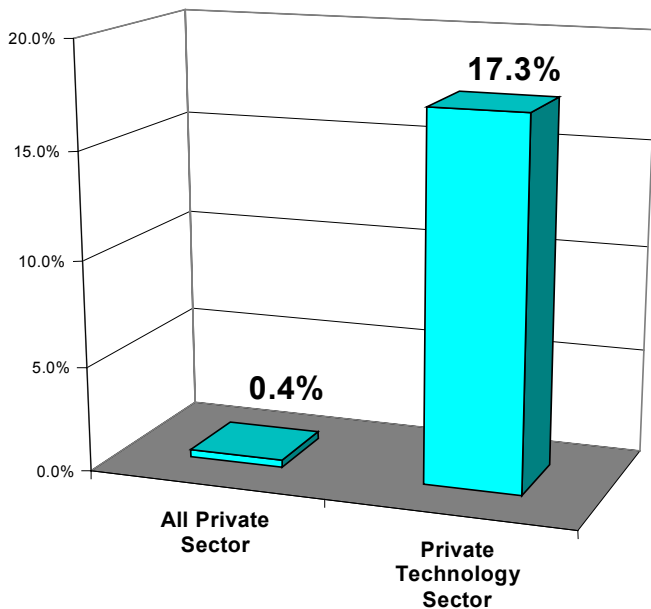


# Hawaii's Expanding Tech Sector

Department of Business, Economic Development & Tourism

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**Fig. 1**  
**Job Growth 1996 to 1999**



Hawaii's private technology sector has grown at an impressive pace since the mid-1990s. In fact, if not for the growth in this sector, the private sector as a whole would have lost jobs. Outside of technology, the number of private sector jobs declined 0.1% from 1996 to 1999. But thanks to the 17% growth in technology sector jobs, the private economy posted an overall 0.4% increase in paid employment over the period.

An increase of more than 1,800 jobs over the 1996-99 period brought the total for jobs in the technology sector that can be readily counted to 12,400. While this represents only about 3% of the total private sector work force, it is a very productive sector as well as a rapidly growing one. It also does not reflect a substantial number of jobs in medical, energy and government technology activities that cannot yet be captured in the measure. Total wages paid by firms that can be counted in the private technology sector represented nearly 5% of all private sector wages in 1999. Moreover, total wages in the technology sector increased 34% from 1996 to 1999, compared to 7.8% for the private sector as a whole. The average annual wage in Hawaii's technology sector is significantly higher than in the rest of the private economy. The average earnings of a worker in the technology sector reached nearly \$46,900 in 1999. This is 66% over the \$28,200 earned by the average worker in the private sector for that year.

## Types of Technology

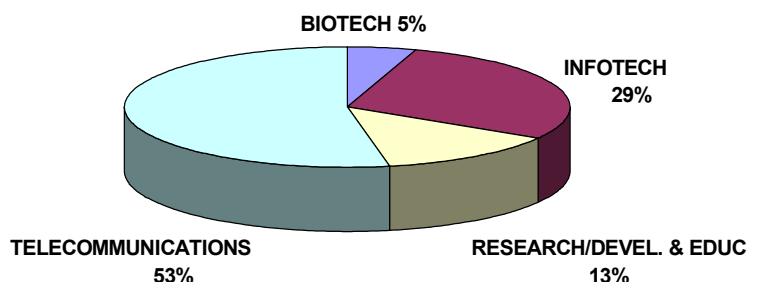
What kinds of activities make up Hawaii's private sector technology? In 1999 more than half of the jobs in the sector were in *telecommunications*. Another 29% were in *information technology*, 5% were in *biotechnology* (although this is probably a conservative figure), while 13% were in the combined category of *research/development and education*.

**Telecommunications** activity registered a 4.3% increase in jobs between 1996 and 1999. More than 70% of the jobs in telecommunications are in the communications subcategory with the remainder in the subcategory of broadcasting.

The communications subcategory includes residential phone service, cell phone service, paging and other forms of two-way communications. Some internet providers fall into this category.

