

Spatial Distribution of the operators of Public Business-to-Business Electronic Marketplaces in Korea*

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Abstract : Electronic Commerce (EC) has been at the center of discussion as a symbol of the integration of unprecedentedly developed Information and Communication Technologies (ICTs) and traditional commerce. In spite of much attention to EC, the research from a spatial perspective has not proliferated yet. EC was regarded to have aspatial characteristics based on the expectation for a global expansion of business activities in a digital economy. This paper attempts to figure out the spatial characteristics of public Business-to-Business electronic marketplaces (public B2B e-MPs), as one of the most evolving forms of B2B EC, regardless of the low proportion in B2B EC at present. Many of the firms operating public B2B e-MPs in Korea were located in Seoul, especially in Gangnam-gu. The analysis of three spatial indices showed their extreme spatial concentration. The analysis on the location factors of public B2B e-MP firms in Korea demonstrated that location factors of public B2B e-MP firms were differentiated by regional groups: Gangnam-gu, Seoul except Gangnam-gu, and the provinces. It was against an initial extreme expectation that the firms relevant to B2B EC will not care about physical locations because they mainly do businesses in electronic space. The differences between those in Gangnam-gu and in the provinces were strikingly prominent. Such differentiated location factors by region were closely related to the different attributes of the public B2B e-MPs by region. In conclusion, public B2B e-MPs are not irrelevant to physical space and physical proximity, at least at a current stage. Customized spatial strategies are required for successful online businesses.

Key Words : B2B electronic commerce, Public B2B electronic marketplaces, spatial distribution, location factors, regional differences, physical proximity

요약 : 전자상거래는 급속히 발달한 정보통신기술과 경제활동의 결합으로 탄생하였다. 그러나, 전자상거래에 관한 관심의 증가에도 불구하고 공간적 관점의 연구는 그다지 많지 않았다. 전자상거래가 디지털 경제시대에 물리적 공간의 장벽을 제거하고 경제활동의 세계화를 더욱 촉진할 것으로 당연하게 받아들여졌기 때문이다. 이 시점에서 본 연구는 공개형 기업간 전자마켓플레이스를 대상으로 전자상거래의 공간적 특성의 한 단면을 살펴보고자 한다. 공개형 기업간 전자마켓플레이스는 현재 국내 전체 기업간 전자상거래 가운데 낮은 비중을 차지하고 있음에도 불구하고 기업간 전자상거래의 가장 발달한 형태 중의 하나로 앞으로의 성장 가능성이 높다. 분석결과에 따르면, 국내 공개형 기업간 전자마켓플레이스는 서울, 특히 강남구 지역에 매우 밀집하여 분포하고 있었다. 세가지 공간 지표를 통해 본 집중도에 있어서도 여타 다른 산업과는 비교할 수 없을 정도로 특정 지역에서의 집중 정도가 높은 것으로 나타났다. 한편, 이들 공개형 기업간 전자마켓플레이스의 입지 요인을 분석한 결과, 서울시, 특히 강남구에 위치한 업체와 지방에 위치한 업체간에 입지 요인이 매우 다를 수 있었다. 전자 공간에서 주로 활동하기 때문에 물리적 공간의 속성에 의해 크게 영향 받지 않을 것이라는 초기의 일부 견해와는 다른 것이었다. 그

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리고, 지역별로 차별적으로 나타나는 업체의 속성 및 전자마켓플레이스의 특성이 지역별 입지 요인의 차이와 밀접한 관련이 있음 또한 밝혀졌다. 결론적으로, 공간적 관점을 통한 연구에 관한 일부의 회의적인 시각에도 불구하고, 공개형 기업간 전자마켓플레이스의 입지와 입지 요인 및 속성에 관한 분석은 온라인 비즈니스의 성공을 위해 물리적 공간을 적절히 활용하는 것이 매우 중요할 수 있다는 시사점을 제공하였다.

주요어 : 기업간 전자상거래, 공개형 기업간 전자마켓플레이스, 공간 분포, 입지 요인, 지역적 차이, 물리적 인접성

1. Introduction

The progress into knowledge-based economy in the 21st century puts much importance on the diverse types of networks covering local and global areas for promoting growth (Park and Choi, 2000). Nobody has doubted the role of Information and Communication Technologies (ICTs) as an essential factor that has affected the landscape of the knowledge-based economy. The contemporary world is so-called electronic economy in that the uses of computer networks potentially affect the performance of the economy by leading to the creation of products and services (Atrostic *et al.*, 2000). Electronic commerce (EC), as a combination of advanced ICTs and traditional commerce, has been a main component of the electronic economy. Although technological impacts on economy are not new at all, current electronic economy gets more attention than ever before. The ways individuals, businesses, organizations, and governments carry out operations with EC are distinguished from those in pre-EC periods (Leinbach and Brunn, 2001).

In terms of the effect of ICTs and EC on economic spaces, much attention has been paid to globally interoperable polices, under the assumption of the born global nature of EC (Dryden, 2000). The Internet was expected to open the possibility of doing businesses with the best suppliers regardless of their locations (Nezu, 2000). In this regard, Internet-based commerce has been believed to reduce greatly the spatial gap posed by geography (Phillips and Meeker, 2000). In contrast with a series of arguments concerning 'the end of geography' in a digital economy, it is gradually recognized that the development of EC does not offer a "friction-free"

environment although it dramatically reduces production costs (OECD, 1999). The reduction of spatial barriers under globalization puts a new opportunity for capital to exploit the minute differences between places (Yeung, 1998). Li *et al.* (2001) argue that the introduction of information systems does not eliminate geography, but redefine it in a complex but cost effective way. Likewise, the role of physical locations needs to be reconsidered in EC and EC is not completely free from the constraints (Steinfeld and Whitten, 1999)¹⁾. Spatial criteria still play important roles in EC because the cost-minimizing behaviors is encouraged by spatial proximity as well as ICTs (Bouwman, 1999). 'Untraded interdependency' is another important factor to facilitate the physical proximity between the firms relevant to EC and B2B EC (Pratt, 2000). In this regard, this paper tries to reveal the characteristics of EC in terms of geography with empirical analyses in Korea.

Research area of this study is narrowed down to Business-to-Business (B2B) EC where the behaviors of economic actors are active and therefore the effects of the introduction of EC are easily monitored. Because of the recent emergence of B2B EC, there are very little empirical works about it (Garicano and Kaplan, 2000). This paper focuses on the spatial characteristics of the firms operating public B2B electronic marketplaces (e-MPs) in Korea. Public B2B e-MPs are defined as the electronic marketplaces where many buyers and sellers meet electronically for the purpose of trading electronically with each other (Turban *et al.*, 2002). By contrast, private B2B e-MPs driven by a single seller or buyer are usually developed on a basis of pre-existing supplier-buyer relationships, regardless of an incremental change (Park, 2003). Public B2B e-MPs usually aim

at providing flexible invisible market-places where all the types of firms can participate in online trading. Public B2B e-MPs are again divided into those based on exchange model and agent model by business model (Choi, 2003b)²⁾.

