the industry has a very low concentration in Hawaii's economy compared to the activity nationally.

Manufactured Housing

Due to the high cost of custom home building in Hawaii, the local, factory manufacture of homes that could be transported to building sites has been suggested over the years as a way to cut housing costs. However, between 2002 and 2008 no jobs were recorded in NAICS categories for manufactured homes and fewer than 40 jobs were estimated in the manufacture of prefabricated wood buildings in 2008. While the reasons why no such activity has emerged in one of the most costly states for housing would be interesting to know, for the purposes of this report, there is essentially no such industry to measure.

Captive insurance

Captive insurance is a very complex area of insurance activity that essentially permits a company, usually with diverse business interests and establishments, to form an insurance company that will provide the insurance needs of the related businesses. It is called a "captive" insurance company mainly because it is owned by its primary client. There are cost and tax advantages of such arrangements. Due to the complexities of this activity, the subsidiary captive insurance company usually outsources its day-to-day operations to an experienced insurance company. Hawaii is one of the leading domiciles for captive insurance companies nationally and internationally because of favorable laws and regulations designed to attract them. For 2007, the Hawaii Insurance Commissioner reported 163 active captive insurance licenses in the state (second greatest number of licenses nationally) with combined assets of about $6.8 billion. The investment of these companies in Hawaii was nearly $1.2 billion in that year. The Insurance Commissioner reports that new licenses have declined in recent years due to lower prices for commercial insurance and competition from other states.

The impact of captive insures on jobs and income in Hawaii is difficult to measure. Captive insurance companies themselves apparently have very few employees. NAICS data for insurance companies does not isolate captive insurance companies, although since those companies probably outsource most of their activity, the data would not reflect the actual size of captive insurance activity.

Due to the unique nature of this activity it will require some concentrated research to flesh out the magnitude, economic impacts and future prospects of this industry.

Specialty Tourism

Specialty or Niche tourism represents an effort to increase the stability and value of tourism for Hawaii by diversifying the visitor base into nontraditional areas of tourism that may be experiencing increasing interest and demand. Often referred to as "niche tourism" developing such markets can help fill in seasonal or cyclical lows in tourist activity or provide higher than average return per visitor.

Table 31 shows the specialty or niche markets for which the Hawaii Tourism Authority is able to collect periodic data. The largest specialty market in 2008 was Honeymoons/Weddings, followed by cruise visitors and conventioneers.

TABLE 31. SPECIALTY TOURISM

Specialty Market	2006		2007		2008	
	Number	% change	Number	% change	Number	% change
Honeymoon/Weddings	637,000	11%	627,000	-2%	577,000	-8%
Cruise	416,000	31%	503,000	21%	267,000	-47%
Conventions:	318,000	-12%	279,000	-13%	254,000	-9%
Sports events	144,000	na	114,000	0%	112,000	-2%
Cultural events	44,000	na	35,000	-21%	32,000	-9%
All Visitors	**7,528,106**	**1.5%**	**7,496,820**	**-0.4%**	**6,713,436**	**-10.4%**

Because tourism is a series of markets, there are no pure producing industries for tourist products in the NAICS system. Instead the tourism markets are served by a number of industries that devote some or most of their output to tourism, such as accommodations, transportation, amusement & recreation and eating & drinking. Surveys help researchers to associate total visitors and visitor spending to the producing industries, but sub-markets in tourism are more difficult to address. Many visitors may fall into two or more of these specialty markets rather than just only one.

Most specialty tourism markets appear to have reached their cyclical peak growth for arrivals in 2006 with only one major specialty market, cruises, showing growth in 2007. By 2008 all markets had been impacted negatively by the recession although, except for the cruise market, not quite as negatively as tourism arrivals overall in that year.

There are two other specialty tourism markets that have been the subject of some development recently. These are agricultural tourism (agri-tourism) and technology tourism (techno-tourism). These have yet to be well defined or measured in terms of visitor numbers and profiles. At this point they appear to be a growing set of supply side attractions vying for a share of the overall visitor market.

Hopefully, there will be more effort to define and measure the markets for such attractions in the future.

Stock Exchange, Regional Headquarters and Recycling/Remanufacturing

Efforts to establish a Honolulu Stock Exchange pursued first in the 1970s have been unsuccessful. Efforts to attract major national and international companies to establish Pacific regional headquarters in Hawaii may have produced some results but due to the nature of this activity there are no statistics to help estimate the magnitude of this.

Economic activity based on recycling and remanufacturing of recycled materials is difficult to assess. Recycling has become a more prominent activity in recent years with the HI-5 deposit program and Honolulu's trash recycling program. Unfortunately there is only fragmented information on the jobs sustained by recycling and re-manufacturing activity and no assessment of the economic development potential of this industry can be made until further research is possible.

Other Potential High-Growth Activities

As indicated earlier in the report, the study looked at the performance of industry groups outside the targets and tourism-related sectors to identify any that might be sources of growth that have been otherwise overlooked. The results indicate that the vast majority of growth activities outside of tourism were accounted for within the targeted industry portfolio. There were, however, some smaller activities in selected areas that were contributing to growth, particularly as import replacement activities. Those industry groups are shown in Table 32.

TABLE 32. ADDITIONAL INDUSTRIES SHOWING EXCEPTIONAL PERFORMANCE

Industry Group	Industry Focus	Total Jobs 2002	Total Jobs 2008	Growth 2002-2008	2008 LQ	Competitive Growth %	2009 Ave. Earnings
Ship/boat, building/repair	Mostly repair & maint.	562	733	30.4%	1.00	3.9%	$ 82,677
Electronic shopping/mail-order	Mostly self-empl selling	531	711	33.9%	0.42	0.9%	$ 14,569
Household & institutional furn. mfg.	Cabinets/wood furn.	453	571	26.0%	0.38	7.9%	$ 51,280
Plywood and wood product mfg.	Roof Trusses	213	393	84.5%	0.84	14.4%	$ 31,996
Architectural & struct. metals mfg.	Doors/windows/bldg compon.	217	335	54.4%	0.17	7.2%	$ 45,675
Plastics product mfg.	Windows/shutters/boxes	216	311	44.0%	0.11	9.3%	$ 93,941
Soap, cleaners & toiletry mfg.	Soaps/fragrance/candles	63	106	68.3%	0.20	12.3%	$ 27,006

Source: DBEDT

Seven non-targeted industry groups performed to the level of emerging industries over the period. These were ship repair, on-line/mail order sales operations and a cadre of diversified manufacturing groups.

Private ship/boat building and repairing accounted for about 730 jobs in 2008, up 30% from 2002. While their concentration in the economy is about average for the U.S., they have increased their competitive share over the 2002 to 2008 period. The strong performance of ship building and repair may be due to the introduction of several large ship services after 2002. These were the inter island supper ferry and Honolulu's Barbers-Point-to-downtown ferry operation. Both of these services have been recently discontinued, so the outlook for continued growth in ship repair activities is problematic.

Electronic Shopping is a collection of mostly small and predominantly sole-proprietor operations, selling a range of goods and services on-line and by mail order. The internet has become a major market place for goods and services over the last two decades. On one hand it has displaced a portion

of physical retailing, but it has also provided a powerful way for small local businesses to market cheaply to national and even international markets. Most large retailers also sell on the internet, but there is a growing proportion of small companies that do business exclusively on the internet or utilize mail order to sell their goods. In 2008 over 700 workers were involved in exclusively online/mail order activities, an increase of 34% from 2002. More than 80% of this industry group's workforce was accounted for by self-employed or proprietors.

A number of diversified manufacturing activities serving the building sector of the economy turned in superior performances in 2002 to 2008. These included furniture, wood, metal and plastic product manufacturing. Together they accounted for 1,600 jobs in 2008, up 46% from 2002. The average earnings for the four building-oriented manufacturing activities exceeded $53,600 in 2008. These activities specialized in the manufacturing of cabinets, roof trusses, doors & windows, and related components. The high performance of these activities is probably explained by the recent construction cycle, which has now subsided. However, all of these products could have been otherwise imported. This means that the local manufacturing activities were sufficiently competitive to replace imported products with locally made products. These activities will be monitored to see how they fair in the construction downturn and if they are able to bounce back during the recovery.

Finally, another small activity that has grown impressively in recent years is the manufacturing of soap, fragrances and candles. While accounting for only about 100 paid and independent workers, the activity has increased 68% since 2002. The activity is very small, but bears monitoring and some investigation as to the nature of its markets and possible competitive advantages.

