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Cyberspace: Connected or Segregated?

Examining Virtual Segregation among Hong Kong Internet Users

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ABSTRACT

This paper discusses how cyberspace has been interwoven in the geographies of social stratification and segregation nowadays. It conceptualizes “virtual segregation” as an extension of the “digital divide” and socio-spatial segregation in urban spaces. A case study was conducted in Hong Kong, where 770 Internet users were surveyed in 2010. A comparison of their Internet use patterns shows that these individuals, all of whom possess devices and Internet access, have varied levels of connectivity in cyberspace. A typology of Internet users was then derived from the perspective of virtual segregation. The findings suggest that people may be stratified and segregated in the cyberspace in similar ways as in the physical world, and that segregation studies should pay more attention to “virtual segregation”.

Key Words: virtual segregation; digital divide; Hong Kong; internet users; connectivity

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INTRODUCTION

Human geographers' understanding of space has undergone substantial shifts in the information era. On the one hand, the wide use of communication technologies largely relaxes the space-time constraints in human life, which leads to the so-called "time-space compression" (Harvey, 1989) and virtually shortens spatial distances. On the other hand, the emerging realm of "cyberspace" enabled by these technologies, in particular the Internet, has extended the concept of space itself. Cyberspace refers to the virtual sphere created by the World Wide Web. It comprises the online platforms in which users conduct virtual activities and the hyper-connected networks through which people communicate with each other. Although cyberspace seems to be a totally different world from physical space, it has increasingly witnessed social phenomena and processes similar to what happen in physical spaces, for example, the issues concerning inequalities and social exclusion that the literature on 'digital divide' has addressed (Norris, 2001).

"Digital divide", or the divide between information "haves" and "have-nots", has been a hot issue in public policy agendas since the 1990s ([Irving, 1999](#)). The literature on digital divide has explored the roles of race, age, gender, income, etc. in defining accessibility to the cyberspace ([Chakraborty and Bosman, 2005](#)). While it addresses the role of social inequality in the diffusion of information technology, some studies call for research attentions to role of information technologies in social inclusion/exclusion

([Goldfarb and Prince, 2008](#); [Schnell and Yoav, 2001](#)). The Internet may provide a means for social interaction, but may also lead to a new form of social stratification or social segregation.

The prevalence of the Internet undermines the traditional conception that spatial separation leads to social segregation, because spatially separated people can stay well-connected through electronic networks. By “connected” we refer to being able to interact with different kinds of people and having access to various resources and opportunities. This is similar to how suburban residents maintain their social relations and activity spaces through the use of automobiles. Some have thus argued that this “virtual accessibility” can compensate the disadvantages in physical mobility and accessibility (Kenyon et al., 2003). Others explored how Internet use might facilitate civic engagement and social capital production (Shah et al., 2001; Wellman et al., 2001). Selwyn (2002) suggested that the super connectivity of cyberspace makes it, seemingly, a great medium for promoting social cohesion and integration.

The optimistic view about the role of Internet in promoting social cohesion is based on the assumption that people can equally benefit from the availability of Internet for use. It ignores the fact that the ability of using Internet or the so-called proficiency of online skills ([Hargittai, 2002](#); [Livingstone and Helsper, 2007](#)) and thus the patterns of using Internet can be substantially different between people. Further, it is also neglected that, as

a growing epitome of the human society, the virtual world has also developed its own social segmentation. Increasing evidences have been reported regarding the different patterns of Internet use and online experiences among different user groups, including but not limited to races, genders, age groups, and social classes (Beckles, 1997; DiMaggio et al., 2004; Hargittai and Walejko, 2008). These differences are not all caused by material or technical inequalities, but on the contrary, the outcomes of cleavages and barriers within cyberspace and the society of Internet users. This “virtual segregation” can be no less complicated and significant than segregation in physical space, and has become an important dimension of social stratification and segregation nowadays.

The objective of this paper is to conceptualize and empirically verify this phenomenon of virtual segregation. Data on online activities and time use of 770 Internet users in Hong Kong were collected on 2010. By comparing the online activity patterns of the Internet users who possess basic Internet access and skills, we show how individuals are, at various levels and in various ways, “connected” or “segregated” in cyberspace. The study may improve the conventional understanding of virtual access and thus advocate a new approach to measuring and studying online connectivity. The findings will shed light on the largely unexplored field of virtual segregation and provide useful supplement to existing studies on socio-spatial segregation. The empirical study in Hong Kong may also add to the literature on the social implications of the Internet, which has been largely

developed from studies in the Western context.

This paper is structured in six parts. The next section reviews the relevant literature. The third section defines and conceptualizes virtual segregation. The following part explains the research methodology and provides details about the case study. The fifth section presents data analyses and an Internet user typology in terms of cyber connectivity. The last part discusses the findings and concludes the study.

FROM DIGITAL DIVIDE TO DIFFERENTIAL USE PATTERNS OF INTERNET

A literature has been developed to examine and trace the digital divide on the basis of race, age, gender, income, education, etc. (Chakraborty and Bosman, 2005; Fairlie, 2004; Hindman, 2000). The causes and implications of these divides have also been explored (Grasland and Puel, 2007; Lenhart et al., 2003). As Internet penetration grows, however, digital divide has been increasingly recognized as a preliminary and simplified terminology of the broader issue of digital inequalities (DiMaggio et al., 2004). Many recent studies have enriched and extended the theory of digital divide with investigations into the different patterns of Internet use and the complex role of information technology in social inclusion/exclusion in modern societies (Goldfarb and Prince, 2008; Hargittai and Walejko, 2008).

A major criticism of the literature on digital divide is its simplistic dichotomy between

online and offline, ignoring a population in between, i.e., the information “have-less” group, who are disadvantaged in both the way they use the Internet and their position in the technology market (Cartier et al., 2005). Hargittai (2002) described the lack of online skills as the “second-level digital divide”, which constrains people who have Internet access from making use of it. In view of the inadequacy of the online-offline binary, Livingstone and Helsper (2007) proposed a “continuum of digital inclusion”, and discussed how different levels of access could lead to differences in frequency, proficiency and outcomes of Internet use.

