

The Perceived Role of ICTs in Quality of Life in Three Chinese Cities

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Abstract This study assesses the perceived role of information and communication technologies (ICTs) including the Internet, mobile telephone, CD/MD/MP3, television and VCR/VCD/DVD in raising quality of life (QoL). A comparison is made between three Chinese cities, namely, Beijing, Taipei and Hong Kong, to see if differences exist in the perceived value of various forms of ICTs in the three cities, which share Chinese culture but different levels of development. Household interviews with probability samples were conducted in the three cities in 2002–2003. The findings show that the Internet and mobile phone are considered as the most and second most important medium respectively in raising quality of life in all three cities, while television ranks third and other ICTs trail behind. Based on the findings, the authors advance four propositions for the perceived role of ICTs in QoL. First, there are four basic needs related to ICT's role in QoL. These "ICT-QoL" needs are the need for interaction, need for being in touch, need for instantaneous communication, and need for entertainment. Second, people's assessment of an ICT's value in raising their QoL varies with the penetration rate of that ICT—the higher the penetration, the more positive is the assessment of that ICT's role in QoL. Third, the perceived value of an ICT in QoL declines with time—the longer the ICT has been around after reaching full penetration rate, the lower the value is attached to its contribution to QoL. Finally, education has strong influences on the assessment of the Internet's role in QoL. Highly educated people tend to value the Internet most as a QoL raiser irrespective of the city they reside in. As a QoL raiser, the Internet is favored more by highly educated while mobile and fixed phone are favored more by lowly educated people.

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1 Introduction

Over the past decade, the information and communication technologies (ICTs), especially the Internet and mobile communication, have changed the way people work, play, learn, and communicate. Today, there is scarcely an aspect of life that is not being affected by the torrent of information available on the hundreds of millions of sites crowding the Internet, not to mention its ability to keep us in constant touch with each other via electronic mails (Henderson 2001). The Internet adds a new entry to the list of older channels such as the postal mail, newspapers, telephone, radio, and TV, all of which import communication and information into the household. Another important development is mobile communication spearheaded by the rapid penetration of mobile telephone. With 3-G technology, voice, data and video can all be transmitted on a wireless handset. In addition, personalization is deepened with increasing storage capacity of the handset. Apart from downloading ring tones and music to meet individual tastes, mobile video clips can enhance further personalization in mediated communication.

The quest for quality of life (QoL) is a growing concern for individuals and communities seeking to find sustainable life satisfaction in a technologically changing world (Mercer 1994). Globalization and rapid advances in information technology offer us vast, unprecedented opportunities to improve life quality. Yet, this opportunity may also be burdened with undesirable consequences. With the Internet and mobile communication, people—living in the most plugged-in and mechanized society in history—may be working harder than ever. Rather than creating time for leisure, our technology is creating ways that make it possible to undertake more work at home. Cellular phone, palmtops, and Internet access devices may be making it virtually impossible to escape surveillance from various sources. Technology may diminish our leisure time, not increase it (Anderson and Tracey 2001).

Previous research in assessing life quality have included selected attributes such as ‘access to leisure activities’, ‘amount of non-work time’, ‘telework’, ‘economic stress,’ and ‘use of new media technology’ (Kernan and Unger 1987; Leung 2004; Moller 1992; Shek 2005; Shek et al. 2005; Wei and Leung 1998), among others. However, with the exception of Leung and Lee (2005), little research has been carried out to further explore the potential relationship between the ICTs and QoL. This study assesses the perceived role of the ICTs, including, the Internet, mobile phone, fixed line phone, television, CD/MD/MP3, and VCR/VCD/DVD, in QoL.

A comparison is made between three Chinese cities, namely, Beijing, Taipei and Hong Kong, to see if differences are found in the three cities which share Chinese culture but different levels of development.

2 Quality of Life

Quality of life, a cognitive judgmental process, is defined as ‘a global assessment of a person’s life satisfaction according to his chosen criteria’ (Shin and Johnson 1978). Diener (1984) suggested that the judgment of how satisfied people are with their present state of

affairs is based on a comparison with a standard, which each individual sets for himself or herself. It is not externally imposed. Although many people see wealth, health, employment, leisure, personal life, and fame as desirable, different individuals may place different values on them. As defined by Argyle (1987), '[the] meaning of happiness is a state of joy or positive emotion; or the satisfaction with life as a whole, or with work, leisure, and other parts of it'. Therefore, quality of life is a measure of overall life satisfaction, rather than a summation of life satisfaction across specific domains.

In reviewing the quality of life literature, two constructs have been used to explain the determinants of life satisfaction or quality of life: subjective and objective perspectives (Diener 1984). The subjective construct hypothesizes that perceived quality of life is influenced by personality or dispositional factors (e.g., optimism, pessimism, isolation, self-worth, and neuroticism). On the other hand, the objective construct proposes that life quality is affected by environmental or situational factors (e.g., family, job, leisure, neighborhood, community, and satisfaction with standard of living). According to the objective determinants of life quality, QoL tends to be a direct function of people's evaluations of important life domains such as social support, leisure activities, and standard of living of overall life (Andrews and Withey 1976; Diener 1984). Satisfaction or dissatisfaction with standard of living is likely to spill over to influence subjective well-being. Therefore, the greater the satisfaction with one's standard of living, the greater the satisfaction with life and vice versa. Here, standard of living is usually meant as 'being materially better off' than a typical family (Andrew and Withey 1976; Diener 1984; Preshaw 1994).

Studies have found that QoL is related to home life and family relationships (Aureli and Baldazzi 2002; Farquhar 1995; Hall 1976), health (Clark and Bowling 1989; Farquhar 1994, 1995; Hall 1976; Michalos et al. 2000, 2001), economic resources (Arnold 1991; Aureli and Baldazzi 2002; Lundberg and Thorslund 1996; Shek 2005), community involvement and social support network (Hughes 1993; Schalock et al. 1989), gourmet cooking and buying works of art (Michalos 2005), etc. Few studies, however, have been done on the role of ICTs in QoL.

