

## The Growth of the IT Service Industry and the Role of Public Organizations in Fairfax County

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### 미국 페어팩스 카운티 IT서비스산업의 성장과 공공부문의 역할

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**Abstract :** This study aims to understand regional specificity and its impact on the IT service industry in Fairfax County. Fairfax County primarily specializes in the IT service in the United States, and it has cultivated a resilient and unique industrial environment. Business-related initiatives by the federal government have resulted in the influx and expansion of IT service firms, the formation of new small firms, the abundance of skilled workers, and the growth of the IT services related with the federal procurement market, though the government policies do not explicitly intend to affect the industrial path in Fairfax County. Meanwhile, local institutions have provided various programs and services for both incumbent firms and potential entrants, and have recently focused on the accumulation and leverage of relational assets among economic actors through a variety of networking venues.

**Key Words :** Fairfax County, IT service industry, Regional specificity, Role of public organization, Federal government, Local institutions

**요약 :** 본 연구의 목적은 페어팩스 카운티 IT서비스 산업의 발달과정에서 지역적 특수성이 끼친 영향을 확인하는 것이다. 페어팩스 카운티의 IT서비스 산업은 미국 내에서 가장 특화되고, 회복력이 높을 뿐만 아니라 독특한 산업 환경을 조성하였다. 이는 수도권 지역이라는 매우 특수한 입지적 조건을 바탕으로, 연방정부와 카운티 기관을 포함하는 공공 부문이 장기적인 지역산업의 발달에서 상당한 역할을 담당하였다는 점에 기인한다. 연방정부는 기업의 유입과 확대, 소기업의 성장, 고속련 인력풀의 조성, 정부조달시장 관련 IT서비스 산업의 성장에 영향을 끼쳤으며, 페어팩스 카운티의 지역 공공기관들은 기업 및 잠재적 기업가들을 위한 다양한 프로그램을 제공하고 있고, 네트워킹의 장을 제공함으로써 지역내 관계적 자산의 구축에 힘쓰고 있다.

**주요어 :** 페어팩스 카운티, IT서비스산업, 지역적 특수성, 공공부문의 역할, 연방정부, 지역 공공기관

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## 1. Introduction

The transition of the world to a knowledge-based economy has facilitated the progress of the service sector, especially of advanced services (Bryson *et al.*, 2004; Park, 2010; forthcoming; Doloreux and Shearmur, 2011). As the world economy now transitions to a service economy, service-oriented thinking is being perceived as one of the fastest-growing paradigms in IT (Demirkan *et al.*, 2008, p. 358) given its relevance to accounting, finance, supply chain management and operations, and strategy and marketing. In economic geography, numerous studies on professional services, including IT services, discuss highly skilled employees and the knowledge creation process, and innovative propensity (Coffey and Shearmur, 1997; Lowendahl, 1997; Beaverstock, 2004; Malerba, 2005; Miles, 2005; Jones, 2007; Tether and Howells, 2007; Bessant and Davies, 2007; Sunley *et al.*, 2008; Doloreux and Shearmur, 2011). Empirical evidence indicates that professional services are knowledge-intensive activities that concentrate in a specific area where highly skilled employees are abundant and customers can frequently meet and exchange their ideas. Contrary to innovation in manufacturing, which focuses on the technical upgrading of a product or process, innovation in the service sector relies on social and cultural knowledge because service outputs are primarily intangible knowledge produced through supplier and client interactions (Miles, 2005; Malerba, 2005; Demirkan *et al.*, 2008).

IT services developed toward the direction of constructing an effective business model to meet the needs of users who utilize complex business

processes<sup>1</sup>). Therefore, IT services carefully consider their interactions with customers, and, to a certain extent, cannot neglect the importance of geographical proximity, either through co-location with customers or through temporary travel for face-to-face contact (Torre and Rallet, 2005). High quality service products likely rely on the continuous interactions between suppliers and customers to produce, sustain, and deliver services rather than on technical knowledge (Miles, 2005). Therefore, learning through such interactions is an important factor for the knowledge creation of IT services<sup>2</sup>).

In economic geography, institutional factors and place-specific institutional settings are explored to understand the emergence of new economic space and the evolution of industrial agglomeration. Initial random territorial differences in institutional contexts are likely to create idiosyncratic environments by deepening existing economic configurations over time (Maskell and Malmberg, 2007; Wenting and Frenken, 2011). Although institutions are regarded as relatively stable entities in evolutionary economics (Essletzbichler and Rigby, 2007), policies and programs initiated and operated by public organizations tend to change relatively fast and to directly affect economic performances, location decision making, and so forth<sup>3</sup>). Through the interdependent relationships among entrepreneurs, large-scale policies, and the local environment, individual agents respond to institutional settings and shape a particular local environment (Feldman *et al.*, 2005). Feldman and Francis (2002) noted that the entrepreneur is active within a regional context. They agreed with Leslie and Kargon (1994) that entrepreneurship responds to each unique environment, by creating clusters that have their own signature characteristics.

This study aims to understand regional specificity and its impact on the growth of the IT service industry in Fairfax County, which is located in the U.S. National Capital Region (Figure 1). Fairfax County has rapidly transformed from a residential suburban area to an innovative technology service center over the past decades. Considering the necessity of studying the service industry and its dynamic process in a local economy, this paper raises a series of questions regarding the effects of the IT service industrial development in Fairfax County. These questions are as follows: why was the IT service industry developed in a specific region?; what are the growth characteristics of the local IT services?; and what is the role of public organizations

in the growth of the local IT services?

Analysis is based on detailed industrial information obtained through a variety of data collection methods, including descriptive socio-economic statistics and secondary data, interviews with representatives of industries and public organizations, and questionnaire surveys for the IT service firms. The questionnaire survey was conducted online from February to May 2012 and finally obtained 53 cases for the analysis. The interviewees included 33 participants in the questionnaire survey, five representatives from local institutions and federal government agencies, and one person with several years of military experience. The interviews were conducted through face-to-face meetings or through

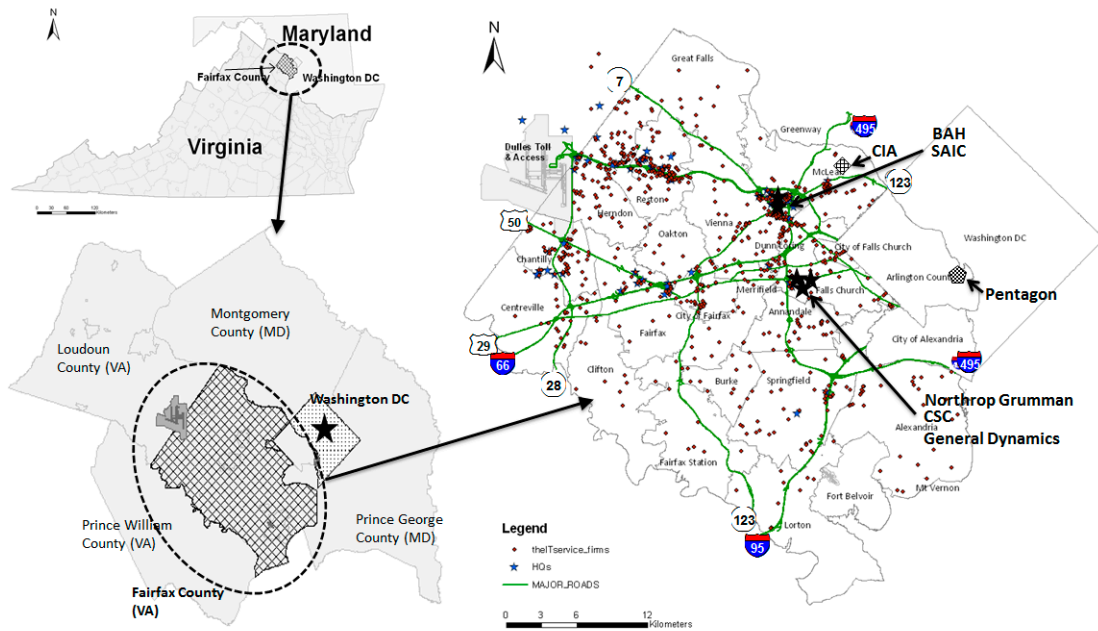


Figure 1. Study area and Spatial distributions of the IT service firms in Fairfax County based on the collected sample dataset

Note: The number of the IT service firms scattering on the map are 1,233 firms including headquarters, subsidiaries, branches, and single locations. The figure includes the locations of the 5 IT service firms listed in the 2012 Fortune 500 which are headquartered in Fairfax County, i.e. General Dynamics (92), Northrop Grumman (104), CSC (162), SAIC (245), and BAH (439).

written formats, such as email and questionnaires from November 2011 to November 2012. Moreover, business-related programs and initiatives organized by the federal government and local institutions were reviewed in order to investigate the role of public organizations.