VII. CONCLUSIONS AND NEXT STEPS

The primary objective of this study was to define and benchmark Hawaii's emerging industries. To do that, industries suggested over the last several decades as potentially promising targets for growth were compiled and more sharply defined for measurement, particularly within the NAICS-producing industry system where possible.

This process resulted in a portfolio of targeted industry groups encompassing about 132,000 jobs, which was then subjected to several key performance measures. Using a framework from the field of economic development research, the performance measures were combined in a way that provided an operational definition and measure for Hawaii's *emerging industries* as well as for *base-growth, transitioning* and *declining* industries in the portfolio.

It was found that Hawaii has a range of growth activity not tied exclusively to tourism or development activity. Most of this activity was in the technology and creative sectors. Eleven activities encompassing around 28,000 jobs registered as *emerging* industry groups from 2002 to 2008, growing 21% in jobs over the period. Moreover, five growth activities with nearly 7,000 jobs qualified as *base-growth* industries, meaning that they were not only growing in national competitive industry share, but were also becoming more concentrated within Hawaii's economy than nationally. This group averaged a 42% increase in jobs over the six-year period.

Another 10 activities showed more modest performance as *transitioning* industries and accounted for around 32,000 jobs. Transitioning industries grew an average 6% over the period.

However, most jobs in the target industry portfolio, 51,000 or 39%, fell into the *declining* industry category for the period. This included 11 industry groups that experienced average job declines of about 9% over the 2002 to 2008 period.

It was stressed that the results of the analysis are simply a guide to understanding the opportunities and challenges among these industries. The time frame for measuring performance was relatively short and all of the factors that may have influenced performance over the period are not yet clear.

It is also not yet clear how much the industries of the targeted industry portfolio are contributing to the state's export base, or what are the particular state, national or international markets that are driving growth of Hawaii's emerging and base-growth activities. These questions will take more concentrated research to address, but with the industries now benchmarked for performance, the priorities for that research are clearer.

Emerging industry research beyond this benchmarking phase could logically take several directions, which could be expanded depending on the comments and needs of policy makers and stakeholders.

As indicated, information is needed on the market sectors served by industries in the portfolio beginning with the most promising, based on benchmarked performance. Understanding those markets, their dynamics and Hawaii's competitive strengths and weaknesses in serving them is important for understanding how the public sector can best help. This will involve close collaboration with the industries, relevant trade groups and county economic development organizations

A second, but closely related direction is the need to better document the linkages among portfolio industries and with industries outside of the portfolio. These linkages (also called value chains) show how the industries depend on one another as suppliers or customers and can help illuminate key

growth clusters. This effort can also help sort out which activities are primary export industries and which may be further back in the value chain that supports exports. Hawaii is one of the few states that maintains statewide and county Input-Output models, which will be invaluable in establishing these inter-industry value chains.

A third direction would focus on the occupational needs of the high performance industries in the portfolio. There are rich sources of data relating industries to their occupational needs and even the supply and demand for training in these occupational areas. Despite current levels of unemployment, the supply of skilled labor is expected to be a limiting factor in economic growth in the decades ahead as the baby boom generation retires. Even before the current recession, Hawaii was facing shortages in key areas of technology and education. Knowledge about how many new workers with what types of skills will be needed by our growth industries can be matched against the expected future labor supply to better understand how to meet economic growth needs on the educational and occupational side of the economic development equation.

Finally, for each of the preceding research directions, the emphasis should shift from a statewide to a county/island focus. State level data and performance results are really just the sum of results and interrelationships among the locations where economic activity is taking place. It is important to better understand the conditions, opportunities and challenges' facing each county's industry portfolio in order to ensure that statewide performance is maximized.

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APPENDIX: DETAILED INDUSTRY DATA