To maintain a high standard of living, technologies and innovations have always played a major role (McPheat 1996). Household technologies introduced around the middle of the last century, such as television, refrigerators, air-conditioners, vacuum cleaners, and clothes dryers, are permanently embedded in society. Even more taken-for-granted are changes in workplace technology such as the use of the Internet, mobile phone, faxes, and e-mails. The impact of the ICTs on society as a whole has been debated continuously since its widespread use in the 1990s. Industry, consumer groups, academics, and policy makers have sought to better understand how the ICTs, especially, the Internet and mobile communication, contribute to or detract from society. Communications media are so fundamental to society that new media forms have the capacity to reshape our work, leisure, life-style, social relationships, national and cultural groups and identities in ways that are difficult but important to predict. Obviously, ICTs affect our day to day life.

Most of the studies in ICTs' impact on quality of life focus on television and the Internet. While some studies found negative impact of television on heavy viewers (Morgan 1984; Sirgy 1998), the study of Kubey and Csikszentmihalyi (1990) found mixed effects of television on family life. They found that television viewing generally harmonized with family life. Heavy viewing adolescents and married adults spent more time with their families and felt better with their families than light viewers. On the other hand, there were heavy viewers who did not have positive familial experiences, and they were single,

divorced, or separated. For this group of viewers, loneliness and negative mood states played greater roles in their choice of viewing.

Studies on information technologies and the Internet, on the other hand, generally found positive effects of ICTs on people's quality of life. A study in Germany compared the adoption of information technology in the home over seven decades. It was found that there was a positive relationship between information technology and quality of life (Mundlorf 1994). Positive results of the Internet are also found in providing health information for breast cancer patients (Gustafson et al. 2005), health officials and community residents (Eng 2005), enhancing social relations and face-to-face interaction (Kavanaugh et al. 2005), providing a valuable means for social interaction and mental stimulation for older adults, as well as empowering individuals with severe functional impairments (Sandberg et al. 2005).

In a six-country study in the EU Fifth Framework project, nevertheless, investigators (Raben et al. 2002) found variations in the impact of the Internet. They found that perceived quality of life was somewhat larger for Internet users in the UK, Israel and Bulgaria, but similar for Internet users and non-users in Italy, Germany and Norway. A regression analysis of quality of life in all six countries showed that there were few reliable associations between ICT access and usage and overall quality of life (Ling et al. 2002).

The impact of using ICTs for office work and telecommuting is less certain. It was found that controversies centered on control, support systems, new ways of organizing work, and gender equity (Kling and Dunlop 1993) in the computerization of offices. The success of telecommuting varies, depending on the employers' management of the telecommuting program and the telecommuter's allocation of time. The influence of telecommuting on people's quality of life seems to be explained by the telecommuter's improved concentration, flexibility, and control of time (Van Sell and Jacobs 1994).

There has been little systematic research in Chinese societies that generates trend data and pointers about the quality of life of Chinese people. When the search term 'quality of life' was used, computer search conducted in August 2006 showed that there were 10,976 citations in PsycINFO, 4,098 citations in Sociological Abstracts, 501 citations in Social Work Abstracts and 94 in Communication Abstracts. However, when the search terms 'quality of life' and 'Chinese' were used, analyses showed that there were only 181 citations in PsycINFO, 131 citations in Sociological Abstracts, 5 citations in Social Work Abstracts and 0 in Communication Abstracts. A search from the China Journal Net of the Databank for China Journals, which contain all academic journals in Chinese, showed only 2,032 citations carrying the keyword of quality of life. Among these citations, more than half, i.e., 1,606 articles belonged to the category of Medicine and Hygiene while the categories of Economics, Politics, Law, Education and Social Sciences contained only 395 citations.

These figures suggest that quality of life in the Chinese culture is under-researched. Chinese people constitute roughly one-fifth of the world's population, the limited number of studies shows that a large gap exists in quality of life research in Chinese societies (Shek 2004). The gap is even bigger in the area of ICTs' role in quality of life. In the Chinese literature, only three articles on that topic were found (Tang 2004; Tung 2004; Wu 2005). Among these three studies, two were theoretical treatises on ICT's impact on family while the third was an empirical study on the link between various leisure activities including television viewing and the unemployed. The two theoretical pieces just talked about the possible impact of the Internet and the concept of Small Office, Home Office (SOHO) on family life (Tang 2004; Tung 2004). The study on the unemployed people found that watching television took nearly half (48%) of the unemployed's free time, followed by

sitting idle (13%) and casual chats (12%). The study did not examine the use of other ICTs by the unemployed people in China.

3 Research Focus

The present study examines the perceived role of ICTs in quality of life. The authors would like to know which ICTs are valued most by people in assessing their QoL, and whether people's income level, education, and gender affect this perception. This study is an exploratory study of ICTs' perceived role in quality of life, the authors will not confine the study to rigid tests of hypotheses because they will limit the investigators' attention to only those variables being tested. It is not desirable to limit the focus of attention to only a few variables in a study of exploratory nature. The authors would like to keep themselves open and explore various possible explanations for the perceived role of ICTs in quality of life. Based on the analysis of perception data obtained from the survey, the authors aim to formulate some propositions for further studies in the relationship between ICTs and QoL.

The three Chinese cities under study, namely, Beijing, Taipei and Hong Kong, vary not only in size, but levels of development. Beijing has a population of approximately 14 million which fluctuate daily due to in- and out-flux of people from various parts of China and the world. In 2003 when the study was conducted, the average monthly per capita income of Beijing's residents was US\$141 (RMB\$1,155) (Chang 2005). Taipei has a population of 2.6 million and the average monthly current income per household was US\$3,334 (NT\$104,187) in 2003 (Department of Budget, Accounting & Statistics 2005). Hong Kong has a population of around 6.5 million, and the average monthly wage rate in 2003 was US\$1,481 (HK\$11,549) (Hong Kong Government 2004). In terms of economic development, Taiwan and Hong Kong are close, while Beijing trails behind.

