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ABSTRACT

This empirical research series, 1966-now, investigated internet users' behavior and the growth of e-commerce in Taiwan. Some new ideas of methodological issues for internet users' surveys have been initiated and employed. There were three major findings:

1. The profiling of internet users and its characteristics of the idea of 'cybercitizen'.
2. A redefinition of the implication of 'Digital Divide'.
3. The reality of e-commerce and its marketing strategy.

Evidence has also shown another angle in which to consider the 'Digital Divide'. Psychological and cognitive factors might be a better approach than demographic variables to analyze the cause.

The reality of current 'e-commerce' is 'communication more than commerce'. Most users consider the internet more important as a media channel than as a purchase place. Goods in the B-to-C market are still limited by price. Four strategies were examined including: market scale and trends, sales volume and trends, best seller and potential products, and barriers to e-commerce.

This research series is the first and only work to conduct internet users and e-commerce research on a random sampling base in Taiwan.

KEYWORDS

Internet, Users' Behavior, E-commerce, Digital Divide, Cybercitizen

1. SPECIFIC OBJECTIVE

The internet is becoming a part of human life and forms a new race of 'cybercitizen'. It brings up a key issue of marketing strategy for e-commerce, cross-cultural business and multinational cooperation. However, there is little related research on internet users in Taiwan although Taiwan plays such a distinguished role in the information industry and international business.

This empirical research series attempted to respond to this scarcity to investigate the following:

To explore internet users' profiles and their behavior as world cybercitizens. To forecast internet activities in Taiwan and its implication for e-commerce and globalization.

To analyze the growth and tends of e-commerce. To propose e-commerce strategies on market planning and public policies for private or governmental sectors.

To initiate new ideas of methodological issues for internet users' surveys and also contribute to the scientific .philosophy in behavioral research.

The findings were also compared with relevant results in the USA to provide cross-cultural perspectives. Furthermore, the author found there were various results in different studies. The statistics were even not convergent in different release versions of the same survey conductor. The different survey methods and interpretation might have produced this conflict. Thus, core methodological issues were selected and discussed in order to initiate integrated points of view.

2. LITERATURE REVIEW

2.1. Taiwan's Experience

There were some reports with indirect methods such as estimating the number of users. The most popular

* Acknowledgement: this research series has been sponsored by the National Science Council, Economics Ministry and the Institute for Information Industry in Taiwan; also has been sponsored by the Fulbright Foundation, and the Georgia Institute of Technology in USA.

way was to estimate by personal perspective. For instance, Liou[25] estimated the user numbers by intuition and observation when maintaining his internet server. This method would also cause a very large estimation range. The Education Ministry[12] provided an analysis of communication quantity on TaNet that is the dedicated network for academic or research institutes. The Economic Ministry examined the numbers of host domain names and counted the subscribers that were announced by ISPs. But those methods made it very difficult to identify the individual users' favor service. It was also impossible to precisely estimate user's behavior and their contribution to e-commerce.

Some ran a non-random sampling survey by putting a questionnaire on the internet. An example was Jang[15]'s work. The problem was that respondents were not randomly selected. It could not draw a whole picture including both users and non-users. A couple of commercial organizations such as the Commonwealth Magazine[5], conducted a sampling survey. However, they kept an aggressive point of view to encourage e-commerce participation that was different from a scientific purpose.

The first internet users' report, based on rigid methods and random sampling in Taiwan, was the first wave of this research series that collected user data in metropolitan Taipei, 1996. Since then the survey has been conducted annually, and the sample frame has extended to Taiwan region wide [42][45][46][47][50]. This research series had provided the analysis of internet users and e-commerce for the Economics Ministry and Institute for Information Industry.

2.2. USA and worldwide

There were many useful empirical reports by different organizations[35] or individuals[15][19] in the USA and other countries such as the European Union17[13], United Kingdom[10], Canada[37], Australia[1], New Zealand[30], Singapore[31], etc. They executed their research in various, heuristic methods. A summarized introduction of most regular surveyors is given in Table 1.

Table 1. Major internet users' surveys and their methods

Organization	Sampling Frame	Research Methods
Network Wizard[30]	Global	Host survey
MIDS[29]	Global	Second level analysis based on data of Network Wizard
CommerceNet -Nielsen[4]	USA and Canada	Random sampling telephone survey series
Find/SVP-Cyber Dialogue[7]	USA	Random sampling telephone survey series
Nielsen-NetRatings[34]	Global	Panel opt-in survey
Media Matrix[28]	Europe and USA	Panel opt-in survey
comScore[6]	USA	Panel opt-in survey
Plurimus[35]	USA	Analysis based on ISP data
Lycos[26]	USA	Second level analysis based on data of Cyber Dialogue
Cyberatlas[8]	Global	Literature analysis

Considering the criteria of a probability sampling procedure, there were two groups and they were generic.

2.2.1. CommerceNet/Nielsen

CommerceNet/Nielsen's Internet Demographic Survey[34] was based on a probability sample of persons 16 years or older among telephone households in the USA and Canada. They made use of re-interviews to compare each other's study. The sample was selected from an unrestricted random digit frame of phone numbers from exchanges operating in the US and Canada. The frame was stratified by geography and approximately 280,000 phone numbers were selected. Up to 8 attempts was made to reach a household and a respondent was randomly selected. Collected data were transferred by a 3-way weighting procedure (Age / Gender / Region) or a 4-way weighting procedure (Age / Gender / Region / Education).

They classified current internet users into long-time internet users and newcomers. Current Internet users are those respondents who have used the internet in the 6 months prior to the interview, and their classification as long-time users or newcomers are a function of whether or not they had used the internet in the 3 months prior to being interviewed.

2.2.2. Cyber Dialogue and Find/SVP

Find/SVP fielded the American Internet User Survey [14] by telephone with the random digits dialing (RDD) method in 1995. They took 'qualified user' (The author will use the term of 'Active user' instead) definition and suggested that the real number of users were more than those who responded that they were users.

