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The influence of social environment on internet connectedness of adolescents in Seoul, Singapore and Taipei

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Abstract

This article examines the influence of the social environment on adolescents' *connectedness* to the internet in East Asia, one of the most wired regions in the world. Connectedness is a qualitative conceptualization of an individual's relationship with the internet, taking into consideration the breadth, depth, and the importance of individuals' internet experience. This study seeks to situate adolescents' internet connectedness in three spheres of social environment: (1) the general social support measured by how easy it is to get help when adolescents encounter problems in using the internet; (2) the parents, where we examine parents' socioeconomic status and their internet use; and (3) the peer group, where we look into the

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proportion of friends who connect to the internet. The results from a survey of 1303 adolescents in Seoul, Singapore and Taipei support our major hypothesis that among the internet-using adolescents, their internet connectedness patterns differ by the nature of their social environments.

Key words

adolescents • digital divide • East Asia • internet connectedness • internet use • parents • peers • social environment

INTRODUCTION

The internet population has grown rapidly in the last decade. As more and more people gain access to the internet, researchers have started to reposition the access issue as it goes beyond a 'yes/no' question to what kinds of relationships people build with the internet. Several studies (Jung, 2003; Jung et al., 2001) have developed a concept of internet Connectedness Index (ICI) where 'connectedness' is defined as the multidimensional relationship between an individual and the internet. With regards to the concept of internet connectedness, significant variations were found among people of different income, education, gender, ethnicity and age (Jung et al., 2001; Kim et al., 2002b; Loges and Jung, 2001). In this conceptualization, the digital divide is not simply reduced to the rates of internet access achieved, but endures 'beyond access' to the quality of people's connections to the internet (Bonfadelli, 2002; DiMaggio et al., 2001; Gibbs et al., 2004; Hargittai, 2002; Jung et al., 2001; Lievrouw, 2000; Morino Institute, 2001; Newhagen and Bucy, 2001; Patterson and Wilson III, 2000; Van Dijk, 1997).

The digital divide has been a prolific research topic in the US since the mid–1990s, but the focus has mostly been on what is happening in this country. Not many studies have introduced internet use patterns in other nations beyond the comparison of access rates between different nations. Considering that the internet has the potential to connect different parts of the world, and that its use is simultaneously increasing in different nations, only studying the digital divide in the US is not sufficient to obtain a picture of how the internet is being incorporated into diverse people's everyday lives. This study examines the internet connectedness in the context of East Asia. In particular, three cities are chosen – Seoul, Singapore and Taipei – for reasons detailed below.[1]

South Korea, Singapore and Taiwan have been characterized by their high rates of internet access. South Korea has about 30 million internet users, or about 70 percent of the total population (NDA, 2004). Moreover, 78

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percent of South Korean households have broadband connection (Shameen, 2004). Taiwan has 12.74 million internet users, accounting for 62 percent of the total population. Singapore has a household internet penetration rate of 61 percent, and 40 percent of the Singaporean households subscribe to broadband services (Infocomm Development Authority, 2004; TNIC, 2004).

In particular, the authors examine the internet connectedness of adolescents in Seoul, Singapore and Taipei based on surveys conducted in the three respective cities. The adolescents are chosen because they belong to a wired generation eager to connect to the internet in a region where internet penetration rates are very high, and the issue of a digital divide based on quality connections is more salient than that of mere access. Among different age groups, adolescents represent the most rapidly growing internet population (Internet Matrix, 2000; NUA, 2001; US Department of Commerce, 2002), and the internet plays a prominent role in the lives of youths today in many parts of the world.[2] For example, in 2002, 38 percent of internet users in Taiwan were 15 to 24 years of age, followed by those aged 25–34 (28%) and 35–49 (25%) (Hsu, 2002). More prominently, a recent survey of the Korea Institute for Youth Development reports that about 93 percent of Korean adolescents use the internet (Hwang et al., 2002), and about 35 percent of the total internet population in Korea is in the age group of 7 to 19 (Internet Matrix, 2002).

Given the high internet penetration rates among adolescents in the respected study cities (Seoul, Singapore, Taipei), the most prominent question becomes how the adolescents are using the internet. We believe that among the internet-using adolescents, disparities are likely to exist in terms of their ability to utilize various resources on the internet. Among the factors that are likely to affect adolescents' internet connectedness, we attempt to examine the influence of adolescents' social environment on the quality of their connectedness to the internet. Particularly, we examine the influence of social support that the adolescents have by asking how easy it is to get help from people around them when having problems in using computers and the internet. In addition to the general social support, we consider the influence of two key players in their social environments, parents and peer group, on their internet connectedness. These are measured by parents' socio-economic status, parents' internet uses, and proportions of friends who use the internet. We hypothesize that these three aspects of social environment, internet-related help, parents, and peer group, would shape the levels and patterns of adolescents' internet connectedness.