A comparison is made between these three Chinese cities, which share Chinese culture but different levels of development, to see if differences exist in the perceived value of various forms of ICTs in them. Since the three societies vary in many respects, including national incomes, political systems, media systems, population size, and even lifestyles, they are *compared* only in the broadest sense. In its broadest sense, comparison is the process of discovering similarities and differences among phenomena (Warwick and Osherson 1973). In line with J.S. Mill's method of differences and method of agreement (see Etzioni and Du Bow 1970), Naroll (1968) elaborates on what he calls "concomitant variation studies" in comparative research of different societies. He distinguishes two approaches in comparative studies. The first seeks a group of communities in which the variables of interest to the investigator vary while all other factors remain constant. The second approach seeks a group of communities in which the variables of interest remain constant while all other factors vary.

In actual studies, however, investigators never consider more than a modest number of fundamental traits, such as economy, language and social organizations, instead of *all* traits which might conceivably be relevant. As a result, in comparative studies, we should always be aware of the limited generalizability of the findings because the gross assumptions we have made about all the traits and the total context in which a finding is obtained may not be the same in other societies. In choosing the three Chinese societies for study, the authors want to find the differences and similarities in the phenomena under study, rather than testing or generating grand theories.

In addition, this study will not examine the "actual" impact of ICTs on quality of life since a valid answer to this question requires a longitudinal rather than cross-sectional

study like the present one. The authors' interest in this study is the role of ICTs on quality of life as "perceived" by people. We hope to derive some basic qualities related to ICTs which are relevant to people's perceived life quality. An understanding of these ICT-related qualities will help us understand better the link between ICTs and quality of life. The authors consider that "perceived importance" is no less important than "actual importance" because people often act according to their perceived reality rather than reality outside of their perception.

The research questions in this study are as follows:

1. Which ICTs do people conceive as important in raising their quality of life?
2. What common attributes do these important ICTs share?
3. Whether these perceptions are affected by demographic factors?

In choosing three Chinese societies for study, the authors have a couple of assumptions about the relationship between the sample and the phenomenon under study, i.e., the perceived role of ICTs in quality of life. The first assumption is that if similarities of perceptions are found, the similarities are most likely due to the sharing of same culture among the three cities. On the other hand, if differences are found in the three cities, they are most likely due to variations in the level of development in economic, social and/or political systems. Since the three societies have great differences in many respects, they should not be treated as equivalence. They should be treated as replicates in the study instead.

4 Methodology

4.1 Sample and Sampling Procedure

In 2002–2003, the investigators of the three cities conducted household surveys with probability samples to examine the uses of ICTs in the three cities, and the opinions of the residents about a series of questions, including quality of life, social support, displacement of media, leisure activities, etc. In this study, the authors will focus only on the perceived role of ICTs in raising people's quality of life in the three cities, and the impact of a few demographic variables which are considered to be important in people's media behaviors.

In all three places, respondents aged 15 or above were sampled. Questionnaires in three cities were standardized with some modification to meet local situation. Pre-tests were done before interviewing the sampled respondents. In Beijing, a multistage cluster sampling was used. The investigator first selected randomly four Districts out of the six Districts of Beijing city. Then 1,500 households were randomly selected from the four districts. In each household, the person who most recently had his or her birthday was requested for being interviewed face-to-face. The survey in Beijing was conducted in January 2003. The response rate was 67% with 998 respondents successfully interviewed.

In Taipei, the multistage cluster sampling method was also used. With the aid of the Statistical Bureau of Taiwan's Executive Council, the investigator randomly sampled 1,350 households from various areas of Taipei listed in the census record. Then 1,350 individuals aged between 15 and 65 of these households were randomly selected from the name list provided by the Statistical Bureau. The respondents were face-to-face interviewed between November 2002 and January 2003. Sixty university students were hired to conduct the interview. However, due to inaccuracy of the Statistical Bureau's name list

from which individual respondents of the sampled households were drawn, many of the selected respondents could not be located. In addition, since all selected respondents were informed of the interview date ahead, some of them chose to stay away from home to avoid being interviewed. Finally, the survey succeeded in interviewing 528 respondents at a response rate of 39%. As a result of the low response rate, the Taipei sample did not closely match the demographic parameters in Taipei. There were a higher proportion of male and highly educated respondents in the sample than the average Taipei resident. The generalizability of the results of the Taipei sample should therefore be treated with cautions.

In Hong Kong, data were gathered from a probability sample of 1,192 respondents, using a face-to-face structured interview during the months of October to December 2002. Respondents were eligible members of randomly generated households from the record of the Census and Statistics Department of Hong Kong. The person aged between 15 and 64 and had the most recent birthday was interviewed. Interviewers were trained university students. A total of 238 households were discarded when interviewers found the premises to be vacant, used for non-residential purposes, having no one at home after visiting there for more than three times, or encountered foreigners who were ineligible for this study. Of the 954 qualified households, 696 successfully completed the questionnaires, resulting in a 73% response rate.

4.2 Measurement

4.2.1 Importance of ICTs in Raising Quality of Life

Respondents of each city were asked to select three from a list of 16 ICTs that they believed were most important in raising quality of life. The list included the Internet, computer, karaoke, fixed line phone, mobile phone, facsimile, free-to-air TV, VCR, radio, digital camera, digital camcorder, VCD/DVD, CD/MC/MP3, video game, cable TV and satellite TV. The order of the items was arranged in the questionnaire as listed above.

4.2.2 Demographics

Personal information such as gender, age, education, and income were collected.