Thus, they formulated the following calculations:

Adult users: respondent household users = 1.43: 1

Total users (including children): respondent household users = 1.61: 1

Cyber Dialogue[7] carried on the American Internet User Survey after they purchased Find/SVP. Using RDD survey of internet users and non-users, they fielded in the second and fourth quarter of every year. They conducted approximately 13,000 screener interviews to identify 1,000 current online users and 1,000 non-users. Their data was weighted for response bias by age, gender, income and geographic region.

CommerceNet/Nielsen (C.N.) was based on general user definition and an aggressive point of view. Cyber Dialogue and Find/SVP (C.D.) took qualified user definition and a careful attitude to interpreting data. There were always conflicts between the two reports.

C.N.'s numbers of users were always much more than C.D.'s every year. The difference was from 50% to 250% (see Table 2). C.N. declared 'Join e-commerce now, or it will be too late' while C.D. warned 'Do not inflate the scale of e-commerce'.

Table 2. Brief comparison of the estimation of users

Year	1995	1999
CommerceNet/Nielsen	16%	41%
Find/SVP/ Cyber Dialogue	6.40%	30%

C.N. suggested the car would be the best seller for e-commerce, while C.D. pointed out people did not shop for new cars online. With a second examination, we found C.N. was asking about the 'searching information to buy a car' when C.D. was talking about real closed transactions.

Those studies provided grounded perspectives, and reference maps to conduct user survey in Taiwan. However, their contradictions proved that different survey methods would produce contrary results and point of view. Wu and Song[44] asserted that are still a lot of questions in the field of behavioral research. We need to adopt Kuhn[23]s' revolutionary spirit, to deliberate more effort on methodological issues to define indicators, to reconsider measurement, to initiate a new behavioral model.

3. METHODOLOGY

The following study design would adopt the former studies' heuristic experiences and attempt to denote a more precise research paradigm to include more comparative respondents' opinions.

Extended methodological issues could be deduced and discussed as follows.

3.1. Identifying Users and Purifying Measurement

Many previous studies measured the users of Adoption by 'counting heads'.

We want to argue 'head' is a demographic variable; it is not a real, latent variable that fully reflects the strength of Adoption.

We found a heuristic clue from two internet users survey series of CN and CD in our above literature review, see Table 2.

We figured out that C.N. was based on general user (they did not specify this term, but they considered all users are the same as a general group) definition while C.D. took qualified user (i.e. our Active user) definition that produced the conflicts between the two reports.

A vague general user's definition was taken by many studies as people who had experience accessing the internet within the last 6 months. However, C.D. advocated a rigid concept of 'qualified users' who had to

have an ISP account and had to use at least one internet application.

It responded our theory of 'people are different in Active or Passive Adoption Motivation (AM)' and 'AM will be divided into two groups: Active or Passive'.(Wu et al. [41]) Our theory also explained why C.N. had a higher percentage of users. A general user was one who had a chance to have a glance or borrow an internet account to have a peek occasionally. It is not necessary he/she had a real Active AM behavior.

According to the changing in the internet market, people would obtain at least a browser in addition to an email when they apply for an internet account. It seemed that C.D.'s two rules could be combined as one. Therefore, we suggested employing 'if the user has a personal email account' to filter active user and to measure the clean Adoption behavior. The Active user is willing to pay a little bit of efforts to activate his/her email account when the Passive user likely does not bother.

3.2. Estimating User Numbers

There were two popular methods to estimate the user percentage: use the household percentage instead of user percentage; or use a weighting scale to modify the household percentage into user percentage.

All former internet user studies interviewed only one respondent who answered the phone in the sample household. It was highly possible that there were more than 1 user in a household. On the other hand, if the respondent answered that he/she was not using the internet, then 1 household would be added to the non-users record. On the contrary, the truth might be there were other users in the household. It would be likely over estimate the user percentage by household percentage.

Many studies reported that they employed 2 possible ways to compensate for such flaws. They would use a weighting skill by demographic variables, especially by sex and age. They made a further step to formulate their own ratio to estimate the user number. The basis of formulation was heavily dependent upon researchers' experience and intuition. It would reveal why there were such large gaps between different organizations' surveys. Furthermore, we could find there were not totally convergent versions of the same organization.

We suggested a 3-step procedure to solve this problem:

In the opening section of interview: ask the respondent if there was anyone who was using the internet in the household. If there was, the interviewer must ask for the user. If the user was not home, the interviewer must make an appointment and callback until the user was located.

In the closing section of the interview: ask the respondent how many households were in this household, how many other households were also internet users and how many of them obtained their own email accounts.

Thus, 2 tables can be produced from the collected data of steps 1 and 2, and can be used to formulate a quantitative ratio of household users and respondent users.

This procedure provided much lower, might be more precise, estimate then other similar surveys.

Our methodological philosophy is better to keep a careful attitude.

3.3. Measuring Sampling Precision Rates

Sampling precision was directly related to the inference of results. It was easy to estimate the sampling error theoretically. It was another story to apply field work.

An early and common equation was suggested by Kuiz[24]:

Response rate = response samples/ (drawn samples- unconnected samples)
= response samples/ (response samples + refusal samples)

It was a somewhat confusing and incomplete definition.

First, ruling out unconnected samples from the denominator of designated samples would cause significant distortion. Research evidence showed that people, who were difficult to locate, always retained different characteristics from those who were easy to be found.

Second, defining refusal as the incomplete part was a bias of interpretation. Refusal meant the selected respondent did pick up the phone, then hung up after understanding the survey's purpose and gave no clear

answers. They, eventually, responded to the call and expressed their attitude for the survey: negative or non-opinion. They were meaningful in the analysis and could not be excluded from the designated samples.

'Refusal' made things hard. In the real world, it is rare to get a one-hundred percent complete response for a long questionnaire and marketing surveys are always relatively long. Each researcher has his own way to screen and interpret the data.