Other critiques point out that digital divide is essentially the continuation of social inequalities in cyberspace, which will not be eliminated through technology diffusion. By discussing the geographies of digital divide at the global level, Warf (2001) showed how cyberspace replicated real-world divisions of wealth and power. Warschauer (2004) argued that the divide in Internet access was more an outcome rather than a cause of existing social divides. In line with his argument, urban researchers such as Graham (2002) and Crang et al. (2006) contended that digital divide often went hand in hand with urban socio-spatial stratification. This phenomenon – poor people can be both physically segregated and virtually disconnected – was referred to by Ferlander and Timms (2006) as “dual digital divide”. Observations suggest that initiatives trying to redress digital divide through providing funds, equipment or free access often result in only transient or limited

uses (Kvasny and Keil, 2006; Warschauer, 2004), implying that the cleavages in cyberspace can be more persistent than the access divide.

DiMaggio et al. (2004) reviewed the development of digital divide in the US and urged digital divide researchers to pay more attention to the differential usage of the Internet by different social groups. Goldfarb and Prince (2008) found that although affluent, better-educated individuals might adopt the Internet earlier, they did not necessarily use it more than those less well-off users. Hargittai and Walejko (2008) examined the differences in creating and sharing contents online among young adults. Zillien and Hargittai (2009) showed how social status of the Internet users was connected to their online practices. More recently, some studies have shown that Internet users may sort themselves out by engaging in different online activities and adopting different websites. Hargittai's (2007) study on the adoption of several popular social network sites (SNS), for example, showed that youths' preferences towards specific sites were related to their ethnic and socio-economic backgrounds. Boyd (Forthcoming) has discussed why large numbers of white teens shift from MySpace to Facebook, indicating a phenomenon resembling racial segregation in cyberspace.

The shift from access divide to differential use has joined the inquiry of digital inclusion to another stream of literature on Internet usage patterns and user typologies. Based on the technology diffusion process, Howard et al. (2001) classified Internet users

into four categories: “Newcomers”, “Experimenters”, “Utilitarians” and “Netizens”. Shah et al. (2001) adopted a motivation-based perspective and classified Internet users according to their purposes, including social recreation, product consumption, financial management and information exchange. A comprehensive review of media-user typologies has been given by Brandtzæg (2010), who develops a classification framework comprising eight categories of users by four criteria: frequency of use, variety of use, media platform, and content/activity preferences. Although not directly addressing the issue of virtual segregation, these studies support that Internet users are highly diversified in the way they make use of the Internet and, consequently, in their levels of connectivity in cyberspace.

THE CONCEPT OF VIRTUAL SEGREGATION

Although it is often defined as the spatially uneven distribution of population groups (Massey and Denton, 1988), “segregation” refers to not only spatial separation but also social, cultural and psychological isolation. As early users of the term have indicated, segregation is the manifestation of social distance in human societies (Park et al., 1925). This experiment of isolating and maintaining social distance could be carried out in non-geographical social spheres as well. “Virtual segregation” in this paper is such defined, therefore, as the state of individuals or social groups being isolated from other Internet users in the cyberspace. It reflects the social structure and stratification in the virtual

world.

This term of “virtual segregation”, like DiMaggio’s “digital inequality” (DiMaggio, 2004), lies in the different ways people make use of the Internet. These two concepts differ in that digital inequality is more concerned with the outcomes from Internet use in, for example, accumulating social capital and improving life chances, while virtual segregation refers to the dearth of interaction with other members of the virtual society in people’s online experiences. Virtual segregation may or may not be caused by digital exclusion or inequalities. In either case, it indicates cleavages and segmentation within the online society.

It might sound absurd that segregation may be fostered in cyberspace, which was designed as a platform of communication and interaction. Depending on the way people use it, however, the Internet can serve as either a mass medium like television, a communicating tool to maintain social relations like telephone, or an extensively connected network that accommodates broad and multidimensional interactions. From that point of view, virtual “places” - websites or other online platforms – and the activities they support can be roughly classified into three categories. The first category comprises news pages, online books/databases, and websites of public/commercial service providers. These websites serve as an alternative to, if not the replacement of the traditional media through which contents are distributed to individual users in a top-down manner.

The second category – emails and instant messengers – forms communication networks that are very similar to telephone networks. Although these tools allow communications with strangers, to a large extent they are used to contact with whom you already know to maintain social connections (Kraut et al., 2002; Smoreda and Thomas, 2001). Interactions through email or instant messengers are much like socializing in the offline world: you know with whom you are interacting (there is always a virtual ID or address, although it may be someone you have never met offline), and information flows directly from user to user.

The third category, in contrast, enables social interactions in a broader sense. These are the websites that allow users to create pages or sections to publicize information of various kinds, viewpoints or writings they want to share. The types of such websites may vary; two famous examples are Wikipedia and YouTube. Yet the most typical ones are virtual communities, forums, blogs, and social network sites (SNS). On these websites flows of information may take place in multiple directions, and it is possible for contents created by individual users to reach mass audience (Hargittai and Walejko, 2008; Kerbel and Bloom, 2005). These are the milieus where people are connected to and interact with, often unwittingly and anonymously, different others and listen to various voices, just like how they encounter different people and interact with them in the public spaces of the physical world. This category of virtual places, therefore, can be seen as “virtual public

spaces”.

It should be noted that, with the evolvement of Internet and web services, many websites have incorporated two or more of the above categories of services. For example, many web portals include email service and forums or blogs, whilst more and more traditional websites begin to allow users to post comments or other information. The three-category classification, therefore, more applies to different web functions or user practices rather than websites. By engaging in different types of virtual spaces and information flows, Internet users may experience different levels and types of online interactions. Those who merely pursue the first category of Internet use may be classified as “utilitarians” (Howard et al., 2001) or “instrumental users” (Brandtzæg, 2010), who treat the Internet mainly as a tool, a medium or a database instead of a social space. Those who actively participate in virtual public spaces and online discussion, on the other side, more use the Internet to expand social interactions and take part in online public discussions. Differential uses of the Internet may result in varied levels of cyber connectivity, which defines the extent to which individuals are segregated from, or connected with, other members in the cyberspace.