4.2.3 Analytic Procedure

In the analysis, we first used Chi Square statistics to examine if there was any association between cities and the perceived importance of each ICT item in raising people's quality of life. After that, we examined the individual impact of a few demographic variables, namely, income, education and gender as a third factor in the first order relationship between cities and perceived importance of some major ICTs. Chi Squares were used. In this second-order analysis, the variables of income and education were dichotomized into high and low categories. For income, we chose the dividing category close to the median of the variable. Since all three Chinese societies vary greatly in income levels, it is inappropriate to compare them directly. A better way is to define high and low income group according to income levels specific to each city. The use of median of its own is an appropriate dividing measure for high and low income group within each city.

For education, we used tertiary education as the dividing line between high and low education. In all three societies, people having tertiary or above education are highly-educated by any definition and distinguishable from those below in many aspects of life including job opportunities, cultural activities, class identity, etc. Although dichotomization of these two variables resulted in a loss of data information, it provided clear and sufficient information for the individual impact of each demographic variable as a third factor in elaborating the original relationship between cities and perceived importance of ICTs in quality of life.

5 Results

5.1 Perceived Importance of the Internet and Mobile Phone in Quality of Life

The sample profiles of the three cities show that Beijing had a slightly higher male ratio (male-female ratio = 51:49) than Taipei and Hong Kong (both had a ratio of 47:53). The mean age of the respondents was 36 for Beijing, 39 for Taipei and 37 for Hong Kong. The average education of the respondents was 4.6 for Beijing, 4.6 for Taipei, and 4.1 for Hong Kong. '4' represents the level of senior high school, while '6' refers to university education or above.

Table 1 shows that in all three cities, most of the people considered the Internet as important in raising their quality of life, followed by mobile phone, free-to-air television, cable television, satellite television, fixed line phone and other media. In Beijing, 78% of respondents considered that the Internet is important in raising their quality of life, while 76% Taipei and 72% Hong Kong respondents thought so. For mobile phone, 57% of Beijing, 47% of Taipei and 61% of Hong Kong respondents considered it important in raising people's quality of life.

The authors observe some interesting differences among the three places. While more Taipei residents (76%), compared with Beijing (68%) and Hong Kong (72%), considered Internet as important in QoL, more Hong Kong people (61%), as compared with Beijing (57%) and Taipei (47%) people, considered mobile phone as important in raising their QoL. A Chi Square test showed that the differences in opinions were statistically significant among the three cities ($\chi^2 = 25.94$, $df = 2$, Cramer's $V = .11$, $p < .001$). The

Table 1 Which ICTs are most important in raising QoL? (% yes with multiple responses)

	Beijing (N = 998)	Taipei (N = 528)	Hong Kong (N = 696)	Chi Square	df	Cramer's V
1. Internet	68% (682)	76% (401)	72% (498)	9.82	2	.07**
2. Mobile phone	57% (570)	47% (247)	61% (425)	25.94	2	.11***
3. Free-to-air TV	40% (401)	38% (200)	54% (376)	42.32	2	.14***
4. Cable TV	30% (297)	31% (165)	13% (91)	76.06	2	.19***
5. Satellite TV	21% (207)	11% (57)	8% (52)	65.86	2	.17***
6. Fixed phone	23% (234)	13% (71)	11% (76)	51.97	2	.15***
7. Digital camera	6% (60)	18% (93)	15% (41)	57.21	2	.16***
8. VCD/DVD player	8% (75)	16% (82)	13% (91)	26.12	2	.11***

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$

Beijing residents (23%), on the other hand, led their counterparts in Taipei (13%) and Hong Kong (11%) in rating fixed line phone as an important medium in QoL. The differences were statistically significant ($\chi^2 = 51.97$, $df = 2$, Cramer's $V = .15$, $p < .001$) (Table 1).

In other words, Taipei residents were more likely to rate the Internet as an important medium in quality of life than people of the other two cities, while Hong Kong residents were more likely than Beijing and Taipei residents to rate mobile phone as an important QoL medium, and Beijing residents were more likely than Taipei and Hong Kong residents to rate fixed line phone as important in QoL.

Explanations for the variations among the three cities may be found in their different levels of social development. One possible explanation is the various penetration rates of different ICTs in the three cities. Since Taipei had the highest penetration rate of the Internet (62% ownership as compared with 56 and 54% in Hong Kong and Beijing respectively found in this study), it is likely that Taipei residents are mostly affected by the Internet in their daily life, and as a consequence, it is perceived to be important for their quality of life. Similarly, Hong Kong had the highest penetration rate of mobile phone which has become an important communication and social interaction means of Hong Kong people. In 2002, Hong Kong had a mobile phone penetration rate of 91% compared with 88% in Taipei and 81% in Beijing.

5.2 Importance of Television in QoL

Table 1 shows that despite sharing a common culture, the three cities have significant differences in the perceived importance of various forms of television in QoL. For free-to-air television, more Hong Kong people (54%) considered it important as compared with Beijing (40%) and Taipei (38%). On the other hand, more Taipei (31%) and Beijing (30%) people considered cable television important when compared with Hong Kong (13%). For satellite television, however, Beijing (21%) led the other two cities (8% in Hong Kong, 11% in Taipei). All the differences were statistically significant (see Table 1 for Chi Square statistics of each medium).

5.3 Penetration Rate, Special Features, and Duration of Existence

These differences can again be partly explained by the penetration rate of various forms of television. In Hong Kong, free-to-air television is still the dominant television medium, while cable television is as popular as free-to-air television in Taipei and Beijing. Mainland Chinese people are particularly attracted to satellite television which provides a great variety of contents throughout the nation while Hong Kong people have little interest in satellite television because it seldom provides programs in the local dialect, i.e., Cantonese. A study showed that only 4% of Hong Kong people frequently or sometimes watched satellite television programs in 2001 (Lee 2002).