The author would introduce two emerging significant problems as follows. (There were more detailed problems in fact)

Most of the telephone surveyors used a telephone directory as the sampling frame. However, the percentage of unlisted users was up to 40%, which already endangers the basis of random sampling. The author suggested that a virtual population directory, with a random dialing method, must be designed and generated by database management techniques instead of a telephone directory.

Next, almost all the survey researchers would take a replacement when they failed to access a designated sample. The replacement percentage could reach as much as 60% due to the growth of social mobility. It would totally distort the precision of the sampling.

An easy to be forgotten principle was: 'Do not replace drawn samples, even they were difficult to connect to.' (Many current surveys violate this rule.) There was only one exception under the method of sampling from a virtual directory. This method would unavoidably draw a certain proportion of inactive phone numbers that did not 'exist' within the designed sampling frame. The inactive samples may or may not be replaced according to the research resource. Active samples did not affect sampling precision, but it determined the real sample size and the denominator of the sampling precision rate.

Since it would produce confusion between 'replacement' and 'non-existing sample', if a virtual sampling directory was adopted, the author also suggested an online control procedure to lower the difficulty.

Unfortunately, there is not a universal standard definition and management procedure to cope with the above problems in the community of marketing survey yet.

Therefore, the author suggested four rates: active rate, accessed rate, response rate, and eligibility rate to evaluate sampling precision for applied surveys. A brief operational definition is provided as Table 3.

Table 3. Four rates to evaluate sampling

Object	Operational Definition
Active sample	Existing sample in the virtual sampling frame
Inactive sample	Non-existing sample in the virtual sampling frame
Updated sample	Updating the inactive sample by a screening procedure, if this procedure is employed
Final active samples	Original active samples + updated active samples
Total samples	= Original drawn samples from virtual sampling frame + updated samples
Active rate	= Final active samples / total samples
Accessed sample	Active sample was connected
Lost sample	Active sample was not connected
Accessed rate	= Accessed sample/ Active samples
Response sample	Sample answers the core questions
Refusal sample	Sample does not answer the core questions completely
Response rate	= Response sample / Active samples
Eligibility sample	Sample passed filtering items
Ineligibility sample	Sample does not pass filtering items
Eligibility rate	= Eligibility sample / Active samples

The four rates were expected to provide a broad scope and clear perspective to examine the sampling precision. The accessed rate was very useful to project the basic level for sampling precision while the active rate could also reflect the cost-efficiency of the research design.

3.4. Research Series Design

3.4.1. Sampling

The sampling frame is the Taiwan region including Taiwan Province, Taipei and Kaohsiung Metropolitan areas.

Sampling method: Systematic or simple random sampling from virtual directories drawn by information systems.

Household selection: Random selection procedure employed.

Expected errors: desired confidence limits and confidence interval based on the research budget and the optimum estimation of the author's[43] design.

This research series, based on the above methodological improvements, developed the following research designs, as Table 4, from 1996 to now.

Special design: No replacement allowed.

3.4.2. Measurement

The main questionnaire structure of the surveys was divided into 3 parts to measure different problems.

To identify if the respondent was an internet user.

Users: to measure their understanding about the internet and information application; to ask their using place, time, and their behavior on e-commerce including their favor, the resources, services, product categories, their purchase history and comments, and their email address.

Non-users: to measure if they knew anything about the internet and information application; to measure if they had related equipment and potential motivation to become users and why; to ask their reasons why they were not users yet.

Some question items and item values were modified every year with concerns of information technology development and market change.

Demographic data will be collected at the end of the interview.

3.4.3. Interviewing

Method: Telephone interviewing.

Verification procedure: 5% of complete interviews were repeatedly interviewed to verify and measure the reliability of interviewer.

Using the continuous call back method to access selected respondents who were always not home. (Wu[43])

4. SELECTED FINDINGS

4.1. Sampling Analysis

A major brief sampling analysis is given in Table 4.

A new random sample set was drawn from Taiwan regional wide every year from 1996 to 2001. For year 2002 to 2003, revisit skill was employed by panel samples redrawn from database of Taipei metropolitan area.

According to the accessed rate, it was gradually improved by experience and the annual control procedure. A rate of above 80% could be considered as convincing, while a rate of above 90% could be seen as very convincing. The series sampling precision was above average except for the survey of 1996.

Two additional procedures were employed to testify sampling precision. The first was to compare the gender distribution of sample and census data. The second was to compare the using time distribution of users' activities reported by respondents and the record of the server.

The gender distribution differences were all within and/or lower than expected errors of sampling design.

On the time distribution of internet usage, this study also found that was matched by the report of the Education Ministry.[12]

The multiple analyses could support the acceptance of this research series.

Table 4. Sampling analysis

	Original samples	Updated samples	Active samples	Active rate	Accessed sample	Accessed rate
2005	3000	4642	4421	57.9%	4390	99.7%
2004*	3103	0	2436	78.5%	2410	98.9%
2003*	2683	0	2308	86.0%	2142	92.8%
2002*	1600	0	1323	82.7%	1266	95.7%
2001	4000	2099	4000	65.6%	3606	90.2%
2000	3200	800	3225	80.6%	2896	89.8%
1999	1600	556	1600	74.2%	1434	89.6%
1998	2000	224	2000	89.9%	1668	83.4%
1997	3000	0	2766	92.2%	2261	81.7%
1996	1500	0	1202	80.1%	905	60.3%

*We employed a revisit design for 2002-2004. All the samples were from the former accessed samples of database. The inactive samples reflected the changing proportion of phone numbers. Furthermore, the analysis technique would be different and would be introduced in another way.

4.2. Proportion of Users

The growth of users and non-users was summarized as Table 5.

Since the sampling unit was the household, the researcher made further questions about how many other members in the household also used the internet and estimated the personal user numbers per home. The author also identified the Active users from the general users.