## 2. Growth of the local IT service industry

### 1) Geographical concentration

In the US, as of 2011, the IT service sector ac-

counted for 1.03% of total employment (1,168,939 out of 113,425,965) and 1.47% of total establishments (108,317 out of 7,354,043). The total number of IT service employees grew by 55.87% from 1998 to 2011 and contributed to a 7.89% increase in total employment. The top 20 counties accounted for 39.09% of the total IT service employment. Thus, the spatial concentration of the IT service sector was much higher than its total employment share, which was 19.74% (Table 1).

Fairfax County had the most IT service employees in 1998 and 2011, followed by the counties of Santa Clara (California), Los Angeles (California), and New York (New York). The location quotients (LQs) in Fairfax County also exceeded 10 during

Table 1. Changes in the degree of concentration of the IT services employment: Top 20 counties, 1998-2011  
(Person, count, %)

Rank	County name	2011 Emp (LQ)	1998 Emp (LQ)	CAGR (98-11)
-	US Total	1,168,939 (1.00)	749,963 (1.00)	3.77
1	Fairfax (VA)*	76,338 (12.22)	47,783 (14.02)	3.98
2	Santa Clara (CA)	52,069 (5.84)	23,490 (3.58)	6.86
3	Los Angeles (CA)	29,779 (0.79)	16,931 (0.66)	4.82
4	New York (NY)	29,581 (1.44)	17,001 (1.26)	4.72
5	Middlesex (MA)	25,548 (3.09)	20,760 (3.80)	1.74
6	Cook (IL)	23,555 (1.04)	16,830 (0.99)	2.84
7	Middlesex (NJ)	23,207 (6.23)	14,391 (5.71)	4.06
8	Dallas (TX)	22,213 (1.74)	19,263 (1.97)	1.19
9	Orange (CA)	18,745 (1.40)	11,238 (1.27)	4.36
10	King (WA)	17,824 (1.68)	9,977 (1.50)	4.95
11	Fulton (GA)	17,712 (2.51)	10,121 (2.15)	4.77
12	Harris (TX)	15,984 (0.87)	9,166 (0.83)	4.74
13	San Francisco (CA)	14,843 (2.92)	8,194 (2.22)	5.08
14	Montgomery (MD)	14,731 (3.47)	15,377 (5.86)	-0.36
15	St. Louis (MO)	14,617 (2.60)	7,414 (1.84)	5.82
16	San Diego (CA)	14,249 (1.22)	8,646 (1.30)	4.25
17	Travis (TX)	12,231 (2.48)	7,375 (2.75)	4.31
18	Maricopa (AZ)	12,142 (0.81)	8,434 (0.98)	3.08
19	Alameda (CA)	10,878 (1.86)	6,894 (1.66)	3.87
20	Hennepin (MN)	10,697 (1.30)	12,727 (2.24)	-1.44

Source: U.S. Census Bureau, County Business Patterns (CBP).

\*Note: Include City of Fairfax and City of Falls Church. The cities have estimated values in some cases. The values are substituted by mean values.

both time periods, but slightly decreased in 2011. Together with Montgomery County (Maryland), the National Capital Region is the most prominent IT service center in the US. Stough *et al.* (1998) argued that the industrial compositions of the National Capital Region were changed by the concentration of technology service sectors that initially developed in response to expanded federal outsourcing and a build-up in the federal defense sector, and then evolved in combination with a variety of business activities. Considering that the number of IT service employees in Fairfax County increased by almost 30,000, the county led the growth of the IT service industry nationwide and almost reached a stage of maturity faster than other counties.

## 2) Resilient industrial environment

The IT service industry in Fairfax County showed continued growth even when the number of employees underwent fluctuations because of external factors, such as the industrial consolidation of defense contractors in 1990s, the dot-com crash in early 2000s, and the global financial crisis in late 2000s. Nevertheless, the IT establishments seldom or never experienced a similar decline. Hence, the employee counts of companies decreased, which increased small-sized firms' share of the local IT service industry. The increased number of new firms was a positive signal of the local business dynamics for potential groups willing to spawn their own companies and spin off from existing companies.

The entry of new firms through spin-offs is a primary factor in the growth of industrial agglomerations and clusters. Similar to previously studied spawned firms that are more likely to locate near

their parent companies (Klepper, 2007; Menzel, 2010), 10 of the 53 firms in the questionnaire survey explicitly indicated they were established by founders who left an existing company and took with them existing customer and partner relationships when they spun off from the parent company. Among the 10 firms, 8 were spawned from the parent companies located in Fairfax County while the remaining 2 did not disclose such information. Moreover, 12 of the 53 firms noted that their former employees left and founded their own firms in Fairfax County or in the National Capital Region. A company in the IT service business mentioned that over the years, six people or about 50% of its early technical staff have started their own companies.

Compared with the IT service industry in Santa Clara County (California), the industry in Fairfax County was more resilient to the collapse of the dot-com bubble. Cannon *et al.* (2008, p.13) noted that government demand even helped to mitigate the effects of the dot-com bubble in 2000 on the IT firms of the National Capital Region. The number of local IT service employees started to rebound in 2003 and, in 2007, returned to its peak levels such as in the early 2000s. By comparison, the IT services of Santa Clara County experienced a terrible recession during the burst, resulting in the large-scale unemployment of almost 30,000 workers, and still has not returned to its original level in 2001 (Figure 2 and 3).

## 3) Changing locational advantages in the local IT services

Previous studies on spatial concentrations highlight several factors that are beneficial for geo-

graphically concentrated firms. Literature presents the functional characteristics of clusters associated with benefits from the externalities of agglomeration (Marshall, 1917; Porter, 1998; Zucker *et al.*, 1998; Gordon and McCann, 2000; Owen-Smith and Powell, 2004; Bathelt *et al.*, 2004; Powell and Grodal, 2005; Chetty and Agndal, 2008; Koo, 2010; Potter and Watts, 2011; Kim *et al.*, 2013)<sup>4</sup>.

Interestingly, as Potter and Watts (2011) elucidated the benefits of spatial agglomeration have changed into diminishing returns based on the evolution of the industry life cycle, locational advantages in the local IT services are not static.