However, penetration rate alone cannot explain sufficiently the perceived value of a medium because free-to-air television has a far greater penetration rate than the Internet or mobile phone in all three cities, and it has been around much longer than the Internet and mobile phone, but the number of people who named free-to-air television as an important medium in QoL was much smaller than that for the Internet or mobile phone (Table 1). This may indicate that both the Internet and mobile phone have some special features to

offer which distinguish them as most important in quality of life when compared with other media. The special features include interactivity, instantaneity, hypertext, intimacy, mobility, and personalization.

Meanwhile, if a medium has been around for a long time, its perceived value in QoL may diminish because its positive effect may have lasted and is being taken for granted, or is mitigated by other new media which serve similar functions in a better and more efficient way. Penetration rate of a medium may contribute to its positive assessment in QoL, but the perceived importance of a medium is also affected by its unique functions and duration of existence.

5.4 Telecommunications and Visual Media

A close examination of the media being considered as important to QoL shows that they belong to two different clusters, namely, telecommunications media and visual media. Telecommunications media include the Internet, mobile telephone and fixed line phone while visual media include free-to-air television, cable television and satellite television (Table 1). These two clusters of media have their own distinctive features. The telecommunications media are strong in interactive capacity and personal touch whereas visual media are good at entertainment and diversion. People in all three cities placed high value to the media in these two clusters. It indicates that people value highly two-way communication and entertainment in assessing their quality of life. If a medium which can combine both elements of two-way communication and entertainment, it will become an extremely important medium in quality of life.

At present, with the advancement of 3-G and other telecommunications technologies, some media are moving toward the direction of combining both two-way communication and entertainment. One example is the Internet which is providing both two-way communication and entertainment. The other example is mobile phone which, with 3-G capacity, provides entertainment such as one-minute story and one-minute film on the small screen. Still another example is interactive television which is adding two-way communication onto its entertainment function. The medium which can provide the most versatile interactive communication platform and most entertaining materials will be the winner of the New Media Age.

5.5 Impact of Income, Education and Gender on the Perceived Importance of ICTs in QoL

Apart from knowing which ICTs have most perceived value in QoL, and whether the three Chinese societies differ in the perceived values, the authors would like to examine the *individual* as well as *relative* impact of income, education and gender on the perceived values since these demographic factors are generally considered important to people's media behaviors.

Table 2 shows the results of people's perception of the role of the Internet, mobile phone and fixed line phone in QoL after controlling the factor of household income across three Chinese cities. Attention is given to telecommunications media rather than visual media because more people in the three cities consider the Internet and mobile phone as important to their quality of life. Although it is not ranked highly in its perceived QoL value, fixed line phone is included in the analysis because it has interactive nature similar

Table 2 Importance of the Internet, mobile phone & fixed line phone in raising QoL in 3 Chinese cities by household income (% yes)

		Beijing (Cutoff = RMB1,500)	Taipei (Cutoff = NT\$100,000)	Hong Kong (Cutoff = HK\$20,000)	Chi Square	df	Cramer's V
Internet	Low income	58% (229)	74% (193)	66% (210)	16.81	2	.13***
	High income	78% (300)	87% (138)	80% (240)	6.60	2	.09*
Mobile phone	Low income	52% (205)	46% (120)	61% (193)	12.76	2	.12**
	High income	63% (242)	48% (75)	61% (182)	11.21	2	.12**
Fixed phone	Low income	24% (95)	16% (41)	16% (52)	10.04	2	.10**
	High income	23% (89)	11% (17)	5% (15)	46.84	2	.24***

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$

to the Internet and mobile phone. It would be enlightening to see if the factors of income, education and gender make a difference in people's perceived value of this interactive medium too.

Since the income levels of the three cities are different, we recoded them into two levels of 'Low' and 'High' income by choosing the median level as a cut-off point which resulted in a half-half or the closest half-half proportions in the two categories. For Beijing, the cutoff point was US\$181 (RMB1,500), resulting 52% of respondents in the low income and 48% in high income bracket. For Taipei, the cutoff point was US\$3,185 (NT\$100,000), which puts 62% respondents in low income and 38% in high income category. The cutoff point for Hong Kong was US\$2,571 (HK\$20,000) which puts 51% respondents in low income and 49% in high income category.

It is found that household income does not affect the variations among the three cities in people's perception of the importance of the Internet, mobile phone or fixed line phone in quality of life. For example, among both the low and high income group of the three cities, Taipei residents still have the greatest percentage of people conceiving the Internet as an important medium. The difference among the three cities remains significant, no matter whether it is among the low income ($\chi^2 = 16.81$, $df = 2$, Cramer's $V = .13$, $p < .001$) or high income people ($\chi^2 = 6.60$, $df = 2$, Cramer's $V = .09$, $p < .05$) (Table 2). The results are similar for fixed line phone. Beijing still has the largest proportion of residents considering fixed line phone an important medium in QoL after controlling for income.

As regards mobile phone, income does not change the variations of the perceived value of this medium greatly among the three cities. Although a slightly greater proportion of Beijing's high income group (63%) consider mobile phone as important in QoL than their counterparts (61%) in Hong Kong, the difference is only 2%. The low income group of Hong Kong still leads the three cities in the perceived value of mobile phone in QoL, and Taiwan remains to have the least proportion of people valuing mobile phone as an important QoL medium.

Similar results are found in the analysis of the factor of education. In all three cities, we recoded educational levels into two groups, classifying those having university education or above into 'High' education category, and those having lower than university education into 'Low' category. Using university education as a cutoff point, 31% of Beijing, 35% of Taipei and 24% of Hong Kong people are classified into the high education category. Table 3 shows that the variations in the perceived values of mobile phone and fixed line phone in QoL among the three cities do not change after controlling for education.