In the meanwhile, the types of traded products also divide e-MPs into two sub-types, horizontal marketplaces and vertical marketplaces (Turban, *et al.*, 2002). Horizontal marketplaces are those that concentrate on a service or a product that is used in all types of industries such as office suppliers, PCs, or travel services. Vertical marketplaces are those that deal with one industry or industry segment such as electronics, cars, steel, chemicals, and so on. MRO e-MPs are representative ones of horizontal e-MPs. MRO products stand for maintenance, repair, and operating products and are not directly used for end products. MRO products range from facilities, maintenance, repair to consumables such as stationery and cleaning material³⁾. Horizontal B2B e-MPs are not limited to MRO e-MPs, though. The e-MPs focused on foreign trade can also be included in this category since they serve various types of industries (Park, S.W., 2001). In this regard, the e-MPs relevant to non-specialized trade are also considered as horizontal B2B e-MPs, because they deal with diverse types of industries in this paper.

In fact, private B2B e-MPs in Korea take the dominant proportion of total B2B EC sale at a current stage. The percentage of B2B EC sales over public e-MPs only stands at 3.5% for the year 2001, according to Korea National Statistical Office (KNSO, 2002). However, regardless of the current low percentage, public e-MP is chosen as a topic in this paper

because it is believed to be an evolutionary type of e-MPs succeeding to private e-MPs. Although direct corporate e-procurement and e-sales are dominant at an initial stage, public e-MPs are considered to grow rapidly in future (Andrew *et al.*, 2000).

This paper attempts to discover the main characteristics of the firms operating public B2B e-MPs in Korea from a geographical perspective and to understand the influence of public B2B e-MPs on the existing structure of economic spaces. Specifically, it intends to exemplify the assumption that regardless of the origin of public B2B e-MPs from advanced ICTs compressing time and space, the firms operating public B2B e-MPs are not likely to be free from physical space and physical proximity, arguing against a rosy prediction for the decrease of the importance of physical space in a digital era.

2. Data and Methods of Analysis

According to KNSO, the total number of public B2B e-MPs stood at 273 at the end of 2001 KNSO, 2002)⁴⁾. However, it was not allowed to get the information on the attributes of the individual firms operating public B2B e-MPs from KNSO. Therefore, the list of B2B e-MPs was acquired from the 2001 Electronic Commerce White Paper published by Korea Institute for Electronic Commerce (KIEC) and Ministry of Commerce, Industry and Energy (MOCIE) in October 2001. The total number amounted to 316 in the list. At first glance, six were excluded because they were listed twice. 310 B2B e-MPs were included in this study. The list from

Table 1. Sources of the list of B2B e-MPs (On June, 27, 2002) (Unit: count)

Source	Only in the KbizBrain website	Only in the 2001 EC White Paper*	Both**	Others***	Total
Number of sites	78	19	291	2	390

Notes: *KIEC · MOCIE (2001). **The number of B2B e-MPs that are listed both on KbizBrain.com (<http://www.kbizbrain.com>) and on the White Paper. ***The number of the B2B e-MPs that are found from other sources such as newspapers or magazines.

KbizBrain.com (<http://www.kbizbrain.com>) was added on the 27th of June⁵. In total, 78 B2B e-MPs were newly detected. Finally, 390 of B2B e-MPs were included in this study (Table 1).

Although most of them were believed to be public B2B e-MPs, the procedures to exclude inappropriate ones were required. First, a phone call survey was carried out to check whether they were public B2B e-MPs and were in operation. The survey was carried out during the months of July and August in 2002. As a result, only 111 public B2B e-MPs were selected for the analysis⁶. A few public B2B e-MPs that were scheduled to begin online transactions within 2002 were included. The result of preliminary phone call survey is shown in Table 2.

As the second step, the operators of the 111 public B2B e-MPs were asked to answer questionnaires from the middle of July to the middle of September in 2002. The firms operating more than one public B2B e-MP were asked to answer about a representa-

tive one. Some answered by e-mail or fax. Others, especially the firms in the provinces⁷ were visited and in-depth interviews were also performed. As a result, 68 cases were used for the analysis of this study. Basically, respondents were limited to the public e-MPs over which B2B transactions were already made⁸. Approximately 25% of total Korean public e-MPs were included in this study. The population and the questionnaire sample are compared in Table 3.

For the analysis, the spatial distribution of the firms operating public B2B e-MPs in Korea is described based on the collected data. Then, the degree of concentration of the firms operating public B2B e-MPs is measured in quantitative terms. For this end, Such three spatial indices as location quotient (LQ), coefficient of localization, and coefficient of geographic association are introduced in this paper. The indices are selected out of various spatial indices because they are known to reflect the degree

Table 2. Result of preliminary phone call survey

(Unit: count)

	No. of B2B e-MPs (Table 1)	Closure*	Contact failure**	Public B2B e-MPs
Sites	390	143	104	111 (143***)

Notes: *Closure: no websites or (temporary) closure of B2B business etc. (the existence of e-MPs was checked twice in February and July 2002). **Contact failure: ① Phone number is available but no one receives, ② website exists but no information on company locations and phone numbers or ③ firms refuse to answer any question. ***The number of B2B e-MPs including private as well as public ones.

Source: Phone all survey.

Table 3. Composition of collected data

(Unit: count, %)

Types	Data from KNSO (as of at the end of 2001)		Phone call survey		Questionnaire sample	
	No. of firms**	%	No. of firms	%	No. of firms	%
Horizontal public B2B e-MPs*	75	27.5	28	25.2	21	30.9
Vertical public B2B e-MPs	198	72.5	83	74.8	47	69.1
Total	273	100.0	111	100.0	68	100.0

Note: *Horizontal public B2B e-MPs include those dealing with MRO products, foreign trade, and non-specialize trade. Refer to the section of introduction for a detailed explanation on horizontal vs. vertical ones. **The number of B2B e-MPs with intermediary-oriented type in KNSO (2002).

Sources: KNSO, 2002, Phone call survey, and questionnaire survey.

of spatial concentration of specific industries in terms of a specific regional unit and a whole country, based on literature review such as Isard (1960) and Wheeler and Shaw (1985).

LQs measure the extent to which different areas depart from some norm such as national average⁹. Coefficient of localization is a measure of relative regional concentration of a given industry compared to some total national magnitude including population, land area, manufacturing employment, or income (Isard, 1960: 251-252)¹⁰. Coefficient of geographic association originally defined by Florence (1943) attempts to compare the geographic distribution of a specific industry to the geographic distribution of the base industry (Isard, 1960: 253)¹¹. The operators of three spatial indices are calculated concerning the public B2B e-MPs from the phone call survey, whose total number is 111.

Succeedingly, questionnaire respondents are asked to evaluate the importance of locations factors. In total, thirty one items are included in the survey. The degree of importance is measured on a five-point scale, on which 1 is very important and 5 is not at all important. The included items are related to cost minimization factors, demand maximization factors, regional factors, strategic factors, and personal factors. Finally, based on the result of the analysis of location factors, three regional groups are defined and the several attributes of public B2B e-MPs by the regional groups are investigated.

