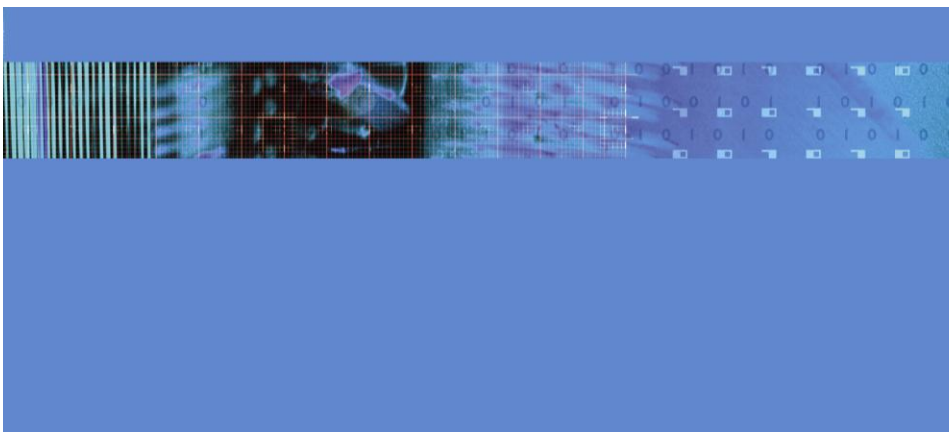

Briefing Paper:

# Iowa IT Cluster

Prepared for:

Iowa Department of Economic Development

Prepared by:

Battelle Technology Partnership Practice

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Battelle

The Business of Innovation

## Contents

# Briefing Paper: Iowa IT Industry Cluster

## I. Introduction

In 2005, at the request of the Iowa Department of Development, Battelle undertook an assessment of the Information Technology (IT) industry sector in Iowa and associated supporting strengths in the R&D community. The assessment was leveraged in developing a strategic action plan for enhancing the IT sector in the state.

Few would have predicted in 2005 the global economic downturn that has so negatively impacted industry development. The U.S. IT sector has been one of the victims of the global recession, and increasing levels of foreign competition and, as a result, employment volumes in the sector have declined nationally, and within Iowa.

Against this background of changing economic fortunes, and the shake-out that has occurred across industry sectors because of it, Iowa now needs to revisit and reassess its position in key strategic economic clusters. In 2010 Battelle completed an update of the Iowa biosciences cluster strategy, and now in 2011 is updating the IT and Advanced Manufacturing work. The briefing paper herein discusses the findings of the IT cluster review.

**Finding Opportunities:**

While the IT sector has faltered, this does not mean that this industry (so crucial to advancement in an information age) will not continue to be the source of innovation and technological development. IT employment may have declined, but scientific research and applied R&D is still, and will continue to be, directed intensively at IT innovations—on both the hardware and software side. IT is ubiquitous in driving productivity enhancements in almost every other industry and is central to core work processes across all sectors—from manufacturing to services.

Because of the incredibly diverse markets for IT products and services no single nation, region or location will have a position across all IT technologies. Some regions such as Silicon Valley and the Boston region certainly enjoy a play in a broad variety of technologies, but certainly not in all. The fact is, that the sector is so diverse that there are opportunities for IT niche specializations at state and regional levels, plus unique opportunities to tie IT R&D and product/service development to other economic clusters at the local and regional level. Indeed, it is often at this intersection of IT capabilities and regional IT demand drivers that robust tacit-knowledge anchored development can occur.

The work of Battelle, reported herein, aims at reassessing and identifying the existing and emerging IT niches for Iowa in 2011. In an industry with such a rapid pace of change as IT, six-years are a very long time, encompassing several product life-cycles. It would be expected that Iowa's IT sector will have undergone change, that some industry and R&D sub-specializations in IT may have declined while others will have emerged and risen in prominence and prospects. Battelle finds that this is indeed the case.

In this paper Battelle first presents quantitative findings from a current analysis of the Iowa economy and trends within the IT sector (with a special focus on IT trends). Individual sub-sectors of the IT cluster are evaluated and trends suggested by the data noted. In addition to evaluating industry employment trends, the Battelle team also evaluates R&D-related data for Iowa—examining academic research strengths, patenting activity and other general indicators.  To gain further insight into the IT strengths weaknesses, opportunities and threats in Iowa the Battelle team also conducted a series of interviews with key stakeholders and university leaders.

# II. The Iowa IT Sector: Economic Analysis

Battelle defines the IT sector to include the following:[1]

**Table 1: NAICS Codes Included Within IT Sector Definition**

| NAICS Code | NAICS Title | Major IT Subsector |
|---|---|---|
| 334210 | Telephone Apparatus Mfg | Communications Equipment |
| 334220 | Radio and Television Broadcasting and Wireless Communications Equipment Mfg | Communications Equipment |
| 334290 | Other Communications Equipment Mfg | Communications Equipment |
| 335921 | Fiber Optic Cable Mfg | Communications Equipment |
| 335929 | Other Communication and Energy Wire Mfg | Communications Equipment |
| 517110 | Wired Telecommunications Carriers | Communications Network Services |
| 517210 | Wireless Telecommunications Carriers (except Satellite) | Communications Network Services |
| 517410 | Satellite Telecommunications | Communications Network Services |
| 517911 | Telecommunications Resellers | Communications Network Services |
| 517919 | All Other Telecommunications | Communications Network Services |
| 334111 | Electronic Computer Mfg | Computer & Peripheral Equipment |
| 334112 | Computer Storage Device Mfg | Computer & Peripheral Equipment |
| 334113 | Computer Terminal Mfg | Computer & Peripheral Equipment |
| 334119 | Other Computer Peripheral Equipment Mfg | Computer & Peripheral Equipment |
| 334413 | Semiconductor and Related Device Mfg | Computer & Peripheral Equipment |
| 519130 | Internet Publishing & Broadcasting & Web Search Portals | Internet Services & E-Commerce |
| 425110 | Business to Business Electronic Markets | Internet Services & E-Commerce |
| 454111 | Electronic Shopping | Internet Services & E-Commerce |
| 454112 | Electronic Auctions | Internet Services & E-Commerce |
| 334611 | Software Reproducing | Software & Computer Services |
| 511210 | Software Publishers | Software & Computer Services |
| 518210 | Data Processing, Hosting, and Related Services | Software & Computer Services |
| 541511 | Custom Computer Programming Services | Software & Computer Services |
| 541512 | Computer Systems Design Services | Software & Computer Services |
| 541513 | Computer Facilities Management Services | Software & Computer Services |
| 541519 | Other Computer Related Services | Software & Computer Services |

*Note: The "Electronic Shopping" and "Electronic Auctions" subsectors are new for this analysis. As such, employment numbers and other data herein are not directly comparable to previous 2005 sector data.*