According to Hammer, Greene, Siler and Associates (1969), most of the companies that relocated to Fairfax County moved there to reduce fixed costs

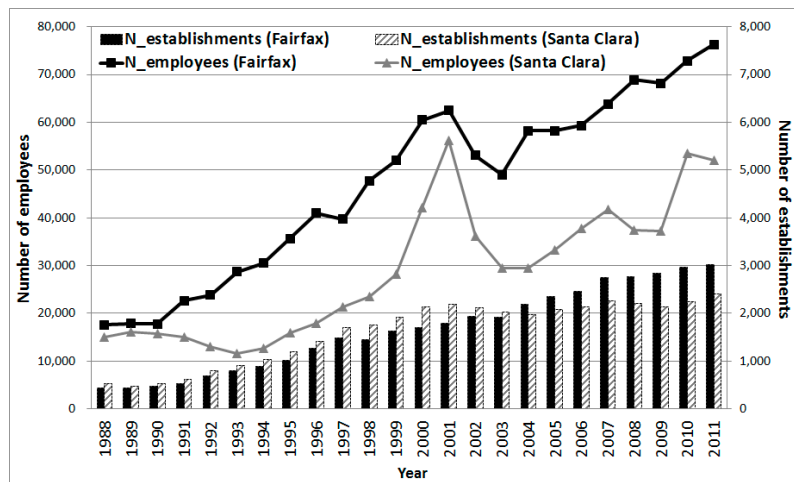


Figure 2. Growth of the IT service industry in Fairfax County (VA) compared with that in Santa Clara County (CA), 1988-2011

Source: U.S. Census Bureau, County Business Patterns (CBP).

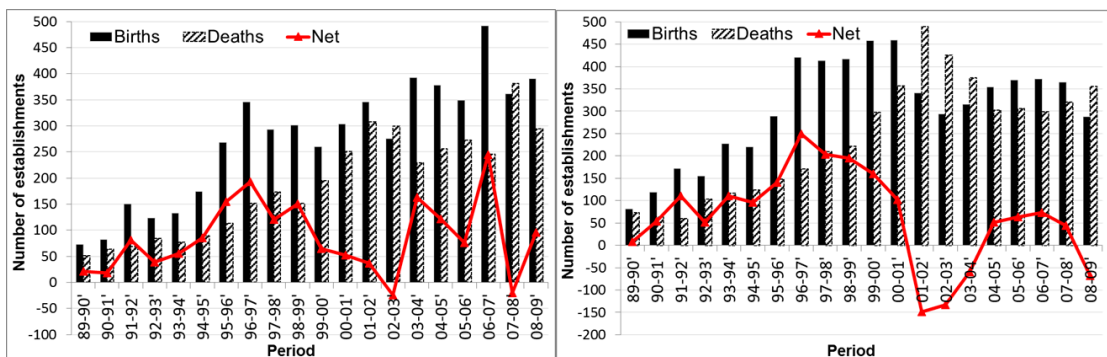


Figure 3. Business dynamics of the IT service industry in Fairfax County (Left) and Santa Clara County (Right), 1989-2009

Source: U.S. Census Bureau, Statistics of U.S. Businesses (SUSB).

and to use the local physical infrastructure. Of the total 199 responses, 116 firms moved to Fairfax County from the outside, particularly Arlington County and Washington DC<sup>5</sup>). Compared with the DC area, local assets that are physically produced in Fairfax County, such as lower real estate costs and better transportation infrastructure connecting the county with DC, could have been the strong points that attracted companies to the county. At present, IT service firms place a high emphasis on the factors that can reinforce customer inter-relationships and create knowledge-based value through the labor pool and networking, with a bearing on the high cost of living, labor cost, and operating expenses (Table 2). The IT service firms currently emphasize their proximity to their main customers or clients as one of the most important factors for locating in the county. In addition to the financial advantage of government contracts, the presence of government offices is related to various aspects, such as a strategic location that allows companies to respond promptly to the changes in

regulations and legislations and to have access to public research institutes. Respondents also choose the abundance of a well-educated labor force as a strong point of Fairfax County. Professionals with abundant experience are highly coveted because IT-related service sectors have to clearly diagnose client problems, which occur in every business field, and provide (ad hoc) solutions in a timely manner. Based on the distribution of the IT service workforce in Fairfax County by education attainment, over 60% of the IT service employees hold a bachelor's degree or above, exceeding the 46.61% average for all industry groups in Fairfax County as of the first quarter of 2011 (U.S. Census Bureau, Local Employment Dynamics (LED)). Subsequently, the high quality of life and the presence of governments are selected. For example, the Fairfax County Public Schools (FCPS) is the 11th largest school division nationwide and its average SAT score surpasses the state and national averages (FCEDA Fact sheet, November 2011). The respondents selected reputation as a technology hub, good transporta-

Table 2. Locational advantages of the IT service firms

(Count, %)

Locational advantages	N of Responses* (% of all firms responding)
Close proximity to main customer or client	29 (54.7)
Highly skilled labor pool	20 (37.7)
High quality of life (public school system, park entertainment facilities, etc.)	11 (20.8)
Presence of governments	10 (18.9)
Reputation as a technology hub	5 (9.4)
Good transportation (easy access to airport and highway, etc.)	5 (9.4)
Agglomeration of related industry or services	4 (7.5)
Agglomeration of same industry	4 (7.5)
Balanced local economy	3 (5.7)
Others (affordable business costs, low commercial tax rate, local gov. support, etc.)	6 (11.3)

Source: Questionnaire survey (N=53).

\*Note: The respondent is asked to select up to two key answers.

tion infrastructure, and the agglomeration of same and related industries as good points. Contrary to the results of Hammer, Greene, Siler and Associates (1969), only two respondents regarded affordable business costs, such as real estate costs, to be a locational advantage; many respondents commented that high rental rates are a huge disadvantage of their Fairfax County location. One respondent noted that their company recently opened a remote office in Austin, Texas, which has even lower taxes and real estate costs than in Fairfax County.

As such, how can Fairfax County gain momentum as one of the most concentrated IT service centers in the US? From the following comments of the local IT service businesspeople, the current study reveals that the growth of the local IT service industry has co-evolved with the regional specific environment.

“I don’t think you can compare Silicon Valley to Fairfax County. The venture capital community/network is not equal and there has been considerable innovation coming from Stanford.”

“With all the federal agencies and contractors here, ... I couldn’t say whether our region is more innovative than others, but I’d guess because we are so closely tied to the federal workforce, ...”

“Most of the IT servicing companies are located here because they work closely with government. 80-90% of IT companies in this area provide services to government agencies. I once worked as a government contractor in Arlington (Virginia) to provide services to DoD. In order to communicate with these people, you will need to be present in that site such as Arlington or DC.”

### 3. The role of public organizations

#### 1) Federal government

The U.K. Department of Trade and Industry (2003) presented a model of how government policies influence business innovation at various levels and highlighted four key government roles, namely, opportunities, enablers, advice and support for business, and a supportive climate for innovation. Understanding the IT service industry in Fairfax County necessitates a discussion on the role of the federal government. In the initial formation stage of the high-technology cluster in the National Capital Region, the federal government and private firms formed a hub-and-spoke type network through project contracts and subcontracts (Park, 2003). The entrepreneurial event in the National Capitol Region also resulted from government policies that generate a supply of potential entrepreneurs, a demand for ICT and biotechnology, and access to intellectual property from government investments (Stough *et al.*, 1998; Feldman, 2001; Feldman *et al.*, 2005; Cannon *et al.*, 2008). The growth of the local IT service firms is partly influenced by the government policies listed in Table 3. Although the impact of federal policy initiatives on the local IT services was not fully uncovered due to the lack of collected data, secondary data and interviews were used to interpret the role of the federal government in terms of four dimensions, including opportunity, purchase, regulation, and support.