3. Spatial Distribution of the Firms Operating Public B2B e-MPs

The analysis of the spatial distribution with phone call survey demonstrates a considerable concentration of the firms operating public B2B e-MPs in Seoul (Figure 1). Approximately 84% (93 firms) out of total 111 firms are located in Seoul. In spite of the general belief about the irrelevance of EC related firms to physical locations, the result implies that the

firms of public B2B e-MPs are overwhelmingly influenced by physical locations. Gangnam-gu takes the proportion of 26% out of the firms in Korea. Seocho-gu and Yeongdeungpo-gu follow Gangnam-gu by 12%, respectively. The three districts occupy about 50% of the total distribution in Korea. In terms of the spatial distribution in Seoul, the number of public B2B e-MPs in Gangnam-gu amounts to 31%. There are 12 firms (11%) in Gyeonggi-do surrounding Seoul. In total, 95% of the firms that operate public B2B e-MPs are agglomerated in the Seoul metropolitan area or the Capital Region covering Seoul, Incheon, and Gyeonggi-do.

The spatial distribution of public B2B e-MPs in Korea by industry is briefly summarized based on the data from phone call survey, where the total number of public B2B e-MPs in operation at the end of August 2002 amounts to 111 firms. In terms of the whole country, all the firms operating the horizontal e-MPs relevant to MRO products and foreign trade/non-specialized trade are located in Seoul (Table 4). Besides, all of the e-MPs relevant to construction/construction materials, medicines/medical equipment and logistics are located in Seoul. Most e-MPs in computer/IT/electronics and chemicals/petroleum are also based in Seoul. Although a half of the firms in each industry are located in Seoul, there are some firms in the provinces in such industries as food and beverage, steel, and machinery/industrial materials. Four firms out of nine firms involved with machinery and industrial materials are located in Gyeonggi-do. Out of twelve firms involved with food and beverage, three firms are in Busan city. Out of seven firms in steel industry, three are located in the provinces. They are located in Gyeonggi-do, Gwangju-city, and Jeollanam-do, respectively.

In the meantime, the analysis of the spatial distribution within Seoul reveals that the e-MPs relevant to computer/IT industry, MRO industry, and foreign trade/non-specialized trade industry are dominant in Gangnam-gu. In addition, at least one public B2B

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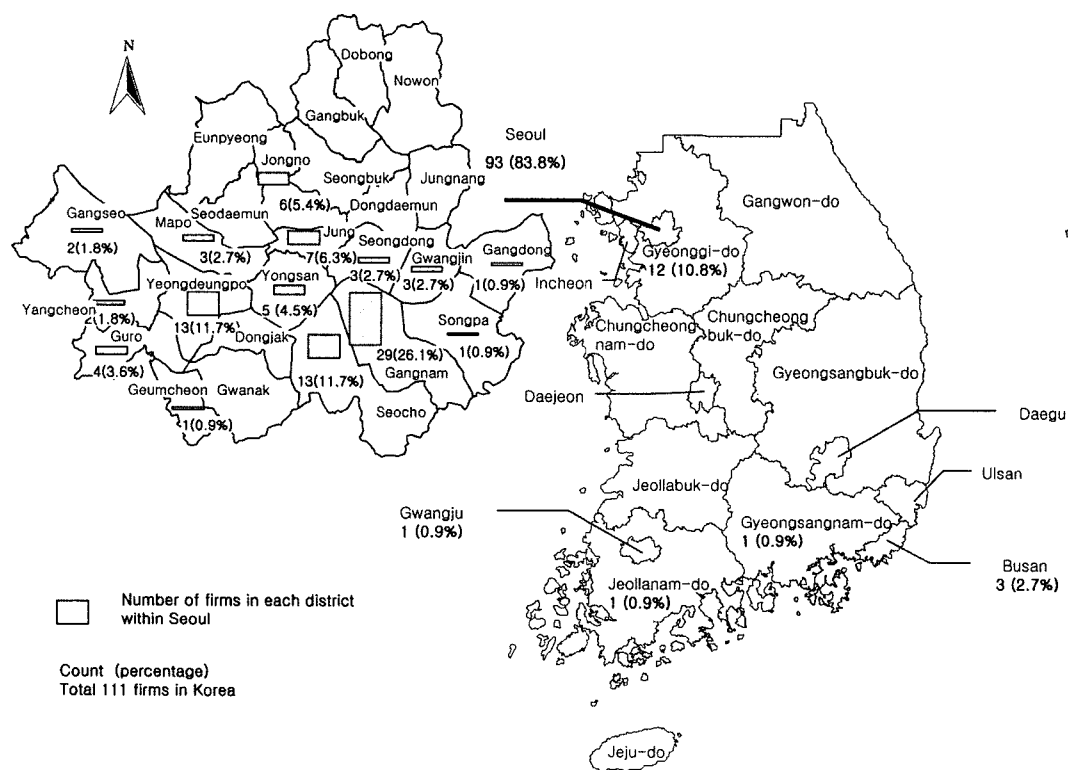


Figure 1. Spatial distribution of the firms operating public B2B e-MPs in Korea

Source: Phone call survey.

Table 4. Spatial distributions of the firms operating public B2B e-MPs in Korea by industry

(Unit: count, %)

Industry*	Seoul	Gyeonggi	Gwangju	Jeonnam	Busan	Gyeongnam	Total
MRO	16(100.0%)						16(100.0%)
Foreign trade / Non-specialized trade	12(100.0%)						12(100.0%)
Chemicals / Petroleum	8(80.0%)	2(20.0%)					10(100.0%)
Construction / Construction materials	5(100.0%)						5(100.0%)
Food / Beverages	8(66.7%)	1(8.3%)			3(25.0%)		12(100.0%)
Steel	4(57.1%)	1(14.3%)	1(14.3%)	1(14.3%)			7(100.0%)
Textiles / Clothing	1(50.0%)	1(50.0%)					2(100.0%)
Medicines / Medical equipment	6(100.0%)						6(100.0%)
Machinery / Industrial materials	4(44.4%)	4(44.4%)				1(11.1%)	9(100.0%)**
Computer/IT/ Electronics	17(89.5%)	2(10.5%)					19(100.0%)
Logistics	2(100.0%)						2(100.0%)
Others	10(90.9%)	1(9.1%)					11(100.0%)
Total	93(83.8%)	12(10.8%)	1(0.9%)	1(0.9%)	3(2.7%)	1(0.9%)	111(100.0%)

Notes: *Industrial classification is originally based on that in KIEC · MOCIE (2001) and KbizBrain.com, as of at the end of 2001. Some categories are modified following the classification from KNSO. **The sum of row may not be 100.0% due to the rounding error.

Sources: Restructured based on KIEC · MOCIE (2001), KbizBrain.com (<http://www.kbizbrain.com>), phone call survey, and questionnaire survey.

e-MP in all the other industries except steel and textiles/clothing are located in Gangnam-gu. MRO e-MPs are also noticeable in Seocho-gu and Yeongdeungpo-gu.

