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**The Contribution of Mobile Information Services to  
Improve the Quality of Young User's Lives Based on  
Bottom-Up Spillover Theory: A Case Study on Japan**

by

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JAPAN

# **The Contribution of Mobile Information Services to Improve the Quality of Young User's Lives Based on Bottom-up Spillover Theory: A Case Study on Japan**

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## **1. Introduction**

A mobile information service (MIS) is defined as use of the Internet via a handheld device (Cho et al. 2005). The consumer pays for the desired mobile content or services. These services include mobile searches, news and sports information, music and video downloads, e-mail, instant messages, etc. Mobile information system is usually embedded in the user's life (Tamminen et al., 2004). The performance of a traditional information system (IS) is usually measured in terms of how effective it is at achieving specific need and goals (e.g., Gefen et al., (2003)) or how satisfying it is to use for particular tasks (e.g., Bhattacharjee and Premkumar (2004). One of the goals of any technology should be to increase the quality of its users' lives (Straub and Watson, 2001). The needs and uses of mobile information services may differ on the basis of age. If there are differences present in service needs between young and older, mobile companies need to vary their international marketing strategies and tactics.

Prior studies of mobile computing have employed satisfaction (Choi et al., 2005) and intention to use (Yang, 2005) to investigate the impact of mobile computing technologies. These outcome variables measure users' feelings or attitudes at the time they use the system, rather than the impact of the system on their overall quality of life (QoL). Very few studies directly addressing the impact of IS on overall QoL. Rahman et. a., (2005) presented a picture of conditions of the world with respect to such interrelated domains of QOL. Choi et al. (2007a) proposed eleven relationships between Individual Contribution and Overall Contribution of quality of life in Korea and Japan and found some of them had stronger influence on the Overall Contribution.

There is also very few studies on how young's quality of life has been improved owing to the mobile technology. At present we have little sense of how much MIS affects young's quality of life, because, as said, quality of life has largely been ignored in mainstream IS literature. At present we do not even know into which domains of a young user's life effect has. Few studies have actually developed to analyze the relationship between technology and QoL. The main goal of this study is to construct a theoretical model that can reliably and validly measure the relationship between MIS and QoL. We designate "contribution to QoL" as an alternative outcome variable for MIS and examine, through a consecutive empirical study in Japan, whether and how MIS contribute to young users' QoL.

Therefore, we examine the contribution of individual life domains to student's "QoL" after using MIS for Japan which has an expanding mobile market. We ground our research framework in two. First one is the bottom-up spillover theory (explained in section 2.3) by Choi et al. (2007a) with their eleven individual life domains contributions of MIS to QoL within individual domains may affect the contribution of MIS to overall QoL. These life domains are: leisure life, family life, friend life, cultural life, work life, community life, consumer life, financial life, health and safety life, and self-life. Second, our newly proposed four individual life domains contributions of MIS to QoL: Health monitoring life, informational life, educational life and trustworthy life has conceptualized from previous studies (Choi et al. 2007b; Jing and Andy, 2010; and Nguyen et al. 2010). More details will be provided later.

The rest of the article is organized as follows. The next sections will describe the

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overview of quality of life, individual life domains with new ones, bottom-up spillover theory, contribution to QoL. These are followed by sections on methodology and statistical results. The last sections present a summary of the discussion, conclusions, implications and directions for future research.

## **2. Theoretical Background**

### **2.1. Quality of Life**

The term QOL has been defined differently by various scholars. McCall (1975) defines QOL as ‘necessary conditions for happiness’, while Terhune (1973) defines it as subjective well-being. There are many terms that are used to represent well-being. Commonly used terms are QOL, standards of living, human well-being, and welfare. QoL is a measure of how happy people or how fulfilled they are in terms of their various wants and needs.

Studies of QoL have been conducted in diverse areas, including marketing (e.g. Sirgy, 1996, health (e.g. Leung et al. 2004), and education (e.g. Huebner and Gilman, 2002). However, only a few studies have been conducted in the area telecommunication services for young user. Here we will try to measure the contribution of mobile information services empirically and will provide a theoretical model that explicitly linked MIS and QoL for young users in Japan.

### **2.2. Individual life domains**

QoL researchers have identified a number of distinct life domains that encompass the various places, things, activities, roles, and relationships in which a person typically finds himself or herself involved (Andrews and Withey, 1976). They propose that people actually experience and store the various events of their life in distinct domains, including leisure life, family life, friend life, cultural life, work life, community life, consumer life, financial life, health life, safety life, and self-life. These eleven life domains have been examined for mobile data services by Choi et al. (2007a) concerning Japan and Korea. Our newly added life domains are educational life (Andrews and Withey, 1976, Choi et al. 2007b), health-monitoring life (Jing and Andy, 2010), trustworthy life (Jing and Andy, 2010) and informational life (Nguyen et al., 2010) which are discussed below:

**Educational Life:** Word translation anytime anywhere, reading e-books via mobile, can improve the learning and teaching activities of mobile users.

