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## Highlights

- Over the past 20 years, the state legislature has provided \$49.4 million in funding for the Centers of Excellence Program (COE). Almost \$47 million has gone into direct funding for 110 Centers located at universities throughout Utah. Currently, the program is funding 18 Centers located at the University of Utah, Utah State University and Brigham Young University.
- State monies committed to the Centers of Excellence Program have resulted in economic growth for the state in the form of new companies, additional jobs and earnings. Since 1986, the program has produced 185 spin-off companies, of which 67 (36%) are still active. The surviving companies employ between 1,500 and 1,800 people.
- Two of Utah's premier high tech companies—Myriad Genetics and Watson Labs/Theratech came out of the COE program. Currently, these companies employ about 875 people.
- A total of 170 patents have been issued for technologies developed through the program. Individual centers have entered into 204 licensing agreements. Total matching funds used to leverage the state's commitment total \$407.2 million, for a matching rate of about 8.7:1.
- Funding for the program has not kept pace with inflation. In 1987, the program received \$3.4 million in state funding. In 2006, the program received a total of \$3 million in state funding. Adjusting for inflation, the program would require approximately \$6.0 million in 2006 to match the initial state allocation to COE.
- The rate at which new companies are being formed through COE has slowed. During the first 10 years of the program, an average of 14 companies were formed annually. Over the past 10 years, that number has declined to about four companies per year.

## Utah's Centers of Excellence Program: A 20-Year Review

Jan Crispin and Sapna Sinha

The Centers of Excellence Program (COE) was established by the Utah State Legislature in 1986 for the express purpose of supporting University-based, industry-supported cooperative research and development. The primary goal of the program is to develop technologies with commercial potential in order to boost economic development within the state of Utah through the creation of new companies and enhancement of business opportunities for existing business.<sup>1,2</sup>

Centers may be established at any university or college in the state of Utah. Proposals for new centers, or for the renewal of existing centers are submitted to the COE office. Centers are competitively selected based on the proposal's technical merits, level of matching funds from private and federal sources, and the potential for job creation and economic development.<sup>3</sup>

To date, centers have been established at the University of Utah (U of U), Utah State University (USU), Brigham Young University (BYU), Weber State University (WSU), Dixie State College, Utah Valley State College (UVSC) and the College of Eastern Utah (CEU).

The amount of funding granted to a Center each year varies considerably, but most receive between \$100,000 and \$200,000 annually. Competition for funding is intense. During the 2005-2006 funding cycle COE received 34 center proposals totaling millions of dollars in requests. During that same year, the Utah legislature authorized just \$3 million for the program and 18 Centers were funded.

Upon selection, centers are required to secure matching funds from private and federal sources. In 2006, state funding provided to a Center of Excellence established at doctoral-degree granting schools must be matched at a minimum basis of 2:1. For non-doctoral degree granting schools, state funding provided to a Center of Excellence must be matched at a minimum of 1:1.<sup>4</sup>

In COE's enabling legislation, centers were eligible for state funding for up to five years, at which point they either closed or became self-sustaining through license contract royalties and new research grants. Under new guidelines established in February 2006, a former Center of Excellence (one that has been "graduated") may return to the program and request a new round of COE funding as long as the proposed technology is distinct enough from the initially funded technology that it will create new market, business and licensing opportunities.<sup>5</sup>

## Centers of Excellence Program Historical Overview

### State Funding

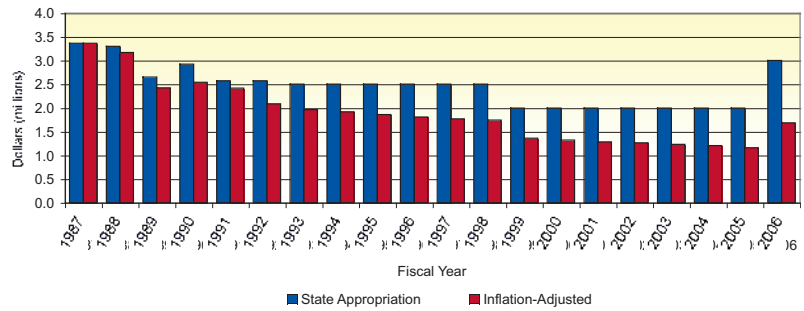
A total of \$49.4 million in state funding has been allocated to the centers program since its inception in 1986. After a strong financial commitment from the state during the late 1980s, funding for the program has declined significantly in real terms (non-inflation adjusted). From FY 1987 through FY 1990, state funding for COE totaled \$12.2 million—slightly more than \$3 million annually. Beginning in FY 1991, state funding declined to \$2.57 million. By FY 1999, the state's annual commitment dropped to \$2 million and stayed at that level until FY 2006 when a one-time appropriation pushed funding to \$3 million. Benchmarked to 1987 dollars, the state's appropriation of \$3 million in 2006 is the equivalent of \$1.6 million. Alternately, *level or inflation-adjusted* funding for the program would require an annual allocation of \$6 million.<sup>6</sup>

Figure 1 shows the state's annual allocation to the centers program in both real and inflation-adjusted dollars.

### Funded Centers

Over the past 20 years, the centers program has issued \$46.7 million in grants to 110 centers. This includes money provided directly to funded centers in the form of operational and planning grants. It does not include money provided to Technology Transfer Offices, planning grants awarded to centers that did not receive full funding or money set aside for business development. Funding provided for the above

**Figure 1: Centers of Excellence Funding History**  
Real and Inflation-Adjusted Dollars  
FY 1987 Through FY 2006



Source: FY 1987 through FY 2004: Centers of Excellence Annual Reports, <http://goed.utah.gov/COE/index.html>. FY 2005 and FY 2006: unpublished data provided by Nicole Toomey-Davis, Director, Centers of Excellence.

mentioned activities totals almost \$2.7 million. COE is currently funding 18 centers—12 at the U of U, three at BYU and three at USU.