Broadcasting includes on-air television stations, cable television and transmission, and radio broadcasting. Telecommunications is probably the most mature and established segment of the technology sector as well as the largest. The fastest growing part of this segment has been

**Fig. 2**  
**Share of Tech Sector Jobs by Major Activity, 1999**



communications (up 5.6% from 1996 to 1999), probably driven by the rapid growth of cellular phone and pager service. Broadcasting, on the other hand, showed only a 1.3% growth in jobs for the 1996-99 period. This slower growth may partly reflect a considerable amount of productivity in this area. Increases in cable channel offerings and upgrades to digital TV service can generally be accomplished without the addition of significantly more staff.

**Information Technology** was the second fastest growing segment of technology, with jobs increasing 51% from 1996 to 1999.

The largest segment of Infotech activity and the driving force over the last half-decade has been software development. Software accounted for 43% of the Infotech jobs in 1999. This encompassed about 1,560 employees at 210 sites around the state. The growth in software development jobs has been impressive -- 178% from 1996 to 1999.

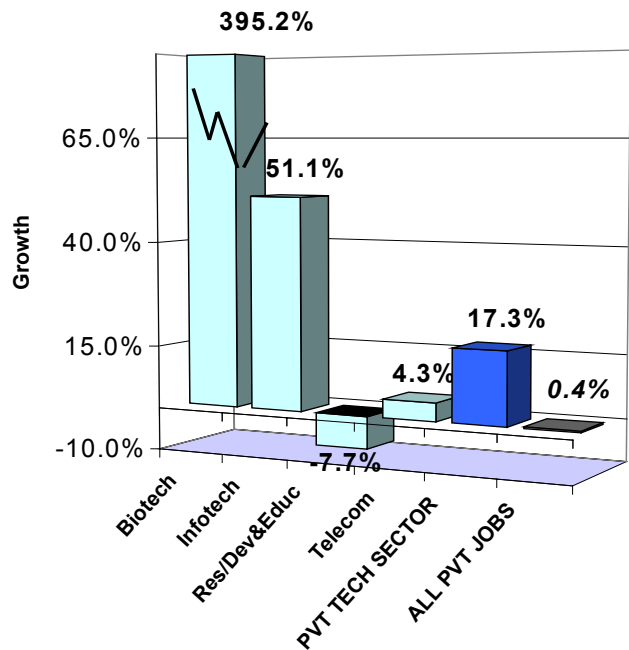
Another large area of information technology is services, which accounted for about 32% of jobs in Infotech in 1999. Infotech services include such activities as information and retrieval systems (which includes most internet service providers), data processing, and computer systems management, maintenance and repair. Jobs in infotech services increased 22% during the study period.

Sales accounted for 23% of infotech jobs in 1999. This segment includes retailers specializing in computer hardware and software. Infotech sales employment experienced a 5% increase in jobs over the period.

Infotech-related hardware assembly accounted for 2% of Hawaii's infotech employment base. Jobs in this small segment showed a decline of about 35% from 1996 to 1999, even though the number of companies increased. However, hardware is currently a very small percentage of total technology activity in Hawaii and the data tend to show volatility from year to year.

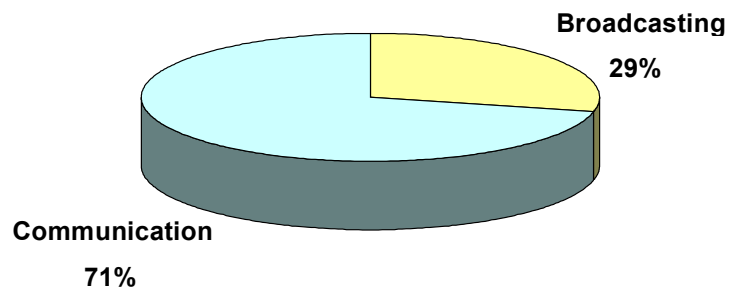
**Biotechnology** has been the fastest growing type of activity in the private technology sector, nearly quadrupling its employment base over the 1996-99 period. However, the small size of the activity, particularly in the 1996 base year, may overemphasize the significance of this growth. Currently, private sector biotechnology as measured in this compilation, is dominated by the growing of sophisticated varieties of seed corn produced for export. However this activity has emerged as a major factor in the biotechnology measure just over the last several years and appears to have leveled off more recently. Overall, the agricultural segment of