**Health Monitoring Life:** User’s require special health vigilance, including monitoring of their physical and emotional conditions and the fulfilment of some medication agenda. Thus, it is necessary to adopt remote monitoring/vigilance of the persons' health state, in order to improve the quality of life.

**Informational Life:** It is necessarily to provide information maintenance, such as medication and food constraints, personal interests and preferences, news and weather information through mobile to improve user’s lives.

**Trustworthy Life:** Privacy and trustworthiness from mobile service provider, can improve the quality of life of users.

We are interested in here to understand how MIS contributes to quality of life than in how generally satisfied people are with their lives. As the use of the mobile phone blurred the boundary between home and work (Haddon, 1998), MIS can be used crossed time and place (Palen, 2002). Therefore, MIS has the potential to affect many life domains. Moreover, we did not know yet which domains were most relevant to MIS in different countries and different users. Therefore, our study for Japanese young users investigated the following life domains show in table 1 which established in the previous literature.

Table 1 Life Domains

Life Domains	Defining Activities, Circumstances, Events
Cultural	Activities and relationships with cultural richness
Leisure	Non-working activities, spare time activities, recreation
Educational	Learning and teaching activities
Consumer	Purchase, preparation, consumption, possession, maintenance and disposition activities of goods and services
Financial	Activities for pay and revenues
Health	Activities pertaining to mental and physical health
Safety	Activities for personal safety
Family	Activities with parents, children, and home
Friend	Activities with colleagues and friends
Self	Activities for self-representation and self-efficacy
Community	Activities with on-line community
Health Monitoring	Activities to monitor own health care
Trustworthy	Activities of privacy and trustworthy
Informational	Activities to get information
Work	Mental and physical activities required by jobs and task

### 2.3. *Bottom-up spillover theory*

The bottom-up spillover theory (Andrews and Withey, 1976) is a model of the relationship between individual life domains and quality of overall life. The theory indicates that quality of life in individual domains has spillover effects on overall quality of life. In other words, happiness in subordinate individual life domains can spill over to produce superordinate overall happiness (Andrews and Withey, 1976). The bottom-up spillover theory has been concretized into the satisfaction hierarchy model. The premise of this model is that overall life satisfaction is functionally related to satisfaction within each of the individual life domains, which can be measured by satisfaction with specific events in each life domain (Sirgy, 2002).

### 2.4. **Contribution to Quality of Life**

The basic premise of the bottom-up spillover theory is that satisfaction levels within individual life domains affect the overall level of life satisfaction (Sirgy, 2002). This relationship between Individual Contribution and Overall Contribution is displayed as our research model in Fig. 2. The bottom layer of our model represents the contribution of MIS to quality of life in those domains (henceforth, Individual Contribution). The contribution of MIS to quality of individual life domains can be measured by the perceived contribution of specific use-experience of MIS services in that domain. The top layer in our model represents the specific contribution of MIS to overall QoL (henceforth, Overall Contribution). Like Individual Contribution, Overall Contribution is conceptualized as the perceived contribution of MIS services to overall QoL.

Past studies suggest that IT does have an influence on users' QoL. For example, Heijden's (2004) study of adoption behavior for hedonic systems implies that IT may have effects on leisure or culture life. Bhattacharjee's (2001) account of users' continuance behavior in online banking systems implies that such systems affect QoL in the domain of financial life. Choi et al. (2007a) measured the contribution of a mobile data service (MDS) technology to the quality of users' lives. They have examined eleven individual life domains for Korean and Japanese respondents. Whereas, we will try to examine fifteen life domains

with our proposed four life domains.

Our measures concern spillover of contribution to QoL by MIS. Therefore, contributions of MIS to QoL within individual domains should affect the contribution of MIS to overall QoL. The research model of Choi et al. (2007a) with their original eleven life domains has shown in figure 1. With our proposed four new life domains is displayed as our research model in figure 2. We expect that improvement of QoL in each life domain (original and additional) after using MIS will positively influence overall QoL for young Japanese mobile users.