RESEARCH DESIGN AND METHODOLOGY

Measuring Virtual Segregation

Virtual segregation is assessed on the basis of Internet users' cyber connectivity, which refers to the chance they are exposed to online interactions in their day-to-day Internet use.

Individuals' cyber connectivity is measured along four dimensions: the geographical extensity, intensity and diversity of their Internet usage, as well as their participation in virtual public spaces.

- **Geographical extensity:** Although cyberspace is often regarded as detached from geographical space, the content, style and membership of websites are still greatly influenced by the countries or regions where they are located in. The geographical coverage of the websites frequently visited in one's Internet use, therefore, could reflect her cyber connectivity, or the extent to which technology expands her personal boundary (Adams, 1995). Use of overseas rather than local websites, for example, is probably associated with more "global" than "local" connections.

- **Intensity:** The intensity of Internet use, measured by online time or frequency, has always been an important indicator of digital inclusion. The chance of interaction in cyberspace is highly correlated with the time individuals devote to Internet use. In more detailed analyses, time spending on different websites or purposes may indicate the relative importance of these virtual spaces or online activities. The more intense one makes use of a website (or an online communicating tool), the more he or she may interact with other users through that site, and the more significant these interactions could be in

his or her social circle in cyberspace.

- **Diversity:** The variety of Internet use is also regarded as associated with greater Internet proficiency and higher connectivity (Brandtzæg, 2010). People who visit diverse websites and perform diverse activities online are more likely to have broad online interactions and are less subject to segregation in cyberspace.
- **Participation in virtual public spaces:** As argued before, some websites or online platforms are more important in terms of fostering interaction and communication than others. These “virtual public spaces” typically include SNS, forums, blogs, etc., and are characterized by user shared contents and multidirectional information flows. Participation in virtual public spaces is considered as an important indicator of virtual segregation, not only because a lot of online interactions take place in these sites, but also because that involvement in public discussion is a vital part of social integration in itself.

Case and Data

Data for this study was collected from July to November 2010 in Hong Kong, a highly wired city with manifold social segments. Internet adoption has increased rapidly since 2000 and stabilized after 2004. By October 2010, 76.4% of Hong Kong households had PCs with Internet connection at home (CSD, 2011).

Respondents were randomly selected from a database of local fixed telephone lines

using a CATI (Computer Assisted Telephone Interviewing) system. Upon “cold calls”, we filtered respondents by a question: “Are you a frequent Internet user?” We only recruited self-reported frequent Internet users because: 1) frequent users have relatively stable Internet use patterns, which can be derived from daily online activity records; 2) the major focus of the study is identifying stratification among Internet users, not studying the divide between Internet users and non-users, or frequent users and unskilled users; 3) since frequent users usually have basic Internet access and knowledge, we can include in the survey more detailed questions about their Internet usage patterns and collect their answers through a web-based platform; and 4) if our hypothesis is justified in this reduced sampling frame, i.e., differential connectivity does exist among these relatively equipped and skilled Internet users, it can well be argued that the larger group of all Internet users (including those who have limited access or online skill), or the society as a whole, is undergoing virtual segregation to a greater extent.

The questionnaires were filled out online, assisted by telephone guidance if needed. Internet use patterns were surveyed from two aspects: habitual patterns and daily use. Questions about habitual online behavior patterns were designed around three issues:

- Internet access: whether the individual has access to Internet at home, at work or school, and by mobile devices (laptop, PDA or smartphones);
- Time and monetary consumption in Internet use;

- Online activities and websites adoption: this part contains two sets of questions. The first set of questions asks the frequencies by which respondents perform various online activities. Answers were given by five-point scales: “Never”, “Seldom”, “Sometimes”, “Often” and “Always”. The types of online activities include work and work related activities, information searching, entertainment, communication, personal affairs, and e-shopping. The other set of questions investigate the respondents’ involvement in certain virtual spaces and the specific websites they favor. The questions are like: “Do you use instant messengers? If yes, which one do you use most frequently?” A range of popular options were given, and the respondents could manually fill in the specific one they use. Different virtual spaces inquired in this part include news pages, searching engines, instant messengers, SNSs, blogs, e-shopping sites, video sites and email services.

The daily Internet use part took the form of a 24-hr online activity diary. Respondents were asked to recall all the Internet use they performed on the last workday. For each episode of Internet use, the starting/ending time, purpose, and websites visited were recorded. It should be noted that online activities may involve numerous web pages and contents, especially when the user was searching for something in dozens of entries and links. It is both impossible and meaningless to ask the respondents to recall and record all these websites. The intent here is to capture the major “anchor points” of individuals’

usage of cyberspace, so the respondents were required to report only the websites which they had visited intentionally and consciously, and on which they spent substantial time. These sites are considered as the “virtual places” in which respondents might interact with other members of the online society. The survey also collects data on respondents’ socio-demographics.

770 completed questionnaires were retrieved. Table 1 presents some sample statistics. The sample contains a larger share of female as compared to 53.3% in Hong Kong (CSD, 2010), and the elders are somewhat underrepresented, which is arguably associated with the filter question regarding regular Internet use. This selection effect is also reflected in an overrepresented group of well-educated individuals, as well as unmarried and non-working individuals, which are probably associated with the overrepresentation of youths and young adults. Notably, the respondents have rather high proportions of home and work Internet access. None of them is entirely “digital excluded”, that is, all have some types of Internet access at home, at work/school, or through mobile devices.