According to the general users' growth percentage of the population, it reached a halfway milestone (50.6%) in 2000. However, the numbers of general users appeared to retreat in 2001, as also happened in the USA.

It was a fast growth for the general user. In 1996, there were 13.5% respondents in metropolitan Taipei who had at least one chance to use internet. The estimation of Taiwan region wide could be around 10%.

The growth rate of the Active user, who owned an email account, had a relatively slower but steady progress. It followed the expected growth curve even in the recent years of the dot-com recession.

Table 5. Users and non-users (%)

	General Users		Active Users		Non-Users	
	Household	Personal	Household	Personal	Household	Personal
2005 Taipei	58.2	37.4	48.6	37.8	41.8	62.6
2004 Taipei	56.8	46.2	47.2	34.8	43.2	53.8
2003 Taipei	64.3	42.8	58.6	36.6	35.7	57.2
2002 Taipei	61.2	38.7	47.7	26.7	38.8	61.3
2001 Taipei	48.0	17.3	36.2	11.6	52.0	82.7
2000 Taipei	42.2	14.7	24.8	7.6	57.8	85.3
1999 Taipei	25.2	7.6	15.5	4.1	74.8	92.4
1998 Taipei	26.2	7.9	16.5	4.1	73.8	92.1
1997 Taipei	27.2	9.0	17.5	5.1	72.8	91.0
1996 Taipei	17.2	-	9.9	-	82.8	-

4.3. Users' Behavior

Internet users' profiles and their chronological changes could be sketched as Table 6:

Table 6 Internet users' profile (%)

	Gender		Age				Education			Income*		
	Male	Fem.	~15	16-30	31-50	51~	-Mid	High	Aca-	low	Ave.	High

2004	44.7	55.3	7.9	50.1	33.3	8.7	13.1	31.5	55.5			
2003	47.9	52.1	7.3	50.2	32.7	9.9	15.5	29.7	54.8			
2002	46.8	53.2	7.1	39.7	36.2	17.0	26.9	32.7	40.4			
2001	54.1	45.9	12.2	55.0	30.4	2.4	11.6	30.2	58.2	65.0	23.2	11.8
2000	49.5	50.5	9.5	44.4	36.6	9.6	21.7	33.7	44.7	45.4	40.4	14.3
1999	50.9	49.1	8.7	58.7	30.7	2.0	10.3	27.9	61.7	99.6	0.4	0
1998	51.6	48.4	2.9	52.7	40.7	3.7	7.0	35.5	57.5	37.7	36.8	25.5
1997	60.2	39.5	~	54.8	28.0	17.2	12.4	25.8	63.8	56.6	28.6	21.6
1996	68.1	31.9	~	55.7	25.6	11.6	2.3	6.6	91.1	38.3	21.3	40.4

*Income data was not revealed after 2002 because of large refusals.

Male internet users were more than female before 1997. After 1998 female users increased and got a natural balance.

More than half of the users were younger than 30. The middle-aged user group increased while the senior users group stayed small.

Use of the internet was correlated with higher education. Most users were educated in an academy or college or above. The number of users under middle school was the least. Users with high school diploma were increasing.

The annual income of users could be categorized into low (under US$7,000), average (US$7,000-17,500) and high (above US$17,500). The result needed a further explanation of why the percentage of the category of 'low income' was so high. The reason was that there were many student users without a stable income. Excluding students, the user's income was above average.

However, we found the missing data of income is constantly large, so this data was not included in the formal report after 2002 to avoid misleading inference.

Though the job fields of the users were various, their ranks seemed higher. The most popular job function was professional and technical, then administrative and managerial.

No significant difference of user behavior was found between users' gender, age and education.

Table 7. Places where the internet was accessed (%)

Place	Home	School	Office	Café etc.	Other
2004	69.5	8.0	18.9	3.5	
2003	74.88	5.34	17.46	1.73	
2002	69.72	7.25	18.76	4.26	
2001*	94.6	-	-	-	
2000	65.4	13.0	18.7	2.5	0.4
1999	65.9	11.9	20.4	0.6	1.2
1997	52.0	24.4	16.3	2.3	5.0
1996	36.0	26.0	32.0	-	6.0

*See explanation

Users would spend on average 3 days or more in a week to surf the internet.

The home, office, school all showed their changing importance of internet usage by their order. The percentage of schools was somehow stable as was expected. It also implied the internet's growing popularity in the household nowadays.

Except 2001, the respondents were asked to answer where he/she used the internet the most. In 2001, the focus was whether or not the user had experience of using the internet at home.

Table 8. Most important resource or service (%)

	WWW	Email	Messenger	FTP	AV	Games	News	BBS & Chat	P2P	Others
2004	33.9	22.9	8.0	1.8	1.6	10.1	10.7	4.1	0.4	6.5
2003	31.5	36.4	8.2	7.4	1.9	8.4	3.9	1.9		0.3
2002	30.4	36.2	4.9	5.9	1.6	8.3	7.4	4.4		0.7
2001	20.9	19.6	5.4	15.1	5.2	8.6	17.1	8.1		-
2000	58.6	26.2	-	2.7	-	-	2.8	8.7		1.0

1999	58.0	20.0	-	1.6	-	-	1.3	6.5	11.6
1997	47.3	21.4	-	2.7	-	-	1.8	17.9	9.0
1996	33.0	23.5	-	14.1	-	-	7.1	21.2	1.2

Table 9. Most important information (%)

	Business	Life	Sciences	Entertainment	Social	Culture & Arts	Government	Education	C&C	Medical care
2004	9.2	22.3	3.2	23.4	6.8	6.3	3.9	5.1	6.2	3.0
2003	8.5	26.5	1.8	28.7	3.3	3.3	6.5	5.7	10.6	3.6
2002	9.9	23.8	2.6	30.3	3.9	4.0	5.7	6.2	9.3	3.0
2001	11.3	11.7	2.5	22.0	1.6	1.7	8.6	6.1	7.0	1.8
2000	12.7	22.5	3.9	29.8	1.5	4.3	3.4	8.7	10.9	2.3
1999	13.1	19.1	2.1	30.5	1.5	3.6	5.8	8.0	10.8	1.8
1997	10.2	20.9	2.8	27.9	1.4	3.3	2.3	7.4	12.1	0.9
1996	17.4	19.7	2.33	26.7	4.7	4.6	2.2	5.8	15.2	1.1

WWW, with their advantages of multimedia performance, became the users' favorite resource. Since the fast growth of websites, the importance of search services and portal sites were getting hotter. Like their significance in the United States, communication, including email, BBS and other chat services, were major activities of the users. The chat function of BBS was more widely adopted than other popular chat applications. The reason is the common language in BBS is Chinese while other chat rooms, such as IRC, use English.