4. Measurement of Concentration by Spatial Indices

The analysis of the firms operating public B2B e-MPs shows a considerable spatial concentration in Seoul, especially in Gangnam-gu. It aims at figuring out the characteristics of spatial distribution of the operators of public B2B e-MPs in quantitative ways. Three spatial indices are chosen and introduced in this section. They include LQs, the coefficient of localization, and the coefficient of geographic association. The reason for selecting the three indices and the way for calculating them were described in the previous section of data and methods of analysis.

1) Location Quotient

LQs measure the deviation of the distribution of a given industry by region. In this study, population, the total number of establishments, the number of the establishments belonging to KSIC51¹²⁾ (wholesale and commission trade, except of motor vehicles and motorcycles) are used as the bases on which the

extent of the deviation is calculated. The number of firms operating public B2B e-MPs from the result of phone call survey is used as the numerator for calculating LQs.

In the analysis carried out about seven metropolitan cities and nine provinces, LQs were more than one only in Seoul, whatever base magnitudes were (Table 5). The value equaled 3.91 based on the spatial distribution of population, 3.51 based on that of total establishments in Seoul. All the other regions showed values less than one. The calculation based on the spatial distribution of wholesale and commission trade is not very different from the previous results. However, the value is 1.84 in Seoul, which is much lower than those based on population and total establishments. It is because wholesale and commission trade were already considerably concentrated in Seoul from the past. Nevertheless, the value of 1.84 means that the operators of public B2B e-MPs reveal a greater tendency towards being located in Seoul than those operating wholesale and commission trade, usually in offline dimension.

LQs are also calculated by district within Seoul (Figure 2). The contrast between Jung-gu and Gangnam-gu is remarkable. The LQ for Jung-gu (LQ=5.69) based on population, a traditional Central Business District (CBD), is almost the same as that of Gangnam-gu (LQ=5.89). However, the LQ based on

Table 5. LQs of the firms operating public B2B e-MPs in Korea by different bases

Region*	Base magnitude (Reference year)	Population (2000)	Total establishments (2000)	Wholesale and commission trade, except of motor vehicles and motorcycles, KSIC51 (2002)
Seoul		3.91	3.51	1.84
Gyeonggi-do		0.56	0.67	1.07
Gwangju		0.31	0.31	0.35
Jeollanam-do		0.21	0.20	0.32
Busan		0.34	0.31	0.29
Gyeongsangnam-do		0.14	0.14	0.21

Notes: *The regions without the firms operating public B2B e-MPs are excluded.

Sources: · Population (KNSO, 2001, 2000 Population and housing census report; Whole country) · Total establishments and KSIC51 (KNSO, 2001, 2000 Report on the census on basic characteristics of establishments; Whole country) · The number of the firms operating public B2B e-MPs (Phone call survey).

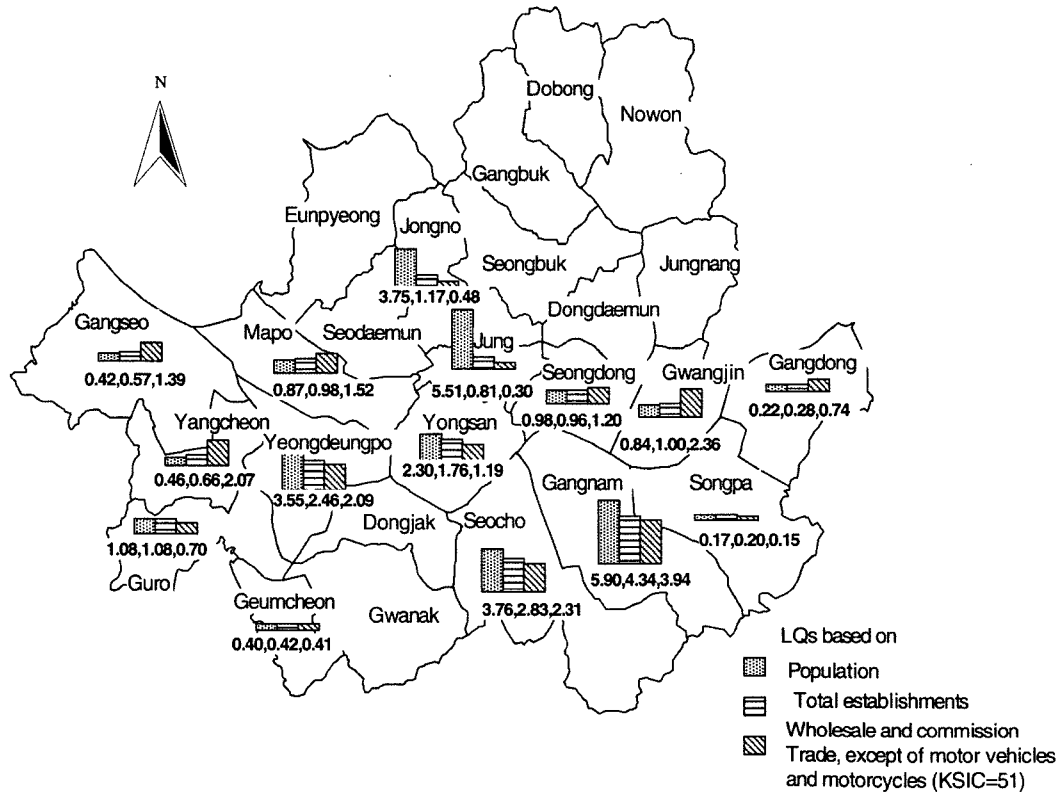


Figure 2. LQs of the firms operating public B2B e-MPs by districts within Seoul

Sources: · Population (KNSO, 2001, 2000 Population and housing census report; Whole country) · Total establishments (KNSO, 2001, 2000 Report on the census on basic characteristics of establishments; Whole country) · KSIC 51 within Seoul (Seoul metropolitan government, 2001, 2000 Report on the census on basic characteristics of establishments; Seoul) · The number of the firms operating public B2B e-MPs (Phone call survey).

the total number of establishment is even less than one in Jung-gu (LQ=0.81), whereas that is still extremely high in Gangnam-gu (LQ=4.34). Gangnam-gu reveals an extreme concentration of public B2B e-MP firms that deviates the spatial distribution of the total establishments highly. In the meantime, while Seocho-gu and Yeongdeungpo-gu indicate almost the same trend as Gangnam-gu, the absolute values of the LQs based on the three base magnitudes are much lower than those in Gangnam-gu.

In conclusion, the LQs by district within Seoul demonstrate an important role of Gangnam-gu,

Seocho-gu, and Yeongdeungpo-gu as new centers. Among them, the highest concentration of Gangnam-gu cannot be overemphasized, as the absolute values are much higher than those of Seocho-gu and Yeongdeungpo-gu.