Table 1. A socio-demographic profile of the sample

	N = 770	Percentage
Female		58.3
Age: 11-29		48.4
Age: 30-49		36.8
Age: >= 50		14.8
Married		35.3
Education: undergraduate & above		51.3

Employed or self-employed	59.4
Household monthly income ¹ : HKD 19999 & below	37.5
Household monthly income: HKD 20000-39999	37.0
Household monthly income: HKD 40000 & above	25.5
Internet access at home	99.0
Internet access at work	87.4
Mobile Internet access	37.9

Variables

Along the four dimensions described earlier, 7 variables are derived from the survey to measure individuals' connectivity in cyberspace. Table 2 gives a list of these variables.

The variables are carefully selected so that cyber connectivity can be evaluated from different aspects, and over redundancy is avoided as much as possible. The geographical extensity of Internet use is measured by *ovsite*, use of overseas websites, i.e., websites based outside the Greater China Area, including Hong Kong, Macau, Taiwan and mainland China. The intensity of Internet use is measured by two indicators of online time, respectively from daily usage (*dnettime*) and self-reported habitual use patterns (*wnettime*). Particularly, *dnettime* does not include Internet use for work, as those who are required to use the Internet at work will report long hours of work related online activities, which may blur the overall pattern of Internet use intensity.

The diversity of Internet use, similarly, is assessed in both daily and habitual use patterns. One of the two indicators measures the number of regularly performed online

¹ 1 HKD = 0.13 USD.

activities by the respondent (*n_{type}*). As mentioned previously, questions were asked on the frequencies by which individuals perform various online activities. Those activities reported as “Sometimes” or more often performed by a respondent are counted as his or her regular online activities. The other indicator, derived from the online activity diary, measures the number of different websites the respondent visited on the diary day (*n_{site}*). Both variables indicate the diversity of one’s Internet usage and complement each other.

Table 2. Measures of cyber connectivity

Dimensions	Variables
Geographical Extensity	<i>ovsite</i> : visiting overseas websites on the diary day (=1)
Intensity	<i>w_{nettime}</i> : average weekly hours online <i>d_{nettime}</i> : time spending online for non-working activities on the diary day
Diversity	<i>n_{type}</i> : number of different types of online activities performed regularly <i>n_{site}</i> : number of different websites visited on the diary day
Engagement in public spaces	<i>blog</i> : being a blogger (=1) <i>p_{bsite}</i> : visiting interactive public websites (forums, blogs and SNSs) on the diary day (=1)

Individuals’ participation in virtual public spaces is also measured by two variables. One is the daily usage of public websites (*p_{bsite}*), including forums, blogs and SNS. This classification of virtual public spaces is not all-inclusive, since other types of websites, such as Wikipedia or news pages that allow user comments, may also enable public discussion and broad interactions. Nevertheless, these three types of websites can be regarded as the most typical interactive virtual spaces that allow and cultivate public life in

cyberspace. Visiting these websites is thus considered as an indicator of involvement in online public life and connection with other society members.

While public websites provide the platform for open, diverse and multidirectional interactions, individuals' connectivity is also dependent on the roles they play in these interactions, since browsing online forums does not necessarily mean taking part in the discussion. The proxy variable adopted here is whether the individual is a blog writer (*blog*). Since blog becomes an increasingly effective channel to share contents and express personal opinions online, many people have adopted this tool and become regular bloggers. By posting their blog writing to the vast audience in cyberspace, these people are more participatory in online public life and have more opportunities to expand social circles in cyberspace. It is reasonable to assume that blog writers may also be more active in other virtual public spaces.

EMPIRICAL RESULTS

Differentiated Connectivity in Cyberspace

While the respondents all claim to be regular Internet users, the breadth and depth of their Internet use differs substantially. Table 3 shows the overall distribution of the seven virtual segregation measures, and the frequency distributions of the intensity and diversity variables are given in Figure 1 and Figure 2. The intensity variables may provide a most

intuitive impression on the different levels of Internet use. Average online time of the respondents ranges from 1 hour per week to 130 hours, whilst a majority of respondents report average weekly use between 1 and 50 hours. As for daily non-working use, while an extreme case reported 24-h online playing web games, most of the individuals spent 8 hours or less on non-working online activities. Below that point, however, the respondents are quite diversified in their daily Internet use intensity.

Generally speaking, the respondents have considerable breadth of Internet use, in that over 90% of them “sometimes” or more often perform at least three types of online activities (Figure 2a). However, most respondents reported only a few websites which they intentionally visited and used on the diary day. This confirms the previous assumption that different scope of Internet use and adoption of specific websites may largely determine individuals’ connectivity in cyberspace.