NAICS Code	Group and Industry Description	Hawaii Jobs & Earnings									Competitive Metrics			U.S. Comparables	
		2002	2003	2004	2005	2006	2007	2008	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008	Compet. Share Chng 02-08	Locat-ion Quotient (LQ)	Change in LQ 02-08	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008
	TECHNOLOGY SECTOR	**20,588**	**20,969**	**21,589**	**22,972**	**23,455**	**23,597**	**24,267**	**17.9%**	**$65,433**	**0.8%**	**0.59**	**0.00**	**12.4%**	**$92,984**
	Computer Services	**5,587**	**5,908**	**6,194**	**6,281**	**6,629**	**6,450**	**6,583**	**17.8%**	**$67,965**	**-0.3%**	**0.74**	**-0.05**	**20.2%**	**$88,821**
541512	Computer systems design services	1,662	1,978	2,249	2,490	2,758	2,552	2,661	60.1%	$73,599	3.4%	0.67	0.08	34.9%	$88,751
541513	Computer facilities management services	2,151	2,145	2,075	2,042	2,008	2,026	2,050	-4.7%	$50,563	0.0%	5.66	-0.26	-4.5%	$71,469
541511	Custom computer programming services	1,521	1,581	1,671	1,688	1,817	1,822	1,828	20.2%	$79,523	0.1%	0.47	-0.02	19.9%	$92,596
541519	Other computer related services	253	204	199	61	46	50	44	-82.6%	$57,806	-16.5%	0.07	-0.25	-18.8%	$76,666
	Engineering and Related Serivces	**4,212**	**4,376**	**4,424**	**4,513**	**4,673**	**4,814**	**4,842**	**15.0%**	**$71,649**	**0.1%**	**0.75**	**-0.03**	**14.5%**	**$78,549**
541330	Engineering services	1,938	2,026	2,159	2,174	2,280	2,359	2,342	20.9%	$79,839	0.7%	0.59	0.00	16.4%	$85,031
541310	Architectural services	1,797	1,867	1,755	1,794	1,814	1,853	1,884	4.8%	$67,291	-1.6%	1.46	-0.22	15.4%	$74,162
541320	Landscape architectural services	280	309	321	341	383	400	396	41.4%	$49,175	4.5%	1.00	0.20	8.8%	$43,318
541380	Testing laboratories	164	149	162	168	158	161	178	8.5%	$58,498	1.1%	0.25	0.00	3.0%	$72,319
541360	Geophysical surveying and mapping services	33	25	27	36	38	41	42	27.3%	$78,029	-0.9%	0.38	-0.07	44.5%	$63,864
	Technical Consulting Services	**2,980**	**2,815**	**2,911**	**3,598**	**3,423**	**3,546**	**3,760**	**26.2%**	**$52,159**	**-1.0%**	**0.66**	**-0.08**	**36.0%**	**$74,280**
541611	Administrative management consulting services	827	811	969	1,352	1,395	1,522	1,633	97.5%	$62,734	8.9%	0.54	0.18	24.9%	$83,589
541620	Environmental consulting services	1,085	951	983	1,229	1,168	1,200	1,237	14.0%	$47,745	0.3%	1.90	-0.10	14.9%	$57,840
541690	Other technical consulting services	450	492	498	610	573	572	612	36.0%	$40,003	-10.6%	0.52	-0.44	140.6%	$66,164
541614	Process and logistics consulting services	526	461	392	377	264	232	243	-53.8%	$36,207	-15.9%	0.33	-0.64	29.4%	$67,574
611420	Computer training	92	100	69	30	23	20	35	-62.0%	$38,035	-2.4%	0.32	-0.36	-23.3%	$48,140
	Research & Development Services	**2,714**	**2,947**	**3,050**	**3,252**	**3,320**	**3,356**	**3,604**	**32.8%**	**$70,946**	**2.3%**	**1.17**	**0.10**	**16.4%**	**$106,626**
541711	Bio R&D	1,020	1,137	1,263	1,458	1,570	1,465	1,595	56.4%	$53,458	2.2%	2.28	0.16	39.5%	$119,939
541712	Physical, engineering and biological research	1,157	1,291	1,300	1,334	1,307	1,396	1,520	31.4%	$92,469	2.4%	0.74	0.06	14.9%	$107,496
541720	Social science and humanities research	537	519	487	460	443	495	489	-8.9%	$61,058	0.3%	1.58	-0.05	-9.8%	$70,740
	Information and Telecommunications Technology	**2,196**	**2,046**	**2,237**	**2,278**	**2,383**	**2,333**	**2,196**	**0.0%**	**$61,301**	**-0.3%**	**0.49**	**-0.03**	**2.4%**	**$96,902**
517510	Cable and other program distribution	719	771	836	874	970	969	925	28.7%	$49,998	1.9%	1.25	0.08	15.7%	$55,495
518210	Data processing and related services	683	643	725	691	764	773	683	0.0%	$62,193	1.9%	0.48	0.02	-8.9%	$77,407
517910	Other telecommunications	198	224	280	278	240	229	227	14.6%	$108,972	6.4%	6.17	1.66	-19.7%	$107,946
518111	Internet service providers	374	234	208	184	178	173	166	-55.6%	$51,525	-7.7%	0.36	-0.30	-22.3%	$93,712
516110	Internet publishing and broadcasting	34	32	36	41	59	79	86	152.9%	$50,675	11.9%	0.35	0.15	37.1%	$92,941
511210	Software publishers	157	113	125	170	144	79	74	-52.9%	$93,039	-9.5%	0.05	-0.08	8.8%	$132,901
518112	Web search portals	31	29	27	40	28	31	35	12.9%	$38,813	-12.5%	0.19	-0.25	151.6%	$159,420
	Medical Labs and Imaging Centers	**1,347**	**1,482**	**1,535**	**1,596**	**1,625**	**1,687**	**1,695**	**25.8%**	**$55,240**	**0.5%**	**1.52**	**-0.02**	**22.5%**	**$62,530**
621511	Medical laboratories	1,310	1,431	1,479	1,549	1,577	1,636	1,625	24.0%	$54,950	1.1%	2.12	0.04	16.8%	$61,692
621512	Diagnostic imaging centers	37	51	56	47	48	51	70	89.2%	$61,975	7.4%	0.20	0.05	37.4%	$64,364
	Technology Equipment Distribution	**854**	**843**	**854**	**893**	**816**	**806**	**871**	**2.0%**	**$77,263**	**0.4%**	**0.34**	**-0.01**	**0.4%**	**$103,788**
423420	Office equipment merchant wholesalers	457	461	466	488	456	455	494	8.1%	$65,357	3.3%	0.97	0.13	-10.7%	$72,155
423450	Medical equipment merchant wholesalers	251	277	282	300	250	225	236	-6.0%	$85,284	-3.9%	0.26	-0.09	21.5%	$92,904
423430	Computer and software merchant wholesalers	146	105	106	105	110	126	141	-3.4%	$105,550	1.7%	0.12	0.00	-7.1%	$126,439
	Technology Manufacturing	**699**	**551**	**384**	**562**	**586**	**605**	**716**	**2.5%**	**$64,493**	**3.5%**	**0.08**	**0.00**	**-0.5%**	**$113,986**
	Alternate Power Generation	**153**	**139**	**24**	**46**	**49**	**48**	**96**	**-37.3%**	**$98,102**	**20.3%**	**0.20**	**-0.08**	**-16.6%**	**$186,622**
221119	Other electric power generation	148	127	24	46	39	36	96	-35.1%	$98,102	22.3%	2.02	-1.43	6.1%	$141,470
221111	Hydroelectric power generation	5	12	-	-	10	12	-	-100.0%	-	na	0.00	-0.02	-41.3%	$140,029
221113	Nuclear electric power generation	-	-	-	-	-	-	-	na	-	na	0.00	0.00	15.2%	$230,626
	Chemicals & Pharmeceutical Mfg	120	112	87	93	92	110	89	-25.8%	$69,361	-3.3%	0.05	-0.02	-2.8%	$133,033
325211	Plastics material and resin manufacturing	11	14	19	23	19	11	39	254.5%	$70,070	46.9%	0.14	0.10	-2.7%	$108,657
325414	Other biological product manufacturing	11	-	-	5	14	27	35	218.2%	$74,178	na	0.29	0.19	1.7%	$119,322
325221	Cellulosic organic fiber manufacturing	-	-	-	-	-	5	5	na	$65,547	na	0.11	0.11	-13.3%	$165,239
325320	Pesticide and other ag. chemical mfg.	19	30	5	5	5	20	5	-73.7%	$51,643	37.0%	0.07	-0.15	-20.5%	$107,835
325412	Pharmaceutical preparation manufacturing	10	20	18	18	5	5	5	-50.0%	$51,643	3.5%	0.00	0.00	-3.2%	$145,715
325311	Nitrogenous fertilizer manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-22.1%	$106,243
325312	Phosphatic fertilizer manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-5.3%	$116,048
325411	Medicinal and botanical manufacturing	69	48	45	42	49	42	-	-100.0%	-	-23.4%	0.00	-0.66	-1.1%	$130,018
325413	In-vitro diagnostic substance manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	40.6%	$104,363
	Other Technology Manufacturing	144	39	21	35	47	57	70	-51.4%	$49,974	4.4%	0.02	-0.02	-0.5%	$109,040
336413	Other aircraft parts and equipment	-	5	-	13	19	21	23	na	$38,553	na	0.05	0.05	15.7%	$75,791
334310	Audio and video equipment manufacturing	-	-	5	5	5	11	21	na	$52,676	na	0.17	0.17	-35.4%	$90,122
333319	Other commercial and service machinery mfg.	5	14	11	17	18	15	16	220.0%	$59,024	36.2%	0.06	0.04	-8.2%	$68,516
311223	Other oilseed processing	16	5	5	-	5	5	5	-68.8%	$37,814	na	0.51	-0.95	-14.5%	$51,293
333314	Optical instrument and lens manufacturing	5	5	-	-	-	5	5	0.0%	$74,362	na	0.04	0.00	-3.2%	$85,931
311221	Wet corn milling	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-3.4%	$124,235

