Modelling predictors of adolescents' attitude towards a cyber lives index

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ABSTRACT

The Internet usage is convenient, borderless, and unrestricted by time limits. However, this convenience can also lead to Internet addiction, especially for teenagers who do almost everything on the Internet, such as playing online games, searching for information, making friends, and staying in contact with friends and family. The current study develops a comprehensive model and instrument for measuring Taiwanese high school students' individual cyber lives. Data on multiple variables (online gaming, cyber friendships, Knowledge growth, family life, and peer relationships) are compiled based on previous research and used to establish a cyber lives scale. The instrument in this study, consisting of 22 items across five factors, is a reliable, valid, and useful measure for assessing adolescent cyber lives. In total, 2113 usable responses are obtained from 1162 males and 951 females aged 16-19. Drawing on some of the key factors that influence adolescent cyber lives, this paper offers a new perspective on this multifaceted topic.

Keywords: Internet leisure activity; Internet use; Internet addiction; Scale development; Cyber lives; Taiwanese adolescents.

INTRODUCTION

The Internet is an important communication channel in terms of both work and leisure activities. According to a recent International Telecommunication Union (ITU) report, the number of Internet users worldwide doubled over the past five years. The number of people worldwide that access the Internet from home has increased from 1.4 billion in 2009 to almost 1.6 billion in 2010, and was expected to surpass the 2 billion mark during 2010 (ITU 2010). According to Foreseeing Innovative New Digiservices (2012), the number of regular Internet users in Taiwan increased from 10.97 million in 2012. As such, the Internet impacts users' communication ability, working style, and lives in significant ways.

The Internet has also become an important source of global media (Kim, LaRose and Peng 2009; Amichai-Hamburger and Hayat 2011), especially in terms of its interactive ability. In existing Internet research studies, researchers often assume that the Internet negatively influences users' daily lives, school grades, and parental relationships (Tsai and Lin 2003). Valkenburg and Peter (2009) point out that the early years of the Internet, conducted among adolescents and adults, demonstrated that the effect of Internet use was positive. Parents encourage their children to access the Internet, especially for educational purposes. Most parents trust the Internet and do not consider it as dangerous. As such, the Internet also can be viewed positively.

Further, the Internet is convenient, borderless, and unrestricted by time or usage limits. Some researchers (Appel 2012; Trepte, Reinecke and Juechems 2012) pointed out that online gaming on the Internet has become an extremely popular leisure activity. Bryce and Rutter (2003) noted that due to the increasing number of computer game platforms and genres, online games have become a popular form of mass entertainment, especially for teenagers, who consider computer games as leisure activities. The online game context helps teenagers shape their personalities; furthermore, they gain peer recognition and become more confident.

However, McMillan and Morrison (2006) pointed out that teenagers have a growing tendency of Internet addiction, and that people with Internet addiction may have trouble fitting into life. The negative impacts of teenager Internet addiction can result in problems such as poor time management, low quality family time, poor interpersonal relationships, financial issues, and low grades at school (Tsai and Lin 2003; Young 2004). Additional studies (Ng and Wiemer-Hastings 2005; Kim, LaRose and Peng 2009) reported that online game addiction could result in isolated interpersonal relationships and psychological symptoms including anxiety, shyness and loneliness.

The main purpose of the current study is to develop a comprehensive model to measure Taiwanese high school students' individual cyber lives. Using variables (online gaming, cyber friendships, Knowledge growth, family life, peer relationships) from previous research (McMillan and Morrison 2006; Galacz and Smahel 2007; Livingston and Helsper 2007; Perdue et al. 2009; Shortland 2010; Boyle, Connolly and Hainey 2011; Holtz and Appel 2011; Appel 2012) the first objective of this study is to construct an Adolescent Attitudes Towards Cyber living Index (AATCI). The intent of this study is to find a model that best predicts adolescents attitude based on rating of AATCI on the basis for understanding adolescent online attitude or about cyber lives. The second objective of this study is to use the AATCI to analyse gender differences within individual's cyber behavior.

LITERATURE REVIEW

Internet Addiction

Advances in Internet technology have resulted in an unprecedented level of accessibility to information, services, communication, and leisure activities. The Internet influences people in terms of their lifestyles, health, education, and interpersonal relationships. Tsitsika et al. (2009) noted that compared to adolescents who lack computer access at home, adolescents who have home computers spend most of their time on the computer, and spend less time studying, exercising or participating in outdoor activities. Theorists have struggled to clearly define the phenomena of problematic computer and Internet use, although the most accepted conceptualization of is that of Internet addiction, which can affect one's personal health, school grades, interpersonal relationships and job performance (Tsai and Lin 2003; Kim, LaRose and Peng 2009; Amichai-Hamburger and Hayat 2011). Internet addiction consumes the time and energy of the addict, destroying interpersonal relationships and limiting the academic, vocational, and social potential of those afflicted (Ko et al. 2007; Wei 2007).