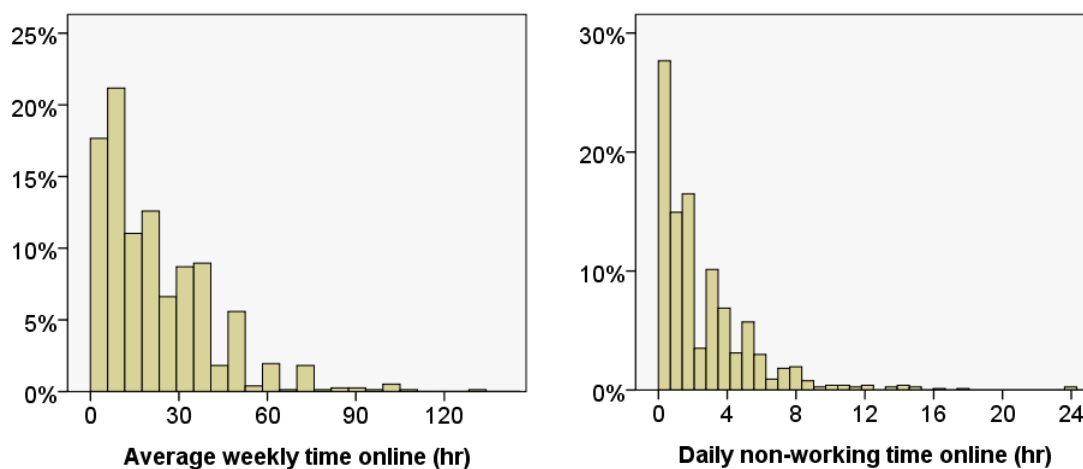


Figure 1. Frequency distributions of the intensity variables

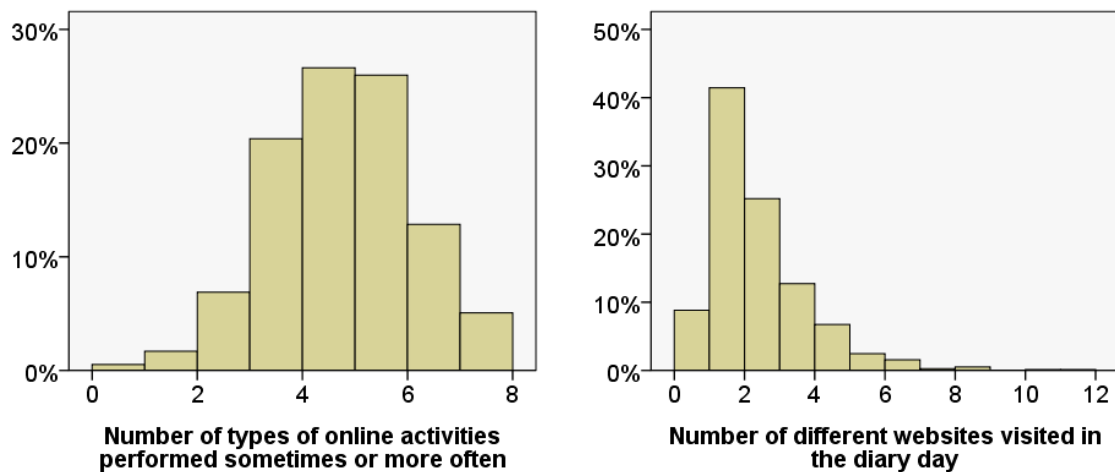


Figure 2. Frequency distributions of the diversity variables

The respondents show a strong tendency of using global rather than local or mainland China based websites. Over 80 percent of them visited overseas websites on the diary day (Table 2b). If we consider the habitual Internet use patterns, an even larger part (83.8%) of the respondents use overseas websites as the homepages of their browsers. 71.8% of them are Facebook users, and 99.6% use either Google or Yahoo as their primary search engine, while the rates of using Chinese social network sites (such as Renren, Kaixin or QQ Zone) and searching engines (such as Baidu) are negligible. This is probably related to Hong Kong's post-colonial and global city status, its loose connection with mainland China, and the prevailing usage of the English language in schools. Participation in online public spaces is moderate. Bloggers and public website users respectively account for over one third of the sample (Table 2b).

Table 3. An overview of respondents' Internet use patterns (N=770)

(a) Quantitative variables

Dimension	Variable	Minimum	Maximum	Mean	Std. Deviation
Intensity	wnettime (hr)	1	130	22.10	18.90
	dnettime (hr)	0	24	2.58	2.95
Diversity	ntype	0	7	4.26	1.37
	nsite	0	11	1.87	1.44

(b) Qualitative variables

Dimension	Variable	0 (No)		1 (Yes)	
		count	percent	count	percent
Geographical Extensity	ovsite	148	19.2	622	80.8
Participation in Virtual	blog	490	63.6	280	36.4
Public Spaces	pbsite	478	62.1	292	37.9

While descriptive analysis shows considerable variation in individuals' connectivity in cyberspace, inferences are difficult to make because the combined patterns of all four dimensions remain unclear. A cluster analysis was hence conducted to derive a typology of Internet users according to their cyber connectivity.

A Typology of Internet Users

A TwoStep Cluster Analysis Procedure² was employed to identify Internet users with different levels of connectivity in cyberspace.

Table 4 shows the three clusters generated. Evidently, the first cluster is the group of Internet users who are most connected with other members in cyberspace. They not only

² See SPSS technical report for more details.

spend more time online, perform more types of virtual activities and visit more websites in a day, but also are more active in virtual public spaces. All of them reported some sort of public sites usage on the diary day, and they have the largest share of blog writers among all three clusters. Members of cluster 2, in contrast, reported no visit of public websites on the diary day, and are significantly less likely to write blogs. Moreover, they have less average weekly online time and less diverse Internet use in terms of both types of activities and websites.

Cluster 3 comprises those whose daily non-working online time is the shortest. These individuals also perform fewer types of online activities and visit fewer websites in a day. Furthermore, their use of cyberspace seems more local based, in that no one in this group reported using overseas websites. However, it should be noted that this might have to do with the fact that nearly half of the cluster members (68) did not use the Internet at all on the diary day. Like those in cluster 2, members of cluster 3 also show very weak inclination to visit, or contribute to public websites.

Table 4. Results of the cluster analysis

(a) Cluster Distribution

	Cluster1	Cluster2	Cluster3	Combined
N	277	345	148	770
Percentage	36.0	44.8	19.2	100.0

(b) Quantitative variables (mean)

Dimension	Variable	Cluster1	Cluster2	Cluster3	Combined
------------------	-----------------	-----------------	-----------------	-----------------	-----------------

Intensity	wnettime (hr)	24.4**	20.0***	22.7	22.1
	dnettime (hr)	3.4***	2.5	1.2***	2.6
Diversity	ntype	4.6***	4.1***	4.1***	4.3
	nsite	2.6***	1.7**	0.8***	1.9

(c) Qualitative variables (within group percentage with value =1)

Dimension	Variable	Cluster1	Cluster2	Cluster3	Combined
Geographical Extensity	ovsite	100.0***	100.0***	0.0***	80.8
Engagement in Public Spaces	blog	49.5***	29.6***	27.7***	36.4
	pbsite	100.0***	0.0***	10.1***	37.9

Notes: * $p < .1$, ** $p < .01$, *** $p < .001$.