**Fig. 3**  
**Tech Job Growth by Activity, 1996-99**



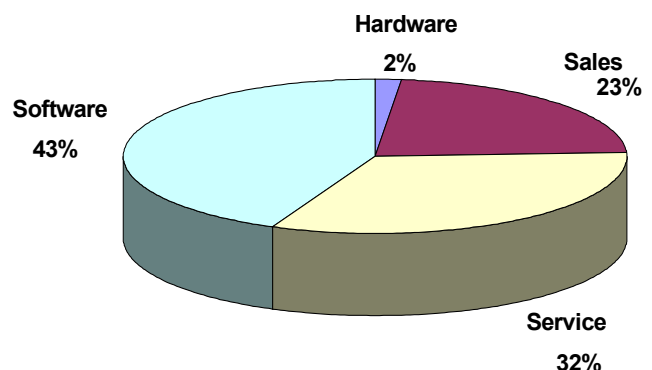
**Fig. 4**

**Telecommunications Jobs, 1999**



**Fig. 5**

**Information Technology Jobs, 1999**



biotechnology accounted for about 85% of total biotechnology activity in 1999. It also includes food crops grown under cover and animal aquaculture. Other biotech activities include medicinals and botanicals, and diagnostic substances.

Due to the limitations of the source data, the biotech research and development occurring at the University of Hawaii and in private hospitals, which could be significant, is not captured in this measure. Thus, the measure understates the scope and amount of biotechnology actually being conducted.

**Research, Development and Education (R/D&E)** activity account for about 13% of employment in the private technology sector. The measure also includes a number of relatively small technology-oriented activities that could not be appropriately assigned to the other major categories of infotech, telecom or biotechnology. Research and development activities are an eclectic mix of specialties such as testing laboratories, commercial and noncommercial research, and some hardware assembly supporting R&D, such as x-ray apparatus and measurement devices. The education component consists of private data processing schools.

R/D&E is the only area of the technology sector to have shown a decline in jobs from 1996 to 1999 --down nearly 8%. By contrast, total wages paid in this activity showed a nearly 10% increase over the period. This contradiction partly reflects the current small size of this sub area, which contributes to volatility in the data. Also, a good deal of the activity in this category may be conducted by sole proprietors who can move frequently between the category of employee (which is captured in this measure), and independent contractor (which is not).

Most technology-related education is probably conducted in the public sector or within private educational institutions. Consequently, that portion of technology education is not included in this compilation.

Thus, a relatively limited amount of the current total R/D&E activity in Hawaii is captured by this measurement. Nevertheless, as Hawaii's base of commercial R&D activity expands, we would expect to see this category reflect that growth in the future.

Table 1 summarizes the size and growth of Hawaii's private technology sector from 1996 to 1999 along with a total private sector comparison.

<b>Table 1. Private Technology Sector 1996 and 1999</b>						
	<b>All Categories</b>	<b>Bio-technology</b>	<b>Information Technology</b>	<b>Research, Development &amp; Education</b>	<b>Tele-communications</b>	<b>ALL PRIVATE SECTOR</b>
<b>Operating Units*</b>						
1996	738	16	415	140	167	<b>31,253</b>
1999	879	25	527	146	181	<b>31,257</b>
%change	19.1%	56.3%	27.0%	4.3%	8.4%	<b>0.0%</b>
<b>Employment**</b>						
1996	10,589	122	2,372	1,772	6,323	<b>427,676</b>
1999	12,421	604	3,584	1,636	6,598	<b>429,179</b>
%change	17.3%	395.2%	51.1%	-7.7%	4.3%	<b>0.4%</b>
<b>Total Wages Paid</b>						
1996 (\$mil)	\$434.7	\$3.9	\$97.3	\$63.5	\$270.0	<b>\$11,208</b>
1999 (\$mil)	\$582.5	\$16.4	\$188.4	\$69.6	\$308.1	<b>\$12,084</b>
%change	34.0%	323.6%	93.5%	9.6%	14.1%	<b>7.8%</b>
<b>Average Annual Wages Per Employee</b>						
1996	\$41,055	\$31,742	\$41,034	\$35,839	\$42,705	<b>\$26,207</b>
1999	\$46,893	\$27,148	\$52,565	\$42,540	\$46,700	<b>\$28,155</b>
%change	14.2%	-14.5%	28.1%	18.7%	9.4%	<b>7.4%</b>
*Total units may include multiple sites of individual companies.						
**Annual average number. Excludes self-employed and proprietors.						