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311222	Soybean processing	-	-	-	-	-	-	-	na	$0	na	0.00	0.00	6.9%	$80,165
325193	Ethyl alcohol manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	147.5%	$88,706
325199	All other basic organic chemical mfg.	12	5	-	-	-	-	-	-100.0%	-	na	0.00	-0.08	-0.3%	$110,801
333295	Semiconductor machinery manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-7.3%	$140,983
333311	Automatic vending machine manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-37.3%	$47,335
333313	Office machinery manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-25.1%	$106,179
333315	Photographic and photocopying equipment mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-45.2%	$116,587
334290	Other communications equipment manufacturing	106	5	-	-	-	-	-	-100.0%	-	na	0.00	-0.82	-16.0%	$88,564
335921	Fiber optic cable manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-25.0%	$94,236
336411	Aircraft manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	9.5%	$117,841
336412	Aircraft engine and engine parts mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-1.7%	$100,750
336414	Guided missile and space vehicle mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	1.2%	$217,440
336415	Space vehicle propulsion units and parts mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	20.2%	$113,718
336419	Other guided missile and space vehicle parts	-	-	-	-	-	-	-	na	-	na	0.00	0.00	7.4%	$120,429
	Medical Device Manufacturing	282	261	252	388	398	390	461	63.8%	$58,761	9.6%	0.16	0.05	4.4%	$96,628
339116	Dental laboratories	227	222	213	223	222	235	234	2.9%	$47,330	0.1%	1.02	-0.04	2.5%	$46,756
334510	Electromedical and electrotherapeutic apparatus man	34	13	15	65	71	56	112	228.2%	$67,779	59.9%	0.39	0.25	15.6%	$107,612
339115	Ophthalmic goods manufacturing	5	11	14	64	79	50	51	918.0%	$45,482	82.0%	0.35	0.31	-4.8%	$67,356
334511	Search, detection, and navigation instruments	-	-	-	5	5	15	34	na	$81,818	na	0.05	0.05	5.1%	$131,315
339113	Surgical appliance and supplies manufacturing	11	5	5	16	16	32	23	108.9%	$121,958	39.7%	0.05	0.03	1.2%	$77,617
334513	Industrial process variable instruments	-	-	-	7	3	1	4	na	$74,315	na	0.01	0.01	5.3%	$86,887
334516	Analytical laboratory instrument mfg.	-	5	-	3	2	1	3	na	$74,315	na	0.02	0.02	-3.4%	$104,239
334517	Irradiation apparatus manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	15.0%	$107,214
339111	Laboratory apparatus and furniture mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-8.6%	$77,890
339112	Surgical and medical instrument manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	7.0%	$97,044
339114	Dental equipment and supplies manufacturing	4	5	5	5	-	-	-	-100.0%	-	na	0.00	-0.06	2.9%	$67,807
	BIOTECHNOLOGY (BIO) BREAKOUT[1]	**3,050**	**3,124**	**3,296**	**3,676**	**3,834**	**3,784**	**3,927**	**28.7%**	**$55,288**	**3.0%**	**0.63**	**0.08**	**8.3%**	**$98,501**
	Agricultural Chemicals	**216**	**75**	**66**	**53**	**69**	**77**	**73**	**-66.2%**	**$32,149**	**-9.7%**	**0.14**	**-0.28**	**-2.3%**	**$106,093**
325314	Fertilizer, mixing only, manufacturing	169	35	56	48	59	47	58	-65.7%	$27,678	-0.9%	1.48	-2.92	-2.2%	$55,441
311223	Other oilseed processing	16	5	5	-	5	5	5	-68.8%	$31,005	na	0.51	-0.95	-14.5%	$51,293
325221	Cellulosic organic fiber manufacturing	-	-	-	-	-	5	5	na	$65,547	na	0.11	0.11	-13.3%	$165,239
325320	Pesticide and other ag. chemical mfg.	19	30	5	5	5	20	5	-73.7%	$51,753	37.0%	0.07	-0.15	-20.5%	$107,835
311221	Wet corn milling	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-3.4%	$124,235
311222	Soybean processing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	6.9%	$80,165
325193	Ethyl alcohol manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	147.5%	$88,706
325199	All other basic organic chemical mfg.	12	5	-	-	-	-	-	-100.0%	-	na	0.00	-0.08	-0.3%	$110,801
325311	Nitrogenous fertilizer manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-22.1%	$106,243
325312	Phosphatic fertilizer manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-5.3%	$116,048
	Drugs & Pharmaceuticals	**21**	**20**	**18**	**23**	**19**	**32**	**40**	**90.5%**	**$77,495**	**14.9%**	**0.03**	**0.01**	**-0.5%**	**$151,501**
325414	Other biological product manufacturing	11	-	-	5	14	27	35	218.2%	$74,178	na	0.29	0.19	1.7%	$119,322
325412	Pharmaceutical preparation manufacturing	10	20	18	18	5	5	5	-50.0%	$100,714	3.5%	0.00	0.00	-3.2%	$145,715
325411	Medicinal and botanical manufacturing	69	48	45	42	49	42	-	-100.0%	-	-23.4%	0.00	-0.66	-1.1%	$130,018
325413	In-vitro diagnostic substance manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	40.6%	$104,363
	Med Devices & Equipment	**282**	**261**	**252**	**378**	**393**	**362**	**346**	**22.7%**	**$64,616**	**4.5%**	**0.18**	**0.02**	**4.0%**	**$85,494**
339116	Dental laboratories	227	222	213	223	222	235	233	2.6%	$47,330	0.1%	1.02	-0.04	2.5%	$46,756
339113	Surgical appliance and supplies manufacturing	11	5	5	16	16	22	65	490.9%	$121,958	66.2%	0.15	0.13	1.2%	$77,617
334510	Electromedical and electrotherapeutic apparatus man	34	13	15	65	71	41	38	11.8%	$67,779	38.6%	0.13	-0.01	15.6%	$107,612
334516	Analytical laboratory instrument mfg.	-	5	5	5	5	5	5	na	$51,471	na	0.03	0.03	-3.4%	$104,239
339115	Ophthalmic goods manufacturing	5	11	14	64	79	59	5	0.0%	$113,785	69.3%	0.03	0.00	-4.8%	$67,356
334517	Irradiation apparatus manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	15.0%	$107,214
339111	Laboratory apparatus and furniture mfg.	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-8.6%	$77,890
339112	Surgical and medical instrument manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	7.0%	$97,044
339114	Dental equipment and supplies manufacturing	5	5	-	5	-	-	-	-100.0%	-	na	0.00	-0.07	2.9%	$67,807
	Research,Testing & Medical Labs	**2,531**	**2,768**	**2,960**	**3,222**	**3,353**	**3,313**	**3,468**	**37.0%**	**$54,588**	**2.3%**	**1.37**	**0.12**	**20.1%**	**$81,156**
621511	Medical laboratories	1,310	1,431	1,479	1,549	1,577	1,636	1,625	24.0%	$54,950	1.1%	2.12	0.04	16.8%	$61,692
541711	Bio R&D	1,020	1,137	1,263	1,458	1,570	1,465	1,595	56.4%	$53,458	2.2%	2.28	0.16	39.5%	$119,939
541380	Testing laboratories	164	149	162	168	158	161	178	8.5%	$58,498	1.1%	0.25	0.00	3.0%	$72,319
621512	Diagnostic imaging centers	37	51	56	47	48	51	70	89.2%	$61,975	7.4%	0.20	0.05	37.4%	$64,364
	CREATIVE SECTOR	**40,718**	**41,467**	**43,467**	**45,195**	**45,136**	**44,857**	**44,649**	**9.7%**	**$49,947**	**-0.7%**	**0.89**	**-0.08**	**14.1%**	**$70,179**