East Asian adolescents and the internet

Adolescents' internet use patterns in the US and Europe have been examined more extensively (e.g., Cheskin Research, 1999; d'Haenens, 2001; Holloway and Valentine, 2003; Johnsson-Smaragdi et al., 1998; Lenhart et

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al., 2001; Livingstone, 1998, 2003; Livingstone and Bovill, 2001; NPR [National Public Radio], 2000; Roper ASW, 1999; Suss, 2001) than in East Asian countries. Among the few studies, Singapore Internet Project reported that the majority of the 13-year-olds surveyed went online for everyday life information such as sports, entertainment, science and technology, and hobbies (Howard et al., 2001). A survey in Taiwan showed that teens turned to the internet mostly for games, information searching, entertainment news, and chatting (Liang et al., 2001). In addition, more than half of the 1861 Taiwanese teens surveyed believed that the internet was able to improve interpersonal relationships as well as school performance. Chen (2000) examined whether and how digital divide might exist among middle school students in Taiwan. The results showed that household income and urbanization level had significant influence on internet access and etiquette. The Korean Network and Information Center survey reported that the main activities Korean adolescents do online included seeking entertainment–related information, games, and email (Internet Matrix, 2002).

Current research on adolescents' connections to the internet, however, is limited in several ways. First, most studies stay on a descriptive level in examining the issue, mainly by reporting percentages or levels of access and use. Second, most studies isolate the internet from other activities that adolescents do in their everyday lives. Studies mainly focus on what adolescents do on the internet, but do not consider how these relate to other aspects of their lives, such as their relationships with family, school, and friends. Third, studies on East Asian adolescents' internet use tend to limit their focus to specific facets, particularly the internet as a tool of entertainment for adolescents. For example, several studies have examined the ways in which adolescents engage in computer and internet games (e.g., Kang, 2001; Lee, 2002), and other studies have described adolescents' addictions to the internet (Kim, 2001; Kim et al., 2000; Lee, 2002).

Social environment and adolescents' internet connectedness

To understand the nature of differences in adolescents' internet connectedness, the authors propose that the social environment should be considered. Researchers have been eager to explore the factors that contribute to the quality of individual's internet connection. Many studies focused on demographic characteristics, such as income, education, gender, age, and ethnicity. Studies on the adoption and use of new communication technologies found that factors related to social networks, such as influences from family or friends, were as important as individual characteristics (Fischer, 1992; Fulk et al., 1990; Marvin, 1988; Rogers, 1983; Schmitz and Fulk, 1991; Williams et al., 1986; Williams et al., 1994).

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Scholars conceptualized the value of the social environment in people's lives as 'social capital,' a resource embedded in our social ties that can be transformed to other types of resources such as human capital or economic capital (Bourdieu, 1986; Burt, 1992; Coleman, 1988; Loury, 1997; Putnam, 1995, 2000). According to Bourdieu (1986), social capital is a resource or profit to which individuals have access as a result of their membership or participation in groups such as families, parties, or associations. Burt (1992) explained that these resources do not flow equally in each set of human relations and therefore individuals in a position to capitalize on opportunities are those who have access to personal contacts that can provide valuable information, knowledge, or expertise. Coleman (1988) argued that social capital, especially that of children, affects the level of their cognitive developments that are key to gaining human capital in various educational settings.

More recently, the communication infrastructure perspective (Gibbs, 2004) directly addressed the importance of social environment in people's internet connectedness. A communication infrastructure includes a network of communicators, including individuals, media, large and small social institutes, and also social and physical environments that either facilitate or constrain communications in the network. From this perspective, the internet, a relatively new medium, is conceptualized as entering the existing communication infrastructure, and the ways in which the internet builds relationships with individuals are influenced by the existing communication patterns in the social context. Researchers taking this communication infrastructure approach stayed away from focusing solely on the features of new media technologies or individuals' needs for using them, but emphasized relational aspects between individuals, media and social contexts that characterize types and levels of the relationships (Ball-Rokeach et al., 2000; Jung, 2003; Kim et al., 2002b).

Unlike earlier internet studies that pictured the internet as a medium that isolates people from their social environment, quite a number of recent studies emphasized the central role of the internet as a facilitator of social relationships (Baym et al., 2001; Castells, 2002; Flanagin and Metzger, 2001; Lee and Chan, 2001; Lee and Kuo, 2002; Livingstone and Lievrouw, 2002; Wellman et al., 2001; Wellman and Haythornthwaite, 2003). These studies examined the internet in relation to people's other social activities, and found that the internet played a positive role in maintaining and extending the existing social relationships. For example, Lee and Chan (2001) found that the internet facilitated Singaporean adolescents' communication with friends, and the majority of them arranged face-to-face social gatherings via email.