For most centers, each dollar received from COE must be matched with at least two dollars from other sources. For many centers this ratio has been much higher. Since the program began, centers have raised a total of \$407.2 million, for a match rate of 8.7:1.<sup>7</sup>

Of the 110 centers funded since 1986, more than half (61 centers) have been located on the University of Utah campus. These 61 centers have received a total of \$23 million, and raised \$206.7 million in matching funds. Utah State University has received \$11.6 million in COE funding for 22 centers, which in turn have raised \$61.4 million in matching funds, followed by BYU which has received \$10 million for

**Table 1**  
**University-Specific Historical Information**  
FY 1987 - FY 2006

Institution	Centers		COE Funding		Match Funding		Total Funding	
	Number	Percent	Total	Percent	Total	Percent	Total	Percent
U of U	61	55.5%	\$23,078,456	49.3	\$206,749,133	51.0	\$229,827,589	50.6
USU	22	20.0%	\$11,629,727	24.9	\$61,423,655	15.0	\$73,053,382	16.1
BYU	20	18.2%	\$10,033,529	21.5	\$132,443,914	32.5	\$142,477,443	31.4
WSU	4	3.6%	\$1,375,100	2.9	\$4,019,457	1.0	\$5,394,557	1.2
Dixie	1	0.9%	\$250,000	0.5	\$520,432	<1	\$770,432	0.2
UVSC	1	0.9%	\$235,000	0.5	\$2,063,913	0.5	\$2,298,913	0.5
CEU	1	0.9%	\$165,000	0.4	NA	—	\$165,000	—
<b>Total</b>	<b>110</b>	<b>100%</b>	<b>\$46,766,812</b>	<b>100.0</b>	<b>\$407,220,504</b>	<b>100.0</b>	<b>\$453,987,316</b>	<b>100.0</b>

Source: Centers of Excellence Annual Reports <http://goed.utah.gov/COE/index.html> and data provided by Nicole Toomey-Davis, Director, Centers of Excellence.

20 centers that have raised \$132.4 million in matching money. Centers have also been established at CEU, Dixie, UVSC and WSU. Together, these four institutions have received \$1.9 million for seven centers. Matching funds raised by these seven centers total \$6.6 million. Table 1 provides university-specific, historical information about the centers program.

Based on Utah’s academic and research strengths, COE guidelines target seven areas of technology. Termed “research clusters,” these broad areas correspond to existing strengths in Utah’s high technology sectors and include Aerospace, Defense and Homeland Security, Energy and Natural Resources, Financial Services, Software Development/Information Technology and Life Sciences. Another area labeled “Competitive Accelerators” is not a research cluster, per se, but includes technologies that serve as competitive accelerators to Utah’s economy.

Table 2 shows data distributed across research clusters. Clearly, in terms of the state’s investment, priority has been given to Life Sciences and Information Technologies. One in three centers has been associated with the Life Sciences research cluster. As a group, these centers have received \$15.8 million—almost 34 percent of all grants awarded. Centers connected with Life Sciences research have raised an additional \$123.5 million in matching funds, for a matching fund rate of 7.8:1.

A total of 30 centers have been connected with Information Technology. As a group, these centers have received almost \$12 million in COE awards and have raised an additional \$93.3 million in matching funds for a matching rate of 7.8:1. In comparison, centers connected with Aerospace and Defense technologies account for the fewest number of centers, have received the least amount of state funding, and report the lowest matching fund ratios.

Two anomalies show up in the data distribution presented in Table 2 . First there are a large number of centers connected with technologies classified as “competitive accelerators”. This cluster includes a wide array of technologies not included in other, more specifically-defined research areas and should be viewed as a default classification. Second the large sum of matching money reported in the Energy and Natural Resource research cluster is the result of money raised by the Advanced Combustion Engineering Research Center at BYU. This center reportedly raised \$75.2 million in matching money over a ten-year period beginning in FY 1987. Other centers in this research cluster have not been this successful in raising matching funds.

## Performance of the Centers of Excellence Program

The success of the centers program can be measured in several ways. The analysis in this study focuses on the spin-off activities of funded centers as defined by the number of companies created to commercialize center-developed technologies, the survival rate of those companies, and the number of people currently employed at these companies. While this is a narrow definition, new companies have, perhaps, the greatest potential to expand the state’s economic base by bringing in taxable revenue and providing new employment opportunities for Utah residents.

Information on the formation of spin-off companies has been fairly well documented in the annual reports. Based on COE annual reports, since 1986 at least 185 companies have spun out of centers funded by the program. Of these, 67 are still active in Utah—a survival rate of 36 percent. As a group, these companies currently employ between 1,500 and 1,800 people.

**Table 2**  
**Number of Centers and Funding Received**  
**Distributed by Research Cluster: FY 1987 through FY 2006**

Research Cluster	Centers Connected with this Technology	COE Funds	Matching Funds	Total Funds	Match Fund Ratio
Aerospace	4	\$2,382,300	\$8,735,773	\$11,118,073	3.7:1
Competitive Accelerators	25	\$9,534,692	\$69,505,887	\$79,040,579	7.3:1
Defense/Homeland Security	3	\$1,801,200	\$11,688,056	\$13,489,256	6.5:1
Energy/Natural Sciences	12	\$5,288,440	\$100,578,158	\$105,866,598	19.0:1
Information Technologies	30	\$11,955,221	\$93,253,491	\$105,208,712	7.8:1
Life Sciences	36	\$15,804,959	\$123,456,139	\$139,264,098	7.8:1
Total	110	\$46,766,812	\$407,220,504	\$453,987,316	8.7:1

Notes: (1) No activity is reported in the Financial Services Cluster.