'Soft information' was the basic demand of the users. Browsing entertainment and life information motivated nearly half of the users' accessing in different time frames.

Business activity was still relatively slow to move onto the internet.

The dominant equipment for surfing on the internet was the PC. The most popular platform was Windows. Considering the browsers, Netscape is slightly more popular than I.E., while less than 10% of users were using both of them.

Table 10. Top 10 internet providers (%)

	HiNet	SeedNet	TANet	Ht.net/APOL	ADSL	ERANet	EBT	GCNet	Giga	FICNet
2000	55.6	10.4	7.3	1.2	0.6	0.6	0.6	0.4	0.4	0.3
1999	60.2	9.8	9.8	1.5	-	-	-	1.8	-	0.9
1997	46.8	10.1	21.1	-	-	-	-	-	-	-
1996	36.0	13.0	11.0	-	-	-	-	-	-	-

Table 11. Top 10 portals of default homepage

	Yahoo	Hinet	MSN	PCHome	Yam	Google	Sina	Giga	Office, School	None
2004	73.92	4.84	2.59	2.76	1.55	2.07	0.35	0.17	1.21	2.07
2003	68.72	7.20	3.67	3.67	2.94	2.06	0.88	0.73	3.23	2.79

It is very useful to examine uses' activity of surfing websites and describing the internet providers. However, the data of top 10 websites was limited to reveal from the beginning of this research series due to the concerns of business conflict in the industry.

The top 3 government funded providers: HiNet, Seednet, TaNet owned a major market share; the ex-monopolized telecommunication company HiNet took the largest proportion. However dozens of private ISPs were playing an aggressive as well as competitive role in the market to develop their holdings. It would also bring a fast acquisition and reorganization of small ISPs under such competition in the near future. Lots of users were using what they were given and they did not have any idea who the provider was.

After 2001, the rank of the ISP was not allowed to be published by the research sponsor anymore.

However, we developed another angle to look out this matter from 2003. We gathered the data which was

the portal of uses' default homepage of their browser, if they had one. The finding was also amazing.

Table 12.Barriers to the users

	None	Connect	Interrupt	Slow	Phone line	Operation	Privacy & Security	Virus	Porno	Spam	Content	Cost
2004	25.4	3.8	12.1	27.3	1.9	1.6	1.8	6.3	2.7	6.6	5.2	1.9
2003	17.3	4.7	9.8	26.9	1.3	0.8	3.3	9.8	3.7	14.6	4.6	2.3
2002	16.6	2.8	13.3	34.0	2.3	1.2	2.1	7.1	1.9	11.5	3.3	3.1
2001	18.5	10.9	20.5	55.0	1.2	1.0	0.3	3.1	0.6	2.9	2.1	0.6
2000	8.5	14.9	17.1	54.7	-	1.9	2.8	-	-	-	2.4	-
1999	10.6	14.5	11.7	50.2	-	1.9	2.2	-	-	-	-	-
1997	6.5	11.1	4.0	39.1	-	2.2	0.3	-	-	-	-	-

Concerning the barriers, bandwidth and related problems included: difficult to connect, interruptions during connection, and slow data transferring were the users' primary complains. Relatively few users became aware of privacy and security issues. An emerging and enlightening issue was that the users began to be dissatisfied to find proper information and content.

4.4. E-Commerce

How many users considered the internet was an alternative use for their normal life? The researcher pointed out 3 alternatives: media and political forum, learning classrooms, and shopping and e-commerce places. Their answers showed that e-commerce was just beginning.

CommerceNet/Nielson claimed 1999 was the beginning year of e-commerce in USA while there were barely 1 tenth internet users shopping online during the same year in Taiwan. The shoppers did not increase much until right now.

After 2002, we put one more indicator that the user would respond to online shops' promotion.

Table 13. Activities in e-commerce (%)

	Taxation	Stock	Shopping	Responding to promotion	willing to pay for Ads
2004	13.9	11.1	42.8	27.2	44.0
2003	4.1	3.0	10.5	8.8	6.1
2002	2.6	3.7	9.7	9.1	-
2001	-	-	17.0	-	-
2000	4.0	5.7	10.9	-	-
1999	-	-	9.9	-	-
1997	-	-	5.0	-	-

If we put the data of e-commerce activities into the same S-type innovation model, we would find that e-commerce was still slowly moving on the flat, long stage of awareness.

The average monthly purchase records were also relatively low.

Table 14. Purchase volume (US$)

	Average per month	Lower limit	Higher limit	Standard deviation
2004	99.3	1.5	2121	291.2
2003	67	1.3	2850	162
2002	108	3	2850	236
2001	90	1	1430	223
2000	96	3	580	
1999	64	9	370	

Of the purchased products, there were not many categories before 1999 while there were diverse choices after 2000.

Relatively stable and hot products were: computer hardware, software, books. Rising products were fashions, commodities, AV resources such as music CDs, and leisure. Since the market is still in fermenting period, the good sellers are expected to be varied.

There were 2 features of online bestsellers for now: low price and stable quality. Service oriented products were also promoted such as 'hours of internet use' (that was included in the item of software) and ticketing.