A fewer number of studies examined the influence of social environments on people's internet use (Fong et al., 2001; Matei and Ball-Rokeach, 2001;

Wilhelm, 2000). Matei and Ball–Rokeach (2001) found that those who had a larger social network in offline interpersonal relations tended to make more friends online. Wilhelm argued from what he called a 'quasi-sociological perspective' that the ways in which one's family members, friends, neighbors or other social contacts perceived the value of the internet and the computer affected the person's adoption and use of the internet (2000: 65). Fong and his colleagues examined the effect of three different social characteristics – individual, household and neighborhood – on people's internet use in Canada and in the US (Fong et al., 2001). They found that in addition to individual's socioeconomic status, household characteristics (e.g., household size and the presence of children), and the neighborhood characteristics (e.g., the proportion of immigrants and rural-urban-suburban locations) were important factors affecting people's internet access. Jung (2003) found that social and technological environments surrounding individuals had significant influence on individuals' internet connectedness.

Measuring the digital divide

Another important research focus of this study is to conceptualize and measure the disparities in how people connect to the internet, widely referred to as 'digital divide' research. Research on the digital divide follows a tradition of studies on social and individual adoption of new communication technology (Douglas, 1987; Fischer, 1992; Marvin, 1988; Rogers, 1983; Rogers and Shoemaker, 1971), social inequality and levels of access to communication media (Dervin, 1980; Donohue et al., 1987; Gaziano and Gaziano, 1999; Tichenor et al., 1970), universal service (Anderson et al., 1995; Lievrouw, 2000; Thomas, 1995), and early personal computer diffusion (Dutton et al., 1987; Dutton et al., 1989).

The most common way of conceptualizing digital divide has been to divide people into 'haves' and 'have-nots.' That is, the digital divide between those who own a computer and those who do not, or the divide between those who have internet access and those who do not. Although this kind of categorization is useful in the early stage of technological diffusion, such dichotomous comparisons are not sufficient when discussing the social consequences of technology as it matures in various sectors in society (Jung et al., 2001).

A set of recent research on the digital divide attempted to go beyond access to examine various aspects involved in people's connections to the internet. In addition to the common way of measuring the intensity of internet use by asking the amount of time spent online (Kraut et al., 1998; Nie and Erbring, 2000; Robinson et al., 2000),[3] several studies used multivariate measures to capture a more in-depth picture of people's internet connections (Anderson et al., 1995; Bikson and Panis, 1999; Bonfadelli,

2002; Hargittai, 2002; Hindman, 2000; Howard et al., 2001; Jung et al., 2001; Shah et al., 2001a; Wellman et al., 2001; Wilhelm, 2000). Wilhelm (2000) categorized information and telecommunications 'have–nots' into three categories: those immune to progress, those with peripheral access and peripheral users – and argued that the groups are distinguished by the different abilities to participate in social and economic life of the larger community. Wellman and his colleagues (Wellman et al., 2001) measured people's online communication in terms of their participation in organizations and political discussion on the internet. The authors argued that people in a disadvantaged community are situated in a 'double digital divide', where the lack of technical access is worsened by the lack of social support in acquiring skills and knowledge about utilizing the internet (Wellman et al., 2001). Hargittai (2002) pointed out study shortcomings that only viewed the binary disparity between those who use the internet and those who do not, and examined disparities in people's online skills, or what she called the 'second–level digital divide.' By assigning search tasks to a random sample of internet users, she found a considerable difference in whether people could find various types of content on the internet and how long it took them to find it.

In an attempt to systematically incorporate multiple aspects of people's internet connectedness, Jung et al. (2001) developed a multidimensional index called the Internet Connectedness Index (ICI). ICI is composed of three dimensions for measuring the quality of people's internet connectedness: 1) history and context of internet connectedness, mostly concerning the economic disparity; 2) scope and intensity of internet connectedness, concerning the depth and breadth of people's internet use in terms of their goals for going online and the activities people engage in on the internet; and 3) the centrality of people's internet connectedness, with a focus on the subjective perception of the importance of the internet in people's lives.

The ICI was developed and applied in several studies (Jung et al., 2001; Kim et al., 2002a; Kim et al., 2002b; Loges and Jung, 2001) based on the assumption that the digital divide is not a single-faceted gap, but a multi–faceted divide reflected in different aspects of people's relationship with the internet. Jung et al. (2001) found that people's scores of ICI had a linear positive relationship with their income and education. Kim et al. (2002b) found that an individual's ethnicity and residential location had interaction effects on ICI after controlling for individuals' socio-economic status. Loges and Jung (2001) examined the relationship between ICI and age and found that younger people had longer experience with the internet with better technological equipment, and they had a broader and more intense scope of goals and activities for going online than the elders. On the other hand,

seniors perceived the internet to be as central in their life as other age groups (Loges and Jung, 2001).