(2) Percentages may not total 100% due to rounding.

Source: Centers of Excellence Annual Reports, FY 1987- FY 2004 and data available at <http://goed.utah.gov>.

A total of 110 companies (59% of all companies formed through the centers program) were formed between 1990 and 1995. Based on BEBR's analysis, a spin-off from a center typically occurs within five years of the date the center was established. Not surprising then, 86 of the 110 companies formed in the early 1990s came out of centers established between 1987 and 1991. In fact, centers funded during the first five years of the program have produced more companies than centers established during any other five-year period since 1991. Possible explanations for this trend are presented later in this study.

Figure 2 shows the number of companies formed each year since the establishment of the COE program.

### University-Specific Spin-off Activities

The efficiency in forming spin-off companies varies considerably between centers. The most prolific centers have been the Center for Advanced Composites Manufacturing and Engineering (ACME) and Rapid Product Realization (RPR) both located at BYU. These centers were "service centers" established for the express purpose of moving technologies into the marketplace by assisting companies in the patent process, providing R&D support, prototyping and business development. In addition to helping existing businesses, ACME and RPR produced 54 companies; 12 of these are still in operation.

Not all centers have been so productive. Apart from ACME and RPR, only four centers have spun-out five or more companies. These include the Center for 3D Computer Graphics (Dixie), Center for Space Engineering Research (USU) Center for Advanced Combustion Engineering (BYU) and the Center for Computer Integrated Engineering (BYU). Most centers have produced fewer than three companies and 47 centers report no spin-off activity.

Since the bulk of COE money has gone to the three largest universities in the state, it is not surprising that centers at these

institutions have produced the largest number of spin-offs. As a result of ACME and RPR, the largest number of spin-off companies has come from centers located at BYU. Over the past 20 years, 82 companies trace their origins to centers at BYU. A total of 53 companies have spun-out of centers at the U of U, 34 companies came out of USU centers and the remaining 16 companies came out of centers at Dixie, Weber and UVCC. Of the 47 centers that have no reported spin-off activity, 29 have been located at the U of U. Table 3

### Research Cluster Specific Spin-off Activities

At least half of all centers within each research cluster have reported spin-off activity. Centers connected with Life Science technologies, however, boast a much higher rate. At least 75 percent of all centers associated with Life Sciences have formed companies. The number of companies formed totals 44, or about 1.2 companies per center. Centers connected with Defense technologies also have a higher than average rate of spin-off performance. Two of the three centers connected with defense research have spun-off technology to six new companies.

About half of all centers categorized as Competitive Accelerators have formed companies; however, as a group, these centers have spun-out more companies than centers in any other research cluster. A total of 80 companies have come from the competitive accelerators cluster, or about 43 percent of all companies formed through COE. More than half of these companies spun-out of ACME-BYU's service center.

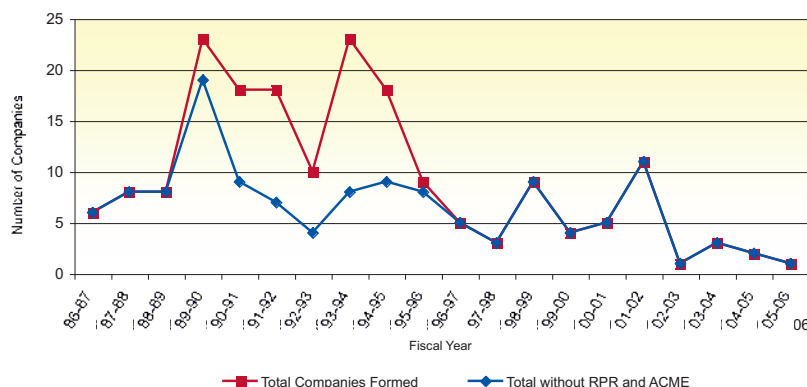
Table 4 presents spin-off activity information distributed across research clusters.

The formation of new companies, in and of itself, is not necessarily a measure of success. In terms of economic benefit to the state, success is measured by employment, and subsequently, the taxable earnings of those employees. Therefore, the survival rate of companies that have spun-out of centers is a more appropriate measure of success than the aggregate number of spin-offs.

Slightly more than three in 10 spin-off companies have survived in the fast-paced, technology-driven marketplace. The median age of the surviving companies is 11 years. One-in-five active spin-offs has been formed within the past five years. Likewise, about one-quarter of all active spin-offs are at least 15 years old. Figure 3

As shown in Table 3 companies formed from centers established at the U of U have a higher survival rate than the group average. Slightly more than half of all U of U spin-offs are still in operation. In comparison, the survival rate of companies formed at both BYU and USU is slightly below the group average.

**Figure 2: Spin-off Company Formation Annually 1987 through 2006**



**Table 3**  
**Spin-off Companies, University Specific**  
**FY 1986 – FY 2006**

	U of U	USU	BYU	WSU	Dixie	UVSC	CEU	Totals
Number of centers formed	61	22	20	4	1	1	1	110
Number of centers with spin-offs	33	15	13	3	1	1	0	66
Number of spin-offs	53	34	82	7	5	4	0	185
Ratio of spin-offs to centers	0.9	1.6	4.1	1.8	5.0	4.0	0	1.7
Number of spin-offs active to date	27	11	24	2	1	2	0	67
Survival rate of spin-offs	51%	32%	29%	29%	20%	50%	—	36%
COE funding per active company (thousands of dollars)	\$854.8	\$1,057.2	\$418.1	\$687.6	\$250.0	\$112.5	—	\$698.0
Total funding per active company (thousands of dollars)	\$8,512.1	\$6,641.2	\$5,936.6	\$2,697.3	\$770.4	\$1,149.5	—	\$6,775.9

Source: Centers of Excellence Annual Reports, FY 1987 - FY 2004 and information obtained at: <http://goed.utah.edu/COE>.