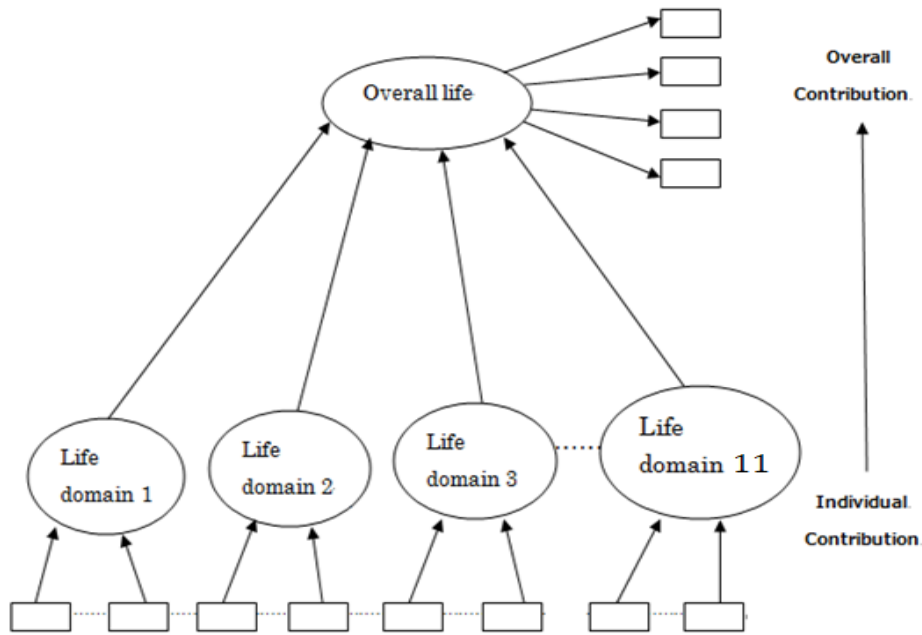


Fig. 1. Relationship between individual contribution and overall contribution from Choi et al. (2007a)

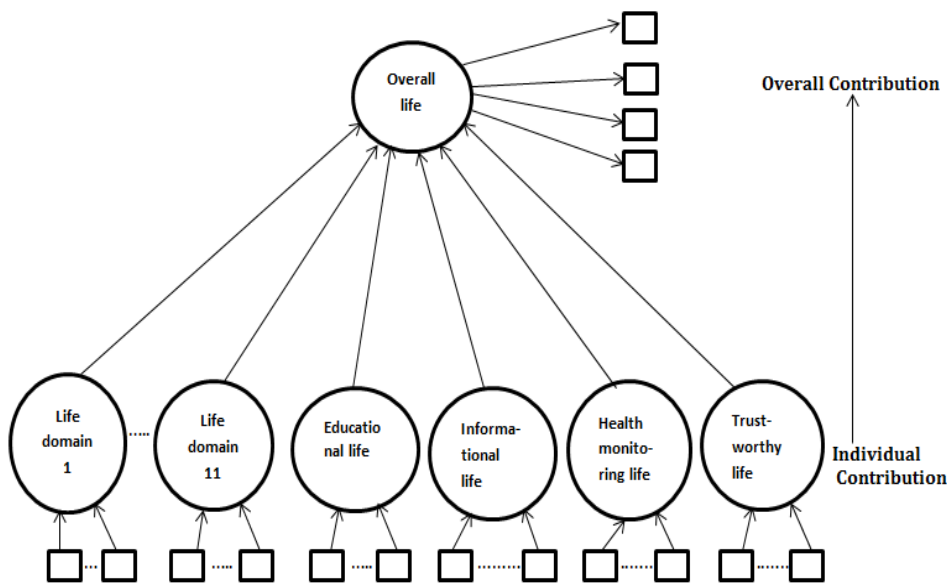


Fig. 2. Relationship between individual contribution and overall contribution with proposed life domains

### 3. Methodology

#### 3.1. Data

A survey was conducted in Japan of 245 mobile phone users at a university in Ibaraki. An online questionnaire was distributed. The Japanese survey was conducted in Ibaraki at the end of 2012. We used responses from users who were 20-40 years for this research. Major respondents were young adults as it has been found that the mobile phone has become a key information technology for youth (de Chenecey, 2002). We eliminated some responses which had missing values. Therefore, after the elimination, in table 1 there were 189 respondents to do the analysis for Japan, 2012.

Our demographic values for Japan have some differences from Choi et al. (2007a) concerning Korea and Japan. They had 89% Korean respondents of age group below 30 years. On the other hand, they had 17% Japanese respondents' age of below 30 years. We have 97% Japanese respondents who are below 30 years old. The age of our sample has similarities with their sample for Korea but different from their Japan sample. In their study, 55-56% respondents were male for Korea and Japan. However, 72% of respondents in our study are male, so that our sample is skewed in gender. Demographic information about the effective participants is presented in Table 2. They conducted a large-scale online survey in 2005-06 before the introduction of 3G services with diverse mobile user groups who had different technological, educational and economic profiles. On the other hand, our online survey was conducted in 2012 among students in a university when mobile data services have adopted much and who have almost same technological, educational and economic profiles. We hope that the difference of gender, age, time and user group may affect our results compare to them.