The items of goods and services were also adjusted by the buyers' responses annually.

Table 15. Purchased products-multiple choice (%)

	Books	H/W	S/W	Leisure	Job	AV	Toys	Furniture	Fashion	Flower	Cars	Adult	Ticket	Commodity	Cosmetic	Education	Gambling	Finance
2004	8.4	8.7	6.1	1.8	0.2	3.2	1	1.3	5.4	0.5	0.3		1	4.9	0.3	0.2	0.2	0.3
2003	2.5	2.0	1.9	0.4	0.2	0.7	0.2	0.0	0.6	0.2	0.0	0.0	0.8	1.1	0.5	0.0	0.0	0.2
2002	3.7	1.3	2.5	0.6	0.1	0.3	0.1	0.1	0.5	0.2	0.0	0.0	1.1	0.6	0.0	0.0	0.0	0.1
2001	5.8	2.8	3.6	1.5		1.5	0.1	0.3	0.3	0.2	0.0	0.0	2.5	0.5	1.6	0.1	0.2	1.7
2000	2.5	1.4	3.1	-		1.5	0.5	0.2	0.3	-	0.2	0.2	0.9	-	-	-	-	-
1999	2.4	0.5	-	-		2.6	-	0.3	-	-	-	-	-	-	-	-	-	-

Were there any concerns for experienced online consumers?

Relatively few people did not worry. The barriers to them were: the security of transaction, the leakage of personal privacy, the product quality, the method of payment, the after service and refund policy, the possibility of fraud, and the time for delivery.

On the other hand, the non-buyers' reasons were almost the same. Some did not know yet that they could shop online. However, there were a certain amount of users who just not used to e-commerce.

Table 16. Barriers to consumers-multiple choice (%)

	None	Quality	Security	Fraud	Price	Payment	Delivery	Services	Privacy
2004	11.7	16.3	15.2	19.5	3.8	6.7	3.5	5	15.2
2003	16.6	9.8	18.0	11.2	2.5	5.9	1.6	9.9	22.8
2002	13.3	10.5	24.1	8.9	5.5	6.5	4.8	3.2	0.0
2001	12.0	18.0	33.5	22.8	3.0	3.0	3.6	6.0	21.0
2000	14.4	13.8	21.6	2.9	-	12.1	2.4	7.3	22.3
1999	14.8	10.2	36.1	-	-	-	25.0	-	-

Table 17. Reasons why the users don't shop-multiple choice (%)

	Not aware	Quality	Security	Fraud	Payment	Price	Delivery	Services	Privacy	Not used to
2004	6.5	13.5	17.1	23.3	1.3	4.1	1.3	0.8	10.1	11.4
2003	3.6	11.9	20.7	11.4	6.5	5.6	1.8	2.2	17.5	18.0
2002	7.7	9.8	18.5	16.5	2.5	5.9	1.4	2.4	17.3	16.3
2001	3.3	24.4	19.2	22.2	1.6	6.2	2.5	1.1	7.0	33.8
2000	3.9	12.9	17.5	12.0	6.9	-	2.1	3.2	17.3	24.2
1999	11.5	47.2	-	-	-	-	-	-	-	17.9

The promising aspect was there were 14.9% of non-buyers who would consider trying e-commerce in the coming 6 months in 2003 and grew enormously to 43.2 in 2004.

For possible future buyers, they provided their shopping list. Most categories were the same as the existing products. However, in 2000, they suggested 2 new potential items: the first is leisure and travel packages, and the second is cosmetics and non-prescript medicines. It ended up to become popular online goods after 2001 and realized the users' expectation.

The average and range they would like to pay for the online shopping coincidentally remained the same as for existing buyers.

Table 18. Potential buyers

	Percentage of non-buyer
2004	43.2
2003	14.9

Table 19. Potential products-multiple choice (%)

	Books	H/W	S/W	Leisure	AV	Toys	Furniture	Fashion	Flower	Cars	Adult	Ticket	Commodity	Cosmetic	Education	Gambling	Finance
2004	7.9	7.6	5	2	0.3	1.7	0.5	0.8	4.4	0.2	0.3	0.2	0.8	2.5	0.2	0.2	
2003	17.8	17.5	12.8	3.6	4.1	8.5	0.8	1.1	1.1	0.8	0.0	0.0	7.4	10.1	2.5	0.5	0.0
2002	21.8	13.3	18.1	11.8	1.9	7.1	1.9	0.7	3.1	0.7	0.0	0.0	3.7	6.7	1.7	0.0	0.0
2001	2.4	1.0	0.9	0.4	0.2	0.8	0.1	0.2	0.5	0.2	0	0.3	0.6	0	0	0.1	0
2000	7.2	4.0	4.5	0.2	-	4.1	0.5	0.6	1.0	0.5	0.2	2.3	-	0.6	1.8	-	6.0

Table 20. Acceptable subscribing price (US$)

	Average per month	Lower limit	Higher limit	Standard deviation
2004	196.6	0	3333	436.1
2003	17	0	94	11
2002	16	0	31	11
2001	16	3	26	5
2000	17	6	19	

Would the potential buyers pay for subscribing to information?

They would agree to subscribe to financial analyses, entertainment features, and computer-related information. The acceptable monthly fee was around US$16.

There was also 16.1% of users who agreed to post internet advertisement if it was necessary.

The longitudinal data suggested the reality of current ‘e-commerce’ is ‘communication more than commerce’. Most users considered the internet more important as a media channel than as a purchase place. Goods in the B-to-C market are still limited by the price. Four strategies were examined including: market scale and trends, sales volume and trends, best sellers and potential products, and barriers to e-commerce.

All the findings showed it would take a very careful policy to run e-commerce in the near future in Taiwan.

4.5. Non-users Behavior

Non-users were asked to report if they had ever heard of the internet, and how much they knew about the internet on a scale of 1 to 100. The mean score was 28.8 in 1997, 20.0 in 1998, 31.2 in 1999, and 17.6 in 2000, 17.5 in 2001, 25.56 in 2002 then it kept of 24.65 in 2003, 26.2 in 2004. Those who reported their knowledge below the mean score would be categorized as not having understood.