## IT Cluster Employment

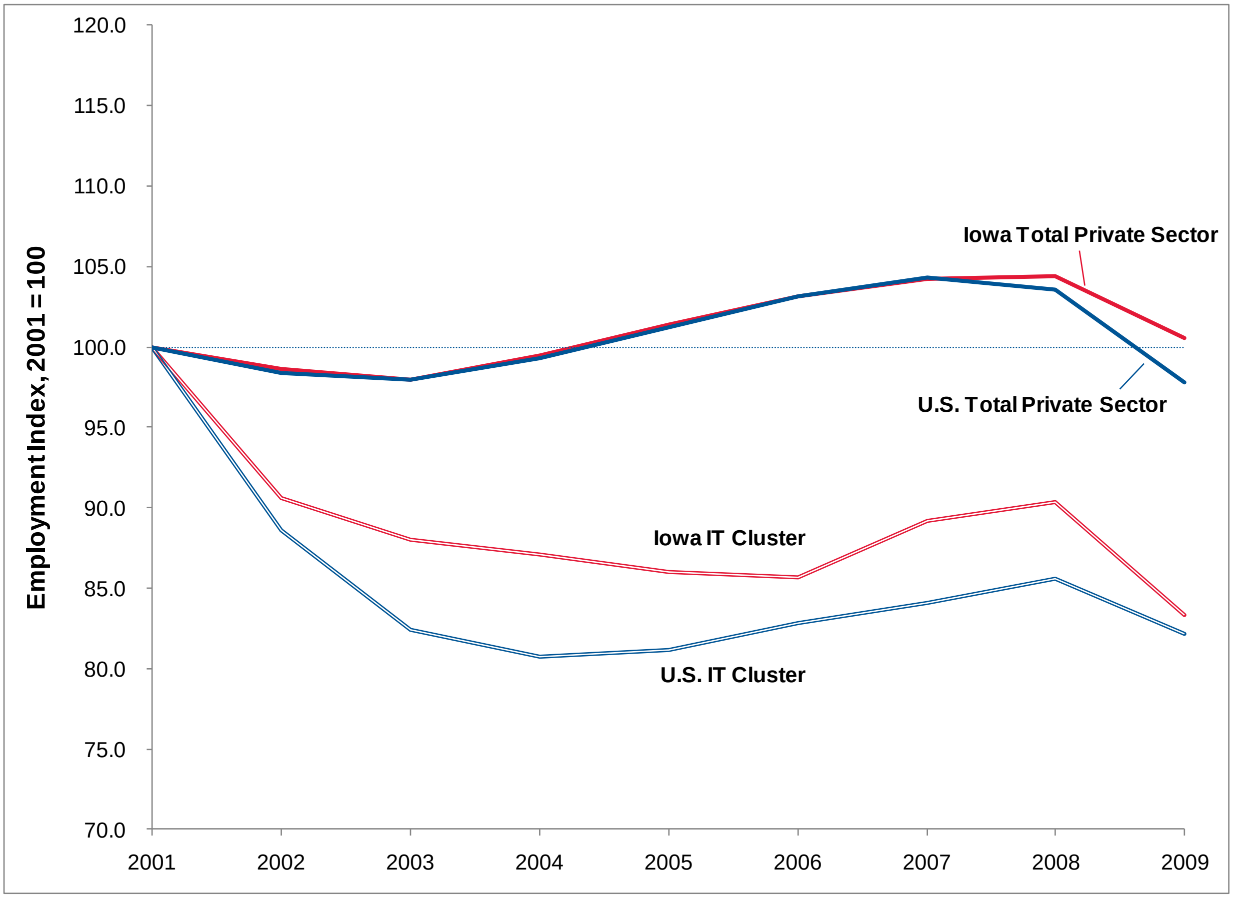
As defined, the IT sector in Iowa and the notion has experienced the following (Figure 1):

- Both the State and National IT sectors have followed very similar trends and not fared well since the recession in the early 2000s and the dot.com bust.
- After being flat from 2003 through 2006 the State cluster experienced employment growth through 2008, adding over 1,300 jobs or 5% before declining again in the recession in 2009.

[1] Note: Industry definition presented here only in current NAICS codes (established 2007; time series analysis uses older 2002 NAICS to bridge differences).

- On net, Iowa's IT Cluster has shed 16.6% of its jobs base since 2009 whereas the U.S. is down even more at 17.9%.

**Figure 1: Trends in U.S. and Iowa IT Employment versus Total Private Sector Employment Trends**




In terms of total employment, the Iowa IT cluster employed 24,042 personnel in 2009 (Table 2). As measured by a location quotient (LQ), this sector does not yet represent a regional specialization for Iowa having a LQ of 0.59 (to be considered a regional specialization this would need to rise to 1.2 or higher). At an LQ of 0.59, IT in Iowa employs approximately 41% less personnel than would be expected given IT's overall share of employment in the national economy.

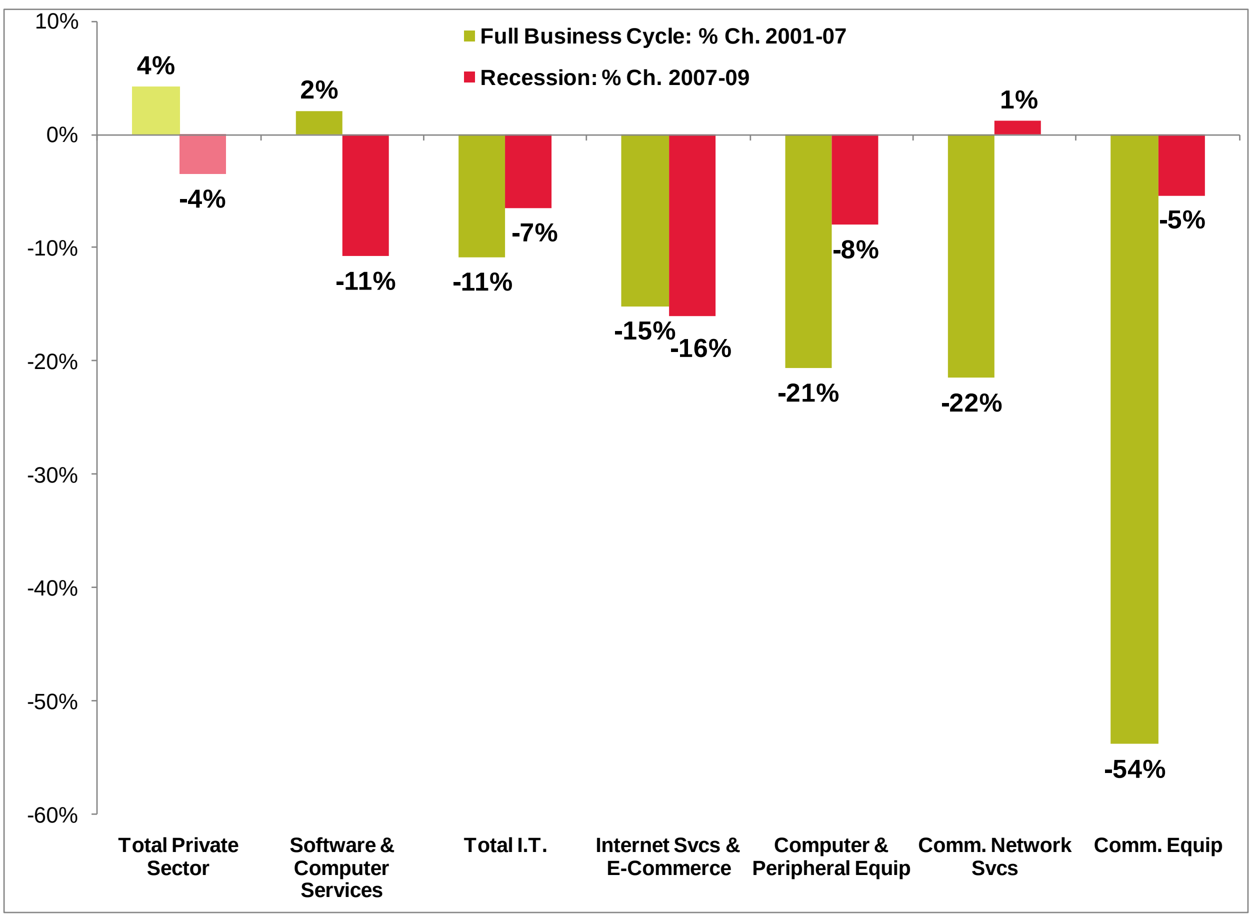
In order to reach parity with national IT employment concentration (a 1.0 LQ) the Iowa IT cluster would need to add 16,700 jobs. To reach the status of "regionally specialized" the sector would need to add 24,900 jobs in Iowa.

**Table 2: Iowa IT Employment Overall and Within Major IT Subsectors**

| Major Information Technology Subsectors | Employment, 2009 | Location Quotient 2009 | Percent Change in Employment, Key Periods | | | |
|---|---|---|---|---|---|---|
| | | | Full Business Cycle: 2001-07 | Recession: 2007-09 | Full Period: 2001-09 | Since Battelle Strategy: 2005-09 |
| **Total Private Sector** | **1,208,027** | **1.00** | **4.2%** | **-3.5%** | **0.5%** | **-0.9%** |
| **Total Information Technology** | **24,042** | **0.59** | **-10.8%** | **-6.5%** | **-16.6%** | **-3.1%** |
| Software & Computer Svcs | 12,940 | 0.60 | 2.0% | -10.8% | -9.0% | -0.9% |
| Communications Network Svcs | 9,330 | 0.85 | -21.5% | 1.2% | -20.6% | -4.0% |
| Internet Services & E-Commerce | 753 | 0.30 | -15.2% | -16.1% | -28.8% | 25.6% |
| Computer & Peripheral Equip | 552 | 0.14 | -20.6% | -8.0% | -27.0% | -5.8% |
| Communications Equip | 467 | 0.29 | -53.8% | -5.4% | -56.3% | -44.3% |

As Table 2 shows, the state IT cluster has had net employment declines over each of the key periods shown in the table (which adjust for the business cycle), even during the economic expansion of the 2000s (though the national trends in IT jobs have generally been even worse).