HYPOTHESES

Based on the previous studies, we propose three components of social environment that are likely to influence adolescents' internet connectedness (*scope and intensity of internet connectedness* and *centrality of internet connectedness).* The first factor that shapes adolescents' internet connectedness is the availability of help from people around them when having problems in using the internet. In other words, internet-related knowledge and expertise of other people in their social network, and the ways in which those resources are available to adolescents when they are in need are important social capital that shapes adolescents' connections to the internet (Hall and Schaverien, 2001; Silverstone, 1996). For example, a recent report by a Silicon Valley based organization found that despite the overall high internet access rate among the youth across different social groups, the ways in which the students perceived the importance of the internet in their future career were highly influenced by whether they were located in a social environment where it was relatively easy to get internet related support whenever needed from people around them (Joint Venture, 2002).

> H1:   The availability of help from others when having problems with computers and the internet is likely to affect the scope and intensity and the centrality of adolescents' connections to the internet.
>
> H1-a. The easier the adolescents are able to get help from others on internet-related problems, the broader and more intense their internet connectedness is.
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> H1-b. The easier the adolescents are able to get help from others on internet-related problems, the higher the centrality of their internet connectedness is.

Second, in adolescents' social environments, we specifically examine the relationship between parents' internet use and the adolescents' connectedness to the internet. Practitioners and researchers have long recognized the importance of parental involvement in students' school performance and their daily activities such as technology use (Ramirez, 2001; Wright, 2001). A pre-internet, longitudinal study of 7–12 graders showed that parental interest and household computer ownership were the most important predictors of student's heavy computer use (Rocheleau, 1995). Recent studies also found a positive influence of parents' socioeconomic status on children's internet use (Guo and Bu, 2001; Holton, 2000; Kuo et al., 2002). A study of 'online households' in the US with children aged 6–12 indicated that 75 percent of either parent had a college degree. In addition, 71

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percent of the households had an annual income of more than $50,000 and only 15 percent had an income under $15,000 (Holton, 2000). A large-scale survey conducted on 4804 students aged 10 to 18 in five cities in China showed that half of the parents of students who used the internet had a college degree or above, whereas the majority of parents of non-users had a high-school diploma or lower (Guo and Bu, 2001). In Singapore, two cross-sectional surveys in 1999 and 2000 similarly indicated that parents of internet using adolescents were likely to be more educated and reported a higher household income than those of non-users (Kuo et al., 2002).

> H2:   Parents' socio-economic status influences the ways in which adolescents connect to the internet.

> H2-a.   Parents' socio-economic status has a positive influence on the scope and intensity of the adolescents' internet connectedness. The higher the parents' educational and income levels, the broader and more intense adolescents' internet connectedness.

> H2-b.   Parents' socio-economic status has a positive influence on the centrality of internet connectedness. The higher the parents' educational and income levels, the higher the centrality of the internet connectedness.

Despite the high internet access rates among the families with adolescents in our targeted East Asian countries, we expect to find significant variance among those wired families in terms of parents' internet use. Such variations are likely to be significantly related to the ways in which adolescents connect to the internet. Parents' internet use concerns whether either or both parents have access to the internet. We believe that parents' internet connections are likely to enhance adolescents' connectedness to the internet.

> H3:   Parents' internet use affects the scope and intensity and the centrality of the adolescents' internet connectedness.

> H3-a.   Adolescents whose parents use the internet are more likely to have broader and more intense connectedness to the internet than those whose parents do not use the internet.

> H3-b.   Adolescents whose parents use the internet are more likely to have higher centrality of internet connectedness than those whose parents do not use the internet.

Another important social group that is likely to have significant influence on adolescents' internet connectedness is their peer group with whom adolescents spend much of their time interacting. Particularly, the internet has become one of the major means of communication to maintain friendship among adolescents. Although several studies reported the effect of

the internet on creating and maintaining peer group communications (Cheskin Research, 1999; Lenhart et al., 2001; Liang et al., 2001; NPR, 2000), very few of them examined the effect of their peer group's internet use on adolescents' internet adoption and use. We hypothesize that proportions of their peer group's internet connections would have significant effects on adolescents' scope and intensity and the centrality of internet connectedness.

> H4: Proportions of adolescents' peers who use the internet affect the scope and intensity and the centrality of adolescents' connectedness to the internet.

> H4-a. Adolescents who have more friends using the internet are more likely to have broader and more intense internet connectedness.

> H4-b. Adolescents who have more friends using the internet are more likely to have higher centrality of internet connectedness.

METHODOLOGY
Research design

Surveys were conducted in three East Asian cities: Seoul, Singapore, and Taipei. A survey questionnaire was first developed in English and translated into Korean and Chinese. Pilot studies were conducted in each city and revisions were made accordingly.

In all of the three cities, a multistage cluster sampling method was used based on different school districts and levels of school resources. In Seoul, a total of 26 school districts were divided into three groups – rich, medium, and poor – in view of the presence of area-based inequality that leads to a difference in economic resources available in different groups of schools. In each cluster, we selected two schools, and from each of these six schools, two second-grade (equivalent to eighth grade in the US) classes were chosen. In the cases of Singapore and Taipei, where economic resources vary more prominently between public and private schools than among geographical areas, schools were categorized into public and private, and classes were chosen from each category.