Online Games, Peer Relationships and Cyber Friendships

Online games require synchronous communication and provide a variety of tools for building and maintaining relationships with others. Yee (2006) reported that online game players exhibit better manners when they play games than in real life; the friends they met in games are often closer than those they know in real life; therefore, interpersonal relationships in online games can be more important than those in real life. That said, a great percentage of online game players also play with their real life friends (Cole and Griffiths 2007). Further, according to the gender gap in Information and Communications Technology (ICT), sex role stereotypes and parental encouragement are the main reasons

why boys play computer games earlier than girls (Boyle, Connolly and Hainey 2011; Holtz and Appel 2011; Appel 2012). In addition, cutting-edge technology is most often associated with male-oriented computer games, which leads to early socialization and greater familiarity with computer games (Tsitsika et al. 2009; Hedman et al. 2010). That said, several fantasy-based computer games have been recently developed to encourage girls to access this form of technology.

Researchers construct and test multifaceted theories pertaining to peer relationships and cyber friendships; and often turn to educational psychological and developmental psychological theories regarding social relations (Perdue et al. 2009; Shortland 2010). While these types of theories do not suit our research purpose, they do provide a foundation for peer relationship research. Several theories claim that peer relationships have a significant impact on psychological development pertaining to cognitive-developmental perspectives, symbolic interaction perspectives, and social cognitive theory. However, as the foci of these theories are unrelated to the topic of social relations, we therefore do not discuss them. The virtual world in the Internet is not unreal, because online relationships still involve real life – friends met online can be contacted in real life. However, Tyler (2002) argued that the Internet is not able to change the nature of interpersonal interactions, but rather an extension of the real world. This statement shows that cyber relationships and interpersonal development are similar and overlap to some degree. Yet compared with real life friendships, cyber relationships are often weaker and more uncertain: when you go offline, the relationship disappears to a large extent.

Family Life, Individual Mental and Knowledge Growth

Family is a key factor that affects the teenager Internet experience. Usually, parents are the ones who introduce computers and the Internet to the family; however, older sisters and brothers are most likely to help teenagers access the Internet (McMillan and Morrison 2006). Heim et al. (2007) pointed out that since teenagers with excessive Internet use spend too much time on their computers, they spend little time with friends in real life, which leads to a decreased possibility of close relationship in real life. Similarly, Internet addicted teenagers have decreased loyalty to their friends. However, Galacz and Smahel (2007) noted that the Internet can help improve one's interaction with family and friends, since online interaction is useful for users that are separated by great distances.

Nowadays, students integrate Internet and Web technology into all aspects of their life for multiple purposes, particularly gain new information, learning (e.g. doing homework, distance education), increase knowledge, communicate and socializing (Na and Chia 2008; Yılmaz and Orhan 2010). Adolescent, especially senior high and university student, are

found to be one of the most active users in the search and help them with their school work on the Internet (Yılmaz and Orhan 2010; Simsim 2011). Overall, the Internet use of the students for educational purposes will also enable students to develop the skills for critical thinking and knowledge gain. When knowledge is changing, students will need information literacy skills in order to comprehend, reach and make use of knowledge in their disciplines of study. Information literacy is a necessary skill for individuals to recognise and important for enhancing success of learners as well (Çakmak 2010). In consequence, information literacy has been seen as associated with learning.

METHODS

Instrument

Items for this study were drawn from the literature as well as interviews with empirical researchers concerned with website visit results. A self-administered, closed-ended questionnaire with ordered choices was used to survey a sample of Taiwanese senior high school students. The questionnaire comprised 34 questions divided into three major sections:

a) demographic profile of adolescents,
b) general information regarding their Internet use behavior, and
c) evaluation of their attitudes toward Internet use.

Participants were asked to rate 27 attributes on a 4-point scale (ranging from strongly disagree to strongly agree). Attribute selection was based on previous research (McMillan and Morrison 2006; Galacz and Smahel 2007; Livingston and Helsper 2007; Perdue et al. 2009; Shortland 2010; Boyle, Connolly and Hainey 2011; Holtz and Appel 2011; Appel 2012) and then modified to address the uniqueness of Taiwanese adolescents and their cyber lives.

Item reduction and refinement were based on a pre-test sample of 30 senior high school students, all of whom used the Internet at least once a week. Based on participant feedback, five items were eliminated due to substantive semantic overlap with other items. The results of the pilot test provided valuable information on the questionnaire design, wording, and measurement scales.