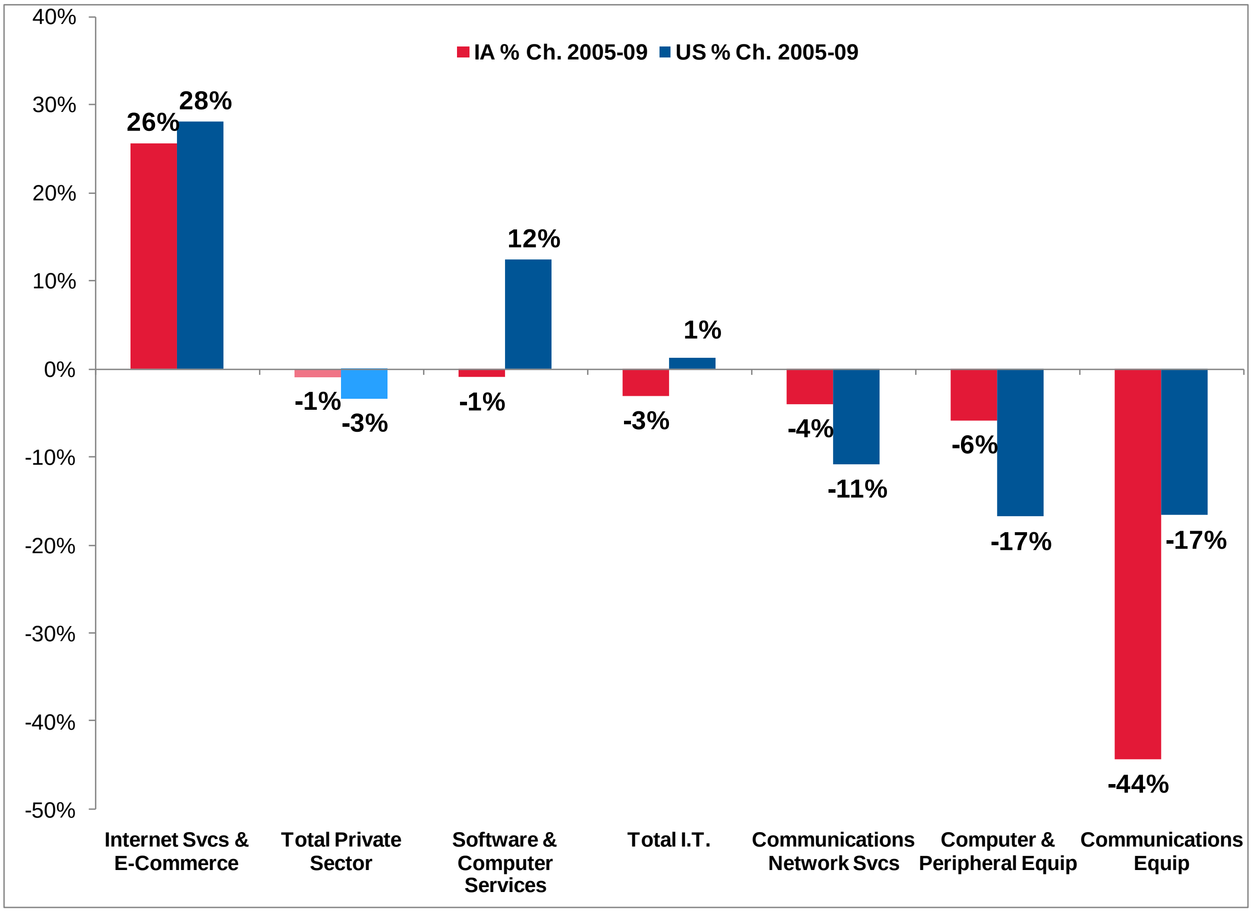
**Figure 3: Iowa IT Employment in Major IT Subsectors**




It is evident from these statistics that IT employment in Iowa is heavily concentrated in two IT subsectors "Software and Computer Services" (12,940 employees, 53.8% of the IT sector total) and "Communications Network Services" (9,330 employees, 38.8% of the IT sector total). Combined, these two subsectors account for 92.6% of IT sector employment in Iowa. In the business cycle time period of

2001-2007 only “Software and Computer Services” experienced an employment gain (a moderate 2% rise). During the recession time period of 2007-2009“Software and Computer Services” shed 10.8% of its jobs, whereas “Communications Network Services” experienced a moderate 1.2% gain.

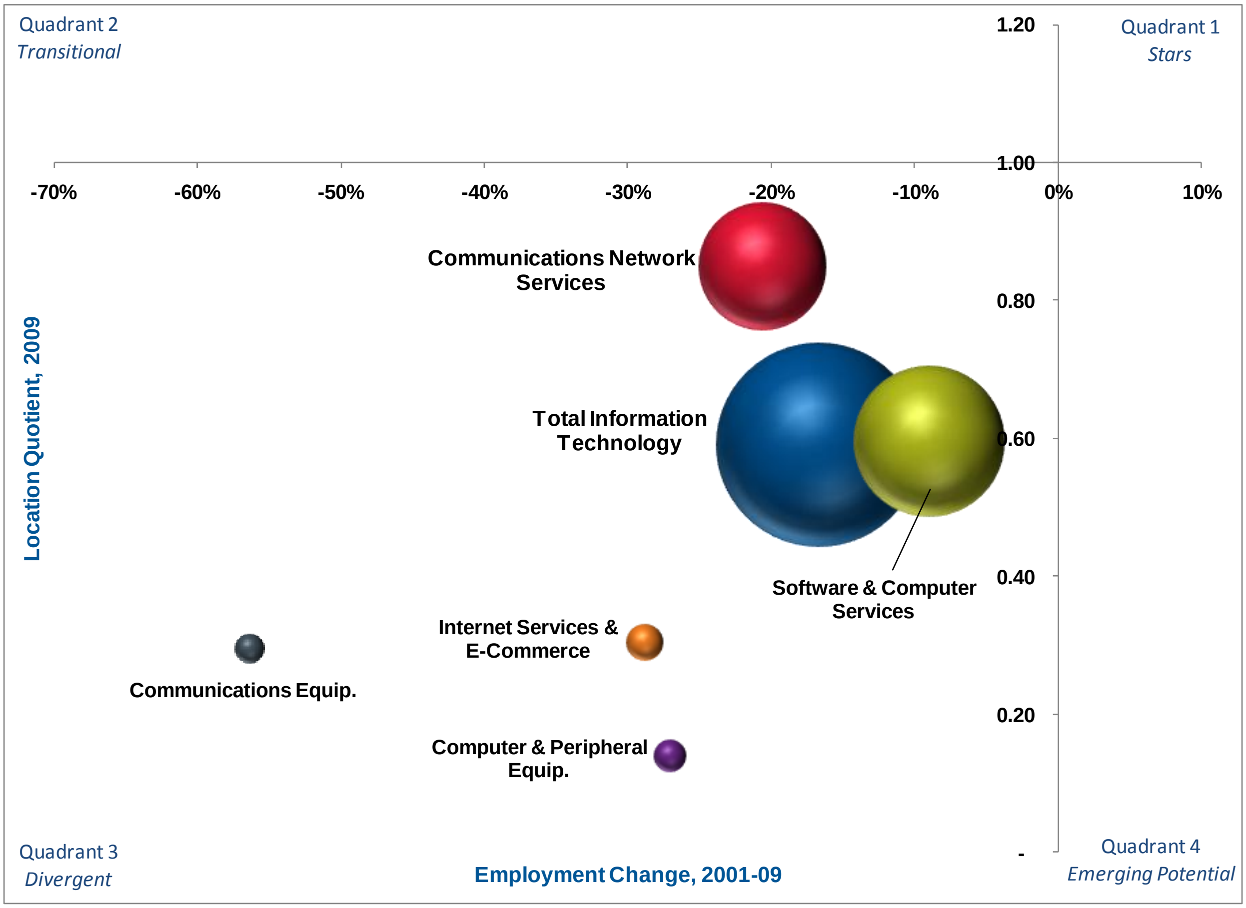
**Figure 4: Iowa IT Employment in Major IT Subsectors Since Battelle Strategy Released in 2005**




Since the release of the 2005 Battelle Cluster Strategy, the IT cluster has had a net loss of 760 jobs or 3%; however nearly all of that job loss came in 2009 amidst the deep recession. From 2006 through the first year of the recession (2008), IT employment had *grown* by more than 1,300 jobs or 5.4%.

Figure 5 repeats the bubble chart analysis used in the original 2005 assessment of the Iowa IT sector—updating it for the full 2001-2009 time period. It is evident that during the full 2001-09 period, each of the 5five major IT subsectors in Iowa can be characterized as ***“Divergent”***—not growing and not highly concentrated or specialized

**Figure 5: Iowa IT Employment Change and Location Quotients**




Given that the entire IT industry within the U.S. has experienced tough times generated by both international competition and recessionary economics, it is logical to re-assess the bubble chart analysis with overall U.S. IT performance as the reference. This results in Figure 6, which shows that while none of the major subsectors in Iowa grew over the 2001-09 period, some did not decline as fast as their national counterparts including: Communications Network Services; Computer & Peripheral Equipment; and the Overall "Total Information Technology" cluster.