Table 3 Importance of the Internet, mobile phone & fixed line phone in raising QoL in 3 Chinese cities by education (% yes)

		Beijing	Taipei	Hong Kong	Chi square	df	Cramer's V
Internet	Low education	60% (390)	71% (241)	67% (354)	13.97	2	.10***
	High education	89% (264)	86% (157)	84% (141)	1.70	2	.05 ^{n.s.}
Mobile phone	Low education	56% (364)	45% (153)	61% (319)	21.07	2	.12***
	High education	62% (184)	50% (91)	63% (105)	8.02	2	.11*
Fixed phone	Low education	23% (151)	14% (49)	13% (67)	24.81	2	.13***
	High education	23% (68)	12% (21)	5% (9)	27.86	2	.21***

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$; n.s. non-significant

For the perception of the Internet, however, there is a difference between low and high education category. Among highly educated people, there is no significant difference among the three cities in their perception of Internet's value in QoL. A comparable great proportion of highly educated people in Beijing (89%), Taipei (86%) and Hong Kong (84%) consider the Internet as important in QoL (Table 3). This may be explained by the fact that the Internet, particularly in its initial stage of diffusion, is usually adopted by highly educated people who have more knowledge to utilize the medium and are more likely to use the Internet for personal or work purposes. Moreover, highly educated people are more likely to engage in information-related occupation than lowly educated people; they may use the Internet more for information purposes. As a result, highly educated people share similar views about the importance of the Internet in quality of life, regardless of which city they live in.

Among lowly-educated people, however, Taipei (71%) still leads Beijing (60%) and Hong Kong (67%) in the perceived value of the Internet in QoL, and the difference is statistically significant ($\chi^2 = 13.97$, $df = 2$, Cramer's $V = .10$, $p < .001$) (Table 3).

The influence of gender on the original relationship between the perceived values of the three telecommunications media and the three societies is not apparent either except for the Internet. Similar proportions of female respondents in Beijing (68%), Taipei (71%) and Hong Kong (72%) value the importance of the Internet in people's QoL. The difference is statistically insignificant. On the other hand, Taipei male respondents (82%) still significantly leads the respondents of Beijing (70%) and Hong Kong (71%) in the perceived value of the Internet in QoL. For mobile and fixed line phone, the original differences among the three cities remain significant regardless of gender. Hong Kong (63% male and 60% female as compared with 59% male and 56% female in Beijing, and 49% male and 45% female in Taipei) continues to lead in the perceived value of mobile phone, and Beijing still has the highest percentage of residents (26% male and 21% female) among the three cities considering fixed line phone important in their quality of life after controlling for gender (Table 4).

The reasons why female respondents in the three cities do not differ in their assessment of the Internet in QoL can probably be sought in gender differences in affect, motivation, personality and psychology (Hamburger and Ben-Artzi 2000; Hills and Argye 2003; Jackson et al. 2001). Women have been found to make up a numerical majority on the Internet and World Wide Web although their voice may not dominate the communication systems (Heider and Harp 2002). Women in the three Chinese cities may share some common attributes or cultural experiences which lead them to share similar views about the role of the Internet in QoL. Women's use of the Internet merits further studies.

Table 4 Importance of the Internet, mobile phone & fixed line phone in raising QoL in 3 Chinese cities by gender (% yes)

		Beijing	Taipei	Hong Kong	Chi square	df	Cramer's V
Internet	Male	70% (344)	82% (198)	71% (231)	11.83	2	.11**
	Female	68% (323)	71% (203)	72% (267)	2.07	2	.04 ^{n.s.}
Mobile phone	Male	59% (290)	49% (118)	63% (203)	11.64	2	.11**
	Female	56% (268)	45% (129)	60% (222)	14.61	2	.11**
Fixed phone	Male	26% (127)	10% (24)	11% (34)	44.58	2	.20***
	Female	21% (100)	17% (47)	11% (42)	13.97	2	.11***

Notes: * $p < .05$; ** $p < .01$; *** $p < .001$; n.s. non-significant

5.6 Relative Impact of Income, Education and Gender on the Perceived Importance of ICTs in QoL

In order to examine the relative and total impact of income, education and gender on the perceived importance of ICTs in QoL, we ran logistic regression of these variables in each city. The perceived importance of ICTs, income and education were continuous variables while gender was categorical in the analysis. The results are reported in Table 5. The logistic regression showed that among the three variables of income, education and gender, education's impact on the perceived importance of the ICTs' role in QoL was the strongest. It was a significant predictor in the perceived importance of the Internet, mobile phone and fixed line phone in all three cities, with the exception of the perception of mobile phone in Taipei. All betas were statistically significant except that of mobile phone in Taipei. Meanwhile, the total impact of income, education and gender on the perceived QoL value of the three telecommunications media ranged from 4% (Nagelkerke $R^2 = .04$) on mobile phone in Taipei to 20% on the Internet in Beijing (Nagelkerke $R^2 = .20$) (Table 5).

It should be noted that the direction of influence of education varied with the ICT. For the Internet, the influence was positive across all three cities, while for mobile phone and fixed line phone, the influence was negative. The higher the educational level, the greater the likelihood that people conceive the Internet as important to people's QoL. On the other hand, the lower the education, the greater the likelihood that people conceive mobile phone and fixed line phone as important to QoL. These patterns appeared in all three cities of Beijing, Taipei and Hong Kong. The Internet therefore seems to be a medium favored more by highly educated people while mobile phone and fixed line phone are patronized more by lowly educated people.

Table 5 also shows that gender is not a good predictor for the perceived importance of the three telecommunications media in QoL. All the betas were insignificant across all three cities.

All the results in this study are discussed in order.