## Technology and the Counties

Not surprisingly, the City and County of Honolulu accounts for a majority of the state's technology workforce -- about 80%. Maui County follows at 8%, Hawaii County has 7% of the state total and Kauai County has 4%. (About 1% of technology jobs in the state could not be identified with a particular county.) Due to the smaller number of tech firms on the neighbor islands, county data combines research, development and education with biotechnology to avoid disclosure problems.

The highest growth in technology jobs over the study period was in Maui, with a nearly 31% increase. Most of this growth was due to the increase in seed crop growing in the county during the period. However, significant gains were also experienced in information technology.

The next highest growth for technology jobs occurred on the Big Island of Hawaii, which experienced an 18% increase from 1996 to 1999. The largest percentage gain for Hawaii County was in information technology with employment up 58%, followed by the combined total for research, education and biotech with a 50% gain. A 7% decline in telecommunications jobs in Hawaii County over the period pulled the overall gain down.

The City & County of Honolulu experienced an overall increase of 15% in technology sector employment from 1996 to 1999. This growth was driven by information technology jobs, which grew 48% over the period. Telecommunications employment on Oahu increased 5.6%. The overall growth of technology jobs in the county was pulled down by the combined research, development and biotech category, which declined 3% for the period.

Fig. 6

Private Sector Tech Job Distribution by County, 1999

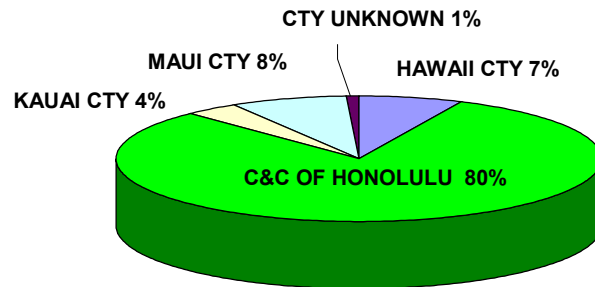
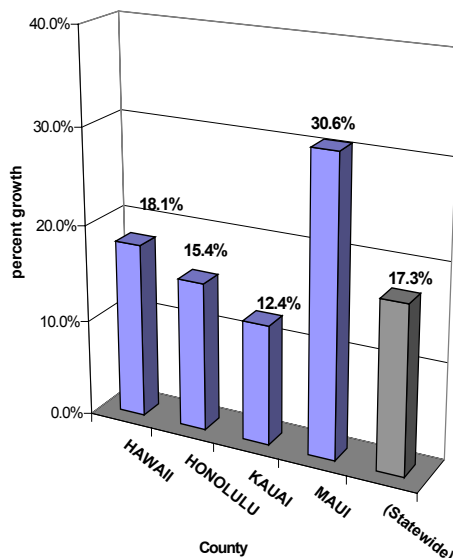


Fig. 7

County Technology Job Growth 1996-99



While last among the counties in terms of growth, Kauai's technology job count still registered an impressive 12% increase from 1996 to 1999. Kauai's small information technology segment showed the fastest growth at 81% for the period. Development of seed corn activity helped the research, development and biotech category show a 62% increase. However a 20% decline in telecommunications jobs pulled overall growth down.

### About the Technology Measure

This compilation of private sector technology is an update and refinement of data presented in DBEDT's January 2000 report, *Hawaii's Emerging Technology Industry*. That report, which takes a close look at the scope of technology in Hawaii is available on the DBEDT web site at <http://www.hawaii.gov/dbedt/hel-00/index.html>.