Further examination of individuals' engagement in various online activities (Figure 3) and time allocation on daily Internet use (Figure 4) reveals more differences between the three clusters. As Figure 3 shows, while respondents in cluster 1 are the most active in many types of virtual activities, including communication, entertainment and e-shopping, they are somewhat less engaged in online personal services and working activities (if we consider the "often" and "always" part). Cluster 2 members show higher involvement in online working, information searching, and particularly personal affairs, but their frequencies of entertaining or shopping online are evidently lower than the other two groups. Cluster 3 has the largest proportion of individuals who "often" or "always" work online and is second to cluster 1 in terms of online entertainment, but its members are less active in communication, information searching or handling personal affairs online.

Figure 4 compares how the respondents allocated their online time on the diary day. Daily Internet use has been plotted in a radar chart, in which the five axes represent time spending for different purposes. As expected, cluster 1's online activities cover a broad

area, with relatively even time allocation among work, communication and leisure activities. Cluster 2's area is narrow and pointed, showing that most of Internet use was for work and work related purposes. These individuals also spend the most time on personal affairs (e-banking, etc.) but significantly less time on entertainment and communication. Cluster 3 members spend more time working online than those of cluster 1, and more time on entertainment than those of cluster 2, but the least time on online communication or personal affairs.

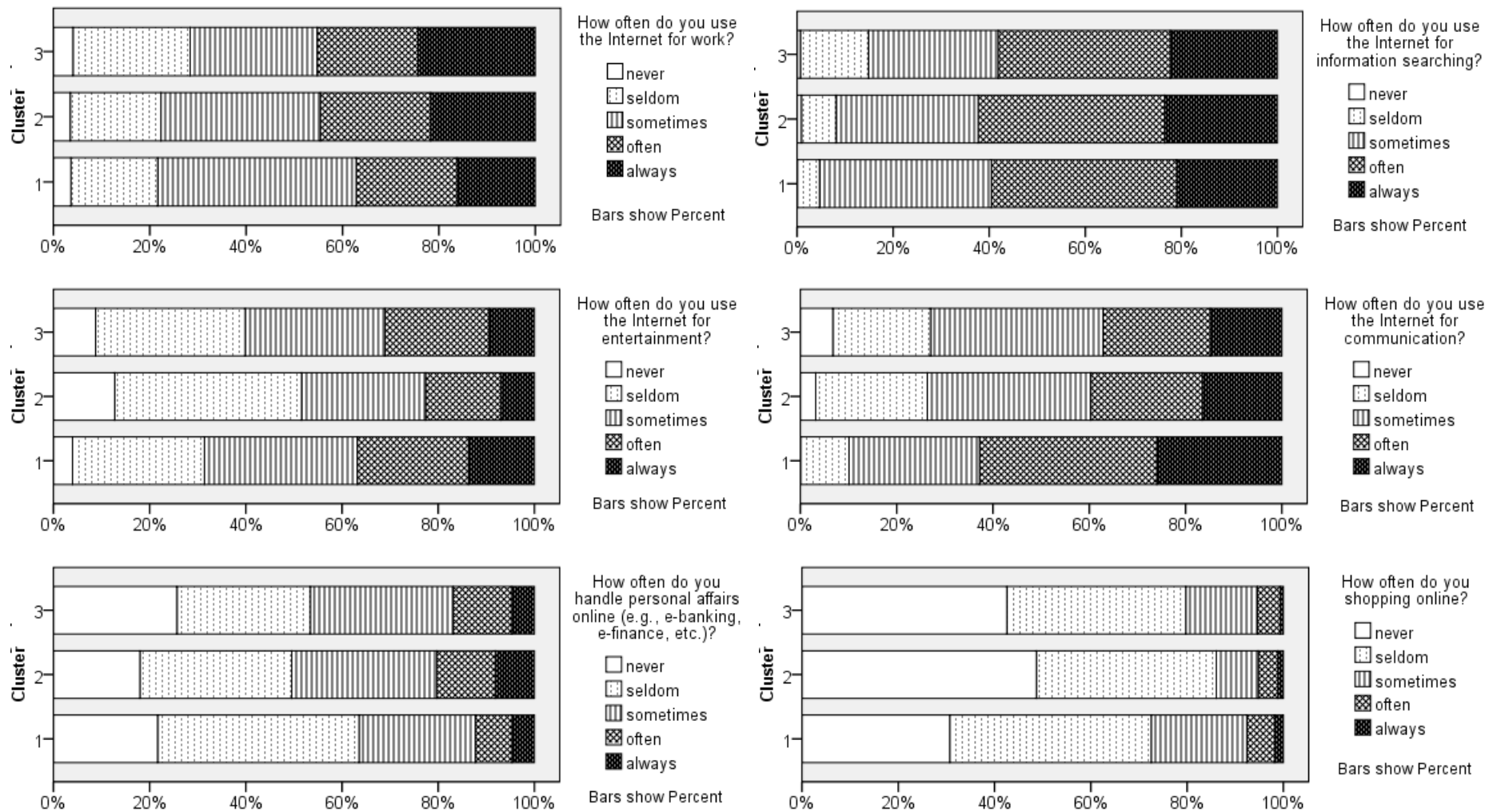
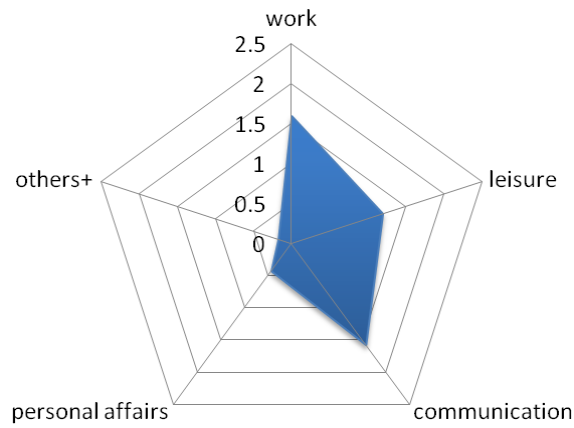
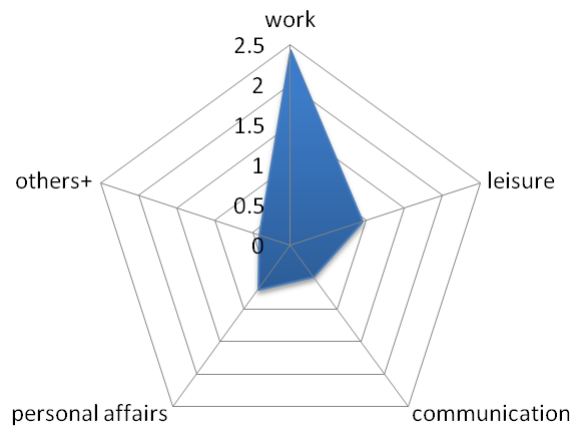