##### (1) Opportunity

Several government policy initiatives related to the downsizing and outsourcing of the federal



Table 3. Federal policy framework affecting on the local IT service industry

Category	Name	Description/program
Entry of potential entrepreneurs	Civil Service Reform Act of 1978	- Limits on the size of the federal workforce. - An initiative to outsource the production of goods and services to the private sector.
	Strategic Defense Initiative	- The Reagan administration's defense initiatives in 1984. - Increase of the federal gov. outsourcing.
	Federal Workforce Restructuring Act of 1994 Voluntary Separation Incentive Payment authority of 1997	- 'Reinventing Government' initiative during the Clinton Administration. - Federal government downsizing. - Industrial consolidation.
Technology transfer and related programs	Stevenson-Wydler Technology Innovation Act of 1980	- Facilitate the transfer of technologies that originated and are owned by Federal Labs to the private sector.
	Bayh-Dole University and Small Patent Act of 1980	- Permitted small business, universities and not-for-profit institutions to retain title to inventions resulting from federally funded grants and contracts.
	Small Business Innovation Development Act of 1982	- Established the Small Business Innovative Research (SBIR) program within major federal agencies.
	National Cooperative Research Act of 1984	- Eased antitrust penalties on cooperative research.
	Federal Technology Transfer Act of 1986	- Amended the Stevenson-Wydler Act to authorize Cooperative Research and Development Agreements (CRADAs) between federal agencies and private firms.
	National Competitiveness Technology Transfer Act of 1989	- Part of a DoD authorization bill, amended the Stevenson-Wydler Act to allow government-owned contractor-operator labs to participate.
	Defense Conversion, Reinvestment and Transition Assistance Act of 1992	- Initiated the Technology Reinvestment Project (TRP) to provide technology development, deployment and training needs of companies adversely affected by defense conversion.
Small business promotion	Small Business Act of 1953	- Management and Technical Assistance. - Microenterprise Development Grants. - Microloan Demonstration Program. - Service Corps of Retired Executives Association. - Small Business Development Center (SBDC). - Small Business Loans. - Veterans Entrepreneurial Training and Counseling. - Women's Business Ownership Assistance.
	Small Business Investment Act of 1958	- Bond Guarantees for Surety Companies. - Certified Development Company Loans.
	Small Business Act of 1958	- Small Business Investment Companies.
Government procurement	Small Business Act of 1953	- 8(a) Business Development Program. - Office of Small Disadvantaged Business Certification and Eligibility. - Procurement Assistance to Small Businesses. - Procurement Technical Assistance For Business Firms (DoD).
	Competition in Contracting Act of 1984	- Full and open competition through the use of competitive procedures.
	Federal Acquisition Streamlining Act of 1994	- To reduce unique purchasing requirements; to increase the use of simplified acquisition procedures for low-income procurement; to obtain goods and services faster.

Source: Jones (1998); Feldman (2001); Manuel (2011); FederalGrantsWire; FederalNewsRadio.com.

workforce allow local potential entrepreneurs to start their own business and work with the federal government by igniting their entrepreneurial spirit. This tendency is maintained, and thus, government contractors undertake projects related to a wide range of IT services, from software development, programming, and application development (Interview with a government officer in a subsidiary of the Department of Defense (DoD)). Meanwhile, technology transfer and related policies stimulate private companies, especially small technology-intensive firms, to develop innovative technology. The Cooperative Research and Development Agreements (CRADAs) enable small firms to extend their R&D capabilities and provide a major boost to the National Capital Region's technological community (Stough, 1999)<sup>6</sup>. Government policies further facilitate the start-ups and competitive viability of small businesses by offering a wide range of services such as direct loans, advisory services, counseling, and project grants. Lerner (1999) verified that high-technology firms receiving Small Business Innovation Research (SBIR) funds perform far better than matched firms in over a decade and will more probably draw venture capital financing. The government, as a public venture capitalist that certifies firm quality to private investors<sup>7</sup> (Lerner, 1999), further contributes unintentionally to potential regional development (Kelley, 1997) to some extent. In fact, five agencies (i.e. DoD, Energy (DoE), Health and Human Services (DHHS), the National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF)) were responsible for 90% of SBIR awards during the 1980s; the DoD in particular accounted for half of all program spending during the same period (Kelley, 1997). The IT service firms in Fairfax

County might have had abundant opportunities to take advantage of the government initiatives as well as to receive a wide range of know-how on obtaining government certifications and awards through local buzz and work experience.

In the local IT service industry, contracts with the federal government not only guarantee a stable source of revenue for companies, but also motivate them to continuously develop innovative skills. In recent years, despite the global recession, the job market for IT services in the National Capital Region, especially in Fairfax County, has improved because of federal IT budgets. In some cases, as the federal government changed their technological environment, local IT service firms were also required to comply with the new environment and to develop their software and services. The federal government also heavily invested in security and information assurance (IA). Hence, security among the various IT services in this area is highly advanced (Interviews with two government officers in a subsidiary of the DoD).

## (2) Purchase

The federal government spent US \$517.5 billion in the 2012 fiscal year, over 2.5 times higher than the spending in 2000 (Figure 4). If the federal government is combined with the state and local governments, then the government procurement market will be one of the largest customers around the world. According to the Federal Procurement Data System (FPDS), federal government contracts performed in the county reached US \$26.4 billion in the 2012 fiscal year, which is higher than those performed in other U.S. counties, cities, 47 states, and the DC area. Those awarded to local computer systems design and related services, including IT

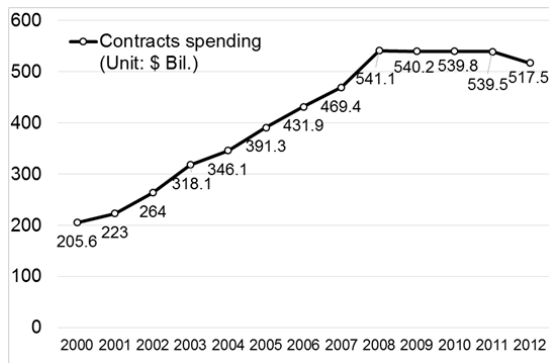


Figure 4. Federal contract spending, 2000-2012

Source: USASpending.gov.

services, amounted to US \$6.7 billion in the same year (FCEDA Fact sheet, June 2013). Washington Technology magazine published a list of the 100 largest government contractors in the nation in 2013, including 29 companies based or had U.S. headquarters in Fairfax County and another 46 companies that operate in the county.

The federal government is one of the most important customers for local businesses. A considerable number of government contractors among the

surveyed firms consider defense-related agencies as their main customers and clients. The DoD and its military agencies are headquartered in the Pentagon, which is about 10 miles away from Tysons Corner in Fairfax County and is one of the largest customers and clients of the local IT service firms. Interestingly, among the top 10 departments ranked by total federal contract spending in the 2012 fiscal year, the DoD accounts for 69.9% of the total, with almost all of the activities comprised of outsourcing (Table 4). A government officer in a DoD subsidiary addressed the outsourced tasks and the need of contractors:

“We might outsource all of the government affairs, A to Z, such as building security, program analyst, system administration, S/W test and so on. Mostly, we, civilian co-work with contractors to a project or we manage the project and contractors. Services are mostly proceeding by employing contractors. ... S/W, programming, IT service, network, technology consulting,

Table 4. Federal spending by department or agency, FY 2012

(\$ Bil., %)

Rank	Department or agency	Spending (% of total federal spending)	% of total federal contract spending	% of contract spending by each agency
1	Homeland Security	1146.8 (36.3)	2.4	1.1
2	Social Security Administration	814.8 (25.8)	0.3	0.2
3	Health and Human Services	365.8 (11.6)	3.7	5.2
4	Defense	365.7 (11.6)	69.9	98.7
5	Veterans Affairs	94.1 (3.0)	3.3	18.3
6	Education	81.7 (2.6)	0.4	2.5
7	Transportation	60.9 (1.9)	1.2	10.5
8	Agriculture	59.3 (1.9)	1.0	8.8
9	Energy	27.1 (0.9)	4.9	92.9
10	Housing and Urban Development	20.7 (0.7)	0.3	7.0
-	Top 10 departments	3036.9 (96.2)	87.4	-

Source: USASpending.gov.

daily maintenance of computers and servers are rarely developed in-house. For example, as we use many Apple products and software, we need to develop a program that we enable to use various applications with keeping security. In fact, someone voiced concern that we heavily rely upon the contractors and we might be behind the contractors in computer technology. Anyway, I can't imagine the situation there are no contractors."