A pilot test was later conducted with 159 senior high school students in Yunlin city, Taiwan to evaluate the revised questionnaire for readability. The results show that the Cronbach's alpha coefficients for all 22 attributes range from 0.918 to 0.923 and were all above the

minimum value of 0.6 that is considered acceptable as an indication of reliability (Hair et al. 2010). Subjects who had participated in the pilot test were excluded from the subsequent study.

The Survey Method

The data for this study were collected using a survey questionnaire in Taiwan from March 1 to June 30, 2010. In total, 2,500 students participated in the study. Following three reminders, a total of 2,153 students completed the questionnaire, achieving an 86.12% response rate. After scrutinizing for missed responses and eliminating questionnaires that did not meet the researchers' specifications, 2,113 respondents were designated as analysis subjects. Table 1 summarises the gender profiles of the respondents.

Table 1: Respondents' Gender Profiles

Demographics	Level	N	Percentage
Gender	Male	1162	55.0
	Female	951	45.0

The descriptive scale and instrument statistics are shown in Table 5. A visual inspection of Table 5 reveals little evidence of major problems with students' cyber activities, with most questions being answered near the midpoint of the four-point scale, other than "I get along better with virtual world friends", which had the lowest score (mean=1.83).

The Model that Best Fit Adolescents Attitude towards Cyber Living Index

Confirmatory factor analysis (CFA) is a hypothesis testing procedure in the classical sense. Given the consideration of psychometric soundness, CFA was performed to assess the measurement properties of the survey instrument. The researcher hypothesized the model on a priori basis and then tested the goodness-of-fit of the model on a particular set of data. The hypothesized models were presented from a variety of perspectives (see Figure 1):

Model A hypothesizes that the five first-order factors are correlated with each other. The model responses to the research can be explained by five factors, which may be correlated, as well as measurement error terms that are uncorrelated.

Model B hypothesizes five first-order factors and a single second-order factor (Cyber Lives). This instrument development effort involves exploratory factor analysis, which does not reveal the statistical evidence for second-order constructs.
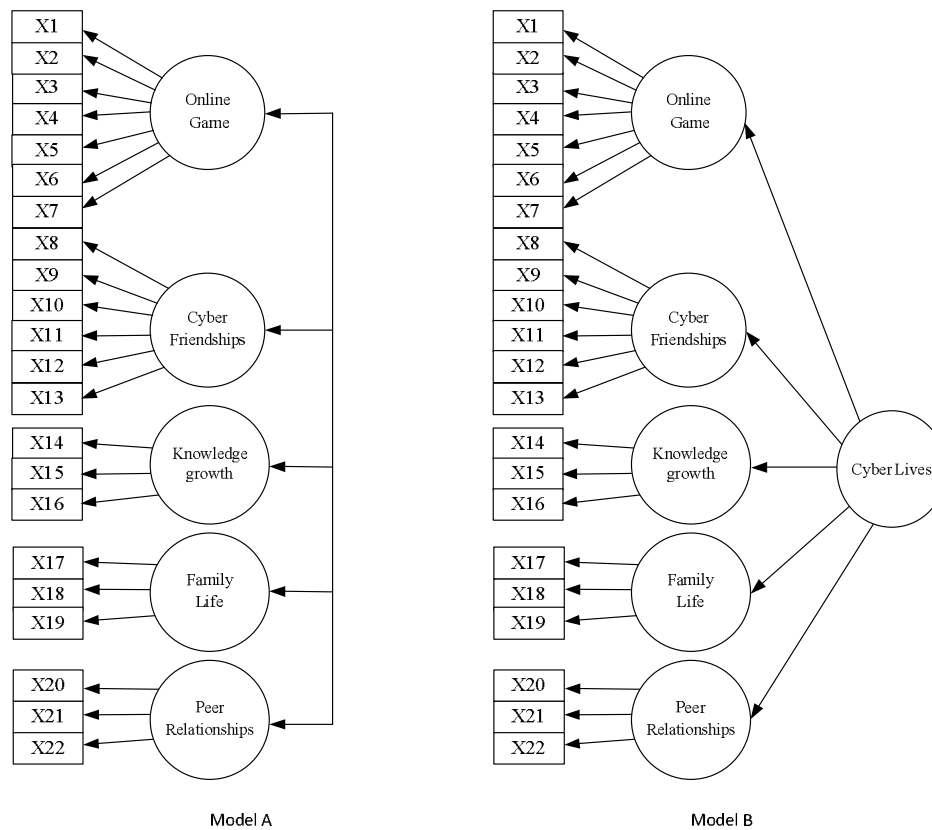
Figure 1: Adolescent Attitude towards a Cyber living Index

VALIDATION OF MEASUREMENT MODEL

Internal consistency

Internal consistency reliability was assessed using Cronbach's alpha coefficients and composite reliabilities. The results presented in Table 2 attest to the high internal consistency of the instrument in that all values are above the suggested 0.6 level for scale robustness (Hair et al. 2010). Further, composite reliability means that a set of latent construct indicators are consistent in their measurement. Fornell and Larcker (1981) suggest that values exceeding 0.60 can be considered adequate. The results presented in Table 2 offer consistent support for the psychometric soundness of the measures.

