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Communications Strategies

March 2006

Online at <https://mpa.ub.uni-muenchen.de/2603/>

MPRA Paper No. 2603, posted 06 Apr 2007 UTC

Impact of Mobile Usage on the Interpersonal Relations

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Abstract: Communication via mobile telephones is widespread in East Asian metropolis such as Seoul, Taipei and Tokyo. In the last ten years, the number of mobile telephone users has increased dramatically, with the younger generation in particular depending on the services available via mobile telephones. This paper explores the relationship between the voice and text messaging communications of these young consumers through their mobile telephones and their interpersonal relations. It analyses how mobile telephone usage affects relationships between respondents by comparing models of the cause-effect relationship of several latent factors in different environments, namely dependency on mobile telephone communication, perception of friendships, individual factors and IT literacy. By applying a covariance structure analysis, the correlations between latent and observable variables can be successfully visualized. The results show that mobile telephones have little influence on the perception of relationships among the younger generation, although somewhat different structures of interdependency exist in these metropolitan areas.

Key words: mobile telephone calls, text messaging, Seoul, Taipei, Tokyo, communication, younger generation, relationship and covariance structure analysis.

This paper explores the relationship between the calls and text messages exchanged via mobile telephones owned by young people in East Asia and their influence on perceptions of friendship with communication partners. In the last ten years, the number of mobile telephone users has increased dramatically. Mobile telephones have become a popular medium of interpersonal communication. The younger generation in particular depends heavily upon mobile telephone text messaging, also known as SMS (short message service) and mobile e-mail to keep in touch with one another, any time and any place. Indeed, the mobile telephone has become an indispensable communication tool in the daily lives of the younger generation.

(*) The authors are indebted to Philip Sugai, Miyuki Aoshima and Chiu Chia Hua for their comments and assistance.

Since the advent of mobile telephone calls and text messaging, communication between young people has been actively conducted via such devices, and as a result, their relations with friends and acquaintances have changed, heralding a new communication culture (ITO & OKABE, 2003). While Tokyo's youth has been identified as one of the world's leading text-messaging populations, young people in other major metropolitan areas such as Seoul and Taipei seem to be following similar trends. Moreover, the usage of mobile telephones has conspicuously influenced the structure of human relationships and methods of communication; with text messages, picture messages and related technological developments influencing the level and frequency of personalized interactions. Consequently, individual perceptions of interpersonal relationships have been influenced by the usage of these mobile devices, with a far-reaching impact on the way that communication communities are developed and structured. Despite the significant impact of the mobile platform, only a few published research papers have focused on the influence of mobile telephone usage upon society.

This paper consequently aims to show how the usage of mobile telephone calls and text messaging affects relationships between individuals. To achieve this goal, the structure of the relationship between several observable variables and latent variables¹ is explored. The differences and similarities between these relationships are also examined across three East Asian cultures. The results of the paper show that, although somewhat different patterns of interdependency among the factors influencing relationships with friends and acquaintances exist in these metropolitan areas, communication through mobile telephones has a relatively low impact on the actual "depth" or "width" of relationships. This implies that mobile telephones only weakly influence the behaviour of the younger generation.

This paper opens with a discussion of patterns of mobile telephone usage specific to young users and analyses primary data collected from surveys in Seoul, Taipei and Tokyo. We then elaborate on how the usage of mobile telephone influences perceptions of relationships among young users. Finally, we present a structural model that describes the effect that mobile telephone usage has upon these relationships within and across the metropolitan areas surveyed.

¹ Latent variables are conceptual variables that cannot be directly observed, but are rather inferred from other observable, measurable variables.

■ Usage of mobile telephones by young people in Seoul, Taipei and Tokyo

Changes in communication

Today's younger generation uses mobile telephones as its primary platform for communication. Use of such advanced communication technologies has fostered the development of new types of friendships, which are created and sustained through electronic connections like mobile internet connections, SMS, e-mail, etc. Furthermore, mobile telephones have changed the way friends and acquaintances communicate, as well as the perceptions of individuals regarding these interpersonal relationships. Recent research has shown that participating in communication is often more important than its content (SOUKUP *et al*, 2001). Some content suggests that there are indeed significant opportunities for establishing better and closer relationships among friends through the use of mobile telephones (VANCLEAR, 1991).