2) Coefficient of Localization

Coefficient of localization is a measure of relative regional concentration of a given industry compared to some total national magnitude including population, land area, manufacturing employment, or income (Isard, 1960: 251-252). In this study, the coefficient of localization is calculated in terms of the

Table 6. Coefficients of localization of public B2B e-MPs by different bases

Coverage	Base (Reference year)	Population (2000)	Total establishments (2000)	Internet users (2002.06)	.kr domain (2002.10)
Korea (by 16 provinces)		0.62	0.60	0.59	0.27
Seoul (by 25 districts)		0.60	0.45	-	-

Sources: · Population (KNSO, 2001, 2000 Population and housing census report; Whole country) · Total establishments: -Korea (KNSO, 2001, 2000 Report on the census on basic characteristics of establishments; Whole country), -Seoul (Seoul metropolitan government, 2001, 2000 Report on the census on basic characteristics of establishments; Seoul) · Internet users (Korea Network Information Center(KNIC), 2002, A survey on Internet users and Internet behavior in Korea) · '.kr' domains (KNIC, 2002, Monthly Internet statistics) · The number of the firms operating public B2B e-MPs (Phone call survey).

spatial distributions of the number of the operators of public B2B e-MPs (Table 6). Spatial distributions of population and the total number of establishments are basically used as the references with which to compare the degree of the deviation of the spatial distribution of the operators of public B2B e-MPs. Furthermore, the two indices representing electronic economy are added. They are the percentage of the Internet users and the percentage of '.kr' domain by region.

As is revealed in the analysis of LQs by region, the spatial distribution of the firms operating public B2B e-MPs is quite different from those of population and total establishments. It is obvious in the calculation of the coefficient of localization. The value of the coefficient of localization of the firms operating public B2B e-MPs based on population is 0.62 in terms of the whole country. The value based on the total number of establishments is 0.60, which is almost the same as that based on population. In the calculation, zero means that the equal distribution of a given industry with base magnitude. The values of 0.62 and 0.60 mean the considerable deviation from the spatial distribution of population and total establishments. The situation in Seoul is not very different from that of the whole country, even though there are some differences in the value based on total establishment.

The coefficient of localization is also calculated based on some base distributions indicating the spatial distribution of the Internet users in terms of the

whole country. The coefficient of localization based on the Internet users (the value=0.59) is almost the same as those based on population and total establishments. It is because the users of the Internet are dispersed across the country almost in proportion to the spatial distribution of population. By comparison, the value based on the regional registration of .kr domain is 0.27 and much lower than those based on the other base magnitudes. It is involved with the fact that about 86% of '.kr' domains are '.co.kr' domains used for commercial purpose¹³⁾ and many of them are used for B2B e-MPs.

3) Coefficient of Geographic Association

The characteristics of the spatial distributions of public B2B e-MPs are compared with those of related industries. The purpose is to clarify the spatial characteristics of public B2B e-MPs by figuring out the similarities and the dissimilarities with seemingly associated industries. For this purpose, the coefficient of geographic association is used in this study (Table 7). When the value is zero, complete geographical association exists, whereas no geographic association exists, when the value is one. In this study, the four types of seemingly associated industries are introduced: the number of the wholesale and commission trade, except of motor vehicles and motorcycles (KSIC 51), the number of the establishments of the KSIC 5-digit level industries dealing with the same kinds of products as public B2B e-MPs treat within those of KSIC 51, the number of the

Table 7. Coefficients of Geographic Association by different bases

Base magnitude (Reference year) Coverage	Wholesale and commission trade, except of motor vehicles and motorcycles KSIC 51 (2000)	Industries dealing with the same kinds of products as public B2B e-MPs within KSIC 51* (2000)	Wholesale on a Fee or Contract Basis KSIC 511 (2000)	B2C e-MPs** (2002)
Korea (by 16 provinces)	0.39	0.39	0.41	0.11
Seoul (by 25 districts)	0.43	0.41	0.36	0.25

Notes: *Chemicals (KSIC=51721, 51722, 51723, 51724), Construction/Construction materials (51511, 51512, 51513, 51591, 51592, 51599), Food and Beverages (51311, 51312, 51313, 51319, 51321, 51322, 51323, 51324, 51329, 51331, 51332), Steel (51601, 51602), MRO (Operating materials: 51461, 51462, 51892), Textiles and Clothing (51411, 51413, 51414, 51732, 51733) Foreign trade and Non-specialized trade (51910), Medicines (51451, 51894), Petroleum (51712), Machinery and Industrial materials (51811, 51812, 51813, 51819), Electronics (51891, 51893, 51896). **The list of B2C e-MPs is indirectly acquired from KbizBrain.com. Some of them may be not in operation at this moment.

Sources: · KSIC 51 and KSIC 511: -Korea (KNSO, 2001, 2000 Report on the census on basic characteristics of establishments; Whole country), -Seoul (Seoul metropolitan government, 2001, 2000 Report on the census on basic characteristics of establishments; Seoul) · Industries dealing with the same kinds of products as public B2B e-MPs: -Korea (2001, 16 local governments, 2000 Report on the census on basic characteristics of establishments), -Seoul (KSIC 5-digit level industrial digital raw data on 2000 Report on the census on basic characteristics of establishments that is acquired from Seoul metropolitan government in 2002) · B2C e-MPs (Restructured from the list from KbizBrain.com in Oct. 2002) · The number of the firms operating public B2B e-MPs (Phone call survey).

establishment of the Wholesale on a Fee or Contract Basis (Commission trade, KSIC 511), and the number of the firms operating B2C e-MPs.

According to the index, the geographic association of wholesale and commission trade with the operators of public B2B e-MPs is not very high in terms of Seoul and the country as a whole. By contrast, the spatial distribution of the operators of B2C e-MPs is geographically associated with that of the operators of public B2B e-MPs in terms of the whole country (the value=0.11). Interestingly, however, the degree of the geographic association between the two industries is relatively low in terms of Seoul (the value=0.25). The firms operating B2C e-MPs are relatively less concentrated in Gangnam-gu within Seoul than those operating public B2B e-MPs.

5. Analysis of Location Factors

Thirty one items are listed in the questionnaire and respondents are asked to evaluate the importance

they put on each item on a five-scale basis where '1' is strongly important and '5' is not at all important¹⁴⁾. The averages of the answers about each item are calculated. The objective is to investigate which location factors were regarded most important by the firms operating public B2B e-MPs and to examine the differences in the location factors by region. Mainly the items that have the averages lower than 3.0 are dealt with significantly in this section¹⁵⁾.

On a level of the whole country, the convenience of transportation (Average=2.55), preferable business infrastructures (A=2.74), the low rent fees of buildings (A=2.86) are ranked as the most important location factors by the firms operating public B2B e-MPs. In the meanwhile, the convenience of transportation (A=2.35), preferable business infrastructures (A=2.60), and the low rent fees of buildings (A=2.91) are also especially important location factors to the firms within Seoul. These factors are related to enjoying traditional urbanization economy, which are usually achieved by being located in large cities. Firms take advantage of superior transporta-

tion facilities, diverse and dynamic labor markets, and higher level of various services. Firms also can enjoy the advanced infrastructure and social capital in large cities without private investments (Berry *et al.*, 1987: 182-183).