In terms of survival rates, spin-offs from centers involved in Defense technologies have the highest. Of the six companies that have spun-out of defense-related centers four are still operating. Companies formed from centers involved in Energy and Natural Resources also have a high survival rate. Approximately half of these spin-offs are still operating in Utah.

In comparison, as shown in Table 4, fewer than 30 percent of companies that have spun-out of centers classified as Competitive Accelerators have survived and just 13 percent of companies formed from centers in the Aerospace cluster are still operating. Companies formed through centers involved in Life Sciences have a survival rate just slightly above the average for all companies.

### Employment

The final measure of COE's success is the number of jobs generated by companies formed through the centers program. Jobs are generated through the centers program in two ways—new jobs created within the individual centers and employment at companies that spin-out of centers. Because of reporting limitations, only employment at spin-off companies is discussed in this report.<sup>8</sup>

In total, COE spin-offs employ between 1,500 and 1,800 people. However, two companies (Myriad Genetics, and Theratech/Watson Labs) account for the largest share of the jobs. Their combined employment is about 875. Both of these companies were formed at least 15 years ago.<sup>9</sup>

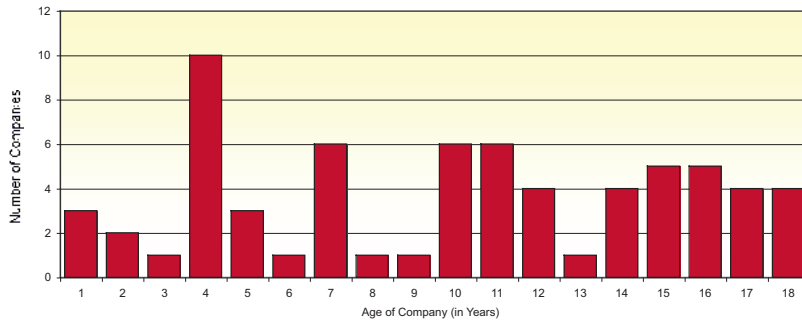
**Table 4**  
**Spin-off Companies, Research Cluster Specific**  
**FY 1986 - FY 2006**

Cluster or Technology Field	Number of Centers	Centers with Spin-offs	Number of Companies	Number of Active Companies	% Active Companies
Aerospace	4	2	8	1	13%
Competitive Accelerators	25	13	80	22	28%
Defense/Homeland Security	3	2	6	4	67%
Energy/Natural Resources	12	6	18	9	50%
Info Technology/Software Development	30	16	29	13	45%
Life Sciences	36	27	44	18	41%
Total	110	66	185	67	36%

Source: Centers of Excellence Annual Reports, FY1987 - FY2004 and information obtained at: <http://goed.utah.edu/COE>.



**Figure 3: Age Distribution of Surviving Spin-off Companies**



Of the remaining companies for which data are available, 26 employ fewer than five people. Although some of these small companies are still in the incubation stage—either formed within the past few years or based on early stage technologies—14, or about half have been active for at least 10 years.

Figure 4 shows the age distribution of surviving companies and the percentage of employment each group contributes to total employment.

Employment estimates for those spin-offs that are still operating in Utah are shown in Table 5.

Within research clusters, centers specializing in Life Science technologies have been the most successful in generating new jobs. Spin-off companies from centers in the Life Sciences cluster employ between 1,250 and 1,289 people. Included in this group are Myriad Genetics, Watson Labs and Sonic Innovations.

Spin-off companies from centers in the Competitive Accelerators cluster employ between 136 and 245 people. Companies from centers specializing in Information Technologies employ 84 to 159 people. Total employment at companies formed from centers involved in Defense and Energy is 45 to 79 and 54 to 105, respectively. No employment information is available for companies from centers in the Aerospace cluster.

A traditional way to measure economic development programs is the cost per job. On this basis, the cost per job at a COE spin-off company is about \$27,500 as measured by total state appropriations to the centers program divided by the total employment average. This estimate compares favorably to the \$35,000 per new or retained job limits imposed by the Department of Housing and Urban Development and the \$50,000 limit per new job imposed by the Small Business Administration.<sup>10</sup>

When this analysis is applied to research clusters, the best value for the state's investment has been

Life Sciences. The average cost per job in this cluster is about \$12,600—less than half the cost per job in all other research clusters. Defense is a far second with an average cost per job of \$29,000. In comparison, the highest average cost per job was in Information Technologies (\$98,000) followed by Energy and Natural Resources (\$81,400). Table 6

### Trend Analysis

As demonstrated in the analysis presented above, the centers program was most successful in spinning out companies during its early years. From 1990 through 1995, 110 companies, or almost 60 percent of total reported spin-offs were established. Further, the majority of the companies—78 percent—came out of centers formed between 1987 and 1991. To determine what factors might influence spin-off activity, centers were placed into four groups based on the date they were established. The characteristics of centers within each group are discussed below and presented in Table 7.

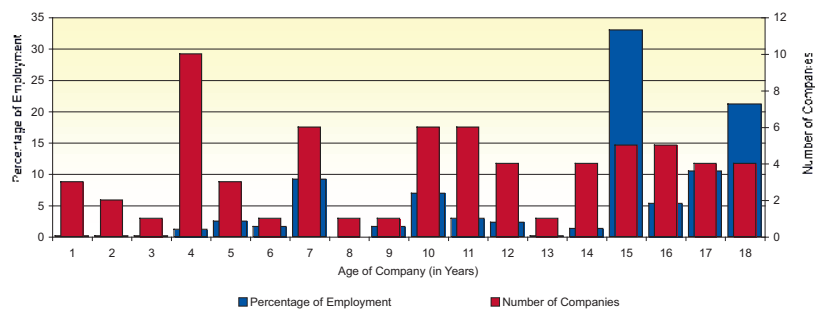
### Group I

Group I includes 36 centers established between 1987 and 1991. This group of centers has produced 111 companies, for an average of three companies per center. Ninety-seven of the companies that spun-out of Group I centers were formed within five years of the date the center was established. Of the companies formed from Group I centers 28, or about one-quarter, are still active. These companies employ between 789 and 943 people.