Table 21. Non-users knowledge about internet(%)

	Non-Users	Never heard	Heard, not understood	Understood, not using	Average Score
2005 Taipei	62.6	42.1	0.7	19.8	13.1
2004 Taipei	53.8	19.2	7.0	27.6	26.20
2003 Taipei	57.2	14.9	19.8	22.5	24.65
2002 Taipei	61.3	14.3	20.0	27.0	25.56
2001 Taipei	82.7	45.2	2.2	35.3	17.5
2000 Taipei	85.3	29.0	32.1	24.2	17.6
1999 Taipei	92.4	25.0	45.8	21.6	31.2
1998 Taipei	54.1	10.8	16.0	27.3	20.0

1997 Taipei	75.4	23.8	39.0	37.2	28.8
1996 Taipei	82.8	25.3	36.9	20.6	

The respondents in Taipei had more knowledge about the internet in each category than people in Taiwan region-wide. It was worth noting that there was always a considerable part of the population who had never heard of the ‘internet.'

Table 22. Reasons of not being on the internet yet (%)

	Lack of knowledge	Shortage of facilities	No need or not interested	Fear of computer, or language concerns	Too busy to use	Cost concern	With replacement
2004	13.1	21.5	46.8	3.8	19.8	0.8	0.4
2003	5.6	19.6	35.8	9.1	19.2	6.5	1.8
2002	10.1	35.5	35.6	6.6	19.7	5.5	4.8
2001	3.6	39.5	26.4	4.1	20.8	5.6	3.8
2000	13.8	22.2	32.9	8.1	18.3	4.7	-
1999	18.5	10.0	33.9	7.1	4.9	20.5	-
1998	19.2	60.7	7.8	1.4	2.3	6.8	-
1997	22.3	33.5	24.4	1.7	8.9	3.0	-
1996	36.1	27.9	-	8.1	-	9.3	-

Shortage of facilities, lack of knowledge and no need or not interested were the biggest obstacles for potential users. The data also implied that the internet is not in ordinary life in Taiwan yet. Anyway, it would promise a lot of attraction to the potential users in the future, if the facilities were more available.

The demographic analysis of non-users was almost opposite to that of the users. A summarized profile was as follows.

In 1997, female users were more than male. It has now reached a balance.

Comparing usage, senior persons were relatively more than young people for non-users.

Most of the non-users’ education background was under high school level. Almost half were under primary school level.

The job fields of non-users were also various except that about one third were housekeepers.

The income of non-users was lower than average, though the trend was gradually changing. It indicated again that the social economic status was highly related to the motivation to access the internet in the entry stage of innovation.

Table 23. Non-users’ profile (%)

	Gender		Age				Education			Income		
	Male	Fem.	~15	16-30	31-50	51~	-Mid	High	Aca-	low	Ave.	High
2003	44.07	55.93	6.90	14.83	45.17	33.10	46.21	33.79	20.00			
2002	40.26	59.74	3.9	22.3	40.1	33.7	46.02	36.33	17.65			
2001	50.5	49.5	6.4	21.5	43.6	28.4	51.0	31.7	17.3	38.8	52.4	8.8
2000	44.1	55.9	7.2	22.9	40.3	29.7	55.7	33.3	11.0	59.6	32.1	8.3
1999	55.0	45.0	7.8	24.0	49.3	19.0	41.5	35.3	23.3	98.0	1.7	0.3
1998	45.7	54.3	3.4	23.7	50.4	22.5	43.6	37.9	18.5	52.1	31.9	16.0
1997	46.2	53.8	6.0	21.5	34.0	38.5	47.9	34.2	17.9	65.0	26.1	8.9

5. CONCLUSION AND SUGGESTION

5.1. Cybercitizens and the Small Village

The features of the internet users in Taiwan look very similar to those of the users in the USA. The world 'cybercitizen' is a real thing rather than a concept.

Gender: Male user and female user were getting closer.

Age: The young generation was playing the leading role.

Education: The higher educated person had the higher possibility of being a user. Students of college and academies were one of the major groups on the internet.

Income: There was an interesting dichotomy that the internet users' income was either above average or not stable. More than one fifth of the users had a good income while student users had no regular wage. An explanation is that students were using the free academic network.

The moving of see-saw was services with command interfaces fell when the WWW and multimedia rose. Web based services had dominated the most popular internet applications.

The hottest information that the users were looking for was entertainment and life. The users need the internet when they want to sit back. Communication was the most important service for the users. The internet was a confident and comfortable conduit to get in touch with others.

The users' behavior in Taiwan was similar to that of the users in the States. It implied that the internet community shared similar interests without international differences. The cybercitizens were staying in a small village together.

5.2. A New Look at Digital Divide

5.2.1. 2*3 User Structure

Most current researches on digital divide focused the causes on demographic variables.[17][18] However, this study provided another point of view. The digital divide might also cleaved by a latent user structure that was determined by users' recognition of internet.

This research series found a '2*3 user structure.

The whole population could be split into two groups: users and non-users.

For the users, there were two segments: general users and Active users.

For non-users, there were 'laggards', who reported they had never heard of the internet, and 'transformers'. A transformer could be categorized into 'heard, but not understood' and 'understood, but not using'. There were a total of three segments.

The 'digital divide' between 'users' and 'transformers' was flexible. A transformer could become a user in the near future. However, the gap between 'users' and 'laggards' could be very sever and very difficult to pass through.

The number of Active users kept on increasing, the transformers were moving towards being users, but the size of the laggards remained the same, around 35%, during the last few years. The laggards were not categorized by any visible demographic variables; it was decided by psychological and cognitive factors. The laggards declared they had never heard of the' internet' even under the bombardment of the media's promotion. An explanation might be 'recognition dissonance' that implied the media failed to leave any trace on their audience's memory.