**Figure 6: Iowa IT Employment Change Relative to the United States Overall and Location Quotients**

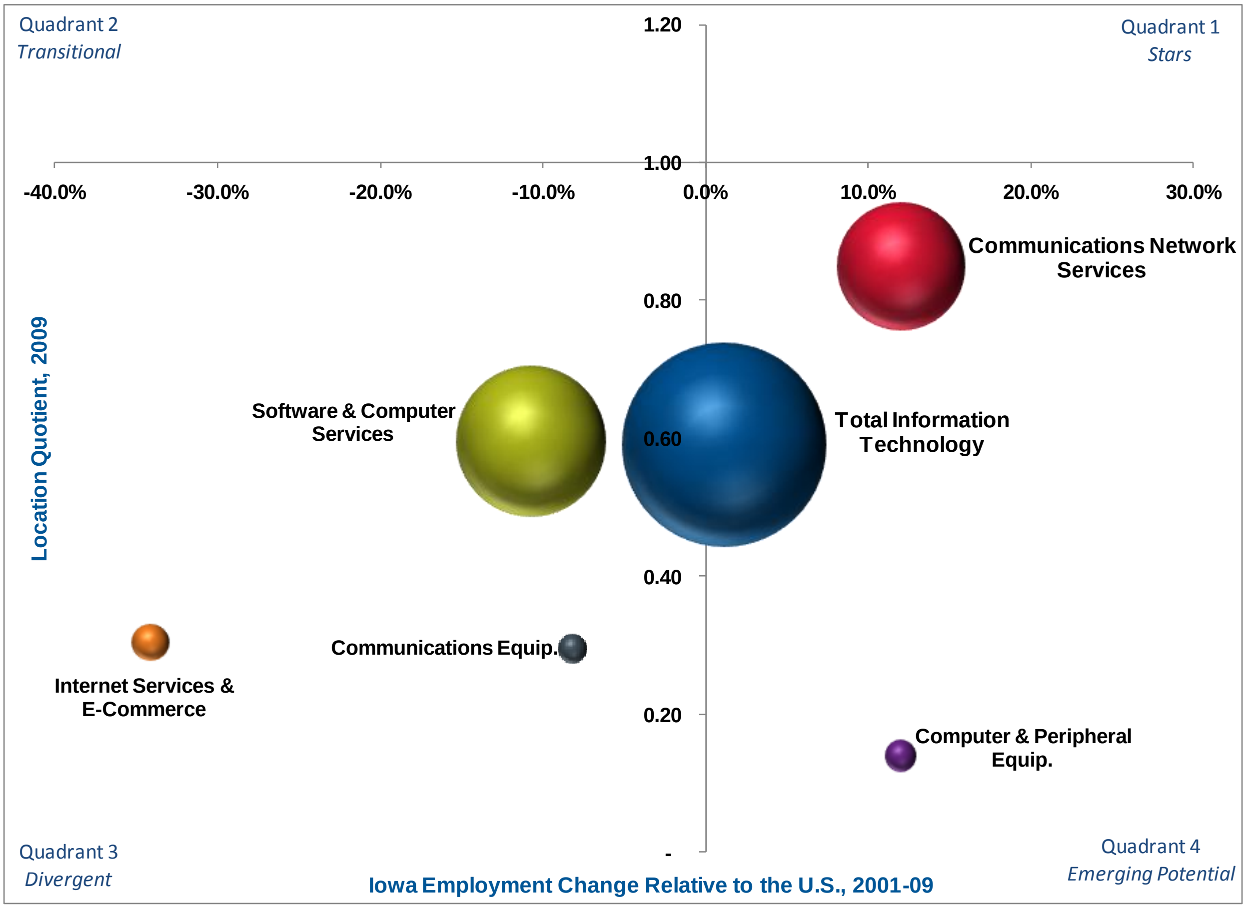
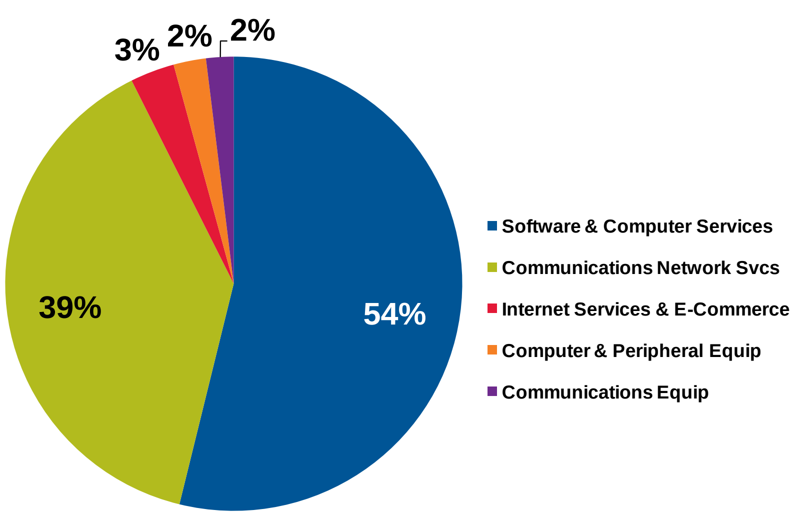



**Figure 7: Iowa IT Employment by IT Subsector**



IT is still a relatively small sector within the Iowa economy overall. At 2009 employment levels, the IT sector represents 2% of all Iowa private sector jobs. In terms of economic output, however, the sector comprises 3% of Iowa private sector output.

**Table 3: Iowa IT Establishment Analysis - Overall and Within Major IT Subsectors**

| Major Information Technology Subsectors | Establishments, 2009 | Percent Change in Estabs, Key Periods | | |
|---|---|---|---|---|
| | | Full Business Cycle: 2001-07 | Recession: 2007-09 | Full Period: 2001-09 |
| **Total Private Sector** | **88,437** | **2.7%** | **0.9%** | **3.6%** |
| **Total Information Technology** | **2,495** | **8.3%** | **9.9%** | **19.0%** |
| Software & Computer Svcs | 1,691 | 22.0% | 18.8% | 44.9% |
| Communications Network Svcs | 628 | -9.0% | -7.0% | -15.3% |
| Internet Services & E-Commerce | 153 | 0.6% | 4.8% | 5.4% |
| Computer & Peripheral Equip | 13 | -31.8% | -13.3% | -40.9% |
| Communications Equip | 10 | -47.2% | -9.1% | -52.0% |

In terms of business establishment numbers, despite the overall decline in sector employment the State has experienced growth in the number of IT establishments (firms). Businesses have primarily developed in the "Software & Computer Services" sector.

Establishment growth has come in Software & Computer Services and in Internet Services & E-Commerce. These are the two subsectors with the smallest average employment per establishment both in Iowa and nationally; helping to explain why jobs might be declining in the cluster but on net smaller establishments are being added. Over the 2001-09 period Iowa's IT sector has expanded its establishment base by 19% compared with a 14% gain seen nationally.

During interviews regarding the IT sector, those familiar with the sector in Iowa noted that much of the IT sector in Iowa is smaller firms primarily providing IT services within the state or within the North Central region. There are a limited number of major Iowa IT players with global reach.

## IT Cluster Wages and Productivity

One of the reasons economic developers seek technology-based economic development is that, on average, technology jobs will tend to pay higher wages than the private sector average. In Iowa this proves to be the case with the IT cluster, with those employed within Iowa IT firms earning 50% higher wages than the Iowa private sector average (which is $36,316).

- Average wages for the IT cluster and each of its five major subsectors are greater than the overall private sector.
- In addition, average IT wages exceed those for other major sectors including Professional Services; Manufacturing; Transportation; and Health Care.

Table 4 illustrates the wage findings for IT sector jobs in Iowa.