Questions measuring Individual Contribution in the fifteen life domains were based on the MIS use experiences. Our initial survey items for eleven original life domains were adapted from Choi et al. (2007a). The items of our additional four life domains were adopted from Andrews and Withey (1976); Jing and Andy (2010) and Nguyen et al. (2010). We chose to use the formative indicators elicited in order to reflect concrete use experiences with MIS because our theoretical foundation, the Bottom-up Spillover Theory, required highly specific events and experiences at the bottom of the satisfaction hierarchy model. Subjects were asked to rate how much they agree that each specific experience of using MIS contributes to the quality of life in the corresponding individual life domains. We constructed questions measuring Overall Contribution of MIS to QoL as reflective indicators based on the Satisfaction with Life Scale (SWLS), which is one of the most widely used scales in QoL research, with high internal consistency and test-retest reliability (Pavot and Diener, 1993). We used the following sets of 7-point Likert scales: Strongly disagree/strongly agree for individual and overall contribution. The survey questions are shown in Appendix 1.

Table 2 Demographics of Respondents

Category	Values	Japan 2012	In %	Korea (Choi et al. 2007a)	In %	Japan (Choi et al. 2007a)	In %
Gender	Male	137	72%	507	56%	569	55%
	Female	52	28%	397	44%	469	45%
Age	Under 19 years	32	17%	177	20%	5	1%
	20-29	151	80%	616	69%	174	16%
	30-40	6	3%	96	11%	462	45%
	Over 40 years	N/A	N/A	18	2%	397	38%

### 3.2. Analytical Method

The validity and reliability of the measures were tested using Partial Least Squares (PLS), a method well suited to handle both formative indicators (for Individual Contribution) and reflective indicators (for Overall Contribution) (Chin, 1998). The research models were analyzed for Japan 2012 via PLS by using the statistical software smart-PLS version 2.0 M3. PLS also has been used to construct a theory of mobile data service contribution to QoL by Choi et al. (2007a) concerning Japanese and Korean mobile users.

### 3.3. Validity and Reliability of the Measures

There are two types of measurement scale in structural equation modeling, i.e., formative or reflective. In the research by Choi et al. (2007), both reflective and formative measurements were present in the same model. PLS is appropriate for handling both formative indicators and reflective indicators (Chin, 1998).

Because the criteria for assessing reflective and formative constructs are different, we assess the two types of constructs separately. In PLS, loadings represent the influence of individual scale items on reflective constructs (Bollen and Lennox, 1991). For reflective measurement scale, their indicator reliability, internal consistency reliability, or discriminant validity should be fully examined (Hair et al. 2013). Therefore, In order to assess the reliability and validity of the reflective constructs, we checked the outer loadings, composite reliability (CR), Cronbach  $\alpha$  coefficient and average variance extracted (AVE) for Overall Contribution in table 3. The results indicating the convergent validity at the indicator level and construct level and the internal consistency of the indicators.

Table 3 Reliability and validity of overall contribution

Reflective Indicator	Items	CR $\geq 0.70$	AVE $\geq 0.50$	Cronbach $\alpha \geq 0.70$	Loading $\geq 0.70$	t-value at $p < 0.001$
Overall Contribution	OVR 1	0.93	0.78	0.90	0.91	90.18
	OVR 2				0.93	108.74
	OVR 3				0.93	108.73
	OVR 4				0.75	25.27

Regarding the formative construct, In PLS, weights represent the comparable influence on formative constructs (Bollen and Lennox, 1991). Thus, we examine the formative item's weights, multicollinearity and discriminant validity of the formative construct. In a formative measurement model, the problem of indicator collinearity may occur if the indicators are highly correlated to each other. We have generated VIF and Tolerance values for collinearity checking. The Collinearity statistics as shown in Table 4, indicating that multi-collinearity is not severe (Hair et al. 2013). We used the standard Bootstrapping procedure of 5000 samples recommended by Hair et al. (2013) to test convergent validity. The weights and  $t$ -statistics of all formative indicators in table 5, found to bear significant relationships within the corresponding life domains. Moreover, the weights for each of the question items are positive, which indicates that measures of Individual Contribution also were found to have the appropriate level of convergent validity.