Researchers administered the survey for self-completion by students in classrooms. Students were not allowed to confer while completing the questionnaire. Students and schools were assured of the confidentiality of their responses. In all, we obtained a sample of 1303 students, of which 456 came from Seoul, 462 from Singapore, and 385 from Taipei. Fifty-five percent of the total respondents were male, and 45 percent were female. The survey implementation was initiated in June and completed in September 2001.

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Variables

Two dependent variables were used in this study. First, a composite variable of the *scope and intensity of internet connectedness* (Jung et al., 2001) was derived by hierarchical cluster analysis, a statistical method for finding relatively homogeneous clusters of variables (Everitt, 1993). Scope and intensity of internet connectedness consists of four variables, *goal scope, activity scope, site scope* and the *internet frequency.* Goal scope indicates the range of goals that respondents have when going online. We asked, 'How helpful is the internet for you in achieving the following goals?' The goals provided were (1) to find out what is going on in society; (2) to express my views; (3) to accomplish school–related tasks; (4) to find things to do when I am alone; (5) to have fun with others; and (6) to ask people for advice (Ball–Rokeach, 1985, 1998). On a four–point scale, ranging from 'not helpful at all,' 'not very helpful,' 'somewhat helpful,' to 'very helpful,' those goals that were rated as either somewhat helpful or very helpful were coded as 1, and the other two were coded as 0, and the numbers were aggregated for individual responses.

Activity scope was derived from the question, 'Please select the activities in which you participate online. You may select more than one'. Nine different activities were given.[4] The number of selected activities was aggregated. Site scope was created by adding the number of places where a person has access to the internet. Places that were provided included home, other people's homes, school, private tutoring centers, community centers, public libraries, and internet cafes. Finally, internet frequency was derived from the question, 'How often do you go online in a week?' Five categories were given, from less than a week to seven days a week.

These four variables – goal scope, activity scope, site scope, and internet frequency – were significantly correlated with one another to cluster together as a composite variable of the scope and intensity of internet connectedness.[5] The Cronbach's alpha is .64.

The second dependent variable, *centrality of internet connectedness*, was measured by the extent to which students would miss computers and the internet if they became unavailable one day. The questions were asked separately for the internet and the computer as: 'Imagine that you woke up tomorrow to find that the internet (or the computer) has vanished. Using the 10-point scale where '1' means you wouldn't miss it at all because your daily life could proceed as normal, and '10' means you would miss it extremely, how much would you miss being able to go online (or use the computer)?' We assumed that the more a person misses going online or using a computer, the more central the internet or the computer is in the person's everyday life (Ball–Rokeach, 1998; Jung et al., 2001; Loges and Jung, 2001).

These dependent variables were regressed on four independent variables. First, *General social support* in using the internet or the computer was measured by asking, 'When you face a problem figuring out how to do something new on the internet or on the computer, on a scale from 1 to 10, where 1 is "very difficult," and 10 is "very easy," how easy is it to get help?'

Second, *parents' socio-economic status* was measured by household income, and father's and mother's education levels reported by adolescent respondents. Third, *parents' internet use* was measured by asking the respondent whether his/her father and mother used the internet at least once a month respectively.

Proportions of peers who use the internet was measured by asking about the proportion of friends who are online. Four categories were given to indicate the proportion – all of them, most of them, some of them, and none of them.

Analyses

In order to partial out the influence of the social environment on adolescents' internet connectedness, multiple regression analysis technique was employed, controlling for parents' income and education (except for H2 where parents' income and education are the independent variables) and cities (Singapore and Taipei). Seoul is left out as a reference.

RESULTS

Basic descriptive information about the respondents' computer and internet access rates is shown in Table 1. Similar to the results obtained in national surveys, the rates of computer ownership and internet access among the respondents were very high in the areas under study. Over 98 percent of all our teen respondents in three cities used computers, and well over 90 percent used the internet. Regarding home computer ownership,

• Table 1   The rate of computer and internet access

	OVERALL	SEOUL	SINGAPORE	TAIPEI
Use computer (%)	99.2	99.6	98.5	99.7
Use internet (%)	95	97.8	94.7	91.9
Own computer at home (%)	94.7	96.2	92.4	95.5
Have one's own computer at home (%)	51.9	30.8	80.3	44.1
Have internet access at home (%)	91.3	92.4	92.3	88.6
Years of owning a computer at home (average years)	4.6	3.8	5.4	4.5
Years of using the computer (average years)	4.3	3.2	5.1	4.5

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• Table 2   Correlations between independent variables

SUBSCALE	1	2	3	4	5	6	7
1. Household income	–	.11★★	.12★★	.13★★	.08★	.03	.34★★
2. Father's education		–	.55★★	.36★★	.31★★	.08★★	.18★★
3. Mother's education			–	.29★★	.30★★	.08★★	.16★★
4. Father's internet use				–	.41★★	.10★★	.11★★
5. Mother's internet use					–	.12★★	.15★★
6. Availability of internet–related help						–	.01
7. Proportions of peers who use the internet							–

★★ $p < .01$, ★ $p < .05$

respondents in three cities showed similar rates ranging from 93 percent to 96 percent. However, in terms of students' having their own computers at home, a large variation existed among three cities. Eighty percent of the teenagers surveyed in Singapore had their own computers, the highest among the three cities, followed by 44 percent in Taipei, and 31 percent in Seoul.