For a detailed analysis, the average of each location factor is calculated by regional groups: the firms in Gangnam-gu, the firms outside Gangnam-gu but in Seoul, and the firms located outside Seoul or in the provinces. Gangnam-gu is selected as an independent group because the degree of the concentration is revealed remarkably high, even compared to the districts with the second highest values. The firms in the provinces are assumed to have some different location factors from those in Seoul.

According to the survey analysis, there are differences in the locations factors that affected location decisions by region. The e-MPs in Gangnam-gu also put the highest priority on the convenience of transportation (A=2.13) and preferable business infrastructure (A=2.31) involved with the traditional urbanization economy. Interestingly, however, the firms in Gangnam-gu consider that to be located in Gangnam-gu makes them feel prestige or pride (A=2.50). Gangnam-gu has been known as the core area where Korean IT-based innovative firms were agglomerated¹⁶. The firms in Gangnam-gu believe that only to be located there can give a good image about the competence of their firms to business partners. The expectation for the growth of Gangnam-gu (A=2.81) is also revealed. Practically, the agglomeration of the advanced service firms in Gangnam-gu is unveiled to be another important location factor to the firms in Gangnam-gu. IT-solution or IT-consulting firms in Gangnam-gu are thought helpful for their businesses (A=2.69). The existence of the firms involved with EC (A=2.88) is attractive, too. The existence of financial firms including banks and venture capital (A=2.94) is also a significant location factor. Moreover, a pool of skilled labor (A=2.75) and the flexible turnover of labor forces (A=2.94) around Gangnam-gu are viewed as advantageous to set up

businesses in the area. Besides, the average figure of the low cost of the use of ICTs and the proximity to potential buyers is 3.0, which means a neutral or normal importance.

In case of the firms in the Seoul area except Gangnam-gu, the convenience of transportation (A=2.44) and business infrastructure (A=2.72) are also important factors to be considered when firms choose their locations. The low rent of buildings (A=2.85) is also considered important. The firms in the other districts except Gangnam-gu place less importance on the expectations for the growth of the regions (A=3.28) and on the regional prestige effect (A=3.36) than the firms in Gangnam-gu.

Importantly, the location factors of the firms that operate public B2B e-MPs in the provinces are proven to be very different from those of the firms in Gangnam and other areas in Seoul. The familiarity of the managers with the regions (A=1.91) is one of the most important location factors. Generally, they feel familiar and comfortable because they have some experiences in working within particular regions. The proximity to the production of the raw materials of traded products (A=1.91) is another most important location factor to the firms in the provinces. The closeness to the manufacturing plants of traded products (A=2.00) is also very important for their location decisions. They also prefer to be located close to sellers (A=2.09) and buyers (A=2.27) very much. It is related to the result of questionnaire survey that says the firms operating public B2B e-MPs in the provinces place importance on face-to-face meeting in the relationship with sellers and buyers as well as in the relationship with cooperative firms (Choi, 2003a: 120). The intention to be closely located to involved logistics firms (A=2.64) is also shown important. The low rent fees of buildings (A=2.64) is a significant factor that influenced their location decisions, too. Besides, likewise in Gangnam, the expectation for the growth of the region (A=2.73) was also considered important to some extent.

Table 8. The differences in main location factors between the firms in Gangnam-gu and in the provinces*

Important location factors in Gangnam-gu	Important location factors in the provinces**
㉔ Traditional urbanization economy - convenience of transportation - preferable business infrastructure	㉔ Familiarity of the managers with regions
㉕ Non-economic factors - psychological prestige or pride - expectation for the growth of Gangnam-gu	㉕ Physical proximity to - production places of raw materials - manufacturing plants of traded products - locations of potential sellers - locations of potential buyers - logistics firms
㉖ Clustered advanced service firms - IT-solution or IT-consulting firms - firms involved with EC - financial firms including banks and venture capital	㉖ Low rent fees of buildings
㉗ Skilled-labors - a pool of skilled labor - flexible turnover of labor forces	㉗ Expectation for the growth of regions

Notes: *Location factors with the average figures only less than 3.0 are included in this table. Unanswered items by respondents are considered as "5", which means "not at all important". **The provinces mean the outside areas of Seoul in this study.

Source: Questionnaire survey.

The analysis of location factors by region shows a differentiated characteristics. Especially, the location factors between the firms in Gangnam-gu in Seoul and those in the provinces are clearly different. The main differences in the location factors between the two regions are summarized in Table 8.

The importance of the physical closeness to raw materials, production plants, buyers and sellers, and logistics firms by the firms in the provinces strongly implies that the successful operation of public B2B e-MPs is not completely irrelevant to the offline business activities in physical space. Spatial strategies are still important to some firms operating public B2B e-MPs. In the next section, it is examined the main characteristics of public B2B e-MPs by the regional groups.

6. Differentiated Attributes of Public B2B e-MPs by Region

The several attributes of public B2B e-MPs and their operators are examined by the three regional

groups. It starts from the assumption that the difference in locational factors by the three regional groups is deeply associated with the different attributes of the operated public B2B e-MPs by the regional groups. The examined attributes in this paper include:

- industrial types of the products traded over public B2B e-MPs,
- the extent of the spatial dispersion of the buyers and sellers that trade over public B2B e-MPs,
- the extent of the importance of trust-based relationships with buyers/sellers and cooperative firms,
- the extent of standardization of the traded products, and
- the types of transferred knowledge with buyers/sellers and cooperative firms.

Questionnaire survey contains several questions concerning those five attributes. The result of the analysis is summarized in Table 9.

According to the analysis, traded products are proven to be differentiated by the regional groups. All the public B2B e-MPs in the provinces are the

Table 9. Differences in the attributes of public B2B e-MPs by regional groups**** (Unit: %, count)

Items	Gangnam-gu	Other Seoul	The provinces
The ratio of horizontal public B2B e-MPs dealing with MRO products, foreign-trade, and non-specialized trade	43.8%	35.9%	0.0%
	7/16*	14/39	0/13
The ratio of the firms that answered that buyers and sellers were dispersed across country to some extent	53.9%	34.2%	30.0%
	7/13	13/38	3/10
The ratio of the firms that answered that trust was a more important factor than other factors such as price in the relationship with buyers and sellers to some extent	64.3%	73.7%	81.8%
	9/14	28/38	9/11
The ratio of the firms that answered that trust was a more important factor than other factors such as price in the relationship with cooperators to some extent	85.7%	76.3%	72.7%
	12/14	29/38	8/11
The ratio of the firms that answered that traded products were standardized to some extent	53.3%	42.1%	16.7%
	8/15	16/38	2/12
The ratio of the firms that answered that codified knowledge** was exchanged with buyers and sellers to some extent	64.3%	60.5%	18.2%
	9/14	23/38	2/11
The ratio of the firms that answered that codified knowledge was exchanged with cooperators to some extent	57.1%	52.6%	27.3%
	8/14	20/38	3/11
The ratio of the firms that answered that tacit knowledge*** was exchanged with buyers and sellers to some extent	35.7%	42.1%	45.5%
	5/14	16/38	5/11
The ratio of the firms that answered that tacit knowledge was exchanged with cooperators to some extent	35.7%	44.7%	54.5%
	5/14	17/38	6/11

Notes: *A/B: A=total number of the firms in each regional group that answered the question related to each item, B=the number of the firms in each regional group that fitted in with each item.