On the other hand, MATSUDA (2001) suggests that the mobile platform has significantly lowered the quality of communication because "consumer related communication" and "brief messaging (just to kill time)" have been identified as the main uses of mobile-related communications. Yet even though the content of these mobile text messages has been labelled as trivial or superficial, small talk itself could be considered an enabler of interpersonal communications (KOPOMAA, 2000).

High mobile telephone penetration rates

Japan, Korea and Taiwan are home to large populations of mobile users. The number of mobile telephone users in Japan is well over 85 million, which represented approximately 65% of the total population in December 2004 (Telecommunications Carrier Association, 2004). In Korea, there are over 32 million users, with a subscription rate of over 75% of the population (Ministry of Information and Communication Republic of Seoul, November 2004). In Taiwan, the number of mobile telephones was well over 22 million in 2003 (The Directorate General of Telecommunication, Ministry of Transportation and Telecommunications), representing an adoption level of 106% and implying that some individuals possess more than one handset.

Recent research has shown that mobile telephones have become inseparable from the daily lives of Japanese consumers (SUGAI, 2005). The diffusion levels stated above suggest that this is also true for subscribers in Taiwan and Korea.

Characteristics of mobile telephone use

Mobility and portability are the mobile telephone's main advantages over other communications devices that are restricted by either time or place. Moreover, the mobile telephone is no longer merely a tool for voice communication and is turning into a more general communication device (WEILENMAN & LARSSON, 2001), with young people being the most advanced users of the mobile platform's text messaging and data services.

One of the reasons for the rapid adoption and widespread usage of mobile text messaging by younger users is the relatively low cost of sending messages versus other communications media. Furthermore, short, "to-the-point" messages can be sent that would traditionally not be considered important enough to make a telephone call or send a PC email. Moreover, an ongoing record of these communications can be kept and re-read at a later date. Since people can read, write and send text messages even in subways, classrooms, and other situations where making a telephone call is almost impossible, the mobile platform has become an extremely popular communications media.

■ Methodology

Relevant literature

For this study, mobile usage is defined as voice and text communication via the mobile telephone. A prior study (TANAKA, 2001) suggests that when considering usage behaviour, three broad factors are to be considered:

- attributes of the medium, in this case a mobile telephone, including technological constraints,
- cost,
- interpersonal (including personality, emotional, and social) factors.

Another study (DALY, 1987) suggests that social, functional, and personal factors may have a more significant impact on user behaviour than the characteristics of the medium. In other words, perceptions of social norms and personality traits such as a "willingness to communicate" affect user behaviour. Cost is also a key factor in the adoption and use of a technology. Text messaging, for example, can be cheaper than voice calls.

Moreover, the social influence model of technology use points out that "individuals' media perceptions and use are, in part, socially constructed" (SCHMITZ & FULK, 1991). The model proposes that people around the user influence the user's perception of the medium, including its usefulness, and that a user's skills and experience of the communication technology facilitate use of the medium (TANAKA, 2001). For example, if one person uses text messaging frequently, another may perceive it to be a useful medium. One individual's use of text messaging thus indirectly influences another's use of text messaging and the perceived usefulness of the medium.

Finally, we should refer to the concept of "deepening" and "widening" friendships. Such technical words used for this analysis are based on other relevant studies that take the effect of mobile telephone use on the development of social relationships and communities into consideration (see, for example, LONGMATE & BABER, 2002). "Deepening" refers to an increased sense of closeness or intimacy between individuals, while "widening" refers to an increase in the number of people one considers a friend.

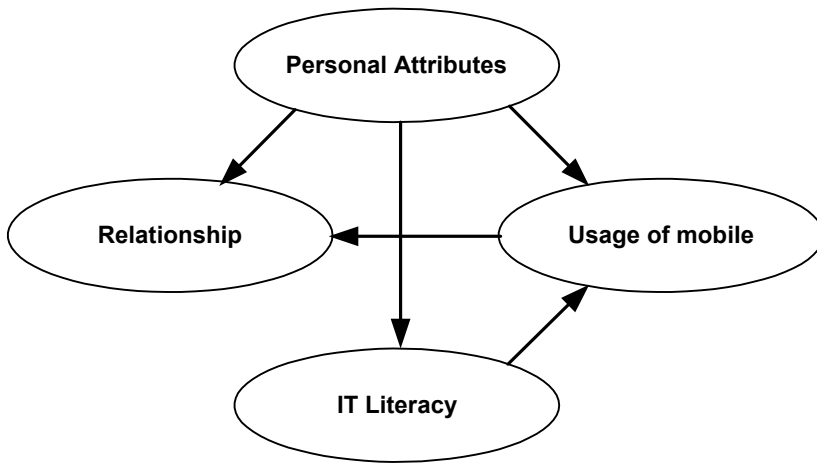
The structure equation model

We construct a structure model based on the covariance structure analysis² that is used to understand the relative strengths of direct and indirect relationships among a particular set of latent variables. The overall causality was demonstrated with statistical significance. In this study, the Analysis of Moment Structures (AMOS) 4.0 software in SPSS 11.5 was used.