About 91 percent of the respondents had internet access at home, with Seoul and Singapore showing slightly higher home access rates than Taipei. Regarding years of owning a computer at home, Singapore households had computers for more than five years on average, followed by four and a half years in Taipei and about four years in Seoul. The descriptive results in Table 1 illustrate high levels of access to the computer and the internet among the adolescents in the three cities.

Table 2 shows correlations between variables included in regression models. First, parents' internet uses were correlated with their income and educational levels. That is, parents with higher socioeconomic status were more likely to use the internet. Second, the availability of internet-related help was correlated with parents' educations and internet use, but not with income. Third, father's and mother's education levels were moderately correlated ($r = .66$), but tolerance tests in multiple regression analyses indicated that the inclusion of both variables did not cause multicollinearity problems in the regression analyses. Similarly, father's and mother's internet uses were moderately correlated ($r = .41$), but were independent. Therefore, each of these pair variables (father's and mother's educational levels; internet uses) was separately entered into regression models.

Internet help availability (H1)

The internet help availability, measured by the ease of getting internet–related help from others, had significant effects on both *scope and intensity of internet connectedness* and *centrality of internet connectedness* when parents'

• Table 3   Multiple regression: The influence of Internet-related help availability on the scope and intensity and the centrality of internet connectedness (controlled for household income, parents' education and cities) (H1-a, b)

	SCOPE AND INTENSITY OF INTERNET CONNECTEDNESS (BETA)	CENTRALITY OF INTERNET CONNECTEDNESS (BETA)
Father's education	−.060	.021
Mother's education	.030	.025
Household income	.054	.025
Singapore respondents	−.238★★★	−.033
Taipei respondents	−.392★★★	−.085★
Ease of getting internet-related help from others	.276★★★	.333★★★
R^2 (df = 6)	.239	.126
F	41.539★★★	19.017★★★

N = 799
p < .05, ★★★ p < .001

• Table 4   Percent getting internet-related help from others

	GET INTERNET-RELATED HELP FROM (%)
Parents	32%
Siblings	41%
Friends	80%
Teachers	18%

educational levels, household income, and cities were held constant (Table 3). The easier people can get help when they have problems with computers and the internet, the broader and more intense and central their internet connectedness is.

In addition, when we asked our respondents whom they get internet-related help from, 80 percent mentioned friends, 41 percent siblings, 32 percent parents, and 18 percent teachers (multiple answers were allowed) (Table 4). Friends and family were the most important sources of internet-related help, while teachers' help was noticeably low.

Parents' socio-economic status (H2)

Parents' socio-economic status, measured by household income and parents' educational levels, did not turn out to be a significant factor on either the scope and intensity nor the centrality of internet connectedness (Table 5). On the other hand, significant city differences were found. Compared to Seoul, both Singapore and Taipei respondents were likely to have lower scores in the two dimensions of internet connectedness.

• Table 5   Multiple regression: the influence of parents' socio-economic status on the scope and intensity and the centrality of internet connectedness (H2-a, b)

	SCOPE AND INTENSITY OF INTERNET CONNECTEDNESS (BETA)	CENTRALITY OF INTERNET CONNECTEDNESS (BETA)
Father's education	−.075	.005
Mother's education	.076	.072
Income	.055	.029
Singapore respondents	−.273★★★	−.081★
Taipei respondents	−.391★★★	−.085★
R^2 (df = 5)	.165	.019
F	31.356★★★	3.133★★

N = 801
★ *p* < .05, ★★ *p* < .01, ★★★ *p* < .001

Parents' internet use (H3)

Next, adolescents' internet connectedness was regressed on parents' internet use after controlling for parents' socioeconomic status. For both the scope and intensity and the centrality of internet connectedness, mother's internet use had significant effects (Table 6). That is, adolescents whose mothers used the internet were more likely to have broader and more intense internet connectedness. The internet was also considered to be more central in their everyday lives. City differences were significant for the scope and intensity of internet connectedness. Both Singapore and Taipei adolescents were likely to have lower score on the internet connectedness than Seoul adolescents.