In terms of state funding, this group received an average of about \$557,000 in real dollars and about \$869,000 in inflation-adjusted dollars. Matching funds averaged \$6.6 million in real dollars and \$10.4 million in inflation-adjusted dollars.

Twenty centers were connected with Information Technologies (10) and Life Sciences (10). Eleven centers were in the Competitive Accelerators cluster.

**Figure 4: Distribution of Spin-off Companies by Age and Percentage of Employment**



Source: Calculated using information provided in the Centers of Excellence Annual Reports, 1988 – 2004.

**Table 5**  
**Active Spin-off Companies, 2006**

Name of Company	Institution	Year Formed	Employment
American Polymer	BYU	1990	1-4
AMIRSYS Inc.	U of U	2001	20-35
Andigen	USU	2004	1-4
Applied Bioscience Corp.	Weber	1996	5-9
Applied Medical Visualization	U of U	2002	1-4
ATL Technologies	BYU	2002	1-4
Autonomous Solutions, Inc.	USU	2000	20-35
Beckwith Technology Group	BYU	1993	1-4
Behavioral Technology, Inc.	BYU	1994	1-4
Combustion Services, Inc.	BYU	1995	1-4
Creative Composites	BYU	1991	1-4
Curecrete	BYU	1996	20-35
CyberKinetics1	U of U	1996	20-35
DelCam USA2	U of U	1988	1-4
Direct Controls, Inc.	BYU	2003	1-4
Echelon Research Laboratories	U of U	1997	20-35
Ellis, Inc.3	BYU	1990	20-35
Envirol, Inc.	USU	1992	1-4
Ergo Web	U of U	1995	1-4
FASIDE Intl, Inc.	U of U	1991	1-4
Summit Technologies	USU	2002	na
Femto Scan Corporation	U of U	1991	1-4
GeoChem Matrix	U of U	1999	1-4
GMH Engineering	BYU	1988	1-4
HGM Medical Lasers	U of U	1989	na
Haelan Medical	BYU	1990	na
Hansen Energy & Environmental	USU	2002	na
IBC Adv. Technologies	BYU	1988	20-35
Infowest	Dixie	1994	10-19
Innosys, Inc.	U of U	1999	1-4
INTECH One Eighty	USU	1992	na
IsoTruss Structures	BYU	2002	1-4
Livewire Test Labs	U fo U	2002	5-9
MC2	UVSC	1994	10-19
MacroMed	U of U	1989	20-35
MedQuest	U of U	1996	20-35
Mega Stir	BYU	2001	na
Milltech Engineering Company	U of U	1999	na
Mineral Technologies, Inc.	U of U	1998	na
MOXTEK	BYU	1989	122
Myriad Genetics	U of U	1991	550
New MATCO4	BYU	1992	10-19
Nuclear Labyrinth LLC	U of U	2002	1-4
One-Stop Satellite Solutions	Weber	1996	na
Part.Net	U of U	1995	20-35
RF Sensors	U of U	2001	na
Reaction Engineering International	BYU	1990	20-35
Rocky Mountain Engineering	BYU	1991	na
Sarcos, Inc.	U of U	1990	30
Sentrex Surgical	U of U	2005	1-4
Shepherds Goat & Cheese Products	USU	1999	1-4
Sonic Innovations Inc.	BYU	1999	145
SP communications	USU	2004	na
Summit Technologies	USU	2002	na
Techniscan, Inc.	U of U	1989	20-35
Theratech//Watson Labs	U of U	1988	325
Tile Roof Accessories	BYU	1995	10-19
Uni Foods	USU	2002	na
Utah Valley Online	UVSC	1995	na
Visco Inc.	U of U	2006	na
Visionary Products, Inc	USU	1996	20-35
Visiual Influence, Inc.	U of U	1999	1-4
Voce Divinia	BYU	1995	1-4
Wasatch Engineering	BYU	1992	1-4
Wasatch Microfluidics	U of U	2005	na
Wasatch Research	USU	2002	1-4
Wasatch Technology Group	BYU	1994	5-9

<sup>1</sup> Was Bionic Technologies.

<sup>2</sup> Was Engineering Geometry Systems.

<sup>3</sup> Was Cali, Inc.

<sup>4</sup> Was MATCO, Inc.

Source: Employment: Utah Department of Workforce Services: <http://jobs.gov/firmfind>; Firms: Utah Department of Economic Development, Centers of Excellence Program: <http://goed.utah.gov> and Centers of Excellence Annual Reports, various years.

## Group II

Group II includes 27 centers established between 1992 and 1996. As a group, these centers have produced 43 companies, for an average of 1.6 companies per center. Again, about 90 percent of these companies were formed within five years of the date the center was established. No companies have been formed from these centers since 2001. Of the companies formed by Group II centers, 16 are still active. These companies employ between 683 and 794 people.

State funding received by centers in Group II averaged about \$364,000 in real dollars, or \$489,000 in inflation-adjusted dollars. Matching funds averaged \$2.7 million, or almost \$3.2 million after adjusting for inflation.

Centers in this group were primarily connected with Life Sciences (11) and Information Technology (9).