They have an unconsciousness to resist innovation. The polarized development of the user structure indicated the true problem of the digital divide. It also reminded us about Masuda's warning[27] about the new problems of the information society.

5.2.2. A Mirage and an Oasis

The internet has been becoming a very hot issue in Taiwan since 1995. All major newspapers have a special page, or pages, everyday and a special stack of internet events in their Sunday edition. Every TV network is used to presenting the internet coverage from time to time. This research result reflected an asymmetrical phenomenon that was out of proportion to the user percentage.

Active users were around one third of the total population. The number indicated that the internet users were still a relative minority in Taiwan.

The hot flame of the internet did not seem parallel to the relatively cool access of use. The internet was still not so easy for people with a lower social and economic status to surf. It was probably still a forbidden palace for the elite, and a somehow distant mirage for the public on the bottom of the pyramid.

On the other hand, there were lots of potential users who wished to surf the net. We could expect that there is an oasis in the near future.

The critical problems for non-users were a shortage of facilities and a lack of knowledge. They would make it to the oasis, if they knew the direction, and had a camel.

5.3. E-Commerce Strategies

5.3.1. Market Scale

The users in Taiwan did not recognize the internet as a regular shopping place yet, while CommerceNet informally announced that e-commerce was already entering ordinary life in the USA.

Less than 20% of users had tried online shopping. The emptying as well as the potential of the market was still large.

A good strategy for current marketing was to promote business to business market and provide unique goods or services.

5.3.2. Purchase Volume

The user percentage in Taiwan was relatively closer to the Cyber Dialogue and Find/SVP‘s findings. Though it might imply a cross-cultural behavioral pattern in the same time frame, its meaning was not the same because the United States’ market size was much larger than Taiwan‘s. The same number did not produce the same values. The internet commerce is still fermenting in Taiwan. Furthermore, we would like to remember Cyber Dialogue’s warning: do not inflate the internet activities.

The reasonable pricing policy should be under US$100. The upper limit would be US$800.

5.3.3. Purchase Products

Computer related goods and services had the advantage of attracting the users’ attention. Low priced products such as books, leisure commodities, music CDs, tickets, toys, fashions were easier to sell via the internet. Adult accessories were another best seller because of the concern of privacy.

Potential customers anticipated two promising products: cosmetics and travel package.

5.3.4. Barriers to e-Commerce

Most online shoppers remained cautious. Before 2000, they worried about the security of transaction, the time for delivery and the exaggerated advertisement. Now, their prior concerns were on the leakage of personal privacy, the product quality, the method of payment, the after services and refund policy.

For the internet users who did not shop online, their reasons were almost the same except that they considered fraud was a more serious problem. An interesting fact was that nearly a quarter of the users did not have any concern; they were just not used to e-commerce.

We could hear the longing bell rhyme shows the camel is heading straight; and we could feel a fresh breeze coming through. It is not too far away to meet the oasis behind the mirage of e-commerce.

We could be optimistic, and should be discreet.

5.4. Future Development

There are four emergent issues, which we have learned from this research series, for future studies.

5.4.1. Comparative Analysis in Cross-Cultural Context

We have found there are a lot of similarities of demographic variables between the users in Taiwan and users in the USA. Those features are also closed to the reports from other countries or areas in the world and profile the concept of cybercitizen. However, threw were little effort on the comparative analysis in

cross-cultural context.

5.4.2. International Cooperation on Standards in Methodology

Though the users' demographic data reached a convergent result by different studies, the discrepancy of users' behavioral analysis remains. Evidences showed there exists huge gaps between different researches even they were conducted in the same area, same time. The reason is the measurement of behavioral variables is much difficult than the collection of demographic data.

There were some organizations, such ISO, suggested some standards for survey. Most of the articles considered the administrative standards instead of research standards. There are none common opinion on some crucial techniques such as identifying users' level, estimating the cumulative user numbers…etc. Ever more, some popular techniques are eventually suspicious such as weighting, sample replacement…etc.

It is impossible to influence all the worldwide surveyors to follow same methodology standards at once. A feasible and reasonable approach is to solicit a joint international survey that will be conducted by the same methodology standards in two areas. This comparative data of the cooperation is expected to solve some ever lasting debates in methodology.

5.4.3. Knowledge Management Systems for Methodology Standards

A good idea is the survey process could automatically proceed under correct methodology standards. This idea had been brought and developed the CATI two decades ago. (Groves et al.[15], Shangraw[38], Shanks[39]). Unfortunately, most current CATI were limited to a word processor based system of questionnaires editing tools with an online interviewing function. Some of CATI even were bundled wrong solutions such as quota sampling, wrong sample error estimation…etc. It is easier to have a machine that can produce trash numbers while investigating scientific data is another thing.

To develop new survey tools, to construct a better survey setting, especially on the internet platform, and to manage all the survey knowledge into an intuitive research environment are the concerns of the author and the new requirements of the Survey Knowledge Management Systems (SKMS) as well.

The SKMS should consist of 4 systems: a Sampling Management System, a Measuring/Questionnaires Design Support System, a Group Interviewing Management System, and a Data Analysis/Decision Support System.

5.4.4. Parameters Base for E-Commerce Strategy

The strategy making process depends on behavioral analysis rather than demographic analysis. The standards in methodology are the preliminary proposition for a scientific decision.

'Can the survey be considered scientific research?' is a frequently asked question as researchers rely heavily on survey data to plan e-commerce marketing strategies, reform organization e-policies, and to make a lot of decisions concerning human behavior. The demand shows the importance of survey logic; the criticism indicates the proven records of poor data quality that have been drawn by unreliable data gathering tools. The solution requires comprehensive, interdisciplinary, sometimes fermenting parameters for analyzing the data.

Thus the SKMS should support Changing Parameters Base Management that is able to maintain an integrated model base and provide better parameters for strategy making.

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