APPENDIX: DETAILED INDUSTRY DATA

		Hawaii Jobs & Earnings									Competitive Metrics			U.S. Comparables	
NAICS Code	Group and Industry Description	2002	2003	2004	2005	2006	2007	2008	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008	Compet. Share Chng 02-08	Locat-ion Quotient (LQ)	Change in LQ 02-08	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008
	Performing and Creative Arts	**8,523**	**8,667**	**9,243**	**9,532**	**9,182**	**8,762**	**8,531**	**0.1%**	**$14,393**	**-2.0%**	**1.29**	**-0.23**	**13.1%**	**$18,680**
711510	Independent artists, writers, and performers	6,016	6,051	6,478	6,820	6,444	6,153	6,104	1.5%	$10,423	-1.6%	1.27	-0.19	12.1%	$13,917
453920	Art dealers	836	897	936	936	891	891	822	-1.7%	$29,199	0.3%	3.05	-0.09	-3.0%	$28,077
711110	Theater companies and dinner theaters	470	507	504	472	512	462	455	-3.2%	$19,416	-2.2%	1.02	-0.20	10.8%	$25,096
711310	Promoters with facilities	429	418	487	477	478	431	397	-7.5%	$23,168	-6.5%	0.78	-0.44	38.1%	$31,311
711410	Agents and managers for public figures	458	463	470	453	409	398	353	-22.9%	$13,518	-7.0%	1.07	-0.64	18.0%	$40,500
711320	Promoters without facilities	180	172	168	151	172	218	262	45.6%	$42,236	6.9%	1.47	0.39	2.2%	$36,324
711120	Dance companies	134	159	200	223	276	209	138	3.0%	$9,377	-1.7%	2.18	-0.80	34.8%	$31,499
	Engineering and R & D	**5,842**	**6,211**	**6,518**	**6,717**	**6,941**	**7,115**	**7,336**	**25.6%**	**$79,672**	**1.1%**	**0.92**	**0.02**	**17.5%**	**$93,373**
541330	Engineering services	3,128	3,264	3,468	3,466	3,621	3,759	3,732	19.3%	$79,839	0.2%	0.76	-0.03	18.2%	$85,031
541710	Physical, engineering and biological research	2,177	2,428	2,563	2,791	2,877	2,861	3,115	43.1%	$82,393	3.1%	1.13	0.14	20.3%	$110,652
541720	Social science and humanities research	537	519	487	460	443	495	489	-8.9%	$61,058	0.3%	1.58	-0.05	-9.8%	$70,740
	Computer Services & digital media	**5,744**	**6,021**	**6,319**	**6,451**	**6,773**	**6,529**	**6,657**	**15.9%**	**$68,244**	**-0.4%**	**0.65**	**-0.04**	**18.6%**	**$94,662**
541512	Computer systems design services	1,662	1,978	2,249	2,490	2,758	2,552	2,661	60.1%	$73,599	3.4%	0.67	0.08	34.9%	$88,751
541513	Computer facilities management services	2,151	2,145	2,075	2,042	2,008	2,026	2,050	-4.7%	$50,563	0.0%	5.66	-0.26	-4.5%	$71,469
541511	Custom computer programming services	1,521	1,581	1,671	1,688	1,817	1,822	1,828	20.2%	$79,523	0.1%	0.47	-0.02	19.9%	$92,596
511210	Software publishers	157	113	125	170	144	79	74	-52.9%	$93,039	-9.5%	0.05	-0.08	8.8%	$132,901
541519	Other computer related services	253	204	199	61	46	50	44	-82.6%	$57,806	-16.5%	0.07	-0.25	-18.8%	$76,666
	Marketing & Related	**4,882**	**5,003**	**5,177**	**5,164**	**5,275**	**5,095**	**4,918**	**0.7%**	**$40,027**	**-1.7%**	**0.78**	**-0.12**	**11.8%**	**$63,537**
541921	Photography studios, portrait	1,286	1,371	1,499	1,501	1,605	1,553	1,460	13.5%	$25,255	0.2%	1.80	-0.06	12.6%	$24,947
541810	Advertising agencies	1,053	1,043	1,013	934	924	887	839	-20.3%	$58,879	-4.4%	0.61	-0.22	4.0%	$87,976
541890	Other services related to advertising	736	782	719	608	600	643	700	-4.9%	$25,836	-2.6%	1.33	-0.33	13.7%	$40,179
541613	Marketing consulting services	558	538	569	721	731	673	627	12.4%	$42,161	-5.4%	0.50	-0.23	57.1%	$64,682
541820	Public relations agencies	290	288	326	367	407	397	415	43.1%	$79,275	5.3%	1.10	0.25	6.1%	$92,498
541910	Marketing research and public opinion polling	409	453	468	439	450	426	391	-4.4%	$25,601	-0.2%	0.60	-0.04	-2.3%	$63,466
541850	Display advertising	88	125	194	190	197	177	150	70.5%	$61,878	8.0%	0.52	0.11	28.2%	$55,003
541840	Media representatives	90	96	95	106	103	108	109	21.1%	$56,683	3.0%	0.45	0.06	1.8%	$81,614
541922	Commercial photography	154	88	79	86	93	101	106	-31.2%	$34,419	-5.1%	0.79	-0.51	8.3%	$58,530
541860	Direct mail advertising	139	122	105	94	90	80	75	-46.0%	$29,026	-6.7%	0.15	-0.09	-16.9%	$56,139
541870	Advertising material distribution services	59	63	82	100	63	45	41	-30.5%	$38,859	-3.4%	0.33	-0.18	3.5%	$49,041
541830	Media buying agencies	20	34	28	18	12	5	5	-75.0%	$54,850	-17.3%	0.06	-0.29	32.2%	$90,780
	Business Consulting	**3,379**	**3,158**	**3,314**	**4,211**	**3,970**	**4,079**	**4,291**	**27.0%**	**$52,948**	**0.7%**	**0.60**	**-0.01**	**24.4%**	**$75,186**
541611	Administrative management consulting services	827	811	969	1,352	1,395	1,522	1,633	97.5%	$62,734	8.9%	0.54	0.18	24.9%	$83,589
541620	Environmental consulting services	1,085	951	983	1,229	1,168	1,200	1,237	14.0%	$47,745	0.3%	1.90	-0.10	14.9%	$57,840
541690	Other technical consulting services	450	492	498	610	573	572	612	36.0%	$40,003	-10.6%	0.52	-0.44	140.6%	$66,164
541612	Human resource consulting services	400	370	398	540	450	414	404	1.0%	$60,758	1.4%	0.45	-0.01	-1.8%	$75,696
541614	Process and logistics consulting services	526	461	392	377	264	232	243	-53.8%	$36,207	-15.9%	0.33	-0.64	29.4%	$67,574
541618	Other management consulting services	91	73	74	103	120	139	162	78.0%	$48,568	13.5%	0.22	0.10	-11.8%	$77,500
	Publishing & Information1	**2,946**	**3,033**	**3,069**	**3,079**	**3,062**	**3,094**	**2,887**	**-2.0%**	**$63,183**	**0.0%**	**0.75**	**-0.03**	**-1.9%**	**$68,948**
511110	Newspaper publishers	2,065	2,091	2,111	2,077	2,040	2,027	1,948	-5.7%	$57,342	0.9%	1.12	0.02	-10.9%	$46,628
511120	Periodical publishers	393	401	403	416	441	461	469	19.3%	$58,549	3.7%	0.63	0.10	-4.4%	$86,208
511140	Directory and mailing list publishers	136	132	144	162	143	160	178	30.9%	$172,345	6.2%	0.75	0.19	-6.9%	$75,369
516110	Internet publishing and broadcasting	34	32	36	41	59	79	86	152.9%	$50,675	11.9%	0.35	0.15	37.1%	$92,941
511130	Book publishers	66	67	78	86	91	88	78	18.2%	$42,415	3.1%	0.19	0.02	0.6%	$75,800
518112	Web search portals	31	29	27	40	28	31	35	12.9%	$38,813	-12.5%	0.19	-0.25	151.6%	$159,420
519190	All other information services	37	46	23	23	25	29	30	-18.9%	$24,059	-4.8%	0.41	-0.29	31.5%	$42,437
511191	Greeting card publishers	37	54	52	44	49	22	26	-29.7%	$37,707	2.1%	0.40	-0.12	-11.9%	$75,771
519110	News syndicates	31	60	53	67	63	54	20	-35.5%	$46,958	0.9%	0.27	-0.26	20.8%	$90,993
511199	All other publishers	116	121	142	123	123	143	17	-85.3%	$53,196	-9.1%	0.22	-1.21	-9.1%	$55,943
	Cultural Activities	**2,014**	**2,109**	**2,048**	**2,104**	**2,212**	**2,344**	**2,311**	**14.7%**	**$43,557**	**0.3%**	**2.69**	**-0.08**	**13.2%**	**$40,194**
813211	Grantmaking foundations	703	733	663	610	645	736	773	10.0%	$67,500	0.2%	2.88	-0.14	10.6%	$54,103
712110	Museums	638	666	674	690	700	724	703	10.2%	$34,751	-0.3%	1.90	-0.12	12.2%	$36,159
712130	Zoos and botanical gardens	492	521	526	598	657	670	623	26.6%	$30,426	0.7%	4.05	-0.05	22.7%	$30,457
712120	Historical sites	181	189	185	206	210	214	212	17.1%	$24,048	1.3%	3.21	0.09	9.2%	$28,994
	Architecture	**2,077**	**2,176**	**2,076**	**2,135**	**2,197**	**2,253**	**2,280**	**9.8%**	**$64,145**	**-0.6%**	**1.35**	**-0.11**	**13.8%**	**$66,960**
541310	Architectural services	1,797	1,867	1,755	1,794	1,814	1,853	1,884	4.8%	$67,291	-1.6%	1.46	-0.22	15.4%	$74,162
541320	Landscape architectural services	280	309	321	341	383	400	396	41.4%	$49,175	4.5%	1.00	0.20	8.8%	$43,318
	Design Services	1,134	1,203	1,341	1,433	1,513	1,516	1,453	28.1%	$42,135	1.5%	0.89	0.04	17.5%	$48,143
541430	Graphic design services	704	737	807	853	889	872	846	20.2%	$31,151	2.2%	0.92	0.07	6.0%	$48,550