6 Discussion

6.1 ICTs' Role in QoL

Based on the analysis and findings of this study, the authors advance four propositions about ICTs and quality of life:

Table 5 Logistic regression analysis of the relative impact of household income, education and gender on the perceived importance of the Internet, mobile phone & fixed line phone in raising QoL in 3 Chinese cities

	Beijing			Taipei			Hong Kong		
	B	NagelKerKe R ²	Total % of correct prediction	B	NagelKerKe R ²	Total % of correct prediction	B	NagelKerKe R ²	Total % of correct prediction
Internet		.20	73%		.18	83%		.15	77%
Income	.17***			.06 ^{N.S.}			.08 ^{N.S.}		
Education	.60***			.60***			.50***		
Gender	.02 ^{N.S.}			.43 ^{N.S.}			-.09 ^{N.S.}		
Mobile phone		.13	91%		.04	95%		.13	88%
Income	-.09 ^{N.S.}			-.07 ^{N.S.}			-.07 ^{N.S.}		
Education	-.61***			-.30 ^{N.S.}			-.58***		
Gender	-.24 ^{N.S.}			-.42 ^{N.S.}			.12 ^{N.S.}		
Fixed phone		.09	90%		.10	95%		.13	96%
Income	-.13 ^{N.S.}			-.08 ^{N.S.}			-.08 ^{N.S.}		
Education	-.48***			-.50**			-.73***		
Gender	.18 ^{N.S.}			-.44 ^{N.S.}			.03 ^{N.S.}		

Notes: ***p* < .01; ****p* < .001; N.S. non-significant

1. There are four basic needs related to ICTs in people's QoL. These 'ICT-QoL' needs are the need for interaction, need for being in touch, need for instantaneous communication and need for entertainment.
2. People's assessment of an ICT's value in raising their QoL varies with the penetration rate of that ICT—the higher the penetration, the more positive is the assessment of that ICT's role in QoL.
3. The perceived value of an ICT in raising QoL declines with time—after reaching full penetration rate, the longer the ICT has been around the lower the value is attached to its contribution to QoL.
4. Education has strong influences on the assessment of the Internet's role in QoL. Highly-educated people tend to value the Internet most as a QoL raiser irrespective of the city they reside in. As a QoL raiser, the Internet is favored more by highly-educated people while mobile phone and fixed line phone are favored more by lowly-educated people.

6.2 ICT-QoL Basic Needs

The findings of this study indicate that people in the three Chinese cities of Beijing, Taipei and Hong Kong share similar views about the role of the Internet, mobile phone, television (including free-to-air, cable and satellite) and fixed line phone in quality of life. The order of importance is similar in all three societies with some variation in the medium of television. The responses of the people indicate that the ICT which possesses the greatest interactive capacity, i.e., the Internet, is valued by most people in its contribution to their quality of life, followed by the second most interactive ICT of mobile phone. Following McLuhan's idea that technology is 'an extension of man', the Internet is serving a very vital need of human existence—interaction with other people. The findings show that people value interaction highly in their assessment of quality of life. The ICTs which can meet the "interaction need" will be valued highly by people in its contribution to their quality of life.

The high value placed on mobile phone points to another important need of people, i.e., the need to be 'in touch'. Apart from interacting with other people, humans want to be in touch with others whenever they want to, regardless of time and place. While fixed line telephone can meet the need for 'being in touch', it is 'fixed' to certain locations. Instantaneous interaction without the restriction of space is a unique feature of mobile phone. It is more instantaneous than the Internet because it is ubiquitous, personal and mobile. From the high value given to mobile phone, we can see that the needs for 'being in touch' and 'instantaneous interaction' are essential constituents in people's quality of life.

A great number of people also considered television as important to quality of life. This medium serves basically the entertainment function although it also provides news and information. Most studies have shown that people still spend much of their leisure on television although its share has been declining. People still rely heavily on television for entertainment, relaxation and diversion after work although the younger generation turns more to the Internet and other new forms of ICTs. The popularity of television points to the fourth need of people which is the 'need for entertainment and diversion'. Since these needs are related to ICTs, they can be named as 'ICT-QoL needs'.

6.3 Penetration Rate of ICTs and QoL

The second proposition these authors make is that people's assessment of the ICTs' role in QoL varies with the penetration of the ICT. The study found that significantly more people in Taipei valued the Internet as an important ICT in QoL compared with Beijing and Hong Kong. This pattern retains even after controlling the factor of income, education and gender, except for females and people of high education. Similarly, significantly more Hong Kong people considered mobile phone as an important ICT in QoL than Beijing and Taipei people, and significantly more people in Beijing considered fixed line phone as important in QoL than people in Taipei and Hong Kong (Table 1). It so-happens that Taipei has the highest penetration of the Internet and Hong Kong has the highest penetration of mobile phone among the three cities. In our study, residents in all three cities have similar ownership of fixed line phones (Beijing 95%, $N = 964$; Taipei 95%, $N = 499$; Hong Kong 96%, $N = 667$). A possible reason why more Beijing residents considered fixed line phone important in QoL than residents of two other cities is that the cost of using fixed line phone compared with mobile is lower in relative terms when compared with Taipei and Hong Kong which have much higher level of household incomes.

6.4 Duration of the Existence of ICTs and QoL Assessment

However, an ICT may not be valued as highly as before if it has been around for some time since other new media which possess stronger capacity to fulfill the ICT-QoL needs may appear. For example, television has had more or less full penetration in all three Chinese cities. It has been around for more than four decades. Its value in QoL is conceived by smaller number of people than that of the Internet and mobile phone. Hence, the authors' third proposition is that the longer the ICT is around, the less value is conceived of its role in QoL. This is a kind of 'taken-for-granted' scenario—after people getting used to it, its perceived value declines. While the capability of fulfilling the ICT-QoL needs and penetration rate would affect the perceived value of an ICT, duration of the existence of the medium is an intervening factor. After full penetration rate is reached, the perceived value of that ICT in QoL will decline with time. The longer the ICTs exist after reaching full penetration, the less value of it in QoL is perceived.