Table 4 Collinearity statistics of formative constructs

Independent Variables	Collinearity Statistics	
	Tolerance > 0.20	VIF < 5
Community Life	0.552	1.81
Consumer Life	0.449	2.228
Cultural Life	0.524	1.909
Educational Life	0.453	2.207
Family Life	0.516	1.939
Financial Life	0.546	1.832
Friend Life	0.47	2.127
Health Life	0.475	2.103
Health Monitoring Life	0.48	2.083
Informational Life	0.363	2.757
Leisure Life	0.385	2.597
Safety Life	0.405	2.467
Self Life	0.537	1.864
Trustworthy Life	0.389	2.567
Work Life	0.455	2.196

Dependent Variable: Overall contribution

We tested nomological validity of the model with and without our additional four life domains. We tested whether domain-specific contribution of MIS to QoL had a significant relationship with Overall Contribution of MIS to QoL. The coefficient of determination,  $R^2$  was 0.58 for model 2, indicating acceptable fit in table 6. The fifteen individual life domains moderately explain 58% of the variance in overall contribution.

Meanwhile, predictive relevance is another aspect that can be explored for the inner model. The obtained Stone-Geisser's ( $Q^2$ ) value (i.e., cross-validated redundancy measures) for overall contribution was 0.42 for model 2 in table 6, which indicates large predictive relevance. Regarding the overall quality of the PLS structural model, we computed the value of the Goodness of Fit (GoF) (Tenenhaus et al. 2005), which is shown in table 6. The GoF,  $Q^2$  and  $R^2$  values for model 2 are larger than those for model 1, resulting in our proposed model comparatively a better model. So, our newly added four life domains in model 2 are useful to forecast overall life and Overall Contribution and Individual Contribution were found to have appropriate levels of reliability and validity for Japan.



Table 5 Reliability and validity of individual contribution

Formative Indicators	Items	CR $\geq 0.70$	Weight	t-value
Health Life	HEL 1	0.87	0.17	1.48
	HEL 2		0.64	5.14
	HEL 3		0.36	2.53
Health Monitoring Life	HML 1	0.92	0.04	0.23
	HML 2		0.98	9.57
Work Life	WOR 1	0.86	0.56	5.72
	WOR 2		0.12	1.47
	WOR 3		0.51	4.69
Safety Life	SAF 1	0.83	0.67	6.68
	SAF 2		0.26	2.61
	SAF 3		0.28	3.37
Financial Life	FIN 1	0.91	0.28	1.98
	FIN 2		0.19	1.18
	FIN 3		0.44	3.43
	FIN 4		0.34	2.18
Consumer Life	CSR 1	0.87	0.14	1.23
	CSR 2		0.32	2.85
	CSR 3		0.63	5.37
	CSR 4		0.10	1.08
Family Life	FAM 1	0.87	0.34	3.06
	FAM 2		0.31	2.41
	FAM 3		0.46	3.64
	FAM 4		0.15	0.97
Cultural Life	CUL 1	0.92	0.49	3.79
	CUL 2		0.35	2.58
	CUL 3		0.06	0.55
	CUL 4		0.08	0.47
	CUL 4		0.19	1.90
Friend Life	FRI 1	0.90	0.19	1.70
	FRI 2		0.69	6.05
	FRI 3		0.24	2.12
Community Life	COML 1	0.94	0.57	4.04
	COML 2		0.50	3.53
Self Life	SEL 1	0.84	0.95	16.25
	SEL 2		0.12	1.02
Informational Life	IL 1	0.86	0.52	5.28
	IL 2		0.57	5.49
	IL 3		0.06	0.78
Trustworthy Life	TWL 1	0.86	0.81	8.75
	TWL 2		0.08	0.88
	TWL 3		0.23	1.91
Educational Life	EL 1	0.89	0.50	5.85
	EL 2		0.38	3.62
	EL 3		0.29	2.56
Leisure Life	LSRL 1	0.91	0.39	3.70
	LSRL 2		0.45	4.57
	LSRL 3		0.31	3.17

Table 6 Model selection criteria for each model

Model Selection Criteria	R <sup>2</sup> of endogenous construct	Q <sup>2</sup>	GoF
Model 1 from Choi et al. (2007a)	0.54	0.40	0.65

Model 2 with our additional four life domains	0.58	0.42	0.67
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## 4. Results

### 4.1. Contribution of MIS to QoL for Japan

According to the theoretical model in Fig. 2, the Individual Contribution of MIS will influence the Overall Contribution of MIS. In other words, if people feel that MIS improves their QoL in individual domains, they will also believe that MIS improves their overall QoL. However, we do not know which of the fifteen life domains are more closely related to the overall QoL. In order to explore these issues, we conducted a PLS analysis using the Bootstrap method of 5000 samples that is recommended by Hair et al. (2013) and estimated the path coefficients between Individual Contribution and Overall Contribution in Table 7.