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541410	Interior design services	419	451	514	555	593	596	549	31.0%	$51,509	0.2%	1.04	-0.04	30.0%	$44,029
541490	Other specialized design services	11	15	20	25	31	48	58	427.3%	$113,614	23.9%	0.33	0.22	61.8%	$58,343
	Radio and television Broadcasting	**1,387**	**1,349**	**1,371**	**1,366**	**1,350**	**1,380**	**1,361**	**-1.9%**	**$58,442**	**-0.4%**	**1.11**	**-0.07**	**0.4%**	**$76,455**
515120	Television broadcasting	712	703	700	707	669	694	687	-3.5%	$69,244	-0.7%	1.04	-0.09	0.8%	$89,515
515112	Radio stations	509	471	491	487	494	508	508	-0.2%	$43,421	0.1%	1.17	-0.05	-0.6%	$57,634
515111	Radio networks	166	175	180	172	187	178	166	0.0%	$59,709	-0.1%	1.31	-0.08	1.5%	$72,497
	Film, TV, Video Production	**1,500**	**1,188**	**1,635**	**1,605**	**1,227**	**1,233**	**1,231**	**-17.9%**	**$33,793**	**-1.7%**	**0.73**	**-0.22**	**2.0%**	**$81,256**
512110	Motion picture and video production	1,447	1,125	1,557	1,523	1,148	1,156	1,155	-20.2%	$33,138	-3.6%	1.09	-0.50	11.5%	$79,808
512191	Teleproduction and postproduction services	8	26	36	35	33	33	33	312.5%	$48,624	41.3%	0.39	0.28	7.3%	$94,251
515210	Cable and other subscription programming	21	23	28	30	31	31	32	52.4%	$45,207	8.3%	0.07	0.03	-5.5%	$85,340
512120	Motion picture and video distribution	24	14	14	17	15	13	11	-54.2%	$24,863	-6.1%	0.27	-0.21	-22.5%	$116,169
334612	Audio and video media reproduction	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-38.8%	$43,462
	Music	**1,048**	**1,095**	**1,099**	**1,128**	**1,155**	**1,153**	**1,106**	**5.5%**	**$26,229**	**1.3%**	**1.69**	**0.06**	**-2.5%**	**$37,505**
711130	Musical groups and artists	793	771	760	808	860	885	848	6.9%	$27,473	0.7%	3.03	0.00	2.3%	$38,184
451140	Musical instrument and supplies stores	158	183	189	175	162	146	143	-9.5%	$26,389	-0.4%	0.71	-0.07	-5.3%	$29,341
512240	Sound recording studios	40	63	67	62	56	54	49	22.5%	$14,559	6.8%	0.83	0.18	-8.4%	$28,942
512220	Integrated record production and distribution	43	57	59	56	49	46	42	-2.3%	$18,831	2.8%	1.49	0.11	-13.2%	$72,763
512210	Record production	3	5	9	13	12	11	12	300.0%	$20,429	29.3%	0.69	0.50	7.3%	$78,209
512290	Other sound recording industries	8	12	11	12	14	9	10	25.0%	$13,934	12.7%	0.36	0.15	-30.9%	$33,009
512230	Music publishers	3	4	4	2	2	2	2	-33.3%	$24,863	-7.5%	0.05	-0.05	30.8%	$47,152
	Arts Education	**242**	**254**	**257**	**270**	**279**	**304**	**287**	**18.6%**	**$13,190**	**-1.6%**	**0.69**	**-0.10**	**30.9%**	**$14,898**
611610	Fine arts schools	242	254	257	270	279	304	287	18.6%	$13,190	-1.6%	0.69	-0.10	30.9%	$14,898
	AGRIBUSINESS	**25,021**	**23,930**	**24,068**	**23,579**	**23,373**	**22,564**	**22,375**	**-10.6%**	**$32,464**	**-1.3%**	**0.82**	**-0.11**	**-3.1%**	**$34,050**
	FARM PRODUCTION	**13,861**	**13,737**	**13,336**	**13,178**	**13,067**	**12,223**	**12,235**	**-11.7%**	**$26,227**	**-1.2%**	**0.79**	**-0.10**	**-4.8%**	**$19,808**
110001	Crop and animal production (Except Aquaculture)	12,115	12,010	11,789	11,659	11,627	11,105	10,826	-10.6%	$27,043	-0.7%	0.83	-0.07	-7.0%	$19,002
115115	Farm labor contractors and crew leaders	830	878	861	891	829	778	1,103	32.9%	$19,355	4.0%	0.64	0.07	12.5%	$21,124
115114	Other postharvest crop activities	876	821	666	597	562	303	268	-69.4%	$21,586	-17.9%	0.62	-1.68	8.3%	$30,320
115112	Soil preparation, planting, and cultivating	35	23	15	5	5	5	21	-40.0%	$31,629	32.3%	0.12	-0.07	-9.6%	$30,905
115116	Farm management services	5	5	5	21	34	27	12	140.0%	$18,307	52.4%	0.13	0.08	-8.9%	$32,299
115113	Crop harvesting, primarily by machine	-	-	-	5	10	5	5	na	$20,761	na	0.08	0.08	-2.2%	$29,680
	AGRICULTURAL PROCESSING	**6,825**	**6,490**	**6,770**	**6,576**	**6,531**	**6,489**	**6,462**	**-5.3%**	**$43,727**	**-0.4%**	**0.92**	**-0.06**	**-2.9%**	**$56,635**
311991	Perishable prepared food manufacturing	942	888	1,064	1,010	981	957	941	-0.1%	$28,505	-5.8%	5.53	-2.74	43.2%	$35,517
311812	Commercial bakeries	928	868	770	738	721	833	780	-15.9%	$37,085	-1.2%	1.26	-0.19	-7.5%	$48,490
311421	Fruit and vegetable canning	932	841	850	692	709	556	524	-43.8%	$34,385	-7.8%	1.66	-1.26	-5.4%	$54,778
311330	Confectionery mfg. from purchased chocolate	413	401	432	454	454	465	458	10.9%	$35,661	4.6%	2.83	0.59	-16.0%	$43,119
311612	Meat processed from carcasses	222	216	465	431	421	407	451	103.2%	$37,320	18.1%	0.87	0.41	2.0%	$45,199
312111	Soft drink manufacturing	488	469	498	476	506	535	406	-16.8%	$81,330	-1.4%	1.07	-0.19	-6.1%	$68,458
311920	Coffee and tea manufacturing	367	353	370	409	403	381	384	4.6%	$43,650	-2.2%	5.11	-0.99	19.8%	$104,487
311311	Sugarcane mills	403	413	414	387	378	366	369	-8.4%	$93,226	3.7%	23.55	4.35	-28.4%	$84,973
311821	Cookie and cracker manufacturing	135	140	160	233	256	300	339	151.1%	$28,745	19.5%	2.25	1.43	-12.7%	$51,071
311919	Other snack food manufacturing	98	143	80	81	92	61	282	187.8%	$31,284	58.4%	1.76	1.15	-5.2%	$57,921
312112	Bottled water manufacturing	141	107	110	132	139	237	248	75.9%	$48,559	15.2%	3.30	1.58	-12.1%	$60,365
311511	Fluid milk manufacturing	257	230	230	241	254	180	211	-17.9%	$66,474	-1.6%	0.83	-0.20	-2.6%	$69,409
312113	Ice manufacturing	36	58	36	56	64	59	196	444.4%	$44,640	51.6%	5.01	3.97	7.9%	$37,498
311520	Ice cream and frozen dessert manufacturing	176	181	136	116	114	125	150	-14.8%	$75,584	1.0%	1.62	-0.08	-14.3%	$59,289
311611	Animal, except poultry, slaughtering	72	64	65	74	86	83	77	6.9%	$34,485	2.3%	0.11	0.01	-4.2%	$38,402
311911	Roasted nuts and peanut butter manufacturing	445	385	401	370	358	330	74	-83.4%	$26,657	-19.8%	1.25	-7.63	13.5%	$48,177
311830	Tortilla manufacturing	42	29	18	5	5	70	68	61.9%	$24,549	190.0%	0.78	0.19	17.0%	$35,677
311211	Flour milling	21	33	27	-	5	5	51	142.9%	$35,180	na	0.85	0.54	-14.7%	$78,152
311712	Fresh and frozen seafood processing	45	53	63	57	67	44	49	8.9%	$22,413	5.4%	0.30	0.04	-10.2%	$45,774
312130	Wineries	29	49	16	30	48	50	46	58.6%	$30,238	16.7%	0.23	0.00	54.5%	$55,440
311340	Nonchocolate confectionery manufacturing	40	39	32	35	37	44	44	10.0%	$13,765	7.0%	0.56	0.17	-26.2%	$51,750
311823	Dry pasta manufacturing	175	159	116	109	105	46	41	-76.6%	$21,147	-15.8%	1.19	-3.21	-17.2%	$53,602
311615	Poultry processing	88	48	39	5	5	5	40	-54.5%	$38,175	91.9%	0.04	-0.05	-2.7%	$28,880
311212	Rice milling	10	5	5	31	15	28	35	250.0%	$26,751	89.1%	1.78	1.28	-4.5%	$52,972
311930	Flavoring syrup and concentrate manufacturing	38	37	36	34	29	36	30	-21.1%	$145,672	-0.9%	0.61	-0.10	-12.2%	$868,287
311999	All other miscellaneous food manufacturing	51	44	43	44	44	39	27	-47.1%	$18,065	-7.6%	0.21	-0.16	-10.3%	$53,247
311942	Spice and extract manufacturing	43	31	22	23	24	18	26	-39.5%	$47,999	-8.8%	0.27	-0.32	25.4%	$71,901
312140	Distilleries	-	5	5	5	5	-	24	na	$42,363	na	0.72	0.72	3.3%	$123,525