• Table 6   Multiple regression: The influence of parents' internet use on the scope and intensity and the centrality of internet connectedness (controlled for household income, parents' education and cities) (H3-a, b)

	SCOPE AND INTENSITY OF INTERNET CONNECTEDNESS (BETA)	CENTRALITY OF INTERNET CONNECTEDNESS (BETA)
Father's education	−.117★★	−.017
Mother's education	.033	.050
Household income	.035	.023
Singapore respondents	−.242★★★	−.068
Taipei respondents	−.358★★★	−.069
Father's internet use	.070	.019
Mother's internet use	.168★★★	.092★
R^2 (df = 7)	.199	.028
F	27.958★★★	3.195★★

N = 801
★ *p* < .05. ★★ *p* < .01. ★★★ *p* < .001.

• Table 7   Multiple regression: The influence of parents' internet use on the scope and intensity and the centrality of internet connectedness (Controlled for household income, parents' education and cities) (H4-a, b)

	SCOPE AND INTENSITY OF INTERNET CONNECTEDNESS (BETA)	CENTRALITY OF INTERNET CONNECTEDNESS (BETA)
Father's education	−.08	.01
Mother's education	.08	.07
Household income	.05	.02
Singapore respondents	−.26★★★	−.06
Taipei respondents	−.37★★★	−.06
Proportion of friends who use the internet	.08★	.10★★
R^2 (df = 6)	.17	.03
F	26.92★★★	3.96★★★

$N = 800$
★★ $p < .01$. ★★★ $p < .001$

Peer group's internet use (H4)

Another important social environment, the peer group's internet use, was associated with respondents' internet connectedness. The proportion of friends who used the internet was positively related to both *scope and intensity of internet connectedness* and *centrality of internet connectedness* (Table 7). That is, adolescents who had more friends using the internet were more likely to have broader, more intense and central connectedness to the internet. Significant city differences existed for the scope and intensity of internet connectedness.

DISCUSSION

The results support the main thesis of this article that the ways in which adolescents connect to the internet are influenced by their social environments. The availability of internet-related help from others was a strong factor that enabled adolescents to broaden and intensify their connectedness, and also to incorporate the internet into the central part of their lives. Mother's internet use played an important role in shaping adolescents' internet connectedness. The proportion of peers who used the internet was likely to broaden and intensify adolescents' connectedness to the internet. All these relationships confirm that the ways and patterns that adolescents use the internet are not merely the product of their interests or tastes. Their internet connectedness is facilitated and/or constrained by the social environment surrounding them. Adolescents do not develop their connectedness pattern in the same way. The disparities exist after they go online.

The most consistent and strongest relationship between the social environment and internet connectedness was found in the aspect of the general internet social support, i.e., the ease of getting internet-related help from adolescents' social network. This result strongly supports the importance of social capital in the post-access stage of people's internet incorporation. That is, beyond parents' socioeconomic status, the availability of support from people in adolescents' everyday lives in using the internet is a crucial factor in enriching adolescents' internet connectedness.

Parents' socioeconomic status did not have a significant influence on adolescents' internet connectedness. That is, in the context of the sample cities where most students have access to the internet, parents' income and educational levels did not significantly affect the breadth, depth and centrality of children's internet connectedness.

On the other hand, adolescents whose mothers used the internet were more likely to have richer internet connectedness than those whose mothers did not. Following the previous studies that showed the influence of mother's guidance and support on children's school performance and their attitudes towards technologies (Berneche and Chalebois, 1997; Knell, 1999; Liang, 1999), our finding highlighted the role of mothers in the process in which adolescents develop their internet connectedness.

Both the scope and intensity and the centrality of internet connectedness were significantly influenced by the proportions of peers who used the internet. This is understandable considering the role of the internet in adolescents' lives as a communication channel among peer group networks. Eighty-nine percent of our respondents used the internet for email, 68 percent for chatting, and 69 percent for internet games. When asked to rate the importance of these activities on a one to ten scale, over 90 percent of the respondents rated 5 or higher for email, and over 80 percent rated 5 or higher for chatting and online gaming. Considering that these activities are more likely to be shared among peers than with parents, the high rates of participation in these activities and the highly perceived importance of these activities among our respondents support our finding that there is a strong effect of peer groups on the level of adolescents' internet connectedness.

The construction of scope and intensity of the internet connectedness variable in itself implies an interesting relationship between 'where' people get connected and 'what' people do on the internet. The site scope (number of places where a person has internet access), goal scope (number of goals that a person has for going online), and activity scope (number of activities a person engages in on the internet) were significantly correlated to form a composite variable (see endnote 5). The correlation between goal scope and activity scope was quite self-evident, and had already been shown in past studies (e.g., Jung et al., 2001), but the correlation between site scope and the other two scopes (goal scope and activity scope) pertained important

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implications. The breadth of places available to people as points of internet connection was consistent with the breadth of goals and activities that people engaged in on the internet. This indicates the significance of place or 'where' people go online. Each place may put a different set of limitations regarding a range of online activities people engage in and a range of goals people pursue online. For example, those who only connect to the internet at school may have different goals and activities and experience different limitations from those who connect to the internet both from home and school. The breadth of places for using the internet is likely to be associated with the breadth and depth of activities engaged on the internet.