² The covariance structure analysis is a statistical model that describes the overall structure and relationships among observable variables via some conceptual unobservable variables, i.e., latent variables, representative of some relevant observable variables. The analysis is very flexible and allows endogeneity between variables.

We first assumed a hypothetical model, in which "Relationship" was explained by "Personal attributes", "Usage of mobile" and "IT literacy" as shown in figure 1.

Figure1 - Basic structure of the Model



■ Analysis

Questionnaire surveys were conducted in Seoul, Taipei and Tokyo between November 2001 and May 2003 at major universities in each city. Survey targets were confined to university students as they were considered the best representatives of young users of the mobile platform. We collected data from over 1,600 university students from those metropolitan areas, 616 from Seoul, 566 from Taipei and 429 from Tokyo. The survey was conducted in each nation's language respectively (Korean, Chinese, and Japanese)³. The questionnaire contained 51 questions that were classified into four sub-categories: personal information, consciousness of friendship within a similar age group⁴, IT usage and dependency on mobile telephones. These questions were designed to test a few of the hypotheses formulated prior to the survey.

³ Samples were distributed over 4 universities in Seoul, 5 universities in Taipei, and 2 universities in Tokyo.

⁴ In this study, friendship refers to a relationship created voluntarily by people who lack kinship.

Table 1 – Basic information on the questionnaire surveys

<i>Categories</i>	<i>Seoul</i>	<i>Taipei</i>	<i>Tokyo</i>
Target	University Students	University Students	University Students
Number of respondents	593	436	406
Gender	Male: 300 Female: 293	Male: 207 Female: 229	Male: 206 Female: 200
Date	Oct. 02 to Nov. 02	May 03 to July 04	Nov. 01 to Apr. 02

Hypothesis

H1: Usage of mobile telephones and text messaging deepens relationships with friends and acquaintances.

H2: Usage of mobile telephones and text messaging widens relationships with friends and acquaintances.

Use of mobile telephones by university students

Younger users of mobile telephone made an average of 4.9 and 4.5 calls per day in Seoul and Taipei respectively, versus 2.4 calls per day by Japanese young users. However, mobile telephone text messaging was used more frequently in Tokyo and Seoul than in Taipei. The number of text messages sent per day totalled 23 in Tokyo, 22 in Seoul, and only 5 in Taipei. The survey data suggests that Japanese university students make the most of text messaging because the charge for calls is considerably higher. In Seoul, the younger generation frequently uses both mobile telephone call and text messaging services. In Taipei, text messaging is used less often, probably due to its complicated input method. People in Taipei use SMS, whereas in Tokyo messages are formatted in HTML, which is fully compatible with PCs.

One question in the survey related to the number of participants' "invisible friends" who were seldom seen, but communicated with through mobile telephone text messaging. The ratio of "invisible friends" was lower in Tokyo and Taipei than in Seoul. In fact, most respondents claimed that they had 1-10 friends who were contacted with mobile telephone mails in Tokyo (64.5%) and Taipei (59.4%), while the number of friends contacted in Seoul (52.8%) was 11-20.

As for the number of friends with whom communication did not depend on mobile telephones, the most frequent answer (84%) was an average of 1-

5 friends in Tokyo and over 10 friends (54.3%) in Seoul. It is not surprising that there are many friends who do not contact one another through mobile telephones. However, approximately 60% of the young generation in Taipei replied that they communicated via mobile telephone with all of their friends. Table 3 summarizes the primary results of the questionnaire survey.