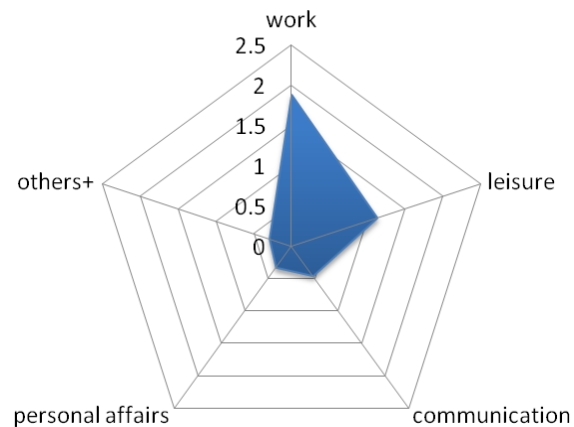
Figure 3. Cluster members' engagement in different online activities



(a) Cluster 1



(b) Cluster 2



(c) Cluster 3*

Figure 4. Cluster members' Internet use for different purposes on the diary day (hr)

+ "Others" include all other purposes such as e-shopping, random browsing, etc.

* The 68 respondents who did not use Internet on the diary day are not included.

If we compare our clustering with existing Internet user typologies, cluster 1 may correspond to “Netizens” (Howard et al., 2001) or “advanced users” (Brandtzæg, 2010). These people are characterized by heavy Internet use and a wide range of online activities. Internet is an indispensable part in their daily lives. Their active participation in cyberspace enables them to interact with various people online, including offline acquaintances, online friends and strangers. These are the most active e-citizens who enjoy most of the opportunities the Internet provides to expand and maintain their social circles, take part in public life, and stay connected with the larger society.

Cluster 2 is more similar to “Utilitarians” in Howard’s classification (2001) or “instrumental users” in Brandtzæg’s (2010). These people mainly use the Internet for instrumental activities, such as working, information gathering and obtaining goods and services. They are less interested in online entertainment, communication or public discussion. For these people, Internet is probably more of a tool than a social space. Their online interactions, if any, are more likely to be instrumentally rather than socially oriented.

Cluster 3 contains individuals with more limited Internet use. Here they are classified as “light users”. Their Internet use are dominated by working and entertaining activities and has little to do with online public life and communication,

which further limits their connectivity in cyberspace.

The three-group typology of Internet users shows stratification and segmentation of the online society from one aspect. In general, “netizens” possess the highest connectivity in cyberspace, while “utilitarians” limit their online interactions mostly within professional or commercial networks, and “light users” have restricted cyber connectivity and are more segregated from the most active part of the online society.

Virtual Segregation, Internet Access and Socio-Demographic Stratification

After clustering the Internet users, a following interest is to examine whether their different levels of cyber connectivity are shaped by Internet access, socio-economic status or other factors. Table 5 compares the availability of Internet access at home, at work, and by mobile devices for the three groups. The differences in Internet access are not as prominent as those in Internet use patterns. Although cluster 3 has slightly lower rate of home access, it is unlikely to be responsible for their light Internet use, as the overall rate of home access is very high and only 5 respondents in “light users” reported no wired PC at home. Moreover, cluster 3 has the highest rate of mobile Internet devices ownership, while that of cluster 1 is the lowest. On the whole, it suggests a rather vague association between Internet access and virtual segregation.

Table 5. Internet access of the three clusters

Internet Access (Percentages)	Cluster 1 Netizens	Cluster 2 Utilitarians	Cluster 3 Light Users	Combined
Internet access at home	99.3	99.7	96.6	99.0
Internet access at work/school	91.7	83.2	89.2	87.4
Mobile Internet access	36.1	38.6	39.2	37.9

Table 6 presents the socio-demographic breakdown of the three groups. The most obvious finding is that the “netizens” group – cluster 1 – is unproportionately comprised of young, unmarried individuals and students, which is understandable given the well-known heavy Internet use of youngsters and college students (Gross, 2004; Lenhart et al., 2005). The proportion of elder “netizens” (50 and above) is extremely low, which might be attributed to the older generation’s lagging behind state in adopting and making use of new technologies. The higher percentage of better educated individuals in that group is also consistent with the widely reported correlation between education level and Internet use (DiMaggio et al., 2004). Interestingly, while females are usually believed as disadvantaged and less engaged in cyberspace (Odell et al., 2000; Schumacher and Morahan-Martin, 2001), cluster 1 contains a higher proportion of females than the other two groups. The “netizens” are also more likely to be from low income than high income households, suggesting that their higher cyber connectivity is not associated with economic privilege in the offline world. The result, if somehow counterintuitive, echoes those of some recent studies on Internet usage patterns (Goldfarb and Prince, 2008; Korupp and Szydluk, 2005).