Co-location with the federal government facilitates transactions by providing more face-to-face contact. A government officer in a DoD subsidiary admitted:

"We don't have a preference for working with a firm located in Fairfax near our office. But in the process of screening applicants, we often visit the applicants' offices to get a demo and talk with them. Actually, a location near our government office is better. Big companies have many offices everywhere, but small companies, ... if a small firm located in California applies for a project hosted by our organization, the representative of the firm should come here to talk with us."

### (3) Regulation

Government policies for promoting formal competition and simplified acquisition purchase procedures in the procurement process consolidate fragmented procurement systems and lower the entry barriers of small IT service firms. These policies also create the current business structure of the government contract market-oriented IT service firms, which consist of a small number of large IT service

firms as prime contractors and a large number of small IT service firms as subcontractors. A chief business development officer of a local IT service firm stated:

"Until the mid-1990s (back in the pre-GWAC days), contracting and management of budgets was highly fragmented. ... Contractor companies tailored their service-delivery to each of its customer's specific needs. ... The contractor-government relationships were proprietary, long-term, and built on trust. It took a long time to establish the trust necessary to have the executive direct one of his prime contractors issue you a subcontract and a task order. ... If you did well, you might be in line for a prime contract award the next time the contracts were competed. ... Nowadays, all of these offices and directorates no longer have the authority to issue their own contracts. IT operations have been consolidated into various IT Enterprises. For instance in 2004 the office (with roughly 7,000 total personnel including very high-level officials) that was our primary client, had over 24 IT contracts for various services and equipment purchases - 2 of these were our prime contracts. Now, there are 2 contract vehicles with only 4 prime contractors. And 3 of these companies had no experience with that customer before. Anybody who wants to do IT work there must subcontract with one of them."

Meanwhile, project (contract) team-based business networks are commonly observed in the local IT service industry. Regardless of customer base, local small IT service firms mostly function as subcontractors and vendors of large-sized IT service

firms. In particular, the federal contracting business is operated in the hierarchical structure that consists of end users (government), prime contractors (first-tier), and sub-contractors (second- and third-tier). Such networks allow local companies to collaborate with others to bid on projects, develop solutions, as well as build formal and informal networks with others. The federal government policy, especially provided by the Small Business Administration (SBA), regulates the winner-take-all system led by a few large-scale prime contractors and drives collaboration with local, small IT service operations. In fact, prime contractors listed in the top 100 federal government contractors account for over 70% out of the total government contracts. Thus, if institutional tools for small businesses are not formally organized, the local IT service environment might be devastated and lose the dynamics triggered by the entry of potential entrepreneurs. The SBA requires prime contractors that are awarded federal contracts valued at \$500,000 or over \$1 million for construction projects to establish plans and goals for subcontracting with small, small disadvantaged and women-owned firms. Moreover, in the case of large-scale consolidated contracts, local IT service firms work with other companies to fill in the areas where they do not have expertise. Thus, local companies consider networking as a key to success. A director of a local IT service firm emphasized the importance of partnering and networking with local colleagues:

“Partnering is a requirement because government issues GWAC contracts that exclude competition. Companies have to partner because companies have won contracts that make them “gate keepers” to a particular customer.

Government contracts create barriers and force companies to partner that might not have ever partnered.”

#### (4) Support

The federal government implements numerous policies to help small firms conduct business with the federal government by establishing contract set-asides, assistance programs, and certifications, among others. Other programs, especially those provided by the SBA, provide a fair opportunity for assigning contracts to small companies as an affirmative action. Local IT service firms involved in the government contract market take advantage of such benefits. Specifically, 23% of prime contracts are assigned to small companies, 5% of prime and subcontracts to small disadvantaged businesses (SDB), 5% of prime and subcontracts to women-owned firms, 3% of prime contracts to small businesses in the Historically Underutilized Business Zones (HUBZone), and 3% of prime and subcontracts to service-disabled veteran-owned small companies (FCEDA Fact sheet, November 2011). The SBA publishes a report card on each agency and sends it to Congress. If an agency repeatedly misses its mandated small business goals, it can be punished. SDBs are certified as 8(a) firms by the SBA, making them eligible for federal contract-bidding benefits and set-asides. As of October 2010, nearly 440 firms in Fairfax County have participated in the SBA's 8(a) business development program (FCEDA Fact sheet, July 2011). Several approved 8(a) local companies were also named as prime contractors serving the federal government on Washington Technology's annual listing of the Top 25 8(a) IT service companies in the US. The 8(a) companies in Fairfax County accounted for 12

of the total 25 firms in the 2011 list.

The federal government and its policies certainly increase business opportunities for local potential entrepreneurs, support the growth and technological development of small businesses, as well as promote a competitive and leading business environment. Geographical proximity to the federal government and its research institutes allows the local IT service firms to adapt easily to the fast-changing and complex policy environment. Moreover, geographical proximity is likely to stimulate social proximity because short geographical distances favor social interaction and trust building (Boschma, 2005, p. 67). The government-contracting business is operated by the federal purchasing regulations, but in practice, it also depends on the human network, reputation, and trust-based social relationships accumulated from previous work experiences. A managing director in the IT service business stated the characteristics of the government-contracting business, which relies highly on relationships and trust:

“... The relation is so complex that the statements of work and requests for proposal are frequently incomplete and unclear. Given that the work is poorly defined and therefore contracts are difficult to enforce the government only wants to award work to those companies that they trust.”

## 2) Local institutions

In the National Capital Region, Fairfax County acts as a hub for IT services that accounted for over half of the total IT service employees. Multi-faceted

support to improve the local IT service industry has been operated by local institutions, such as FCEDA and Mason Enterprise Center (MEC) (Table 5). Local institutions have clearly contributed to the growth of the local IT service industry, and their programs and services to attract companies have received favorable praise (Interviews with a representative of FCEDA and a government officer in a subsidiary of the DoD). Although their main objectives and programs have changed over time, the local institutions evidently contributed to the county's transformation into a promising IT service center. The local institutions primarily focused on physical infrastructure, such as office buildings, shopping centers, and industrial facilities, until the 1970s. In the 1980s, they recognized the impact of social infrastructure on the local industrial bases, and thus devoted themselves to attracting skilled workforce, financial sources, educational institutes, and industrial associations. Recently, the local institutions are focused on diversifying local industrial profiles, such as the convergence between biotechnology and IT. Moreover, they are assisting companies in collaborating on large IT service projects with local partners, and in building and deepening trust with each other by frequently organizing industrial seminars and networking events for local small businesses. According to the 2012 Small Business Datebook provided by the FCEDA, industrial seminars and networking events, such as Breakfast Club Networking and Federal Contractors Roundtable, accounted for 44.81% of the total small business events in Fairfax. An MEC representative notes that the institution is a university-based economic development enterprise and George Mason University participates with other universities on select joint programs and regional start-up