Codified knowledge or information is defined as routine, easily codified, public, or context-free one. *Tacit knowledge is referred to concrete know-how, crafts, skills, personal, practical, context-specific knowledge, or knowledge acquired from experiences. ****a cautious interpretation is needed due to an insufficient number of sample size originated from the small population size.

Source: Questionnaire survey.

vertical B2B e-MPs that serve specific industries, according to the questionnaire survey as well as the phone call survey. Vertical e-MPs in the provinces deal with such industries as machinery and industrial materials, food and beverage, steel, chemicals, textile and clothing. By comparison, the public B2B e-MPs in Seoul (35.9%), especially in Gangnam-gu (43.8%) show the high percentage of horizontal marketplaces, especially MRO public B2B e-MPs.

The high ratio of horizontal, especially MRO public B2B e-MPs in Gangnam-gu result in the differentiated attributes of their business activities. The higher percentage of the operators of public B2B e-MPs in Gangnam-gu (53.9%) answer that their buyers and sellers are dispersed across the country than those in the other two regional groups. It is inferred that because horizontal e-MPs deal with diverse

types of items that are needed by all the types of firms, the buyers and sellers of those products tend to be more dispersed across the country than those of vertical manufacturing products. The higher degree of the dispersion of buyers and sellers in the public B2B e-MPs in Gangnam-gu is associated with the less importance of the trust-based relationship with dispersed buyers and sellers (64.3%) than with cooperative firms (85.7%). A little more importance of the trust-based relationship with buyers and sellers in the provinces (81.8%) than with cooperative firms (72.7%) seems to be related to the importance of the physical proximity to their buyers and sellers as an important location factor by the firms operating public B2B e-MPs in the provinces.

The higher percentage of the e-MPs dealing with MRO or horizontal e-MPs in Gangnam-gu also lead

to the high degree of the standardization of the traded products over the e-MPs in Gangnam-gu (53.3%). The standardized attribute of the product types traded over the public B2B e-MPs in Gangnam-gu also seems to be deeply related to the types of knowledge transferred with business partners such as buyers/sellers or cooperative firms. Regardless of the types of business partners, the firms in Gangnam-gu show the lower percentage of the exchange of tacit knowledge (35.7% with buyers/sellers, 35.7% with cooperators) and the higher percentage of exchanging codified knowledge (64.3% with buyers/sellers, 57.1% with cooperators) than those in the provinces. In contrast, the firms in the provinces reveal the higher percentage of exchanging tacit knowledge (45.5% with buyers/sellers, 54.5% with cooperators) and the lower percentage of exchanging codified knowledge (18.2% with buyers/sellers, 27.3% with cooperators) than those in Gangnam-gu.

The regional difference in the transferred type of knowledge may be involved with the better ICT infrastructures, that encourage the transfer of codified knowledge, in Gangnam-gu as the most innovative and advanced local area, than in the provinces. In spite of the difference in the infrastructures, however, the result may not be completely understood, in that the firms in Gangnam-gu have been known to show a remarkably high level of formal and informal networks between firms and the exchange of tacit knowledge for innovation (Kim *et al.*, 2002; Park and Nahm, 1998). The key to understanding the seemingly unreasonable result comes from the attributes of the products traded over the public B2B e-MPs in the district. Considering the fact that relatively standardized items are traded over the public B2B e-MPs in Gangnam-gu, the firms do not need to exchange tacit knowledge, compared to the other types of firms in the district whose main purpose is to create the most innovative technology-based products. Second, a more important clue comes during the interviews with a manager of the firms oper-

ating public B2B e-MPs in Gangnam-gu. According to him:

"Most firms operating public B2B e-MPs in Gangnam area were established since the second half of 1999. At that time, the firms operating public B2B e-MPs were considered as IT-related firms without any doubt. For that reason, many flocked together in Gangnam area known as the Silicon Valley of Korea like other IT-related innovative firms.

Before long, however, the first movers realized that the firms operating public B2B e-MPs were not IT-firms. Rather, they were similar to offline wholesales and therefore the offline marketing activities and the effective operation of marketing organizations were the most important factors for the success in online businesses.

IT firms are forced to communicate with related firms in informal as well as formal ways. It is mainly because the product life cycles of innovative IT technology-based products are very short and the dispersion of the important knowledge and information is not easily transferred beyond a local boundary. Such characteristics reasonably have encouraged firms to be clustered in the specific innovative local area such as Gangnam area.

In contrast, however, the emphasis on the marketing activities to attract buyers and sellers in the firms operating public B2B e-MPs lessens the need to insist on being located in Gangnam area. Some firms move from Gangnam area following other offline business factors. Our company is also considering moving to another area in Seoul in future."

It cannot be said that the above situation would be true for all the public B2B e-MP operators in Gangnam-gu. However, it shows a profile of the current status of the public B2B e-MPs in Korea and put some meaningful research topics for future study.

5. Conclusion

This paper starts from the questions concerning the impact of the unprecedented development of ICTs from a spatial perspective. Much attention has been paid to EC as a symbol of the combination of advanced ICTs and commerce. However, the research on the spatial impact of EC has not prolifer-

ated because the aspatial attribute of EC was believed without any clear evidence. In recent years, however, a group of researchers have tried to demonstrate the spatial attribute of EC and the importance of spatial strategies for the success of EC. In this regard, the purpose of this paper was to suggest a key to understanding the spatial impact of B2B EC based on empirical analysis. This paper focuses on the firms operating public B2B e-MPs.

The analysis of LQs showed an extreme concentration of the distribution of the operators of public B2B e-MPs in Seoul and especially Gangnam-gu within Seoul. The value of the coefficient of localization revealed how much different the spatial distribution of the operators of public B2B e-MPs was from the base magnitudes such as population, total establishments, the Internet users, and the regional registration of the '.kr' domain. In addition, based on the coefficient of geographic association, the spatial distribution of the operators of public B2B e-MPs proved not to be closely related to that of wholesale and commission trade, although public B2B e-MPs originated from wholesale and commission trade.

The analysis on the location factors of public B2B e-MP firms in Korea demonstrated that such location factors as convenient transportation, preferable business infrastructure, and low rent fees of buildings were considered as the most important location factors. Interestingly, however, the location factors of public B2B e-MP firms were differentiated by regional groups. The agglomeration within Seoul could be explained as a result of the effort to pursue traditional urbanization economy. By comparison, the location factors of firms in Gangnam-gu included non-economic factors including the prestige or pride effect and the expectation for regional growth. The physical proximity to potentially cooperative firms was also significant, together with traditional location factors of urbanization economy. On the contrary, the firms in the provinces showed completely different location factors from those of the firms in Gangnam-gu or other Seoul areas. The

familiarity of the managers with the regions was one of the most important factors in choosing locations. The physical proximity to raw materials and to the production places of traded products and the spatial closeness to potential buyers or sellers were also on top priorities.