**Table 4: Iowa IT Sector Average Wages**

| Major Industries & IT Subsectors | Avg. Annual Wages | |
|---|---|---|
| | IA 2009 | U.S. 2009 |
| **Computer & Peripheral Equipment** | **$ 73,469** | **$ 107,261** |
| Mgmt of Companies & Enterprises (Corp HQs) | $ 69,558 | $ 91,405 |
| **Software & Computer Services** | **$ 57,759** | **$ 90,959** |
| Finance & Insurance | $ 55,905 | $ 79,736 |
| **Total Information Technology** | **$ 54,211** | **$ 86,057** |
| Professional, Scientific, & Technical Services | $ 50,505 | $ 74,738 |
| **Communications Network Services** | **$ 49,855** | **$ 70,692** |
| Wholesale Trade | $ 49,813 | $ 61,588 |
| Manufacturing | $ 47,330 | $ 54,854 |
| Information | $ 43,627 | $ 71,182 |
| Construction | $ 43,527 | $ 49,312 |
| **Communications Equipment** | **$ 41,975** | **$ 83,476** |
| **Internet Services & E-Commerce** | **$ 40,687** | **$ 78,803** |
| Transportation & Warehousing | $ 36,758 | $ 42,819 |
| **Total Private Sector** | **$ 36,316** | **$ 45,146** |
| Health Care & Social Assistance | $ 36,109 | $ 43,217 |
| Agriculture, Forestry, Fishing & Hunting | $ 30,999 | $ 26,017 |
| Retail Trade | $ 22,320 | $ 26,161 |
| Arts, Entertainment, & Recreation | $ 17,959 | $ 31,627 |

It should be noted that there is a considerable disparity between Iowa IT sector wages and those for sector overall in the U.S. From an economic development recruitment perspective, this represents a competitive advantage for Iowa—although such wide disparities are unusual and may reflect a lower value-added content in Iowa IT, or lower productivity levels.

Battelle's analysis shows that while Iowa's IT cluster is more productive and adds greater value, on average, compared with Iowa's overall private sector, the IT sector is lagging behind national productivity levels in the sector. (Table 5):

**Table 5: Iowa IT Sector Productivity**[2]

| Industry Cluster | Iowa Productivity, 2009 | U.S. Productivity, 2009 | IA/U.S. |
|---|---|---|---|
| **Total Private Sector** | **$ 68,714** | **$ 83,128** | **83%** |
| **Information Technology Cluster** | **$ 112,901** | **$ 150,219** | **75%** |

[2] **Value-added** represents the difference between an industry's total output and the cost of its intermediate inputs; a measure of the cluster's contribution to gross state product. The measure of value-added per employee is often used as a measure of overall industry productivity. Source: Battelle analysis of IMPLAN Input/Output Model for IA and US.

## IT Cluster Drivers - Detailed Industries

Examining the subclusters of It in Iowa further, it is evident that the state possesses one **large and specialized**[3] detailed industry in Iowa: **Data Processing, Hosting, & Related Services.** This is a subset of the larger Software & Computer Services segment and contains 5,902 jobs with an LQ of 2.13. However, even this highly specialized subsector for Iowa has experienced employment declines:

- Employment Change 2001-07: -11%
- Employment Change 2007-09 (Recession): -21%

The IT cluster also contains some subsets of clusters that are not "specialized" (as defined by LQ) but that have **experienced positive growth** that outpaced the U.S. from 2001-09 and a 2001 building upon a base of at least 100 jobs, these include:

- **Custom Computer Programming** – 3,496 jobs; 0.50 LQ; employment up 41% since 2001; steady growth even during recession
- **Wireless Telecommunications** – 1,492 jobs; 0.68 LQ; employment up 5% since 2001; steady growth even during recession
- **"Other" Computer-related Services** (includes disaster recovery; software installation services) – 450 jobs; 0.39 LQ; employment up 51% since 2001
- **Electronic Shopping** – 362 jobs: 0.37 LQ; employment up more than 200% since 2001
- **Semiconductor Manufacturing** – 192 jobs; 0.09 LQ; employment up 98% since 2001

## Companies in the IT Cluster

Within Iowa's IT cluster several companies stand-out as significant employers—businesses whose retention and expansion should be considered a high-priority for Iowa economic developers. Examples include:

- **CDS Global** (HQ in Des Moines, several IA branch locations), provider of business IT solutions including e-commerce, payment processing, marketing, order management and fulfillment solutions
- **Fiserv Solutions** (West Des Moines and Cedar Rapids), develops information management and e-commerce solutions for the financial services industry
- **DataVision Resources** (Carlisle), data processing, management services for firms in banking, insurance, media, healthcare, and other sectors
- **Verizon Business Network Services** (Cedar Rapids), wireless telecomm
- **Rockwell Collins Satellite Communications Systems** (Cedar Rapids), satellite telecomm

It should be noted that beyond employment in direct IT industries, IT is an embedded job category within many other industries. IT is a key job function within almost every industry, and in some sectors

[3] Battelle defines a *specialized* industry as one with a location quotient that meets or exceeds 1.20

such as finance and insurance, health care, advanced manufacturing, corporate HQ operations and aerospace, for example, is a central driver of business processes and productivity.

It is also important to take note of the companies in the IT sector and associated telecommunications sector that have been the subject of equity/venture capital deals since 2005. Typically, these will represent fast growing, entrepreneurial companies with aggressive business growth strategies. Key deals recorded in the IT and associated sectors for 2005 through the end of year 2010 include:

**Table 6: Equity Capital Deals in Iowa IT Companies - 2005 through 2010.**

| Company | Line of Business | Sum of Equity Invested **($ millions)** |
|---|---|---|
| **Ruffalo, Cody & Associates, Inc.** | Provides enrollment management services. The Company provides strategic fundraising and enrollment management services focusing on business survey/data base development work, and business to business selling. | 55 |
| **GeoLearning, Inc.** | Provides managed learning services and hosts learning platforms. The Company's products and services are used by corporations, government agencies and non-profit organizations to manage human capital development, develop critical business processes and drive organizational performance. | 35.1 |
| **Long Lines LLC (formerly Northwest Iowa Telephone)** | Operates a telecommunications company providing voice, video, and Internet Services in rural areas within the state of Iowa. | 11.1 |
| **MediNotes Corporation** | Develops and markets electronic health record (EHR) solutions. The Company provides EHR solutions for primary care and specialty medical practices. MediNotes offers EHR/practice management suite, as well as EHR solution that allows MediNotes to meet a physician practice's needs. It provides software such as practice management software, scheduling software, reference lab and diagnostic equipment. | 7.91 |
| **GCommerce, Inc.** | Develops software-as-a-service (SaaS) technology solutions. The Company's software solutions enable information sharing between incompatible business systems and technologies. GCommerce's focus is on electronically connecting trading partners in distribution industries, to automate manual processes, while aligning solutions with business requirements. | 6.15 |
| **Palisade Systems, Inc.** | Provides enterprise content security and data protection solutions whether data is at-rest or in-motion. The Company offers solutions that help organizations proactively secure sensitive and proprietary intellectual property from leaving data networks, defines and enforces access to internal network resources, and enforces compliance with federal privacy and industry security regulations such as HIPAA, FERPA, PCI and GLBA. | 2.6 |
| **NewCom Technologies, Inc.** | Develops mobile Geographic Information Systems (GIS) to support government facilities and utilities. The Company performs engineering services and network data management for the telecommunications industry. NewCom specializes in customized software development and management of GIS for governments and utilities. | 2.5 |
| **Dynamic Broadband Corporation** | Provides broadband wireless Internet access in the upper Midwest. The Company operates as an Internet service provider and offers services in Iowa, South Dakota, Nebraska, Minnesota, and Illinois regions. | 0.5 |

| | | |
|---|---|---|
| **Heartland Technology Solutions** | Offers services including hardware and software procurement, integration, training and support. The Company's services include IP Telephony, Document Management, Global Positioning Systems and Web Development and Hosting. | 0.15 |
| **Light Edge Solutions, Inc. (formerly Lighthouse Communications)** | Provides data communications and value-added services for business. The Company's services include Internet connectivity, managed firewall security, wide area networking, remote access, managed e-mail services, hosting and Web and voice conferencing. | Not recorded |
| **Alaniz, LLC.** | Provides production and mailing services for direct and bulk mail. The Company offers various merge and purge services including: deceased file processing, multiple gift array creation, and daily detailed statistical reports. The Company also provides a full range of data hygiene services that minimize bad addresses, maximize the elimination of bad records, and optimize the deliverability of the mail. | Not recorded |
| **WebEquity Solutions, LLC. (formerly Equity Consultants, Inc.)** | Provides enterprise level lending solutions. The Company's product is an On-Demand Software as a Service (SaaS) enterprise lending solution. It provides a single system of record for processing credit in lending disciplines. Its workflow capabilities allow tracking, ticker functions and communications. Other features are also made available by the product. | Not recorded |

Both Iowa State University and the University of Iowa operate research parks dedicated to serving the needs of growing R&D based industries and helping them to access university resources and expertise to support their business growth. The tenant lists for these parks indicate that there has been a significant concentration of new business development with an IT focus. IT and related businesses present on the parks include:

**Table 7: IT Company Tenants on University Research Parks in Iowa**

**University of Iowa Research Park**

| Company Name | Line of Business |
|---|---|
| **ABMIGroup, LLC** | Biomedical Informatics Consulting Service |
| **Angel eCare, LLC** | eHealth Care Provider |
| **Bio::Neos, Inc.** | Bioinformatics software tools technologies |
| **Celadon Applications, LLC** | Intelligent green energy and transportation software |
| **Componica, LLC** | Math-intensive specialized software |
| **Digital Artefacts** | Interactive computer graphics and 3D modeling |
| **InnoMatix, LLC** | Specialized transportation/vehicle software |
| **Ramaanchar Technologies, Inc.** | User-configurable custom software |

**Iowa State University Research Park**

| Company Name | Line of Business |
|---|---|
| **Acumen Instruments Corporation** | Data collection, storage and analysis systems |
| **Alliance technologies Group, Inc.** | Radio frequency (RF) communication algorithms |
| **BodyViz** | 3D MRI and CT scan visualization systems |
| **Demonstratives, Inc.** | 3D animations for courtroom/legal application |
| **Ensoft Corporation** | Software engineering tools and services |
| **Global Reach Internet Products** | Web application developer/e-commerce systems |
| **Intuition Games** | Electronic games developer |
| **iSEEK Corporation** | Software development and search engine design for CAD applications |
| **Priority 5** | 3D/visualization consulting and software development |

| | |
|---|---|
| **Proplanner** | Software design for manufacturing and industrial engineers |
| **Siemens PLM Software** | Product life cycle management software |
| **Web Filings, LLC** | Business process automation software |

## IT Occupations in Iowa

IT jobs exist both in "pure-play" IT companies (such as IT and communications equipment manufacturers and software companies) and embedded as a job-function within almost every other industry. Some industries, such as finance and insurance, for example, are extremely IT intensive. Table 8 below outlines key IT-related occupation data for Iowa from the Bureau of Labor Statistics.

**Table 8: IT and Related Occupations in Iowa**

| Occupational Title | Iowa, 2010 | IA LQ 2010 | IA Employment Change (2004-2010) | US Employment Change (2004-2010) |
|---|---|---|---|---|
| **All Occupations** | **1,438,510** | **1.00** | **1.1%** | **-0.8%** |
| **Total IT-related Occupations** | **28,040** | **0.70** | **12.0%** | **11.9%** |
| Computer Support Specialists | 5,000 | 0.76 | n/a | n/a |
| Software Developers, Applications | 4,200 | 0.74 | 89.2% | 17.2% |
| Network and Computer Systems Administrators | 4,050 | 1.07 | n/a | n/a |
| Computer Systems Analysts | 3,430 | 0.61 | n/a | n/a |
| Computer Programmers | 3,080 | 0.82 | -9.7% | -19.0% |
| Computer and Information Systems Managers | 2,120 | 0.65 | -2.3% | 8.0% |
| Software Developers, Systems Software | 2,090 | 0.49 | -2.3% | 19.1% |
| Information Security Analysts, Web Developers, and Computer Network Architects | 1,520 | 0.55 | n/a | n/a |
| Computer Occupations, All Other | 1,110 | 0.54 | 14.4% | 40.4% |
| Database Administrators | 950 | 0.81 | 55.7% | 7.3% |
| Computer Hardware Engineers | 460 | 0.61 | 119.0% | -10.4% |
| Computer and Information Research Scientists | 30 | 0.11 | -50.0% | 0.7% |

- In 2010, more than 28,000 Iowans were employed in IT-related occupations. Between 2004-2010, IT-related occupations grew by approximately 12%, slightly higher than the U.S. growth rate for IT-related occupations.

- "Computer Software Specialists" (5,000 employees), "Software Developers, Applications" (4,200 employees), and "Network and Computer Systems Administrators" (4,050 employees) comprise more than 47% of IT-related occupations in Iowa.

- "Computer Hardware Engineers" (119% growth rate), "Software Developers, Applications "(89% growth rate), and "Database Administrators" (56% growth rate), have grown rapidly in recent years, outpacing the U.S. occupational average between 2004-2010.

- Despite significant occupational growth between 2004-2010, total IT-related occupations in Iowa have a 0.70 location quotient. "Network and Computer Systems Administrators" (1.07 LQ) stands as the only IT-related occupation with an above average employment concentration in Iowa.

# III. The Iowa IT Sector: R&D Strengths and Competencies

Growth of the innovation economy, and competitiveness in technology-based business sectors, depends on a constant flow of new products, technologies and services from research and development. R&D occurs at universities, government labs and within private industry and it is important to understand Iowa's IT R&D strengths since they are so critical to industry performance moving forward.

## R&D Data Assessment

In examining the current situation for 2011, Battelle utilized a range of data resources and interviewed several key stakeholders in Iowa familiar with R&D strengths relative to IT. On the data front, Battelle accessed information resources for:

- Recipients of SBIR and STTR funding, illustrating R&D based endeavors that have passed the rigorous vetting/application procedures for the receipt of federal SBIR/STTR funds. A particularly useful data set for indentifying areas of applied R&D resulting in commercial technology development.
- Patent data showing patents for innovations invested or assigned to Iowa inventors. Again, this is a resource for identifying applied technology areas.
- Academic R&D funding statistics by major discipline.
- Iowa academic publication statistics, identifying areas of comparative publication (and therefore research) strengths in fields relevant to IT sector R&D.

### *SBIR Data*

SBIR and STTR funding to Iowa entities provided by federal government agencies is shown in Table 9. In total, IT-related R&D projects attracted a total of $5.7 million over the 2005-2009 time period (adjusted to 2010 dollars).

**Table 9: SBIR/STTR Funding Recipients in Iowa IT Cluster 2005-2009**

**SBIR**

| Agency | Recipient | Subcategory | Year | Amount | Real $2010 |
|---|---|---|---|---|---|
| USDA | **Biotronics, Inc.** | Software & Computer Services | 2008 | $80,000.00 | $81,022.93 |
| USDA | **Biotronics, Inc.** | Software & Computer Services | 2006 | $79,943.00 | $86,468.51 |
| USDA | **Biotronics, Inc.** | Software & Computer Services | 2007 | $346,000.00 | $363,878.89 |
| NSF | **Clearsighted** | Software & Computer Services | 2005 | $99,638.00 | $111,247.64 |
| NSF | **Clearsighted** | Software & Computer Services | 2006 | $499,999.00 | $540,812.41 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2007 | $69,984.00 | $73,600.29 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2008 | $449,881.00 | $455,633.46 |
| HHS | **InteriorSoft, LLC** | Software & Computer Services | 2009 | $140,000.00 | $142,296.39 |
| DOD,DARP | **Northern Microdesign, Inc.** | Communications Equipment | 2006 | $375,000.00 | $405,610.12 |
| USDA | **Tripletail Ventures, Inc.** | Internet & Data Services | 2007 | $80,000.00 | $84,133.85 |
| NSF | **Vision-1** | Software & Computer Services | 2010 | $149,544.00 | $149,544.00 |
| | | | **SBIR Total** | **$2,369,989.00** | **$2,494,248.48** |

**STTR**

| Agency | Recipient | Subcategory | Year | Amount | Real $2010 |
|---|---|---|---|---|---|
| DOD,Navy | **Advanced Infoneering, Inc.** | Software & Computer Services | 2007 | $69,997.00 | $73,613.96 |
| DOD,Navy | **Advanced Infoneering, Inc.** | Software & Computer Services | 2009 | $496,429.00 | $504,571.81 |
| DOD,Navy | **Advanced Infoneering, Inc.** | Software & Computer Services | 2009 | $69,941.00 | $71,088.23 |
| DOD,Navy | **Advanced Infoneering, Inc.** | Software & Computer Services | 2010 | $499,967.00 | $499,967.00 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2007 | $69,949.00 | $73,563.48 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2007 | $69,923.00 | $73,536.14 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2008 | $499,512.00 | $505,899.08 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2009 | $499,696.00 | $507,892.40 |
| DOD,Navy | **Etrema Products, Inc.** | Computer & Peripheral Equipment | 2010 | $69,910.00 | $69,910.00 |
| DOE | **Northern Microdesign, Inc.** | Communications Network Services | 2005 | $750,000.00 | $837,388.63 |
| | | **STTR Total** | | **$3,095,324.00** | **$3,217,430.72** |
| | | **Combined SBIR/STTR Total** | | **$5,465,313.00** | **$5,711,679.19** |

## *Patent Activity*

In terms of patent generating activity, between 2005 and 2010 Iowa-based patent assignees were awarded 941 patents (Table 10). This represents 18.1% of all patents awarded in Iowa for that time period. Using patents as a surrogate for "innovation" it is clear that IT is an extremely important innovation area for Iowa. While the direct IT sector accounts for only 2% of Iowa employment, it is generating over 18% of Iowa patents.