Table 5. Local institutions and their programs

Institutions	Year	Covered Area	Services & Programs
Community Business Partnership (CBP)	1995	Fairfax County	- Business Development / Finance / Incubation Centers - Financial Education Center for Women Entrepreneurs - Women's Business Center of Northern Virginia
Fairfax County Economic Development Authority (FCEDA)	1964	Fairfax County	- Business retention program - Entrepreneurship 101&201: Starting a Business in Fairfax County - Provides a wide range of information on demographics, employment, housing, taxes, and available commercial building space and sites.
Southeast Fairfax Development Corporation (SFDC)	1981	Fairfax County	- Provides extensive, up-to-date real estate and market data, site location information, financial and technical resources, educational programs, business networking opportunities, access to community and county governmental representatives, and redevelopment assistance.
SCORE	1964	USA	- The FCEDA offers the business counseling services through an arrangement with SCORE, a resource partner of the SBA.
Virginia's Center for Innovative Technology (CIT)	1984	State	- CIT Entrepreneur (GAP Funds, Commonwealth Energy Fund, Federal Funding Assistance Program) - CIT R&D (Commonwealth Research Commercialization Fund, (R&T) Strategic Roadmap) - CIT Broadband (Office of Telework Promotion and Broadband Assistance) - CIT Connect
Northern Virginia Technology Council (NVTC)	1990s	State	- The Entrepreneur Center @NVTC - Equal Footing Foundation
Mason Enterprise Center (MEC)	1995	State	- International Business Development Program - The Virginia Small Business Development Center Network (Mason SBDC) - The Fairfax Innovation Center -Mentor-Protégé Program - Procurement Technical Assistance Program - Flex-Office/Telework Services

Source: FCEDA (2010); Potomac KnowledgeWay; each organization website.

programs in support of university-based start-ups. Four companies that participated in the questionnaire survey have experienced the PTAP operated by the MEC to learn of the federal procurement market and develop award-winning skills. Several counselors who have experience in the federal marketplace help a company collect information, such as what government agencies are buying in the company's product and services, or what kind of contracts are matched with the company's line of

business, laws, and regulations. The PTAP-related seminars and conferences are held every month at the MEC building in the Fairfax County. Also, companies that joined in the questionnaire survey have received information on GSA schedule and ISO, telework incentive programs, and general advice and education especially about the federal marketplace from the local institutions. Through a wide variety of programs, local institutions contribute toward reinforcing superstructure or relational

**Table 6.** The role of local institutions to influence on the IT service firms

The role of local institutions	Mean	Std. Dev.
It helped to improve business network with local companies.	3.83	.577
It helped to set up a long-term vision.	3.58	.515
It helped to reinforce the membership as a local community's member.	3.50	.522
It generated direct effects for company growth in size or revenue.	3.42	.669
It helped to form and strengthen network with customers.	3.42	.515
It helped to recruit local skillful workforce.	3.33	.651

Source: Questionnaire survey (N=12).

Note: 1(Strongly disagree) to 5(Strongly agree)

assets, called “regionally-specific assets” Storper (1997), in the local IT service environment.

Local institutions help IT service firms to connect with other firms and build their long-term vision, and allow firms to clearly recognize their own presence as a local community member (Table 6). In fact, many employees engaged in local companies have come from other places to seek employment. A Chief Business Development Officer in the IT service business indicated that county residents may be more likely to lose the sense of community because they come from elsewhere and their families do not live in the community. A government contractor exemplified a case where some consultants who reside outside the county stay at a hotel during the weekdays, take a plane to go home on weekends, and then come back to their workplace. This practice means that if they have little opportunity to earn money in this area, they could leave any time. In this context, various programs implement-

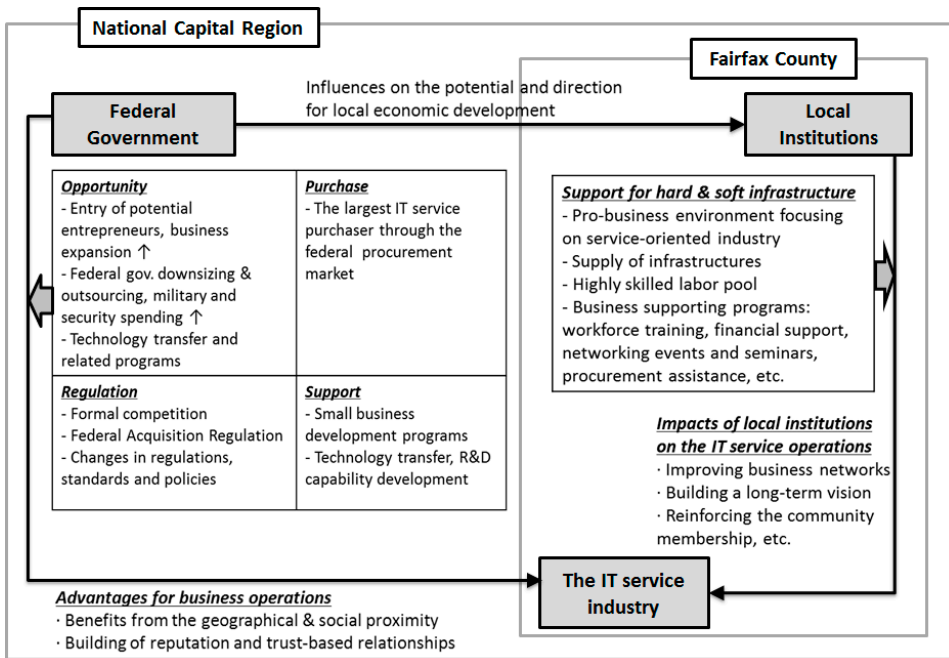
ed by the local institutions help local companies and the workforce to settle in this community and foster their business activities in the county.

Overall, public organizations operating at different spatial scales affect the building of a specialized environment within the IT service industry in Fairfax County (Figure 5). The federal government plays a pivotal role in the growth of the local IT service industry. Changes in government policies, such as downsizing and outsourcing, increase the opportunity for start-ups to enter the IT service market. Policies regarding technology transfer and R&D also enhance the buildup of a competitive business environment. Geographical proximity to the federal government provides IT service firms in Fairfax County more opportunities for building trust-based relationships and for working with the federal government. The federal government also indirectly influences the economic development in Fairfax County, that is, the service-oriented industrial development, federal procurement-related businesses, and so forth. The main objectives and programs of local institutions have changed over time, and recently, they are engrossed in providing networking venues and supporting new start-ups.

## 4. Conclusion

This study demonstrated that the IT service industry in Fairfax County was created based on regional-specific contexts, even though the region does not provide a business-friendly industrial environment. Unlike California's Silicon Valley and Boston's Route 128, Fairfax County is not a





**Advantages for business operations**

- Benefits from the geographical & social proximity
- Building of reputation and trust-based relationships

Figure 5. The role of public organizations in the operations of the IT service firms  
 Source: Summary of literatures, questionnaire survey and interviews.

research-oriented, high-technology cluster that relies on an excellent higher education infrastructure to drive economic growth, nor is it an industrial agglomeration promoted by the local government’s intention. Instead, Fairfax County is included in the National Capital Region. The proximity of the county to the center of the federal government is possibly a crucial factor in the progress of its local IT service industry, a unique feature that only this area enjoys.

Using the cluster adaptive cycle model (Martin and Sunley, 2011), Huh (2013) indicated that the local IT service industry has evolved into a trajectory-labeled constant cluster mutation with a high degree of resilience. The constant mutation of the local IT service industry partly resulted from its geographical proximity to the federal government,

the reinforcement of the adaptive capacity of local firms, and the network of economic agents, such as firm and supporting institutions (Huh, 2013). The local IT service industry coevolves with the regional specific context observed in the National Capital Region. The impact of the federal government on the local IT service industry is critical and decisive. Decisions made by the federal government, such as the location of the Pentagon, the increase in military spending and outsourcing, the downsizing of the federal government, and other business-related initiatives, have resulted in the influx and expansion of IT service firms into the local environment, the formation of new small firms, the abundance of skilled workers, and the growth of the IT service industry toward the federal procurement market. The federal government has affected and has been

affected by the evolution of the local IT service industry. The federal government has outsourced a wide range of tasks to IT service providers and relies on its IT counterparts that are more technologically predominant. The symbiotic relationship between the federal government and local IT service firms is a coevolutionary process derived from the regional specific context. Furthermore, the local IT service industry has coevolved with Fairfax County itself. Fairfax County has been transformed from a peripheral suburban area to one of the most concentrated IT service centers in the U.S. In 2011, the IT service employees accounted for approximately 13% of the total employees in Fairfax County, making the IT service industry one of the most specialized and influential fields in the local economy. The local IT service industry has shown continued growth and more resilience than that in Santa Clara County with respect to its business entry and exit patterns. Local institutions provide various programs and services for both incumbent firms and potential entrants, and are recently focused on the cultivation and leverage of relational assets among economic actors through a variety of networking venues. The transformation of the county into an IT service cluster repeatedly affects the local embeddedness of IT service firms and continuously stimulates the industrial dynamics in the local environment.