Table 2 - Number of mobile telephone calls and text messages placed per day

<i>Categories</i>	<i>Seoul</i>	<i>Taipei</i>	<i>Tokyo</i>
Average number of mobile telephone calls per day	4.9	4.5	2.4
Average number of mobile telephone text messages sent per day	22	5	23

Table 3 - Number of friends through mobile telephone communications

<i>Categories</i>	<i>Number of People</i>	<i>Seoul</i>	<i>Taipei</i>	<i>Tokyo</i>
Friends who are seldom seen, but contacted via mobile telephone text messages recently	1 -10	29%	59.4%	64.5%
	11 - 20	52.8%	22.7%	20.7%
	Over 20	18.2%	17.9%	14.8%
Friends to whom one neither sends mobile telephone text messages nor makes mobile telephone calls recently	0	5%	59.2%	3%
	1 - 5	15%	14%	84%
	6 - 10	25.7%	6.7%	10 %
	Over 10	54.3%	23.1%	3 %
Experience in mobile telephone text messaging (years)	N/A	2.5	2.1	2.8

Analysis with the structure equation model

Four latent variables and fifteen observable variables were identified for this paper ⁵.

Personal attributes

Personal attributes were represented by three observable variables:

[V1] Amount of pocket money (Monthly disposable income)

[V2] Number of hours worked at part-time jobs

⁵ Originally, a total of 22 observable variables were identified, but a factor analysis deemed 7 to be statistically insignificant. Specifically, for personal attributes, 5 out of 8 observable variables (clothing expenses, cosmetic expenses, hobbies, lodging, and marital status) were statistically insignificant; for mobile usage, 1 out of 4 observable variables (cost of sending and receiving text messages and voice calls) was statistically insignificant; and for IT literacy, 1 out of 4 observable variables (use of game players) was statistically insignificant.

[V3] Number of days spent attending school

Relationships

Relationships with friends and acquaintances are represented by six observable variables:

[V4] Number of friends contacted only via mobile telephone text messaging

[V5] Number of friends contacted not only via mobile telephone text messaging, but also with other media

[V6] Number of friends not contacted with mobile telephone text messaging

[V7] Number of shopping trips with friends per month

[V8] Number of sightseeing trips with friends per month

[V9] Number of dinners out with friends per month

Literacy

IT literacy has been shown to influence communication skills. Whether young people use mobile devices for communication may depend more or less on their use of PCs. In view of this fact, three observable variables are adopted:

[V10] Hours of PC use per day

[V11] Hours of internet use per day

[V12] The number of PC internet mails sent per week

Usage of mobile telephones

The following three observable variables are assumed to represent mobile telephone usage:

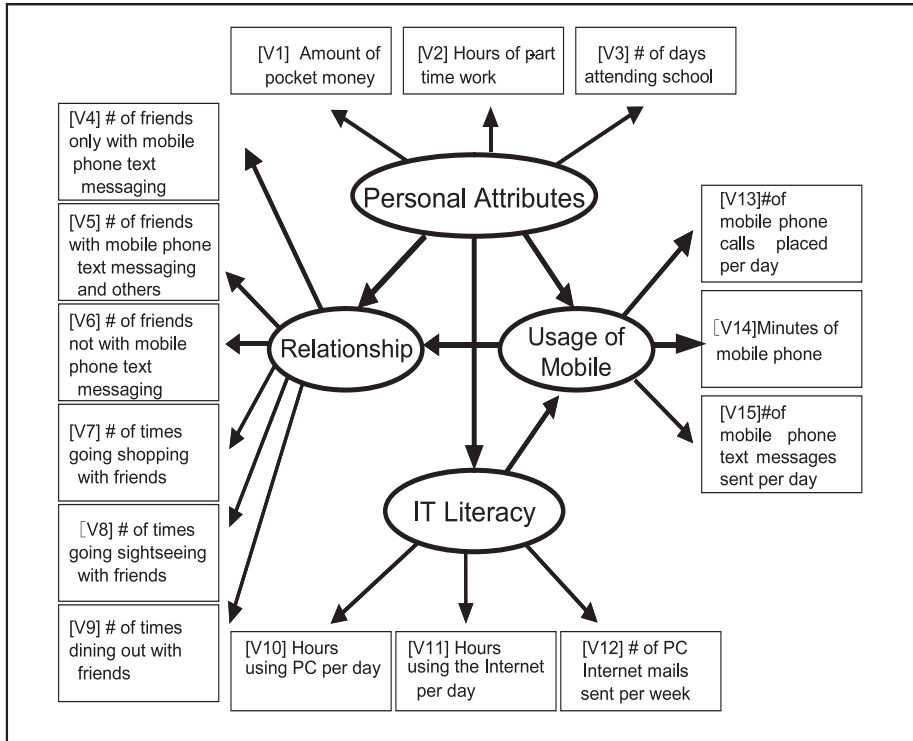
[V13] Number of mobile telephone calls placed per day

[V14] Hours or minutes of mobile telephone usage per day

[V15] Number of mobile telephone text messages sent per day

The full specification of the model is demonstrated in figure 2.