The results from Japan indicate that contributions to six individual life domains had significant impacts on the overall contribution of MIS. In other words, if MIS can contribute to the QoL in the six life domains, it will have a high possibility of improving the overall QoL of young Japanese respondents. Contribution to the Informational life has the highest influence on the Overall Contribution with  $\beta = 0.19$ ;  $t = 2.97$ ;  $p < 0.001$ , followed by culture life ( $\beta = 0.149$ ;  $t = 4.273$ ;  $p < 0.001$ ), friend life ( $\beta = 0.17$ ;  $t = 2.70$ ;  $p < 0.001$ ), leisure life ( $\beta = 0.15$ ;  $t = 2.84$ ;  $p < 0.001$ ), educational life ( $\beta = 0.11$ ;  $t = 2.34$ ;  $p < 0.05$ ) and work life ( $\beta = 0.10$ ;  $t = 2.02$ ;  $p < 0.05$ ). As the t-statistics, all these path coefficients are significant at the level of 5% or less.

Our result for Japan has some similarities with those from Choi et al. (2007) for Korea and Japan. Choi et al. (2007) measured the contribution of a mobile data service technology to the quality of users' lives. From our Japan results, contribution to the cultural and leisure life has the influence on the Overall Contribution. These results are the same as those were significant in Choi et al., (2007) for Japan also. As the country is the same, Japan, we got similar result probably due to same cultural and economy. We also have some similarities in case of non-significant results. Consumer life, health life and safety life were not the determinant of overall contribution in Choi et al. (2007) for both Japan and Korea, we also found the same for Japan 2012.

Our results for Japan have some differences compare to those from Choi et al. (2007a) for Korea and Japan. They got significant effect of financial life and self life to the overall contribution for Japan. But we get insignificant result on those. This may be possibly due to the characteristics of sample such as gender ratio. Another difference is on Friend life, which is significant in our result, but insignificant for Japan as well as Korea in those of Choi et al. (2007a). All of our respondents are students, so, friend life is a focus for them. The contribution to work life in Choi et al. (2007a) for Japan was found to be negatively related to the Overall Contribution but in our result, it is opposite, positively related. Our respondents in Japan were in their twenties, it is reasonable that work life as part-timers may be important for them. Those differences indicate the sample difference on gender, age, or job status and timing.

Out of our additional four life domains, informational and educational life domains become significant for Japan in our results. Since the respondents all are students, MIS has strong impact on their educational lives by searching dictionary, on-line translation, on-line education and etc. MIS also has strong impact on their informational life by searching news, weather, maps, personal information and etc. Our data was from 2012 at the later adoption stage of 3G/4G services, so that mobile device has become a key device for information gathering after the introduction of 3G/4G services. It helps user to get information via mobile anytime and anywhere.

Table 7 Comparative analysis between Japan 2012 and Japan-Korea from Choi et al. (2007) in terms of path coefficients

Hypotheses	Japan 2012	t-value	Japan (Choi et al. 2007)	t-value	Korea (Choi et al. 2007)	t-value
Cultural Lifeà Overall Life	0.18	4.08***	0.12	3.85***	0.02	0.27
Leisure Lifeà Overall Life	0.15	2.84***	0.11	3.39***	0.06	1.63
Community Lifeà Overall life	0.08	1.78	0.08	2.13	0.15	4.27***
Consumer Lifeà Overall Life	0.07	1.32	0.09	2.05	0.05	1.52
Family Lifeà Overall Life	-0.08	1.66	0.02	0.94	0.14	3.20***
Health Lifeà Overall Life	0.10	1.68	-0.00	0.31	0.00	0.03
Safety Lifeà Overall Life	-0.01	0.22	0.02	0.55	0.02	0.67
Self Lifeà Overall Life	-0.08	1.65	0.37	10.84** *	0.33	9.34***
Financial Lifeà Overall Life	0.00	0.09	0.23	6.34***	0.14	3.87***
Friend Lifeà Overall Life	0.17	2.70***	0.03	0.78	0.06	1.57
Work Lifeà Overall Life	0.10	2.02**	-0.06	2.52***	0.04	1.21
Health Monitoring Lifeà Overall Life	0.09	1.64	-	-	-	-
Educational Lifeà Overall Life	0.11	2.34**	-	-	-	-
Informational Lifeà Overall Life	0.19	2.97***	-	-	-	-
Trustworthy Lifeà Overall Life	-0.02	0.45	-	-	-	-
R <sup>2</sup> value	0.58		0.63		0.51	

Note: \*\*\* $p < 0.001$ ; \*\* $p < 0.05$

## 5. Discussion

This study has two variables (Individual Contribution and Overall Contribution) to measure the contribution of mobile information services to users' quality of life. Results from the two consecutive studies clearly indicate that two variables are valid and reliable in the bottom-up spillover theory. As users perceived a stronger contribution of MIS in specific life domains, they perceived a stronger contribution of MIS to their overall quality of life. The Individual Contribution in the cultural, leisure, informational, friend, educational and work domain had the greatest impact on the Overall Contribution among Japanese young users.