**Table 10: Iowa IT and Related Patent Classes and Award Counts for 2005-2010**

| Main National Class Name | Total |
|---|---|
| **Multiplex communications** | 95 |
| **Communications: directive radio wave systems and devices (e.g., radar, radio navigation)** | 84 |
| **Data processing: vehicles, navigation, and relative location** | 81 |
| **Telecommunications** | 73 |
| **Pulse or digital communications** | 65 |
| **Communications: electrical** | 63 |
| **Communications: radio wave antennas** | 36 |
| **Data processing: financial, business practice, management, or cost/price determination** | 34 |
| **Data processing: generic control systems or specific applications** | 31 |
| **Image analysis** | 29 |
| **Data processing: measuring, calibrating, or testing** | 29 |
| **Computer graphics processing, operator interface processing, and selective visual display systems** | 28 |
| **Telephonic communications** | 25 |

| | |
|---|---|
| **Electrical computers and digital processing systems: multicomputer data transferring or plural processor synchronization** | 23 |
| **Electrical computers and digital processing systems: support** | 22 |
| **Electrical computers and digital data processing systems: input/output** | 16 |
| **Data processing: database and file management, data structures, or document processing** | 14 |
| **Optical: systems and elements** | 13 |
| **Optical waveguides** | 13 |
| **Active solid-state devices (e.g., transistors, solid-state diodes)** | 13 |
| **Data processing: presentation processing of document** | 13 |
| **Data processing: software development, installation, and management** | 12 |
| **Electrical audio signal processing systems and devices** | 11 |
| **Cryptography** | 10 |
| **Electronic digital logic circuitry** | 9 |
| **Recording, communication, or information retrieval equipment** | 8 |
| **Information Security** | 8 |
| **Electrical computers and digital processing systems: interprogram communication or interprocess communication (ipc)** | 8 |
| **Miscellaneous active electrical nonlinear devices, circuits, and systems** | 8 |
| **Static information storage and retrieval** | 7 |
| **Optical communications** | 7 |
| **Semiconductor device manufacturing: process** | 7 |
| **Coded data generation or conversion** | 7 |
| **Wave transmission lines and networks** | 6 |
| **Data processing: structural design, modeling, simulation, and emulation** | 6 |
| **Interactive video distribution systems** | 4 |
| **Data processing: design and analysis of circuit or semiconductor mask** | 4 |
| **Optics: image projectors** | 4 |
| **Data processing: speech signal processing, linguistics, language translation, and audio compression/decompression** | 3 |
| **Single-crystal, oriented-crystal, and epitaxy growth processes; non-coating apparatus therefor** | 2 |
| **Electrical computers and digital processing systems: virtual machine task or process management or task management/control** | 2 |
| **Electrical computers: arithmetic processing and calculating** | 2 |
| **Communications, electrical: acoustic wave systems and devices** | 1 |
| **Liquid crystal cells, elements and systems** | 1 |
| **Dynamic information storage or retrieval** | 1 |
| **Superconductor technology: apparatus, material, process** | 1 |
| **Dynamic magnetic information storage or retrieval** | 1 |
| **Electrical computers and digital processing systems: memory** | 1 |
| Total IT and Related Patents in Iowa | **941** |
| Grand Total (all Iowa assigned patents) | **5192** |

It should be noted that not all IT patents are generated in “pure-play” IT or telecommunications companies. A number of the patents are awards to companies such as Deere, Maytag and Vermeer, which develop embedded IT or associated products for incorporation into larger products. This is illustrated by the following listing of companies (Table 11) receiving the highest volumes of IT and related patent awards in Iowa for 2005-2010. The importance of Rockwell Collins in the innovation sphere is clearly evident.

**Table 11: Top Patent Recipients in IT and Associated Technologies in Iowa for 2005-2010**

| Patent Recipient | Number of Patents Awarded |
|---|---|
| **Rockwell Collins, Inc.** | 305 |
| **Deere and Company** | 68 |
| **Broadcom Corporation** | 62 |
| **Gateway 2000, Inc.** | 48 |
| **Xilinx, Inc.** | 28 |
| **Intermec IP Corporation** | 27 |
| **Fisher Controls International, Inc.** | 20 |
| **Verizon Business Global LLC** | 20 |
| **MCI** | 16 |
| **SIRF Technology, Inc.** | 16 |
| ***Iowa State University Research Foundation*** | 14 |
| **First Data Corporation** | 13 |
| **Lightwaves Systems, Inc.** | 12 |
| **IBM** | 11 |
| ***University of Iowa Research Foundation*** | 10 |
| **Square D Company** | 9 |
| **Micrel, Inc.** | 8 |
| **Samsung Electronics Co., Ltd.** | 8 |
| **Skyworks Solutions, Inc.** | 8 |
| **Maytag Corporation** | 6 |
| **West Corporation** | 6 |
| **Vermeer Manufacturing Company, Inc.** | 5 |
| **Electronic Data Systems Corporation** | 4 |

### *Academic R&D Expenditures*

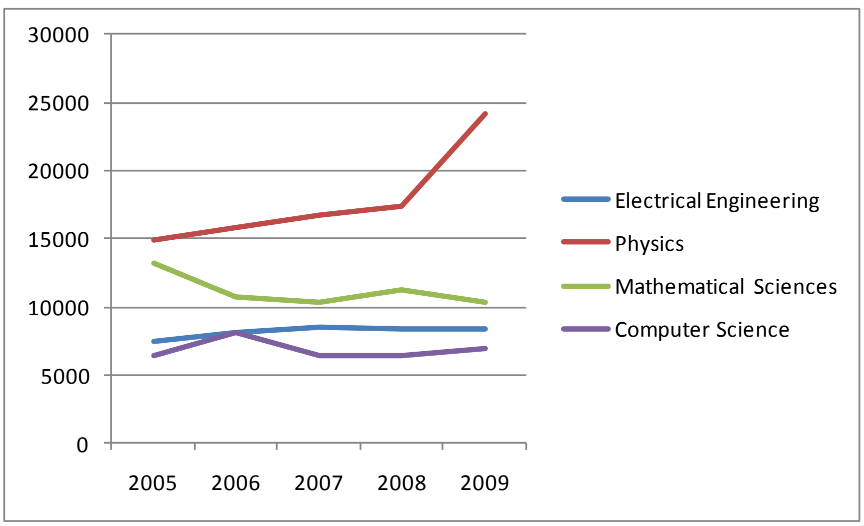
In this analysis Battelle examined total academic R&D expenditures for those academic disciplines most related to IT R&D—"Electrical Engineering," "Physics," "Mathematical Sciences" and "Computer Sciences".[4] Data were examined for the years 2005 through 2009 (the latest available). As Table 12 indicates, in 2009 the three Iowa regent universities had research expenditures in these disciplines totaling a combined $49.8 million. This represents a significant increase over 2005's figure of $41.9 million (an 18.9% increase).

[4] It should be noted that not all funding in these disciplines may be IT related. For example, physics could include funding for basic physics research with no application to computer systems or information technology, likewise so could mathematical sciences and electrical engineering.

**Table 12: Academic R&D in IT-Related Disciplines – Iowa Universities 2005-2009**

| Discipline | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| **Electrical Engineering (three universities)** | **7477** | **8138** | **8463** | **8315** | **8411** |
| Iowa State University | 6240 | 6580 | 6424 | 5995 | 6207 |
| University of Iowa | 1237 | 1558 | 2039 | 2320 | 2204 |
| University of Northern Iowa | 0 | 0 | 0 | 0 | 0 |
| **Physics** | **14905** | **15782** | **16778** | **17367** | **24194** |
| Iowa State University | 4349 | 4856 | 5093 | 4618 | 5207 |
| University of Iowa | 10556 | 10889 | 11603 | 12403 | 18865 |
| University of Northern Iowa | 0 | 37 | 82 | 346 | 122 |
| **Mathematical Sciences** | **13182** | **10765** | **10282** | **11204** | **10292** |
| Iowa State University | 10322 | 8588 | 8443 | 10000 | 9146 |
| University of Iowa | 2860 | 2177 | 1839 | 1204 | 1146 |
| University of Northern Iowa | 0 | 0 | 0 | 0 | 0 |
| **Computer Science** | **6388** | **8161** | **6454** | **6455** | **6952** |
| Iowa State University | 5818 | 7508 | 5515 | 5616 | 6326 |
| University of Iowa | 497 | 619 | 771 | 708 | 556 |
| University of Northern Iowa | 73 | 34 | 168 | 131 | 70 |
| **Combined Total** | **41952** | **42846** | **41977** | **43341** | **49849** |

**Figure 7: Academic R&D Trends in IT-Related Disciplines – Iowa Universities 2005-2009**




### *Academic Publications*

Another indicator of academic research concentration is an institution's record of publication by discipline. Battelle subscribes to the USI (University Science Indicators) system, which tracks publication across major journals by individuals and universities. Table 13 shows the results of the analysis for fields in IT and related science and engineering fields

It is evident that in computer science (and multiple sub-disciplines of computer science) Iowa benefits from high levels of publication impact at Iowa State University, the University of Iowa and the Ames National Laboratory. Optics is a strength across all three institutions also. Imaging Science, at both Iowa State and the University of Iowa have strong publications impacts, although the number of publications is relatively small. The University of Iowa is building a track record in influential publications in the medical informatics field.