6.5 Education in the Assessment of ICTs in QoL

The fourth proposition is that education has strong influences on the assessment of the Internet in quality of life. Highly educated people tend to value the Internet greatly in its contribution to their quality of life. They share similar assessment of the Internet's role despite various levels of Internet penetration, socio-economic developments and political systems in the three Chinese cities. The Internet seems to have a strong 'educational bias' in favor of the highly educated. This is understandable given the fact that the Internet demands computer literacy and constant updates of hardware and software.

In this study, it is also found that the highly educated people are more likely to take the Internet as a QoL raiser while lower educated people are more likely to consider mobile phone and fixed line phone as important in QoL. The educational differentiation of ICTs in the assessment of their contribution to QoL can be explained by the fact that the Internet, as

of today, is still basically a text-based medium, while mobile phone and fixed line phone are voice-based. Highly educated people tend to use the Internet with greater ease due to their better literacy skills, especially in words and computer than less educated people. Since the Internet can provide many uses including information seeking, emails, chatting, games and videos, it naturally becomes an important medium in enhancing quality of life for many people. However, less educated people who possess lower written literacy skills tend to gain less from the multifarious uses of the Internet. Instead, they found mobile phone and fixed line phone more important in their life because they are voice-based. The barrier of written languages is surmounted by voice. People without good literacy skills are likely to find telephones more accessible and helpful in seeking information and getting in touch with the outside world.

7 Conclusion

The findings of this study show that people in Beijing, Taipei and Hong Kong gave same order of ranking for the Internet, mobile phone and free-to-air television in assessing their role in raising people's QoL. However, the proportions of people in considering these ICTs as important in QoL are significantly different across the three societies. The sharing of Chinese culture does not seem to reduce the differences. Instead, the various stages of development of the cities seem to contribute more to the variations. The medium's penetration rate is one explanation for people's variations in assessing the values of the ICTs in QoL across the three cities. This is borne out by the fact that more people in Taipei considered the Internet as important in QoL compared with Beijing and Hong Kong, and more people in Hong Kong considered mobile phone as important compared with Beijing and Taipei. Both Taipei's Internet penetration rate and Hong Kong's mobile phone penetration rate happened to be the highest among the three cities.

Another supporting evidence for the importance of development levels in explaining people's perceived values of various ICTs is found in the perceived value of the visual media. Residents in the three Chinese cities gave different emphases on the importance of various forms of television. More Hong Kong people considered free-to-air television as important to QoL whereas more Beijing people considered satellite television and more Taipei people considered cable television important in raising their QoL. In Hong Kong, free-to-air television is still the dominant medium, while cable television is very popular in Taipei and satellite television provides badly needed alternative programming for Beijing residents. It shows that the particular situation of a medium in society and the stage of social development matters.

It is further found that household incomes do not intervene in the differences in assessment of the importance of various ICTs among the three cities. After controlling household incomes, Taipei still leads Beijing and Hong Kong in the assessment of Internet as an important ICT in QoL, and Beijing still leads Taipei and Hong Kong in the assessment of fixed line phone in raising people's quality of life.

Similarly, education and gender do not change the above assessment except for the highly educated people and women in their assessment of the Internet. Similar proportions of highly educated people and women in the three cities value the Internet as an important ICT in QoL; they do not show significant differences in their assessment. This is probably due to the fact that both groups tend to use the Internet a lot and have taken Internet activities as an important part of their life.

The findings of this study show that ICTs are contributory to quality of life in meeting four basic needs, namely, interaction, being in touch with the outside world, instantaneous communication and entertainment. Any medium which can serve these four basic ICT-QoL needs simultaneously will become the dominant medium in the New Media Age. The mobile phone is a potential prototype of this 'all-powerful' medium which does not only communicate data, voice and videos, but in an interactive, wireless, personal and entertaining mode, in addition to the news and information function. The mobile terminal may finally render all other ICTs, such as the Internet, video games, television, security system, office communications and the like obsolete or as supplementary devices in raising people's quality of life. Any medium which can serve the four basic ICT-QoL needs will usher in significant socio-economic transformations, spearheading another wave of economic growth, changing people's media consumption patterns and embarking a series of changes in people's daily activities at workplace, home and leisure.

However, while ICTs may promote quality of life, it may also impair the tranquility and resting behavior of people. Technology may have created an environment for even greater intrusion, expectations, and stress. For example, many workers today are perhaps concerned that with their mobile phones, e-mails, and Internet at home, their work may appear to be a 24-h job intruding into every other aspect of their lives. In fact, the long hours' culture may seriously undermine the quality of family life.

Nevertheless, the finding of the four basic ICT-QoL needs can indeed be used to throw light to other areas of QoL studies. For example, if a family or work setting can provide opportunities for people to meet the above four needs, namely, interaction, being in touch with the outside world, instantaneous communication and entertainment, people's overall life quality will probably be increased. With further understanding in the ICT's role in quality of life and the varied uses of ICTs by various social categories in relation to the increase of life quality, a theory of ICT and quality of life can be constructed.

This study has some limitations. First, the low response rate at 39% in the Taipei sample, due mainly to inaccurate individual household members' records kept by the Statistical Bureau of Taiwan, would certainly compromise our ability to make reliable parallel inferences and comparisons across the three cities. Future research should, if possible, employ a current and complete list of residence and individual household members to ensure higher response rate and generalizability. Second, the sample profiles of the three cities had a slightly higher male ratio for Beijing than Taipei and Hong Kong. Therefore, results on the perceived importance of the Internet, mobile phone, and fixed phone on QoL after controlling for gender across the three samples should be taken with cautions. Third, as in any comparative studies, it is impossible to account for all traits of the cities to explain their similarities and differences. Readers should be aware of the limited generalizability of the findings. Fourth, the findings of this study may not be unique for the three Chinese cities. Further studies can be done on other Chinese cities such as those in the inland, and societies of different cultures such as the American and European cities. With more cross-cultural comparison, our understanding of the relationships between ICTs and QoL will be enhanced in an increasingly globalized world.

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