With findings and implications discussed above, limitations exist. First, the randomness of our sample was compromised by the sampling frame in which respondents were chosen. Surveys were conducted in a classroom setting, and schools were chosen in terms of geographic areas in Seoul, and types of school, either public or private, in Singapore and Taipei. This way of conducting surveys may have caused some bias in the responses, for instance, an extremely high percentage of computer and internet usage. Nonetheless, we believe that the classroom environment in schools of different types and geographies gives a fair level of diversity, in terms of the items that we considered in this study. In addition, the internet use patterns of these samples are similar to those reported in the national surveys in the three cities (Hsu, 2002; Hwang et al., 2002; Internet Matrix, 2002).

Second, information regarding household income, parents' education, and parents' internet connections was based on students' responses. Like all other self-administrated surveys, self-reporting problems might have occurred. For example, parents' educational levels and internet connections were relatively easy questions for adolescents, but household income may have been beyond their knowledge.

Finally, the differences among three cities, Seoul, Singapore and Taipei were not analyzed in detail. In this article, the multiple regression analyses showed that these cities of similar rates of internet penetration had different levels of internet connectedness. In the future, it would be valuable to further analyze these differences in terms of culture, educational system or telecommunication policies.

Currently, three East Asian countries, South Korea, Taiwan and Singapore, have announced various policy initiatives aimed at connecting their citizens to the internet, and making available various resources on the internet. Yet, not much effort is made to diagnose the quality of people's connectedness to various resources available on the internet. Most policy plans focus on giving access to the non-internet users, and providing more broadband infrastructure. Hence, people who already have access to the internet but do not possess higher-order computers or internet skills to broaden and enrich connectedness have not been the target of policy making. Now policy

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makers should extend their attention to helping adolescents obtain appropriate skills and knowledge to make use of the internet not only for the goals related to communication or play, but also for the goal of enhancing their educational and future career development. As the current study suggests, disparities in internet connectedness do not disappear when most people go online. What different adolescents do on the internet reflects different kinds of digital divides that are likely to reflect people's existing socio–economic status and their social environments. We believe that the social environment approach taken in this study and the internet connectedness concept used to diagnose the quality of adolescents' internet connections will contribute in providing information for developing social and policy initiatives to better incorporate the internet into our society in general and into everyday lives of adolescents in the East Asian context in particular.

Notes

1 Our study areas will extend to other East Asian cities including Tokyo and Beijing, pending available funding.

2 This wired generation utilizes the new information and communication technologies in almost all aspects of their lives, including communicating, surfing, and doing their homework. In particular, the internet is prized as an educational resource for helping students with their schoolwork (Roper ASW, 1999). The internet is also an asset outside the classroom. For example, 54 percent of online teens in the US expressed that internet materials are informative of the latest fashion or music trends (Lenhart et al., 2001). The internet is also utilized by teens as a relationship-building tool. An online survey completed by 2759 teens in the US concluded that social interaction was a strong motivator of internet behavior, among the top online activities being emailing friends, instant messaging and using chat rooms (Cheskin Research, 1999). In their 2000 survey, the Pew Internet and American Life Project (Lenhart et al., 2001) found that nearly half of the teens surveyed reported that their relationship with friends did improve with their use of the internet, and one-third of them expressed that internet tools helped them make new friends. Furthermore, many American youths regarded internet communication, especially instant messaging, as essential to their social lives (Lenhart et al., 2001). Indeed, teenagers without computers were concerned that they were missing something important in their lives (NPR, 2000).

3 An exclusive focus on time spent online, as several scholars point out (Hawkins and Pingree, 1981; Jung et al., 2001; Moy et al., 1999; Norris, 1996; Shah et al., 2001b), does not take into account dynamic ways in which people use the internet. For example, two people who use the internet for the same amount of time may have very different activities that they engage in on the internet, and this would affect what the internet means in their lives. In addition, a novice may need more time to accomplish what an experienced user can do quickly. To fully understand a person's connection to the internet, it is necessary to know what the person intends to accomplish by going online and what the person does on the internet beyond the amount of time spent online (Jung et al., 2001).

4 Activities include email, chatting/IRC/ICQ/Instant Messaging, game playing/online gaming, mailing lists/listserv, newsgroups/USENET/bulletin board (BBS), surfing the

web, maintaining personal websites, listening to or downloading music, and reading online newspapers.

5 Correlations between Internet-related variables:

	GOAL SCOPE	ACTIVITY SCOPE	SITE SCOPE	INTERNET FREQUENCY
Goal scope	1	.33★★	.17★★	.26★★
Activity scope		1	.40★★	.40★★
Site scope			1	.31★★
Internet frequency				1

★★ $p < .01$

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