APPENDIX: DETAILED INDUSTRY DATA

		Hawaii Jobs & Earnings									Competitive Metrics			U.S. Comparables	
NAICS Code	Group and Industry Description	2002	2003	2004	2005	2006	2007	2008	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008	Compet. Share Chng 02-08	Locat-ion Quotient (LQ)	Change in LQ 02-08	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008
312120	Breweries	68	44	87	26	22	40	20	-70.6%	$78,526	1.8%	0.16	-0.39	-2.2%	$165,714
311411	Frozen fruit and vegetable manufacturing	5	19	5	28	5	-	17	240.0%	$66,621	na	0.12	0.09	-24.0%	$44,544
311613	Rendering and meat byproduct processing	17	62	58	60	47	48	14	-17.6%	$62,190	27.6%	0.33	-0.11	5.3%	$59,183
311111	Dog and cat food manufacturing	5	5	5	5	5	13	5	0.0%	$37,814	15.7%	0.06	-0.01	4.4%	$79,768
311223	Other oilseed processing	16	5	5	-	5	5	5	-68.8%	$37,814	na	0.51	-0.95	-14.5%	$51,293
311320	Confectionery manufacturing from cacao beans	15	-	-	-	5	5	5	-66.7%	$37,814	na	0.14	-0.22	-20.0%	$81,723
311412	Frozen specialty food manufacturing	11	5	22	-	12	27	5	-54.5%	$37,814	na	0.02	-0.03	2.5%	$46,685
311423	Dried and dehydrated food manufacturing	5	5	5	5	5	5	5	0.0%	$37,814	1.6%	0.10	0.01	-9.6%	$44,578
311513	Cheese manufacturing	-	-	-	-	-	76	5	na	$37,814	na	0.03	0.03	2.2%	$54,747
311711	Seafood canning	17	17	12	11	23	5	5	-70.6%	$37,814	1.5%	0.22	-0.44	-15.5%	$44,104
311822	Mixes and dough made from purchased flour	5	19	42	73	67	5	5	0.0%	$37,814	63.5%	0.07	0.00	-7.0%	$59,564
311119	Other animal food manufacturing	5	5	5	5	5	-	-	-100.0%	-	na	0.00	-0.03	-2.7%	$52,561
311813	Frozen cakes and other pastries manufacturing	19	15	21	85	5	-	-	-100.0%	-	na	0.00	-0.44	18.0%	$36,354
	FISHING	**2,331**	**1,781**	**1,891**	**1,776**	**1,660**	**1,517**	**1,497**	**-35.8%**	**$21,955**	**-3.5%**	**4.04**	**-1.19**	**-20.3%**	**$22,970**
114111	Finfish fishing	2,259	1,754	1,875	1,748	1,624	1,483	1,465	-35.1%	$21,981	-5.4%	6.94	-3.10	-10.1%	$26,491
114112	Shellfish fishing	72	27	16	28	36	34	32	-55.6%	$20,763	3.6%	0.20	-0.13	-30.7%	$18,315
	FARM PRODUCTION SUPPORT SERV.	**1,002**	**1,050**	**1,155**	**1,136**	**1,141**	**1,207**	**1,248**	**24.6%**	**$33,569**	**1.9%**	**0.55**	**0.04**	**11.6%**	**$44,244**
54194	Veterinary services	684	719	794	814	858	920	964	40.9%	$35,924	2.3%	0.66	0.06	23.7%	$35,482
11521	Support activities for animal production	183	148	141	137	135	137	117	-36.1%	$13,259	-5.8%	0.27	-0.14	-7.4%	$28,390
11531	Support activities for forestry	71	88	112	87	92	86	106	49.3%	$40,294	8.7%	0.65	0.20	-0.8%	$32,361
52313	Commodity contracts dealing	40	60	70	63	51	59	56	40.0%	$21,807	8.0%	0.67	0.17	-0.5%	$199,777
52314	Commodity contracts brokerage	24	35	38	35	5	5	5	-79.2%	$44,007	-5.8%	0.04	-0.14	-4.6%	$106,348
	AGRICULTURAL INPUTS	**443**	**409**	**397**	**396**	**393**	**420**	**414**	**-6.5%**	**$48,878**	**-0.9%**	**0.38**	**-0.04**	**-0.8%**	**$60,594**
424910	Farm supplies merchant wholesalers	158	260	263	271	254	261	277	75.3%	$58,265	11.9%	0.53	0.22	0.2%	$55,965
424520	Livestock merchant wholesalers	55	55	60	67	70	75	69	25.5%	$26,967	5.4%	0.67	0.16	-7.6%	$18,356
325314	Fertilizer, mixing only, manufacturing	169	35	56	48	59	47	58	-65.7%	$27,678	-0.9%	1.48	-2.92	-2.2%	$55,441
325320	Pesticide and other ag. chemical mfg.	19	30	5	5	5	20	5	-73.7%	$51,643	37.0%	0.07	-0.15	-20.5%	$107,835
333111	Farm machinery and equipment manufacturing	37	24	13	5	5	17	5	-86.5%	$74,362	2.8%	0.02	-0.13	10.1%	$66,821
325311	Nitrogenous fertilizer manufacturing	-	-	-	-	-	-	-	na	-	na	0.00	0.00	-22.1%	$106,243
424590	Other farm product raw material merch. whls.	5	5	-	-	-	-	-	-100.0%	-	na	0.00	-0.12	0.1%	$67,209
	AQUACULTURE PRODUCTION	**144**	**160**	**145**	**134**	**152**	**220**	**221**	**53.5%**	**$39,882**	**8.5%**	**7.95**	**2.49**	**1.0%**	**$28,957**
112510	Aquaculture	144	160	145	134	152	220	221	53.5%	$39,882	8.5%	7.95	2.49	1.0%	$28,957
	PACKAGING & WAREHOUSING	**342**	**288**	**315**	**329**	**343**	**389**	**197**	**-42.4%**	**$78,231**	**-5.5%**	**0.25**	**-0.20**	**-0.6%**	**$50,839**
49312	Refrigerated warehousing and storage	88	88	78	82	88	132	90	2.3%	$45,589	1.0%	0.37	-0.06	13.5%	$49,310
332431	Metal can manufacturing	143	123	132	147	146	148	84	-41.3%	$118,006	-3.9%	0.80	-0.43	-13.6%	$88,899
326160	Plastics bottle manufacturing	80	47	79	80	92	87	12	-85.0%	$92,797	-7.1%	0.07	-0.41	-6.1%	$57,008
32192	Wood container and pallet manufacturing	31	30	26	20	17	22	11	-64.5%	$25,667	-12.2%	0.04	-0.07	-2.3%	$35,142
	FORESTRY & HUNTING	**73**	**15**	**59**	**54**	**86**	**99**	**101**	**38.4%**	**$36,784**	**46.3%**	**0.77**	**0.18**	**2.5%**	**$37,474**
11311	Timber tract operations	19	5	15	10	26	40	46	142.1%	$47,986	50.4%	1.33	0.64	19.9%	$87,203
11321	Forest nursery and gathering forest products	49	5	39	39	55	49	43	-12.2%	$29,130	101.5%	1.79	-0.30	-1.9%	$35,466
11421	Hunting and trapping	5	5	5	5	5	10	12	140.0%	$21,274	20.0%	0.17	0.10	-2.9%	$14,113
	HEALTH & WELLNESS	**46,248**	**47,563**	**48,879**	**50,401**	**50,522**	**51,147**	**51,346**	**11.0%**	**$57,697**	**-0.5%**	**0.83**	**-0.06**	**14.4%**	**$54,182**
	Health Practitioners	**20,277**	**20,722**	**19,889**	**19,788**	**19,691**	**19,387**	**19,907**	**-1.8%**	**$63,921**	**-2.6%**	**0.97**	**-0.21**	**15.0%**	**$67,262**
621111	Offices of physicians, except mental health	11,429	11,498	10,284	10,058	9,999	9,299	9,337	-18.3%	$80,716	-5.3%	0.84	-0.37	12.8%	$83,470
621210	Offices of dentists	3,639	3,842	3,928	3,960	4,065	4,161	4,217	15.9%	$50,126	0.5%	1.06	-0.02	12.8%	$52,297
621399	Offices of miscellaneous health practitioners	1,610	1,727	1,855	1,851	1,875	2,100	2,167	34.6%	$42,672	0.7%	1.74	-0.01	29.7%	$43,170
621330	Offices of mental health practitioners	961	1,103	1,306	1,350	1,177	1,205	1,448	50.7%	$52,696	6.1%	1.70	0.41	10.0%	$46,345
621340	Offices of specialty therapists	1,086	1,159	1,147	1,204	1,239	1,248	1,298	19.5%	$53,043	-2.6%	0.84	-0.18	39.0%	$44,647
621320	Offices of optometrists	710	504	501	497	513	549	640	-9.9%	$37,685	-3.0%	1.13	-0.37	15.0%	$45,049
621310	Offices of chiropractors	387	413	402	400	405	404	391	1.0%	$44,491	-1.4%	0.56	-0.08	9.9%	$39,153
621112	Offices of mental health physicians	402	431	418	420	377	373	355	-11.7%	$75,305	-3.0%	0.78	-0.20	6.9%	$64,979
621391	Offices of podiatrists	53	45	48	48	41	48	54	1.9%	$29,084	-0.2%	0.30	-0.03	8.1%	$48,987
	Hospitals & Nursing Facilities	**17,015**	**17,087**	**18,518**	**18,628**	**18,421**	**19,003**	**18,874**	**10.9%**	**$60,295**	**0.4%**	**0.66**	**-0.02**	**8.9%**	**$51,252**
622110	General medical and surgical hospitals	10,409	10,451	11,981	11,952	11,841	12,427	12,086	16.1%	$67,994	1.1%	0.62	0.01	10.2%	$58,162
623110	Nursing care facilities	4,305	4,442	4,361	4,515	4,486	4,548	4,718	9.6%	$40,936	1.0%	0.62	0.01	3.6%	$32,897
622310	Other hospitals	1,994	1,834	1,764	1,712	1,640	1,759	1,459	-26.8%	$64,097	-9.6%	1.73	-1.54	32.5%	$61,191
622210	Psychiatric and substance abuse hospitals	307	360	412	449	454	269	611	99.0%	$48,400	19.5%	1.36	0.56	12.0%	$43,256
	Specialty Health Care Services	**3,954**	**4,648**	**5,236**	**6,630**	**6,919**	**7,154**	**6,909**	**74.7%**	**$43,803**	**4.6%**	**0.84**	**0.14**	**38.8%**	**$36,648**
621610	Home health care services	2,581	2,782	3,147	4,147	4,278	4,238	4,112	59.3%	$27,735	2.5%	0.72	0.04	43.3%	$27,806