Rather than being based on a survey of firms in the technology area (such as conducted by Hawaii's High Technology Development Corporation -- HTDC), this measure of the technology sector is based on the count of paid employees and their wages reported by all employers to the State Department of Labor and Industrial Relations. Every employer in the state that pays such payroll taxes as unemployment insurance is assigned a detailed, standard industrial classification code (SIC) for record keeping purposes based on its principal business activity. Collection and compilation of the data follow uniform Federal standards. The data are compiled annually and are available about eight months after the end of the calendar year. While the data provide information on employment, wages and the number of operating units, they do not provide sales information.

From this database, DBEDT's Research and Economic Analysis Division (READ) has selected more than 50 detailed industry groups that probably reflect most of the private sector high technology activity in the

State. Most of these detailed industry groups cannot be reported separately due to confidentiality rules. In order to maintain that confidentiality and to permit a better focus on broader areas of technology activity, the detailed industry data have been consolidated into four basic categories, each with a few subdivisions, as shown below.

<b>Table 2. Technology Groups</b>			
<b>Biotechnology</b>	<b>Information Technology</b>	<b>Telecommunications</b>	<b>Research, Development &amp; Education</b>
<ul style="list-style-type: none"> <li>• Agricultural Bio-tech</li> <li>• Other Biotech</li> </ul>	<ul style="list-style-type: none"> <li>• Software Development</li> <li>• Info Tech Services</li> <li>• Info Tech Sales Activity</li> <li>• Hardware</li> </ul>	<ul style="list-style-type: none"> <li>• Communications services*</li> <li>• Broadcast/Cable Services</li> </ul>	<ul style="list-style-type: none"> <li>• R&amp;D Services*</li> <li>• Technology Education</li> </ul>
<p>*Includes some a small amount of hardware manufacturing or assembly activity which cannot be shown separately due to disclosure issues.</p>			

The data are also available for the counties, although the categories of biotechnology and research, development and education are combined at the county level because the small numbers of units in some counties present confidentiality problems. Future reports will examine the county data in more detail.

The major categories of *information technology* and *telecommunications* are based on the U.S. Department of Commerce's definition of *information technology*, which includes telecommunications. DBEDT has broken down the broader Commerce definition into the two major components. Together these two categories accounted for 82% of Hawaii's high tech industry employment in 1999.

The detailed industries making up biotechnology and research, development and education reflect the judgement of READ economists based on a review of other measures of technology and a look at the technology activity actually occurring in Hawaii.

This technology measure is meant to capture the more common types of technology activity found through the U.S. as well as some specialty areas of interest to Hawaii. It excludes exotic technology activity such as the production aircraft, weaponry, and space vehicles, which tend to be concentrated in only a few areas of the country.

There are limitations to this measure of technology, which should be kept in mind. First, due to the limits of the data source, it excludes technology activity occurring in government, which may be considerable. Examples of this are the cloning, astronomy, ocean, energy and other technology research being conducted through the University of Hawaii, the technology coordination and technology park development and management by the State and counties, research and development activity conducted by the State and Federal governments, and data processing and information technology activities at all levels of government.

Second, the measure also excludes most of the engineering firms and all of the hospitals in Hawaii. This is because the source data are not detailed enough to separate high technology activity, such as energy technology firms and medical research activities, from the large amount of standard, non-technology activity occurring in these industries. Including the broader categories of engineering and hospitals in the measure would seriously cloud interpretation of the true size and growth of the technology sector.

Third, since the source data are for firms with payroll, the measure does not include the operations of sole proprietors and independent contractors performing technology work.

Finally, even though the industry statistics used are as detailed as possible the measure unavoidably includes some firms and employment that would not otherwise be considered "high tech." However, it is expected that the growth rate over time in these selected industries will reflect the fortunes of the more numerous technology firms.

While not a complete compilation of technology activity in the state, the DBEDT measure has identified the key components of that sector outside of government. Its main value will be in providing a consistent benchmark for growth in Hawaii's private technology sector over time in enough detail to examine the sources of that growth. It also provides a complement to survey-based measures of technology that provide information on clusters of technology firms. As the sources of information improve it may be possible to include in this measure areas of technology not adequately captured in the current compilation.

This report was prepared by the Research and Economic Analysis Division of DBEDT. Comments may be e-mailed to [hecon@dbedt.hawaii.gov](mailto:hecon@dbedt.hawaii.gov) or Faxed to (808) 586-8449.