Figure 2 - Full specification of the model



Since we adopted a non-parametric approach, the empirical test was quite adjustable. Even if a model did not fit well, some modified models could be applied by adding new pathways or removing the original ones. This feature would be advantageous to conducting an analysis of a single data set. However, in a comparative study, the existence of a definitive structure for testing the hypothesis can prove a disadvantage. In addition, sample populations were obviously different in the three metropolitans. Therefore, a rigorous comparative study using such an approach would not be optimal. To avoid this problem, we applied the multiple population analysis of AMOS, which enabled the structure model to be created using multiple data sets. Table 4 shows the results and fit of this model. The detailed results of the model applied to each of the metropolitan areas are given in annex.

Table 4 - Fit of the model

	<i>GFI</i>	<i>AGFI</i>	<i>RMSEA</i>	<i>AIC</i>
Model 1	0.94	0.93	0.032	844.25

< Criteria >

GFI/AGFI (Adjusted Goodness of Fit Index): more than 0.9

RMSEA (Root Mean Square Error of Approximation): less than 0.08

AIC (Akaike Information Criterion): the lower, the better

■ Empirical results

Influence of "mobile telephone usage" on "relationships"

The coefficients estimated on the path from a latent variable "mobile telephone usage" to another latent variable "relationships" are 0.26 for Tokyo, 0.32 for Seoul and 0.40 for Taipei. These results suggest that the mobile telephone usage has a certain influence on relationships, but this effect is not significant. However, compared with the other factor that affects "relationships", "mobile telephone usage" has a larger impact in Tokyo and Taipei. In Seoul, "personal attributes" have a larger impact. This suggests that even although "mobile telephone usage" does not have a remarkable impact on relationships alone, it is likely to contribute to the enhancement of relationships with friends and acquaintances.

One aspect of the hypothesis assumes that the use of mobile telephones deepens closeness with friends and acquaintances. The correlations between the latent variable "relationship" and the observable variables [V7] - [V9] represent how much the latent variable is reflected in these observable variables. They are as follows: 0.38, 0.42 and 0.42 in Tokyo, 0.42, 0.53 and 0.45 in Seoul and 0.47, 0.54 and 0.48 in Taipei. The effect of "mobile telephone usage" on deepening relationships can be measured by the joint correlations calculated as the value of multiplying the correlation between the above two latent variables by the correlation between the "relationships" and each of the observable variables [V7] - [V9]. These values are 9 - 11%, 13 - 17%, and 18 - 22%, respectively. These values cannot be compared between metropolitan areas, but in Taipei young people are more likely to develop closeness with friends through mobile communications.

The other aspect of the hypothesis assumes that mobile telephone users tend to develop a wider relationship with friends and acquaintances. This

can be seen in the correlations between "relationships" and the variables [V4] - [V6]. The correlations are relatively low in Tokyo (0.18, 0.32 and 0.21, respectively), which imply that "relationships" is less reflected in the variables representing a wide relationship than those representing a deep relationship. A similar tendency can be found in Taipei, but in Seoul both sets of variables almost equally have an impact. The joint correlations 5 - 8%, 8 - 16% and 7 - 16% are found between "mobile telephone usage" and the observable variables in Tokyo, Seoul and Taipei, respectively. It seems that young people in Tokyo are less likely to increase friends and acquaintances through mobile telephone communications than those from Seoul and Taipei.

These results clearly indicate that mobile telephone communications do not make a significant contribution to the development of either wider or deeper relationship with friends in these metropolitan areas. Thus, neither hypothesis was accepted. Although young people use the mobile platform for their communication needs, it does not strengthen the relationships between friends as we had hypothesized.

Relative importance of mobile telephone calls and text messaging

The difference between the impact of mobile telephone calls and text messaging can be seen in the correlations between the latent variable "mobile telephone usage" and the corresponding observable variables [V13] and [V15]. The values are: 0.72 and 0.62, 0.51 and 0.46, and 0.46 and 0.3, in Tokyo, Seoul and Taipei, respectively. Obviously, the difference between the correlations is small in each country, suggesting that young people place a similar importance on calls and text messaging, although they may actually differentiate between the purpose of calls and text messaging communications. Both the number of participants placing calls and sending mails affects the usage of mobile telephones most significantly in Tokyo.