## Group III

Group III includes 24 centers established between 1997 and 2001. This group has produced a total of 25 companies of which 17 are still active. These companies employ between 66 and 131 people. These centers are out of their funding cycle, that is they either received COE funding for the maximum number of years allowable or they are no longer active. If the relationship between the center establishment date and the formation of companies parallels that of centers in Groups I and II, it is unlikely that centers in this group will spin-out many companies in the future. In fact, none of the centers in Group III have reported spin-offs since 2004.

State funding received by Group II centers averaged about \$456,000 in real dollars, and \$541,000 inflation-adjusted dollars. Matching funds averaged \$3.3 million in real dollars, or almost \$4.0 million after adjusting for inflation.

**Table 6**  
**Cost per Job by Research Cluster**

Research Cluster	Estimated Average Employment	Jobs per COE Dollar
Aerospace	NA	NA
Competitive Accelerators	193	\$49,400
Defense	62	\$29,000
Energy and Natural Resources	65	\$81,400
Information Technology	122	\$98,000
Life Sciences	1,253	\$12,600
Overall Average	1,700	\$27,500

Notes: (1) For each research cluster, average employment is the average of the cluster's employment range. (2) Jobs per dollar were calculated by dividing the estimated average employment by direct center funding. Source: Calculated by the Bureau of Economic and Business Research.

Centers in this group were connected with Life Sciences (7), Energy (6), Competitive Accelerators (5) and Information Technology (5).

#### Group IV

Since 2002, a total of 23 new centers have been established. Since most of these centers are still in their funding cycle, there is a high likelihood they will produce more companies in the coming years. Since 2002, six companies have been formed by Group IV centers, of these all six are still active. Virtually all of these companies employ fewer than four people.

Centers in Group IV have received an average of almost \$258,000 (\$277,000 after adjusting for inflation). Matching funds have averaged \$1.0 million (about \$1.1 million in inflation-adjusted dollars).

Centers in this group are concentrated in Life Sciences (8), Information Technology (6) and Competitive Accelerators (5).

Again, it is still too early to evaluate the overall contributions of this group, but the number of companies formed to date is small when compared with the experience of centers in the other three groups.

#### Trend Analysis Summary

Many factors affect the ability of a center to spin-out its technology. Some of those factors can be quantified (money, research orientation, university affiliation). Others are less tangible, such as the philosophy of the center director regarding commercialization or market demand for center technologies. However, on the face, it appears that a clear relationship exists between funding and spin-off activity.

As shown in Tables 7 through 10, centers formed after 1991 have received less in state funding (in both real and nominal dollars), reported a lower matching fund ratio and produced fewer companies than centers formed before 1991. To determine just how important the relationship is between funding and spin-off activity, BEBR performed a regression analysis that included the following variables: 1) university at which the center was established, 2) research cluster association, 3) state funding 4) and matching funds. Of these, state funding was the most highly correlated to spin-off activity.<sup>11</sup>

Several factors could explain this relationship. First, there is much less variability between the average state funding per center and the average matching funds per center. In many instances, centers that have secured large amounts of matching funds have not always reported high levels of spin-off activity.

Data reliability poses another problem. While the amount of state funding can be verified with relative ease, the amount of matching money individual centers claim to have raised is much harder to substantiate. In fact, data published in the Centers Annual Reports have been inconsistent and

contradictory from year to year. While BEBR attempted to accurately estimate the value of matching funds raised by individual centers, the matching fund amounts used in this analysis may be overstated which could explain the low correlation between matching funds and spin-off activity.

Finally, state money is the core funding for many centers. Less money means a center must narrow its research efforts thereby limiting the number of technologies that are available for commercialization. In other words, the amount of money the center has to spend may affect the number and depth of technologies that can be explored.

#### Conclusion

For the past 20 years, COE has provided a modest amount of money to fund later-stage research at universities and colleges throughout Utah. The ultimate objective of the program is to encourage economic development through a commercialization process whereby technologies developed at university-based centers are moved into the private sector. It is a program that helps fill the gap between basic research and applied research underway in the private sector.

Establishing an exact relationship between funding and economic activity (formation of new companies and new jobs) is difficult, but it is evident the program has been successful in generating new companies. At least 65 ongoing businesses in Utah trace their roots directly to technologies funded through COE. These companies employ between 1,500 and 1,800 people thereby contributing to the state's economic base.

Despite COE's obvious success, the state's financial commitment to the program has not kept pace with inflation. The consequences of these cutbacks have been identified in this report—specifically, fewer companies are being generated through the program.

Clearly, the Centers of Excellence Program has the potential to contribute to Utah's economic growth. The state could effectively increase this potential by providing funding at levels sufficient to generate new technologies, produce new companies and ultimately, create new jobs.



**Table 7  
Characteristics of Group I Centers**

Institution	Number of Centers	COE Money	Matching Funds	Total	Average per Center	Number of Spin-offs	Number Still Operating
University of Utah	17	\$7,525,580	\$86,720,048	\$94,244,645	\$5,543,803	21	7
Utah State University	8	\$5,698,387	\$36,950,120	\$42,648,515	\$5,331,064	14	2
Brigham Young University	9	\$5,892,329	\$114,894,394	\$120,786,732	\$13,420,748	70	18
Weber State University	2	\$937,100	\$1,638,415	\$2,575,517	\$1,287,759	6	1
<b>Totals</b>	<b>36</b>	<b>\$20,052,396</b>	<b>\$240,202,977</b>	<b>\$260,255,409</b>	<b>\$7,229,317</b>	<b>111</b>	<b>28</b>
<b>Average COE Funding Inflation Adjusted</b>					<b>\$557,011 \$868,937</b>		
<b>Average Match Funding Inflation Adjusted</b>					<b>\$6,672,305 \$10,408,796</b>		
<b>Average COE and Match Inflation Adjusted</b>					<b>\$7,229,316 \$11,277,733</b>		
<b>Research Focus of Group I Centers</b>							
Aerospace	2	\$1,967,600	\$7,905,776	\$9,873,373	\$4,936,687	8	1
Competitive Accelerators	11	\$5,285,992	\$50,034,243	\$55,320,235	\$5,029,112	62	14
Defense/Homeland Security	0	\$0	\$0	\$0	\$0	0	0
Energy/Natural Resources	3	\$2,231,440	\$81,599,798	\$83,831,238	\$27,943,746	12	4
Information/Software	10	\$4,015,968	\$49,698,418	\$53,714,386	\$5,371,439	8	2
Life Science	10	\$6,551,396	\$50,964,745	\$57,516,141	\$5,751,614	21	7
<b>Totals</b>	<b>36</b>	<b>\$20,052,396</b>	<b>\$240,202,977</b>	<b>\$260,255,373</b>	<b>\$7,229,316</b>	<b>111</b>	<b>28</b>
Number of Spin-off Companies	111						
Number Still Active	28						
Average per Center	3.1						
Jobs	789 - 943						