**Table 13: Academic R&D in IT-Related Disciplines – Iowa Universities 2005-2009**

| Institution | Field | Citations | Papers | Cited Papers | Publication Impact | Share of US Publications |
|---|---|---|---|---|---|---|
| **Iowa State** | Comp Sci Hardware & Arch | 65 | 61 | 29 | 1.37 | 0.63% |
| | Comp Sci Information Sys | 358 | 93 | 41 | 1.36 | 0.73% |
| | Comp Sci Interdisc Appls | 492 | 140 | 83 | 1.18 | 1.02% |
| | Comp Sci Software Eng | 103 | 60 | 30 | 0.98 | 0.65% |
| | Comp Sci Theory & Methods | 146 | 167 | 67 | 0.64 | 1.07% |
| | Eng Electrical & Electronic | 755 | 291 | 160 | 0.88 | 0.63% |
| | Imaging Sci & Photo Tech | 24 | 4 | 2 | 1.33 | 0.17% |
| | Mathematics | 190 | 139 | 65 | 0.86 | 0.63% |
| | Mathematics Applied | 263 | 144 | 75 | 0.90 | 0.76% |
| | Med Informatics | 13 | 8 | 3 | 0.47 | 0.25% |
| | Optics | 1,109 | 87 | 57 | 2.52 | 0.43% |
| | Physics Applied | 2,429 | 432 | 302 | 0.97 | 1.04% |
| | Remote Sensing | 42 | 4 | 4 | 2.38 | 0.13% |
| | | | | | | |
| **Univ. of Iowa** | Comp Sci Hardware & Arch | 59 | 59 | 26 | 0.51 | 0.61% |
| | Comp Sci Information Sys | 178 | 44 | 23 | 1.43 | 0.34% |
| | Comp Sci Interdisc Appls | 798 | 170 | 115 | 1.58 | 1.24% |
| | Comp Sci Software Eng | 105 | 42 | 27 | 1.43 | 0.46% |
| | Comp Sci Theory & Methods | 96 | 83 | 41 | 0.84 | 0.53% |
| | Eng Electrical & Electronic | 401 | 129 | 81 | 1.05 | 0.28% |
| | Imaging Sci & Photo Tech | 209 | 23 | 20 | 2.02 | 0.97% |
| | Mathematics | 457 | 241 | 137 | 1.19 | 1.09% |
| | Mathematics Applied | 453 | 215 | 120 | 1.04 | 1.13% |
| | Med Informatics | 252 | 50 | 39 | 1.45 | 1.53% |
| | Optics | 219 | 34 | 27 | 1.27 | 0.17% |
| | Physics Applied | 391 | 86 | 63 | 0.78 | 0.21% |
| | Remote Sensing | 19 | 7 | 5 | 0.62 | 0.22% |
| | | | | | | |
| **Ames Nat'l Lab** | Comp Sci Hardware & Arch | - | - | - | - | 0.00% |
| | Comp Sci Information Sys | - | - | - | - | 0.00% |
| | Comp Sci Interdisc Appls | 18 | 1 | 1 | 6.05 | 0.01% |
| | Comp Sci Software Eng | 4 | 5 | 3 | 0.46 | 0.05% |
| | Comp Sci Theory & Methods | 3 | 8 | 3 | 0.27 | 0.05% |
| | Eng Electrical & Electronic | 108 | 22 | 14 | 1.66 | 0.05% |
| | Imaging Sci & Photo Tech | – | – | – | – | 0.00% |
| | Mathematics | – | 1 | – | – | 0.00% |
| | Mathematics Applied | 6 | 9 | 4 | 0.33 | 0.05% |
| | Med Informatics | – | – | – | – | 0.00% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Optics | 1,004 | 46 | 38 | 4.32 | 0.23% |
| | Physics Applied | 1,612 | 274 | 203 | 1.01 | 0.66% |
| | Remote Sensing | – | – | – | – | 0.00% |

## Conclusions on R&D Strengths

In 2005 Battelle concluded that the following technology areas (the left side column on Table 14) represented established or emerging R&D core competencies upon which to focus technology-based economic development around IT in Iowa. Based on the interviews and data analysis for 2011, Battelle draws conclusions, in the right side column of Table 14 in relation to the current situation in the 2005 identified areas.

**Table 14: Summary of Current Situation on 2005's Identified Research Strength Areas in Iowa IT**

| 2005 Identified Research Strength | Comments on Current Situation (2011) |
|---|---|
| Radio Frequency (RF) and Radio Frequency Identification (RFID) technologies | Continued strength and innovation record at Rockwell Collins. Not relayed as a major R&D focus by leaders at regent universities. |
| Advanced visualization systems and virtual reality technology; and human computer interaction | Ongoing R&D strength area within universities with major continued investment. New company formation has occurred in Iowa. |
| High reliability, ruggedized IT systems | Some continued work within universities, but not relayed to Battelle as a major focus or area in which new business development has occurred. |
| IT systems security and information assurance | Leaders interviewed noted that it was attempted to bring key parties together in Iowa in this, but the effort did not gain traction. Continued focus of Information Assurance Center at ISU |
| IT systems and solutions for finance and insurance business operations | Still a logical thrust for Iowa, but tending to be active within individual companies in relationships with their clients (rather than a coordinated platform effort) |
| Software quality assurance and testing | Not relayed as a major focus by leaders at regent universities. |
| Optical science and laser technology | Continued focus of the Optical Science and technology Center at the University of Iowa |
| Quantum electronics and spintronics | Set-back by major flooding of facilities at University of Iowa |
| **2005 Recommended Development Platforms Based Upon Review of Strengths** | |
| Specialized IT applications in finance and insurance | Still a logical thrust for Iowa, but tending to be active within individual companies in relationships with their clients (rather than a coordinated platform effort). Probably does not require major engagement of economic development. |
| Radio frequency (wireless) technology | A core technology for Rockwell Collins and a technology with expanding market applications. Supporting Rockwell Collins needs in terms of R&D support and education should still be a priority for Iowa. |
| Advanced visualization and human-computer interaction systems | Continued robust R&D strength area for Iowa across a range of technologies and applications—including visualization and virtual reality systems, advanced modeling and simulation systems, virtual human development and application to process design and human computer/human factors engineering. Logical linkage into Advanced Manufacturing Platform with Iowa R&D skills in this area being applied to needs of major in-state and out-of-state manufacturing companies. |

| | |
|---|---|
| High reliability ruggedized systems | Has not emerged as a major platform for growth, although still embedded in needs of the advanced manufacturing sector. |
| **2005 Recommended Longer-Term/Emerging Platforms** | |
| Optical electronics and photonic systems | R&D area of focus, but not emerged as a platform for major company formation or economic development in Iowa |
| Quantum electronics and spintronics | Set-back by major flooding of facilities at the University of Iowa. Rebuilding. |

What is apparent from the 2011 R&D review is that the R&D strengths in Iowa are quite fundamental or "basic" in nature, encompassing strengths in platforms of technologies that are quite diverse. The key identified strengths are in:

- Visualization and VR (which also includes health science/biomedical imaging)
- Virtual human/soldier and related in-silico process design for manufacturing
- Human computer interaction and human factors engineering.
- Modeling and simulation is a broad capability, with many applications, and has a developing emphasis in:
  - Data analysis and modeling for water resource management, flooding and hydrology
  - Materials for wind turbine applications and optimized manufacturing
- High performance computing infrastructure
- Bioinformatics and computational biology
- RFID technology
- Optics

**In some of these areas there is a clear overlap with applications relative to the Advanced Manufacturing Cluster**—with much of the work taking place in visualization and VR, virtual humans and production process design, human computer interaction and interfaces, and modeling and optimization systems applied to manufacturing processes and materials.

Supported by high performance computing infrastructure, and associated expertise in mathematics and advanced data analysis, Iowa has a robust strength in the IT that underpins the design of enhanced products and industrial processes.