Cultural and leisure life domains are significant as these in Choi et al. (2007a) for Japan. They explained the strong effects of leisure and cultural life for the Japanese people by the higher national wealth (GNP and GDP) of Japan. People with greater monetary resources are more interested in their leisure and cultural life. Although our data set was for 2012 but we got similar result because of the stable economy of the same country, Japan.

Contribution of MIS to QoL in the Informational life-our newly added life domain; has the strongest impact on overall contribution of MIS. According to the proposed theory by Wilson (2006), information seeking behavior is triggered from physiological, socio-psychological, and cognitive needs as perceived by the information user. Wilson (2006) especially stressed the importance of studying the users' information needs and that such needs are embedded in the user life world, the user him/herself, his/her role (e.g. job tasks, care needs) and the environment. The information users in Japan may seek information from different sources. Mobile device is one of the greatest devices among choices to get

information and Japanese young can improve their life by getting information anytime anywhere through mobile devices.

Contribution of MIS to QoL in the friend life has stronger impact on overall contribution of MIS. Relationship with friends should be considered in any measure of QOL (Rahman et al. 2005). Satisfaction with friend life is an important element of an individual's well-being in fact when they are young adults. It is quite reasonable that, in most cases, an individual young mobile user with strong friend ties will be happier by sending photos, contracting with friends and congratulating friends on their birthday, etc.

Contribution of MIS to QoL in the educational domain has significant effect on overall Contribution of MIS to QoL for Japan. But Choi et al. (2007b) did not get significant effect between the contribution of MDS to educational life and the contribution to overall for Korean young users. They showed the reasons were poor usability of mobile devices inhibits active participation, and their limited bandwidth precludes effective use of multimedia broadcasting on online education. Our data set was for Japan 2012 when they are effective 3G/4G and iPhone users. So, mobile devices become effective media for online education of young students. Hence, our result for educational life domain may become significant.

Contribution of MIS to QoL in work life has stronger impact on overall contribution of MIS in our result. Rahman et al. (2005) identified the work life domains of depending on what were considered to be the major element of well-being. Estimates of unemployment rate and combined first, second and third level school gross enrolment ratio are used to capture the 'extent of work and productive activity' that exists in a country. Young citizens of Japan are productively engaged either in work employment, or engaged in the process of learning in school.

## **6. Implications**

The study has several implications. First, it has noted that six significant individual life domains, specifically relevant to mobile computing environments that contribute in multiple ways to various facets of a young user's life. We recommend focusing on these life domains for young mobile users. Second, it verifies the reliability and the convergent, divergent, and nomological validity of the original and our newly proposed life domains and through an empirical study. These life domains can be used in future studies to measure MIS contribution to QoL.

This study firstly provides a framework to understand the contribution of MIS to young's quality of lives from the perspective of its actual user. The life domains proposed and verified in our study can be used in future studies, to evaluate the potential of MIS to contribute to young user's quality of life. If a firm intends to specialize in a specific life domain for young users, our findings on contribution of MIS to QoL can indicate what services will be used, with what goals, in what contexts, and can thus suggest which services will most improve quality of life for their users. The results on the relationship between Domain- Specific Contribution of MIS to QoL and Overall Contribution of MIS to QoL will also help companies allocate resources to the life domains that bear most strongly on overall quality of life.

## **7. Limitations**

Our study has some limitations. All of the respondents are young students who have good education and knowledge in technology who had from a national university in Japan. Also, they are convenience samples. Thus the results cannot be generalized to the whole population in Japan. Moreover, our respondents in Japan were clustered on males in their twenties which might bias the survey results. Second, this study was conducted in Japan with Japanese MIS

users, and it is not clear whether the results can be applied to other countries. We recommend an increased focus on the importance of age, gender, culture and economic characteristics in future research.

## 8. Conclusion

This paper operationalized fifteen life domains with our newly added four life domains to measure the contribution of MIS to QOL across Japanese young students. We successfully applied bottom-up spillover theory for the use of MIS by Japanese young users and found the importance of information and educational life domains out of our proposed four life domains. By using a model to measure the contributions of mobile information services to quality of life with the original and our additional life domains, the research of Choi et al. (2007a) and this research gave stable results after considering time difference. Out of these considered life domains of the QOL, we showed that the perceived contribution of each use experience for the following six life domains were found to be the key domains for Japanese young MIS users: informational life, cultural life, friend life, leisure life, educational life and work life.