The overall structure of the model shows that "relationships" are not greatly influenced by either "personal attributes" or "mobile telephone usage" in Tokyo. One of the distinct features is that "mobile telephone usage" is independent of "IT literacy" In the other two metropolitan areas, IT literacy was shown to have a small impact on mobile telephone usage. It has often been pointed out that young people in particular tend to feel that they don't need a PC if they have a cell telephone in Tokyo (CLARK, 2003). Our results support this argument.

Personal disposable income, represented by the observable variable [V1], was included in the latent variable "personal attributes" most significantly in Tokyo and Taipei, but the latent variable showed a weak correlation with other latent variables.

■ Conclusion

Mobile telephones are now an indispensable communication tool among young people. In Seoul, Taipei and Tokyo, the younger generations especially enjoy telephone calls and text messaging, and use mobile telephones very frequently. This has been shown most clearly in Japan, where CLARK (2003) asserted that "mobile telephones have replaced computers as the de facto e-mail terminal of choice for the majority of Japanese." However, the situation in Korea and Taiwan is quite similar to Japan and would seem to follow on from the Japanese experience.

This paper examined how relationships with friends could be affected by dependency on mobile telephones in the context of IT literacy and personal attributes. The analysis of this paper showed that despite the existence of somewhat different patterns of factor interdependency influencing the relationship with friends and acquaintances in these metropolitan areas, communication through mobile telephones has a relatively low impact on the actual depth or width of relationships.

We originally hypothesized that the usage of mobile telephones for voice calls and text messages would deepen or widen relationships with friends and acquaintances. It is evident in the analysis that these hypotheses were incorrect in all three metropolitan areas that we studied. These results suggest that the mobile platform only holds a weak influence upon the relationships of the younger generation. As a result, communications via the mobile platform can be considered to be of a superficial nature, maintaining the strength of relationships developed through other communications media.

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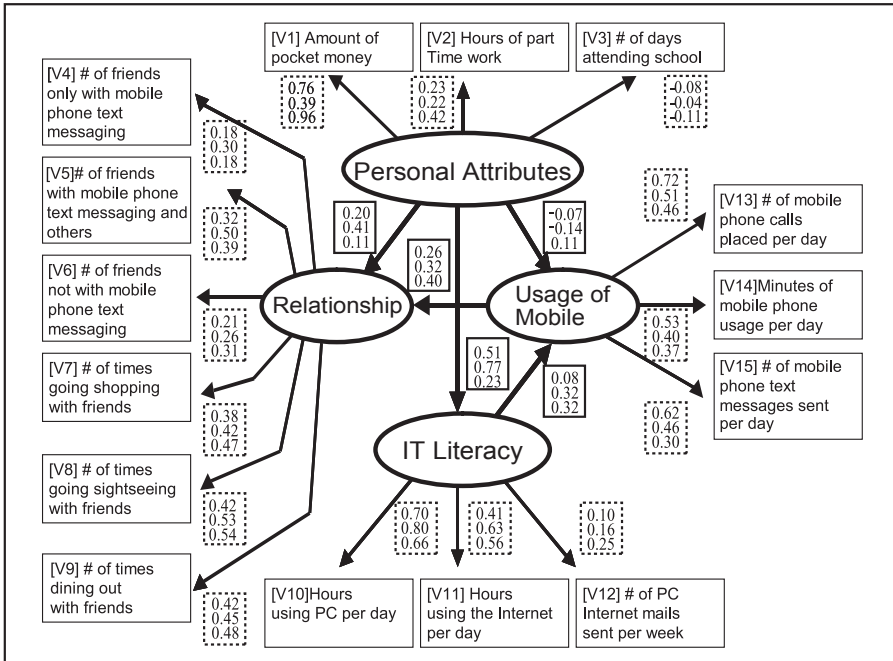
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Telecommunications Carriers Association, Japan. See: <http://www.tca.or.jp/>

Annex

Detailed results of model 4



The values in the box beside each arrow are the coefficients estimated for each metropolitan area:

- Top = Tokyo
- Middle = Seoul
- Bottom = Taipei