**Table 8  
Characteristics of Group II Centers**

Institution	Number of Centers	COE Money	Matching Funds	Total	Average per Center	Number of Spin-offs	Number Still Operating
University of Utah	13	\$4,924,476	\$42,036,768	\$46,961,244	\$3,612,403	16	10
Utah State University	8	\$3,342,240	\$15,001,538	\$18,343,778	\$22,921,972	11	2
Brigham Young University	3	\$915,000	\$4,166,202	\$5,081,202	\$1,693,734	7	1
College of Eastern Utah	1	\$165,000	\$0	\$165,000	\$165,000	0	0
Dixie State College	1	\$250,000	\$520,432	\$770,432	\$770,432	5	1
Utah Valley State College	1	250000	2063913	2298913	2298913	4	2
<b>Totals</b>	<b>27</b>	<b>\$9,831,716</b>	<b>\$63,788,853</b>	<b>\$73,620,596</b>	<b>\$2,726,689</b>	<b>43</b>	<b>16</b>
<b>Average COE Funding Inflation Adjusted</b>					<b>\$364,138 \$489,037</b>		
<b>Average Match Funding Inflation Adjusted</b>					<b>\$2,362,550 \$3,172,905</b>		
<b>Average COE and Match Inflation Adjusted</b>					<b>\$2,726,688 \$3,661,942</b>		
<b>Research Focus of Group II Centers</b>							
Aerospace	0	\$0	\$0	\$0	\$0	0	0
Competitive Accelerators	4	\$875,000	\$6,488,461	\$7,363,461	\$1,842,865	12	3
Defense/Homeland Security	1	\$810,000	\$9,037,750	\$9,847,750	\$9,847,750	3	2
Energy/Natural Resources	2	\$567,000	\$1,895,485	\$2,462,485	\$1,231,243	3	2
Information/Software	9	\$3,465,153	\$19,120,728	\$22,585,881	\$2,509,542	15	6
Life Science	11	\$4,114,563	\$27,246,429	\$31,360,992	\$2,850,999	10	3
<b>Totals</b>	<b>27</b>	<b>\$9,831,716</b>	<b>\$63,788,853</b>	<b>\$73,620,569</b>	<b>\$2,726,688</b>	<b>43</b>	<b>16</b>
Number of Spin-off Companies	43						
Number Still Active	16						
Average per Center	1.6						
Jobs	683 - 794						

**Table 9**  
**Characteristics of Group III Centers**

Institution	Number of Centers	COE Money	Matching Funds	Total	Average per Center	Number of Spin-offs	Number Still Operating
University of Utah	15	\$6,761,500	\$62,244,211	\$69,005,711	\$4,600,381	12	6
Utah State University	3	\$1,427,000	\$5,561,798	\$6,988,798	\$2,329,599	8	6
Brigham Young University	4	\$2,324,000	\$9,817,418	\$12,141,418	\$3,035,355	4	4
Weber State University	2	\$438,000	\$2,381,042	\$2,819,042	\$1,409,521	1	1
Totals	24	\$10,950,500	\$80,004,469	\$90,954,969	\$3,789,790	25	17
Average COE Funding Inflation Adjusted					\$456,271 \$540,681		
Average Match Funding Inflation Adjusted					\$3,333,520 \$3,950,221		
Average COE and Match Inflation Adjusted					\$3,789,790 \$4,490,902		
<b>Research Focus of Group III Centers</b>							
Aerospace	0	\$0	\$0	\$0	\$0	0	0
Competitive Accelerators	5	\$2,104,000	\$7,108,573	\$9,212,573	\$1,842,515	4	4
Defense/Homeland Security	1	\$577,500	\$1,856,407	\$2,433,907	\$2,433,907	2	2
Energy/Natural Resources	6	\$2,350,000	\$16,617,520	\$18,967,520	\$3,161,253	3	3
Information/Software	5	\$2,725,000	\$18,138,229	\$20,863,229	\$4,172,646	5	3
Life Science	7	\$3,194,000	\$36,283,740	\$39,477,740	\$5,639,677	11	5
Totals	24	\$10,950,500	\$80,004,469	\$90,954,969	\$3,789,790	25	17
Number of Spin-off Companies	25						
Number Still Active	17						
Average per Center	1.0						
Jobs	66 - 131						