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NAICS Code	Group and Industry Description	2002	2003	2004	2005	2006	2007	2008	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008	Compet. Share Chng 02-08	Locat-ion Quotient (LQ)	Change in LQ 02-08	% Change in Jobs 2002-08	Ave. Ann. Earnings 2008
621498	All other outpatient care centers	290	316	365	798	844	1,065	1,142	293.8%	$56,776	23.4%	2.62	1.58	49.6%	$58,557
621492	Kidney dialysis centers	282	443	471	512	631	715	741	162.8%	$64,175	14.2%	1.80	0.87	30.1%	$56,119
621420	Outpatient mental health centers	482	784	902	879	848	784	523	8.5%	$36,986	1.6%	0.65	-0.12	23.4%	$37,403
621491	HMO medical centers	159	272	286	233	267	244	333	109.4%	$162,032	13.4%	0.94	0.38	21.0%	$92,730
621410	Family planning centers	19	22	20	22	46	53	53	178.9%	$46,574	25.0%	0.54	0.35	-9.3%	$48,047
621493	Freestanding emergency medical centers	141	29	45	39	5	55	5	-96.5%	$86,059	124.0%	0.01	-0.53	47.8%	$64,602
	Pharmacies	**3,655**	**3,624**	**3,701**	**3,759**	**3,866**	**3,916**	**3,961**	**8.4%**	**$39,330**	**-0.1%**	**1.16**	**-0.06**	**9.3%**	**$39,205**
446110	Pharmacies and drug stores	3,655	3,624	3,701	3,759	3,866	3,916	3,961	8.4%	$39,330	-0.1%	1.16	-0.06	9.3%	$39,205
	Medical Labs and Imaging Centers	**1,347**	**1,482**	**1,535**	**1,596**	**1,625**	**1,687**	**1,695**	**25.8%**	**$55,240**	**0.5%**	**1.52**	**-0.02**	**22.5%**	**$62,530**
621511	Medical laboratories	1,310	1,431	1,479	1,549	1,577	1,636	1,625	24.0%	$54,950	1.1%	2.12	0.04	16.8%	$61,692
621512	Diagnostic imaging centers	37	51	56	47	48	51	70	89.2%	$61,975	7.4%	0.20	0.05	37.4%	$64,364
	EDUCATION	**7,658**	**8,128**	**7,489**	**7,761**	**7,461**	**7,525**	**7,581**	**-1.0%**	**$32,472**	**-3.3%**	**0.62**	**-0.17**	**20.8%**	**$39,240**
	HIGHER EDUCATION	**5,248**	**5,487**	**4,967**	**5,293**	**5,078**	**5,092**	**5,095**	**-2.9%**	**$33,626**	**-3.0%**	**0.55**	**-0.14**	**16.7%**	**$42,148**
611310	Colleges, universities, and professional schools	4,661	4,922	4,509	4,701	4,516	4,527	4,530	-2.8%	$33,862	-3.2%	0.51	-0.14	18.0%	$42,648
611210	Junior colleges	587	565	458	592	562	565	565	-3.7%	$31,732	1.4%	1.50	-0.02	-6.3%	$30,368
	SPECIALTY EDUCATION	**2,410**	**2,641**	**2,522**	**2,468**	**2,383**	**2,433**	**2,486**	**3.2%**	**$30,107**	**-4.6%**	**0.84**	**-0.31**	**35.5%**	**$30,147**
611620	Sports and recreation instruction	304	344	378	439	467	494	518	70.4%	$20,541	1.4%	1.09	0.03	58.2%	$13,528
611430	Management training	468	501	508	469	433	435	431	-7.9%	$56,922	-3.0%	1.48	-0.37	10.5%	$56,494
611699	Miscellaneous schools and instruction	324	340	340	348	308	361	351	8.3%	$37,229	-4.0%	1.40	-0.48	39.2%	$30,027
611610	Fine arts schools	242	254	257	270	279	304	287	18.6%	$13,190	-1.6%	0.69	-0.10	30.9%	$14,898
611630	Language schools	236	229	255	253	222	223	257	8.9%	$15,326	-1.7%	2.47	-0.43	22.4%	$20,184
611710	Educational support services	189	322	217	245	222	213	226	19.6%	$34,914	-4.4%	0.39	-0.27	92.7%	$36,308
611519	Other technical and trade schools	153	174	154	136	147	172	216	41.2%	$29,318	1.5%	0.50	-0.01	36.8%	$32,796
611512	Flight training	135	130	103	107	102	91	74	-45.2%	$18,646	-9.5%	0.63	-0.58	1.3%	$46,801
611511	Cosmetology and barber schools	31	45	53	65	79	73	68	119.4%	$24,116	10.4%	0.65	0.24	34.0%	$23,658
611420	Computer training	92	100	69	30	23	5	33	-64.1%	$40,361	67.5%	0.30	-0.38	-23.3%	$48,140
611410	Business and secretarial schools	236	202	188	106	101	62	25	-89.4%	$12,261	-27.3%	0.29	-2.45	-4.5%	$26,250
	GARMENT MANUFACTURING	**1,809**	**1,608**	**1,657**	**1,451**	**1,360**	**1,282**	**1,165**	**-35.6%**	**$23,798**	**0.2%**	**1.21**	**-0.04**	**-36.3%**	**$42,088**
31523	Women's cut and sew apparel manufacturing	638	490	488	463	454	509	469	-26.5%	$26,663	2.5%	2.23	0.20	-35.8%	$60,390
315211	Men's cut and sew apparel contractors	514	529	573	518	448	352	317	-38.3%	$22,366	1.0%	3.66	-0.02	-40.6%	$33,169
31522	Men's cut and sew apparel manufacturing	302	303	336	243	207	227	198	-34.4%	$20,886	4.5%	1.01	0.17	-47.8%	$42,264
315212	Women's cut and sew apparel contractors	294	242	224	191	182	145	132	-55.1%	$21,611	-6.6%	0.46	-0.29	-30.1%	$32,617
31599	Accessories and other apparel manufacturing	24	11	5	5	12	39	36	50.0%	$23,117	48.0%	0.40	0.22	-33.5%	$40,152
31529	Other cut and sew apparel manufacturing	37	33	31	31	57	10	13	-64.9%	$23,829	6.0%	0.14	-0.19	-20.1%	$39,758
	CALL CENTERS	**223**	**436**	**487**	**454**	**472**	**424**	**435**	**95.1%**	**$16,726**	**13.8%**	**0.21**	**0.08**	**14.3%**	**$31,634**
561422	Telemarketing bureaus	112	334	382	359	370	337	355	217.0%	$15,671	31.2%	0.19	0.12	19.9%	$31,035
561421	Telephone answering services	111	102	105	95	102	87	80	-27.9%	$21,405	-1.5%	0.39	-0.07	-19.3%	$36,919
	TOTAL CIVILIAN EMPLOYMENT, HAWAII & U.S.	**710,023**	**726,003**	**751,274**	**778,559**	**798,033**	**810,907**	**804,244**	**13.3%**	**$43,915**	**8.5%**				**$49,170**