Such differentiated location factors by region were closely related to the attributes of the public B2B e-MPs. The ratio of horizontal public B2B e-MPs was high in Seoul, especially in Gangnam-gu, whereas public B2B e-MPs in the provinces were mainly related to vertical ones. The buyers and sellers of the public B2B e-MPs in Gangnam-gu was more dispersed across the country than those in the provinces. Thus, the trust-based relationship with cooperative firms was considered a little more important than with dispersed buyers and sellers in Gangnam-gu. In addition, more standardized products were traded over the e-MPs in Gangnam-gu. Based on the advanced ICT infrastructures, the exchange of codified knowledge was active by the firms in Gangnam-gu. However, the exchange of tacit knowledge was lower than expected. It was in line with the in-depth interview with a manager in Gangnam-gu that emphasized on the attribute of public B2B e-MPs as wholesalers, not as technology-intensive innovative firms.

As a conclusion, this study attempted to demonstrate that public B2B e-MPs were not free from physical space as well as physical proximity. The analysis of the spatial distribution of the firms operating public B2B e-MPs, their location factors, and the regional differences in main attributes supported the hypothesis. The appropriate exploitation of physical spacial dimension can add a valuable competitive advantage to the firms operating public B2B e-MPs. The practical recognition on the importance of offline business activities is a starting point for the success in online businesses.

It is dangerous to make a hasty conclusion regarding the spatial attributes of the firms operating public B2B e-MPs and a clear suggestion on their spatial

strategies, when it is considered that they just moved from an infant stage and many of them were still in it. The insufficient number of sample firms due to the small population size also limits the interpretation based on the empirical analysis of this paper, in spite of in-depth interviews. Nevertheless, it is expected that this paper can highlight several issues that should be researched in future and be a cornerstone on which future empirical research on B2B e-MPs is based from a geographical perspective.

Notes

- 1) Refer to Knoppers (1998), Steinfield and Klein (1999), Steinfield, Mahler and Bauer (1999), and Dainel and Klimis (1999) for more information.
- 2) B2B e-MPs with agent models are the public e-MPs which directly buy what their buyers want from suppliers and resell them to buyers, earning profits by price difference, or markups. By comparison, public B2B e-MPs with exchange models are not involved with the transactions of their participating firms. Instead, they are only concentrated on giving the room for comfortable transactions through auction or bidding etc. and their profits are mainly from membership fees or transaction fees.
- 3) For example, stationery such as copy paper, printer toner, pencils, electricity or electronic products such as electric cables, lubricants and gas, machinery parts such as bolts and bearings all belong to MRO products (<http://www.imarketkorea.com>).
- 4) public B2B e-MPs are expressed as e-MPs with intermediary-oriented type in the materials from KNSO.
- 5) KbizBrain.com is a company that provides diverse information and knowledge on EC online. Because it provided the list of B2B e-MPs to the 2001 Electronic Commerce White Paper, it was expected to get recently updated list by visiting the site (<http://www.kbizbrain.com>).
- 6) According to the phone call survey, over 140 e-MPs proved not to be in operation. Besides, some were not contacted in spite of several trials and these were regarded to have stopped operating their businesses, at least temporarily. This showed an unstable situation of the firms operating B2B e-MPs in Korea.
- 7) The provinces mean the outside areas of Seoul in Korea in this study.
- 8) However, even though the two of the respondents did not carry out B2B electronic transactions at the end of August 2002, they were included because one was doing associated businesses over a year and was expected to start B2B trading businesses within that year and the other had an experience to mediate trading even though they shut down trading temporarily.
- 9) When the value of LQ equals unity, the spatial distribution of a given industry is the same as that of the base magnitude. When the value is higher than one, the given industry is more concentrated in a specific region than base magnitude. By comparison, when the value is lower in a region than one, the degree of the concentration is less than that of the base magnitude in the region. As an example, LQ can be calculated with the equation below (Wheeler and Shaw, 1985: 304-305):

$$LQ = \frac{(X_i/X)}{(Y_i/Y)}$$

X_i =employment in a given industry i in an area,
 X = total employment in an area,
 Y_i =national employment in activity i ,
 Y = total national employment.

However, the numerators and the denominators are not fixed with the equation. Researchers can use any base they consider important for understanding specific regional phenomena (Isard, 1960: 124). According to him, the variables such as income, value added, population, and area can also be regarded as good bases.
- 10) For instance, the index can be the comparison of the percentage of regional employment in a given industry with the percentage of regional distribution of base magnitude. When the given industry is spatially distributed exactly the same as the base magnitude, the value of the coefficient of localization is zero. In contrast, when the given industry is entirely concentrated in a region, the value is unity. The way to calculate the coefficient of localization is outlined as follows:
 - (1) Subtracting the percentage share of the given industry (A_n) from the percentage share of total base magnitude ($B_n, C_n, D_n...$) for each region
 - (2) Adding all positive differences, or all negative differences
 - (3) Dividing the sum of the positive (or negative) differences by 100
- 11) Coefficient of geographic association can be considered as the expanded form of the coefficient of localization. It measures the extent of the deviation of the spatial distribution of the given industry from the base industry. The way to calculate the coefficient of geographic association is the same as that of the coefficient of localization.

- 12) KSIC stands for Korea Standard Industrial classification. For more information, please refer to <http://www.nso.go.kr>.
- 13) According to Korea Network Information Center (KNIC), the ratio of '.co.kr' domains are 85.86%, followed by '.pe.kr' domains (6.18%) as of October 2002 (<http://isis.nic.or.kr>).
- 14) In some cases, the respondents of questionnaires may not be the founders of the companies. They are asked to evaluate the importance of each location factor based on the knowledge they learned or heard. Because most companies in this field have been established since 1998, respondents are considered to have some information on the location factors of their companies.
- 15) In fact, the differences in the average figures by each location factor are not high, according to the data analysis. There are many location factors with the average figures right above 3.0. However, for the convenience of the analysis, the location factors with the average figures less than 3.0 are mainly introduced in this paper because the question concerning location factors are created on a five-scale basis.
- 16) Gangnam-gu has been known as the habitat of many IT-related innovative venture firms both in name and reality. Teheran Valley inside Gangnam-gu is a representative area where high-technology based innovative firms and associated advanced service firms are clustered. Teheran valley is the area along Teheran-road which is between Gangnam subway station and Samsung subway station. The area was named as Teheran Valley in the mid-1990s when about a hundred IT-related firms became clustered in the area. Knowledge-based advanced service firms were also clustered around the area such as computer-software firms, engineering firms, advertising and design firms or financial and legal service firms (Kim *et al.*, 2002).

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