Table 6. Socio-demographic composition of the three groups

Percentages	Cluster 1	Cluster 2	Cluster 3	Combined
	Netizens	Utilitarians	Light Users	
Female	63.2	56.8	52.7	58.3
Married	16.6	47.5	41.9	35.3
Age				
11-29	66.4	35.9	43.9	48.4
30-49	29.2	43.2	35.8	36.8
50 & above	4.3	20.9	20.3	14.8
Educational Attainment				
Post-secondary & below	42.6	50.7	55.4	48.7
Undergraduate & above	57.4	49.3	44.6	51.3
Employment Status				
Self employed	3.2	5.5	10.8	5.7
Employed	49.8	57.7	51.4	53.6
Housewives	2.9	8.4	8.1	6.4
Unemployed	2.2	2.9	2.7	2.6
Student	40.8	18.6	23.6	27.5
Retired	1.1	7.0	3.4	4.2
Monthly Household Income (HKD)				
19999 & below	45.8	31.3	36.5	37.5
20000-39999	37.2	38.0	34.5	37.0
40000 & above	17.0	30.7	29.1	25.5

More elderly and wealthier individuals are classified as “utilitarians”. The percentages of married and employed individuals of this group are the highest among all three groups, and the rate of students is the lowest. This partly explains these individuals’ strong inclination towards using the Internet for work and other capital enhancing activities. The composition of “light users” is somewhat in between. What might be noticed are the higher proportion of self-employed individuals and the relatively low education attainment which may be related to their less use of the

Internet.

Multinomial logistic analysis was conducted to examine if there is any association between socio-demographics and memberships of the three user groups³. Table 7 shows the modeling results, which suggests few statistically significant associations. Compared to the base group, “utilitarians”, the membership of “netizens” is significantly negatively associated with marital status (married) and age (elder). As for cluster 3, “light users”, only the coefficient of home Internet access is significant.

The logit model suggests that socio-demographics and Internet access are insufficient predictors of Internet use patterns and cyber connectivity. The percentage of correct predictions is rather low (53.9), and the model is extremely incapable in identifying “light users” from “utilitarians” (the percentage of correct predictions for cluster 3 is only 2.7). The conclusion might be drawn that elders and married individuals (the marital status, of course, may also be associated with age) are possibly more subject to virtual segregation. Beyond that, however, the mechanisms beneath the obvious interpersonal differences in Internet use and cyber connectivity

³ The multinomial logistic model estimates the probability of an individual being in a certain category i (in contrast to a selected base category). The model takes the following form:

$$prob_i = \exp(u_i) \times \left(\sum_{i=1}^I \exp u_i \right)^{-1}$$

where u_i is predicted by:

$$u_i = A_i + \sum_j B_{ij} X_{ij}$$

with constant A_i , coefficients B_{ij} and explanatory variables X_{ij} .

needs to be explored in further studies.

Table 7. Logit model: Impacts of socio-demographics on cluster memberships (Base group: Cluster 2)

Variables	Cluster1 - Netizens		Cluster3 - Light users	
	Coefficient	Odds ratio	Coefficient	Odds ratio
Intercept	0.435		0.689	
Gender (Male = 1)	-0.113	0.893	0.157	1.170
Marriage Status (Married)	-0.835***	0.434	0.060	1.062
Age (11-29)	0.319	1.375	0.423	1.527
Age (50 & above)	-1.003***	0.367	0.184	1.202
Education (Undergraduate & above)	0.264	1.302	-0.263	0.769
Employment (Self-employed or employed)	-0.080	0.923	0.081	1.084
Monthly Household Income (Low)	0.309	1.362	0.272	1.313
Monthly Household Income (High)	-0.281	0.755	0.144	1.155
Internet access at home	-0.826	0.438	-2.411**	0.090
Internet access at work	0.308	1.361	0.491	1.635
Mobile Internet access	-0.026	0.974	0.136	1.146
Model Statistics	N=770 persons			
-2 Log Likelihood (Intercept only)	808.546			
-2 Log Likelihood (Full model)	692.745			
Model improvement	115.802			
LR Chi-Square test	0.000			
Percentage of correct predictions (Null model)	44.8			
Percentage of correct predictions (Full model)	53.9			

Notes: * $p < .1$, ** $p < .01$, *** $p < .001$.

DISCUSSION AND CONCLUSION

Cyberspace has become an important platform of social activities nowadays. It does not only allow people to communicate in more prompt and convenient ways, but also create a social realm that parallels and complements the physical world. Ongoing

social processes in this virtual realm, including exclusion, stratification and segregation, are gaining increasing importance in contemporary societies. This paper proposes the concept of “virtual segregation” and a four-dimensional framework to define and measure Internet users’ level of segregation, or connectivity, in cyberspace. It extends the discussion on digital divide or digital inclusion and supplements the conventional studies on segregation.

Individuals’ experiences of virtual segregation depend on the specific ways they use the Internet. According to their varied levels of connectivity in cyberspace, we classified regular Internet users into three groups – netizens, utilitarians and light users. Substantial differences in their Internet use patterns and cyber connectivity confirm the existence of virtual segregation. Furthermore, it suggests that Internet use *per se* may not necessarily encourage social interaction and integration. The “utilitarians”, for example, effectively make use of the Internet but mainly for instrumental purposes. Although they spend considerable time in cyberspace, they hardly participate in online interactions and are practically “segregated” from the rest of online society.

Multivariate analysis shows that the stratification of online society has little to do with differential Internet access. In other words, having access to the Internet does not necessarily mean being well connected in cyberspace. Individuals’ socio-demographic

characteristics also perform poorly in explaining differences in cyber connectivity. One of the few significant factors is age, that is, the elder Internet users tend to be less connected. Beyond that, what factors stratify Internet users need to be further explored.

This study reveals a new dimension of social segregation in the information era. Since the Internet pervades almost all aspects of modern life, segregation researchers may need to pay more attention to “virtual segregation”. Better understanding of virtual segregation may provide valuable insights into government policies aiming to promote social integration. Another implication of the present study is that digital inclusion policies should not only focus on Internet access and intensity of Internet use, but also take into account how people make use of the Internet, and the extent to which they are connected with, or segregated from, the online society. This supports and forwards the argument of DiMaggio et al. (2004), Warschauer (2004), and Livingstone and Helsper (2007). Further studies may explore the implications of the mechanisms underlying virtual segregation and factors that influence individuals’ connectivity in cyberspace. Moreover, a new development concerning Internet use is mobile internet use because of the fast penetration of smart phones such as iPhone. What are the implications of mobile Internet use for virtual segregation will be another topic for future study.

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