**Table 10**  
**Characteristics of Group IV Centers**

Institution	Number of Centers	COE Money	Matching Funds	Total	Average per Center	Number of Spin-offs	Number Still Operating
University of Utah	16	\$3,867,900	\$15,748,106	\$19,616,006	\$1,226,000	4	4
Utah State University	3	\$1,162,100	\$3,910,199	\$5,072,299	\$1,690,766	1	1
Brigham Young University	4	\$902,200	\$3,565,900	\$4,468,100	\$1,117,025	1	1
Totals	23	\$5,932,200	\$23,224,205	\$29,156,405	\$1,267,670	6	6
Average COE Funding Inflation Adjusted					\$257,922 \$276,750		
Average Match Funding Inflation Adjusted					\$1,009,748 \$1,083,460		
Average COE and Match Inflation Adjusted					\$1,267,670 \$1,360,210		
<b>Research Focus of Group IV Centers</b>							
Aerospace	2	\$414,700	\$830,000	\$1,244,700	\$622,350	0	0
Competitive Accelerators	5	\$1,269,700	\$5,874,610	\$7,144,310	\$1,428,862	1	1
Defense/Homeland Security	1	\$413,700	\$793,899	\$1,207,599	\$1,207,599	0	0
Energy/Natural Resources	1	\$140,000	\$465,355	\$605,355	\$605,355	0	0
Information/Software	6	\$1,749,100	\$6,296,116	\$8,045,216	\$1,340,869	2	2
Life Science	8	\$1,945,000	\$8,964,225	\$10,909,225	\$1,363,653	3	3
Totals	23	\$5,932,200	\$23,224,205	\$29,156,405	\$1,267,670	6	6
Number of Spin-off Companies	5						
Number Still Active	5						
Average per Center	0.3						
Jobs	3 - 12						

## Endnotes

<sup>1</sup> Rockwood, Lucynthia, "Centers of Excellence, Historical Report July 1986 – June 2004," Department of Economic and Community Development; 2004.

<sup>2</sup> Plosila, Walter H.; "A Program Review and Assessment: State of Utah's Centers of Excellence Program," Utah Department of Community and Economic Development, January 1991.

<sup>3</sup> Centers of Excellence, enabling legislation.

<sup>4</sup> Utah Department of Economic Development, Centers of Excellence Program: <http://goed.utah.gov/COE/overview.html>.

<sup>5</sup> *ibid.*

<sup>6</sup> Inflation adjusted to 1987 dollars using the Consumer Price Index (CPI) produced by the U.S. Department of Labor, Bureau of Labor Statistics available at <http://stats.bls.gov>.

<sup>7</sup> Utah Department of Economic Development, Centers of Excellence Program: <http://goed.utah.gov/COE/overview.html>.

<sup>8</sup> These employment estimates were generated using secondary sources, specifically the Utah Department of Workforce Services (UDWS) and the Centers of Excellence Program websites. UDWS does not provide actual employment at the firm level, but does provide an employment range available through the UDWS website. For all but the largest firms, this employment range was used to develop the employment range estimates for the group as a whole. Employment for the largest firms was obtained from the COE website.

<sup>9</sup> The information presented here is based on employment for 52 spin-off companies. No employment information is available for the remaining 15 spin-offs.

<sup>10</sup> United States Small Business Administration, SBA Loan Programs, CDC/504 Loan Program: accessible at: [www.sba.gov/financing/sbaloan/cdc504.html](http://www.sba.gov/financing/sbaloan/cdc504.html); U.S. Department of Housing and Urban Development, Community Planning and Development, Section 108 Loan Guarantees: accessible at: [www.hud.gov](http://www.hud.gov).

<sup>11</sup> As a rough rule, a t-static larger than 2 in absolute value would have a 5% or smaller probability of occurring "by chance". As seen in the following table, the COE match is the one variable with a strong, positive correlation.

Variable	Unstandardized Coefficients		Beta	t statistic	Significance
	B	Std. Error			
(Constant)	-.367	5.303		-.069	.945
COE (millions of \$)	2.929	1.201	2.72	2.438	0.17
Match Funds (millions of \$)	-.006	.043	-.015	-.139	.890
Aerospace Cluster	-1.132	3.533	-.046	-.320	.749
Competitive Accelerator	1.292	2.874	.117	.449	.654
Energy/Natural Resources	-.187	2.991	-.013	-.062	.950
Information/Software Tech.	-.685	2.808	-.066	-.244	.808
Life Sciences	-.293	2.756	-.030	-.106	.916
University of Utah	-.157	4.617	-.017	-.034	.973
Brigham Young University	2.241	4.745	.0188	.472	.638
Utah State University	.101	4.692	.009	.021	.983
Weber State University	1.240	5.119	.050	.242	.809
Dixie State College	5.056	6.502	.104	.778	.439
Utah Valley State College	.138	6.503	.003	.021	.983

## Data Sources and Methodology

The Centers of Excellence annual reports from FY 1987 through FY 2005 were the primary data sources used in this analysis. Over the past 20 years the reporting formats have changed considerably. For most years, the annual report lists the centers that received funding and provides financial information for those centers. In some years the annual reports also specify the number of patents generated through the program, the number of patents pending and the number of spin-off companies formed using center technology or assistance. Information sheets for FY 2006 were used to identify new centers. This information was accessed at: <http://goed.utah.gov/COE/index.html>.

Because of changes in reporting formats the amount of matching funds raised by individual centers has not been consistently reported from year to year. To the extent possible, BEBR has tried to reconcile the amounts using the annual reports; however, no attempt was made to independently verify the accuracy of matching funds reported by individual centers. Finally, no attempt has been made to verify the accuracy of claims regarding spin-off activity.

Information about employment and status of spin-off companies was collected from the Utah Department of Workforce Services, from the Internet and through telephone calls placed to spin-off companies that are still operating.

There are drawbacks to using COE annual reports as the primary data source. The most significant is the lack of specific information about graduated centers. In general, an annual report only includes information about centers that were funded during the most recent fiscal year. Information about the specific activities of graduated centers, or centers that did not receive state funding in the given year is typically not included in the annual report. In many instances, graduated centers have continued their research activities without COE funding. Spin-off companies that may have resulted from these independently-funded activities are not known and therefore not included in the analysis.

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