Our research also identified the importance of appropriateness of sample characteristics such as gender, age, and culture/economy. A technology used in as many contexts as MIS can enhance its users' lives in numerous ways. To assess those contributions, however, we need to know how they focused on specific tasks and functions for different user segments. Our study takes a step in that direction by offering a practical basis for measuring the contributions of mobile information services to quality of life for young MIS users.

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## Appendix 1. Survey Questionnaire

(A.1) Overall, how do you feel about mobile information services (MIS) and the overall Quality of Life?

Overall Contribution	Items
	1) Using the MIS helps me make my life close to ideal. 2) Using the MDS improves the general conditions of my life. 3) Using the MDS helps make my life more satisfying. 4) Using the MDS helps me achieve important things in my life.

(A.2) Original individual life domains from Choi et al. (2007a)

Original Domains	Life	Items
Cultural		1) Purchasing movie or concert tickets over the MIS whenever I want, improves my cultural life; 2) Making reservations for movies and concerts through the MIS while I am out improves my cultural life; 3) Getting discount vouchers through the MIS before going to a restaurant or cinema improves my cultural life; 4) Getting movie information through the MIS on the street improves my cultural life; 5) When it's too bothersome to go to the cinema, reserving tickets through the MIS improves my cultural life.
Leisure		1) Using the MIS to lift my spirits when I am gloomy improves my leisure life; 2) Using the MIS to spend my spare time while I am out helps my leisure life; 3) MIS help me to stay close with my personal interests, preferences and hobbies which improves leisure life.
Consumer		1) Frequently checking prices through the MIS while I am shopping improves my life as a consumer; 2) Buying goods through the MIS instead of actually going out for shopping improves my life as a consumer; 3) Searching for information on goods I want to buy through the MIS, improves my life as a consumer; 4) Exchanging goods over the MIS improves my life as a consumer.
Financial		1) Using the MIS to send money electronically to another person when I am away improves my financial life; 2) Using the MIS to check my bank account improves my financial life; 3) Using the MIS to buy and sell stocks/options instantly improves my financial life; 4) Making reservations for trains with low commissions on the MIS improves my financial life.
Health		1) Recording health data daily through the MIS improves my health life; 2) Using the MIS to take the medical advice when I can't use a PC improves my health life; 3) Instead of going to the clinic or hospital, making an appointment by the MIS will improve my health life.
Safety		1) Using the MIS to search my location when I get lost at a strange place improves my personal safety; 2) Searching for a safe route to my destination through the MIS late at night improves my personal safety; 3) Being in contact with other people through the MIS when I am alone improves my personal safety.
Family		1) When I am concerned about my family members, searching for their current location using the MIS improves my family life; 2) Getting in touch with my family members through the MIS to relieve their worries improves my family life; 3) Sending photos to my family over the MIS help my family life; 4) To be in constant contact with my family when I am away improves my family life.
Friend		1) Frequently sending photos to friends over the MIS improves my friendships; 2) Frequently contacting friends through the MIS improves my friendships; 3) Congratulating friends on their birthday over the MI improves my friendships.
Self		1) Using the MIS to share my own photos with others improves my self-expression; 2) Immediately upgrading to the latest services over the MIS increases my self-esteem.
Community		1) Informing members of on-line community meeting dates over the MIS, improves my community life; 2) Checking bulletin boards and e-mail from the on-line community over the MIS improves my community life.
Work		1) Searching for recruiting information through the MIS helps my work life; 2) Discussing job-related issues with co-workers through the MIS helps my work life; 3) Working through the MIS when I can't use a PC helps my work life

### (A.3) Proposed individual life domains

Proposed Domains	Life	Items
Trustworthy		1) Having trust on the Internet services by MIS, improves my trustworthy life; 2) Having trust on paying for the on-line shopping via MIS, will improves mu trustworthy life; 3) Having trust on MIS while I am reading, entertaining and getting information via internet, will improves my trustworthy life.
Information		1) MIS helps me to get information of news, weather, maps, etc. when I need which improves my information life; 2) I can search personal information through MIS when I need which improves my personal life; 3) at anytime, anywhere, be Searching information at anytime, anywhere by the MIS is fully useful in order to improve my informational life
Health Monitoring		1) Using MIS to monitor blood pressure, glucose level, weight, food calorie etc. by own self when I am home, improves my health life; 2) Using MIS in home for diet control and medication agenda, etc., improves my health care
Educational		1) Translate words through mobile dictionary anywhere anytime, improves my educational life; 2) Reading newspapers, e-books through MIS, improves my educational life; 3) to see the education program by the MIS when I cannot use the PC, will improves my educational life.