This study reveals that the regional-specific settings in the cluster literature should be understood to analyze how a cluster evolves, how the economic actors constituting the cluster grow and adapt in a changing environment, and in what ways the cluster is distinguished from others elsewhere. This study has an implication to the IT service industry in Korea. The structure of the IT service industry

in Fairfax County is quite similar to that of Korea, which consists of a few large firms and numerous small firms. The IT service industry in Korea has grown with a captive market where consumers are mostly affiliates of large firms and thus large companies account for over 70 percent of the total market share with regard to system integration (Oh, 2006; Song *et al.*, 2009). In contrast, the IT service industry in Fairfax County has built a collaborative business environment between large and small firms through supportive programs and regulations provided by public organizations at various scales. Strategies that facilitate cooperation between large and small firms, protect company-proprietary information, and support small businesses through set-aside goals should be established.

Future studies may focus on the cross-sectional analysis of regions similar to the research area. Theoretical discussions on the evolution of the service industry in a specific region should be undertaken in future research through comparative studies. Cases similar to that of Fairfax County, which has transformed into a high-technology center, can be observed in terms of the regional-specific context in industrial clusters located in the Capital Region of Korea. The evolutionary processes of the local economy surrounding the capital region can be theoretically elaborated as the “capital region effect.”

## Notes

- 1) The IT service industry was initially developed with the support of government projects. It was recently highlighted as a knowledge-based industry that facilitates service-oriented business activities. In the US, the role of the federal government as both provider of funds and product con-

- sumer led to the early formation of IT-related industries.
- 2) Co-producing process between service providers and clients which is commonly observed in IT services can be categorized the synthetic knowledge base by the industrial knowledge based approach (Asheim, 2007; Asheim and Hansen, 2009).
  - 3) Public organizations, which can be narrowly defined as institutions, include research centers, universities, other educational and training institutions, chambers of commerce, technology-transfer agencies, as well as federal, state, provincial, and local governments (Gertler and Wolfe, 1998; Wolfe, 2003).
  - 4) The external benefits include specialized local labor pool, specialized suppliers, shared infrastructure and knowledge spillovers (Marshall, 1917), minimization of spatial transaction costs based on neo-classical location theory, access to a local science base (Zucker et al., 1998), access to local buzz to share information (Bathelt et al., 2004) and access to networks (Owen-Smith and Powell, 2004; Chetty and Agndal, 2008; Koo, 2010).
  - 5) This survey, which was conducted in 1968, was based on results from 199 firms listed in the Fairfax County Industrial Directory. The findings were composed of 77 % of all research and technical manufacturing employment, 55% of other manufacturing employment, and 73% of the wholesale and warehousing employment. A total of 68 research and technical manufacturing firms and a substantial number of these companies are heavily reliant upon government contracts (57 out of 68).
  - 6) A Cooperative Research and Development Agreement (CRADA) is a written agreement between a federal research organization and one or more federal or non-federal parties (collaborators) to work together as partners on a research project of mutual interest (U.S. Department of the Interior (DoI)). A CRADA is intended to speed the commercialization of technology, optimize resources, and protect the private company involved.
  - 7) Small Business Innovation Research (SBIR) program, launched in 1982, has encouraged several US federal agencies to set aside a percentage of their contract and grant R&D budgets. The SBIR program was initially designed to support small, high-tech firms to develop commercializable technology as well as to employ small firms as technology

providers for use by government agencies.

## References

- Bathelt, H., Malmberg, A. and Maskell, P., 2004, "Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation," *Progress in Human Geography* 28(1), pp.31-56.
- Beaverstock, J. V., 2004, "Managing across borders': knowledge management and expatriation in professional service legal firms," *Journal of Economic Geography* 4(2), pp.157-179.
- Bessant, J. and Davies, A., 2007, *Managing service innovation, Innovation in Services*, DTI Occasional Paper No. 9, London, Department of Trade and Industry, UK Government, 2007.
- Boschma, R., 2005, "Proximity and Innovation: A Critical Assessment," *Regional Studies* 39(1), pp.61-74.
- Bryson, J. R., Daniels, P. W. and Warf, B., 2004, *Service Worlds, People, Organizations, Technologies*, London and New York: Routledge.
- Cannon, J., Dunn, M., Tompkins, G. and Prasad, S., 2008, *Washington, D.C. MSA IT/Tech services cluster: Microeconomics of Competitiveness 2008*, MOC Final Paper, pp.1-30.
- Center for Regional Analysis George Mason University, 2009, *Fairfax County Economic Index June 2009*.
- Chetty, S. and Agndal, H., 2008, "Role of Inter-organizational Networks and Interpersonal Networks in an Industrial District," *Regional Studies* 42(2), pp.175-187.
- Coffey, W. J. and Shearmur, R. G., 1997, "The Growth and Location of High Order Services in the Canadian Urban System, 1971-1991," *Professional Geographer* 49(4), pp.404-418.
- Demikian, H., Kauffman, R. J., Vayghan, J. A., Fill, H.-G., Karagiannis, D., and Maglio, P. P., 2008, "Service-oriented technology and management:

- Perspectives on research and practice for the coming decade," *Electronic Commerce Research and Applications* 7(4), pp.356-376.
- Doloreux, D. and Shearmur, R. G., 2011, "Collaboration, information and the geography of innovation in knowledge intensive business services," *Journal of Economic Geography* 11(1), pp.1-27.
- Essletzbichler, J. and Rigby, D., 2007, "Exploring evolutionary economic geographies," *Journal of Economic Geography* 7(5), pp.549-571.
- Fairfax County Economic Development Authority, 2010, *Doing business in Fairfax County*, Fairfax County Economic Development Authority (FCEDA).
- Feldman, M. P., 2001, The Entrepreneurial Event Revisited: Firm Formation in a Regional Context, *Industrial and Corporate Change* 10(4), pp.861-891.
- Feldman, M. P. and Francis, J., 2002, The Entrepreneurial Spark: Individual Agents and the Formation of Innovative Clusters, in Curzio, A. Q. and Fortis, M.(eds.), *Complexity and Industrial Clusters*, Springer-Verlag New York, LLC, pp.195-212.
- Feldman, M. P., Francis, J. and Bercovitz, J., 2005, "Creating a Cluster While Building a Firm: Entrepreneurs and the Formation of Industrial Clusters," *Regional Studies* 39(1), pp.129-141.
- Gertler, M. S. and Wolfe, D. A., 1998, Ontario's regional innovation system: the evolution of knowledge-based institutional assets, in Cooke, P., Heidenreich, M. and Braczyk, H.-J.(eds.), *Regional Innovation Systems: The role of governance in a globalized world*, London and New York: Routledge, pp.91-124.
- Gordon, I. R. and McCann. P., 2000, "Industrial Clusters: Complexes, Agglomeration and/or Social Networks," *Urban Studies* 37(3), pp.513-532.
- Hammer, Greene, Siler Associates., 1969, *Industrial analysis, Fairfax County, Virginia*, Washington, D.C.
- Huh, D., 2013, "The Evolution of the IT Service Industry in the U.S. National Capital Region: The Case of Fairfax County," *Journal of the Economic Geographical Society of Korea* 16(4), pp.567-584. (In Korean with English summary)
- Jones, A., 2007, "More than 'managing across borders?' the complex role of face-to-face interaction in globalizing law firms," *Journal of Economic Geography* 7(3), pp.223-246.
- Jones, V. D., 1998, *Downsizing the Federal Government: The Management of Public Sector Workforce Reductions*, New York: M. E. Sharpe, Inc.
- Kelley, M. R., 1997, "From Mission too Commercial Orientation: Perils and Possibilities for Federal Industrial Technology Policy," *Economic Development Quarterly* 11(4), pp.313-328.
- Kim, Y., Lee, H. and Kwon, K., 2013, "Place-based Credit Advantages as a Factor of Agglomeration Economies: A Case Study of the 'Jungbu' Traditional Market in downtown Seoul," *The Geographical Journal of Korea* 47(2), pp.183-200. (In Korean with English summary)
- Klepper, S., 2007, "Disagreements, Spinoffs, and the Evolution of Detroit as the Capital of the U.S. Automobile Industry," *Management Science* 53(4), pp.616-631.
- Koo, Y., 2010, "Agglomeration Patterns of Advertising Industries and Spatial Networks of Advertisement Production," *Journal of the Korean Geographical Society* 45(2), pp.256-274. (In Korean with English summary)
- Lerner, J., 1999, "The government as venture capitalist: the long-run impact of the SBIR program," *The Journal of Business* 72(3), pp.285-318.
- Leslie, S. and Kargon, R., 1994, "Electronics and the Geography of Innovation in Post-War America," *History and Technology* 11, pp.217-231.
- Lowendahl, B., 1997, *Strategic Management of Professional Service Firms*, Copenhagen: Copenhagen Business School Press.
- Malerba, F., 2005, Sectoral systems of innovation, in Fagerberg, J., Mowery, D. C. and Nelson, R. R.(eds.), *The Oxford Handbook of Innovation*, New

- York: Oxford University Press, pp.380-406.
- Manuel, K. M., 2011, *Competition in Federal Contracting: An Overview of the Legal Requirements*, Congressional Research Service 7-5700, June 30, 2011.
- Marshall, A., 1917, *Industry and Trade*, London: Macmillan and Co., Ltd.
- Martin, R. and Sunley, P., 2011, "Conceptualizing Cluster Evolution: Beyond the Life-Cycle Model?," *Regional Studies* 45(10), pp.1299-1318.
- Maskell, P. and Malmberg, A., 2007, "Myopia, knowledge development and cluster evolution," *Journal of Economic Geography* 7(5), pp.603-618.
- Menzel, M.-P., 2010, Sources of 'second generation growth': spin-off processes in the emerging bio-chip industries in Jena and Berlin, in Fornahl, D., Henn, S. and Menzel, M.-P.(eds.), *Emerging Clusters: Theoretical, Empirical and Political Perspectives on the Initial Stage of Cluster Evolution*, Cheltenham, UK: Edward Elgar Publishing Limited, pp.239-264.
- Miles, I., 2005, Innovation in Services, in Fagerberg, J., Mowery, D. C. and Nelson, R. R.(eds.), *The Oxford Handbook of Innovation*, New York: Oxford University Press, pp.433-458.
- Oh, J., 2006, *New growth engine of IT industry in Korea, IT service industry*, National Information Society Agency. (In Korean)
- Owen-Smith, J. and Powell, W. W., 2004, "Knowledge Networks as Channels and Conduits: The Effects of Spillovers in the Boston Biotechnology Community," *Organization Science* 15(1), pp.5-21.
- Park, S. O., 2003, "Industrial changes in a networked world: innovative cluster in the greater Washington region," *Journal of Geography* 42, pp.17-32. (In Korean with English summary)
- Park, S. O., 2010, "Dynamics of Economic Spaces and Spatial Economic Inequality in East Asia," *Journal of the Korean Geographical Society* 45(4), pp.478-501.
- Park, S. O., 2014 (forthcoming), *Dynamics of Economic Spaces in the Global Knowledge-based Economy: Theory and East Asian Cases*, London: Routledge.
- Porter, M. E., 1998, "Clusters and the New Economics of Competition," *Harvard Business Review* 76(6), pp.77-90.
- Potter, A. and Watts, H. D., 2011, "Evolutionary agglomeration theory: increasing returns, diminishing returns, and the industry life cycle," *Journal of Economic Geography* 11(3), pp.417-455.
- Powell, W. W. and Grodal, S., 2005, Networks of Innovators, in Fagerberg, J., Mowery, D. C. and Nelson, R. R. (eds.), *The Oxford Handbook of Innovation*, Oxford, UK: Oxford University Press, pp.56-85.
- Song, Y., Kang, J. and Keum, H. Y., 2009, *Development Strategies for Korean IT Services in the Era of Globalization*, Korea Institute for international Economic Policy. (In Korean with English summary)
- Storper, M., 1997, *The Regional World: Territorial Development in a Global Economy*, New York and London: The Guilford Press.
- Stough, R. R., 1999, Building and Embedding an Innovative Culture in the Regional Economy, paper presented at the Seventh Annual Conference on the Future of the Northern Virginia Economy, George Mason University, 26 May 1999.
- Stough, R. R., Haynes, K. E. and Campbell, H. S., 1998, "Small Business Entrepreneurship in the High Technology Service Sector: An Assessment for the Edge Cities of the U.S. National Capital Region," *Small Business Economics* 10, pp.61-74.
- Sunley, P., Pinch, S., Reimer, S. and Macmillan, J., 2008, "Innovation in a creative production system: the case of design," *Journal of Economic Geography* 8(5), pp.675-698.
- Tether, B. and Howells, J., 2007, *Changing understanding of innovation in services: From Technological Adoption to Complex Complementary Changes to Technologies, Skills and Organization*, *Innovation in Services*, DTI Occasional Paper No. 9, London, Department of Trade and Industry, UK Govern-

- ment, 2007.
- Torre, A. and Rallet, A., 2005, "Proximity and Localization," *Regional Studies* 39(1), pp.47-59.
- U. K. Department of Trade and Industry, 2003, *Competing in the global economy: the innovation challenge*, DTI Innovation Report 2003, Department of Trade and Industry.
- Wenting, R. and Frenken, K., 2011, "Firm entry and institutional lock-in: an organizational ecology analysis of the global fashion design industry," *Industrial and Corporate Change* 20(4), pp.1031-1048.
- Wolfe, D. A., 2003, *Clusters from the Inside and Out: Lessons from the Canadian Study of Cluster Development*, Paper to be presented at the DRUID summer conference, pp.1-30.
- Zucker, L. G., Darby, M. R. and Brewer, M., 1998, "Intellectual human capital and the birth of US biotechnology enterprises," *American Economic Review* 88(1), pp.290-306.
- Center for Innovative Technology (<http://www.cit.org/>)
- Community Business Partnership (<http://www.cbponline.org/>)
- Fairfax County Economic Development Authority (<http://www.fairfaxcountyedea.org>)
- FederalGrantsWire (<http://www.federalgrantswire.com/>)
- FederalNewsRadio.com (<http://www.federalnewsradio.com/>)
- Mason Enterprise Center (<http://www.masonenterprise-center.org/>)
- Northern Virginia Technology Council (<http://nvtc.org/>)
- Potomac KnowledgeWay (<http://www.knowledgeway.org/>)
- SCORE (<http://www.score.org/>)
- Southeast Fairfax Development Corporation (<http://www.sfdc.org/>)
- U.S. Census Bureau (<http://www.census.gov/>)
- U.S. Department of the Interior (<http://www.doi.gov/>)
- U.S. Small Business Administration (<http://www.sba.gov/>)
- USASpending.gov (last access date: 2014.01.14.)
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