Convergent and Discriminant Validity

The test of construct validity is important to stabilize the measure dimensionality while conducting measure development (DeVellis 2003). Convergent and discriminant validity were evaluated by calculating the average variance extracted (AVE) for each factor within each model. Convergent validity is established if the shared variance accounts for 0.50 or

more of the total variance. The results presented in Table 2 show that all of the convergent validity figures exceeded this criteria, except for three variables (knowledge growth, family life, peer relationships). As such, the results in Table 2 confirm both the convergent and discriminant validity of the research model.

Table 2: Validity and Reliability

	Online Games	Cyber Friendships	Knowledge growth	Family Life	Peers Relationships
Average Variance Extracted	0.53	0.56	0.44	0.41	0.34
Composite Reliability	0.89	0.88	0.69	0.67	0.60
Alpha Coefficient	0.89	0.88	0.69	0.67	0.60

AVE=average variance extracted = $\Sigma$of standard loading^2/$\Sigma$of standard loading^2+$\Sigma$of ε

In this investigation, we carried out a discriminant validity test. Hatcher (1994) suggested using CFA to do paired comparisons with all variables, and to conduct constrained and non-constrained nested model comparisons to evaluate the significance of the chi-square variables. When the result is significant, discriminant validity exists. All study variables were grouped into 10 pairs, and the delta chi-square of all groups showed significance ($p<=0.01$). In addition, the non-constrained comparisons showed better data fitness, which suggests that the research variables have adequate discriminant validity test (Bagozzi and Phillips 1982). All variables included in the discriminant validity test are listed in Table 3.

Table 3: All Variables Accessed by Discriminant Validity Test

	Paired Variable	Constrained model		Non-constrained model		Delta chi-square
		Chi-Square	df	Chi-Square	df	
Online Games	Cyber Friendships	5529.59	65	914.20	64	4615.39
	Knowledge growth	1045.54	35	418.92	34	626.62
	Family Life	1036.25	35	319.39	34	716.86
	Peer Relationships	651.81	35	358.35	34	293.46
Cyber Friendships	Knowledge growth	723.21	27	421.93	26	301.28
	Family Life	986.18	27	573.16	26	413.02
	Peer Relationships	587.56	27	485.82	26	101.74
Knowledge growth	Family Life	561.33	9	54.07	8	507.26
	Peer Relationships	251.71	9	97.94	8	153.77
Family Life	Peer Relationships	81.48	9	74.64	8	6.84

RESULTS

The Model that Best Fit the AATC Index

Before conducting the CFA, the data was examined for normality – a condition necessary for CFA (Anderson and Gerbing 1988). The goodness-of-fit indexes for the alternative models and hypothesizes model are summarised in Table 4. Model A has a substantially better fit related to the Model B for indexes of goodness-of-fit (0.06).

Model A (five factor correlated first-order model) scores for all indicators of goodness-of-fit do not differ significantly from the Model B scores. Model B hypothesizes five correlated first-order factors and one second-order construct. The ratio of chi-square to degrees of freedom and other goodness-of-fit indicators suggests a reasonable fit, but the Adjusted Goodness-of-Fix Index (AGFI) is below the required score of 0.9 and as such is not a "well-fitting" model. This suggests that Models A and B are satisfactory competing representations of the underlying structure of the instrument. As Model B has the additional advantage of providing estimates of the validity and reliability of the latent factors. The researchers recommend Model B and proceed with the analysis of the validity and reliability of factors and items based on this second-order model.

Table 4: Goodness-of-fit Measures for the Structural Model

Model	χ^2 (df)	GFI	AGFI	CFI	RMSEA
5 First-order Factors (Correlated) (model A)	1848.42(199)	0.92	0.90	0.98	0.06
5 First-order Factors and 1 Second-order Factor (model B)	2126.13(204)	0.91	0.89	0.97	0.07
Suggested Cutoff Value	Statistical Test of Significance	≥ 0.9	≥ 0.8	≥ 0.9	≤ 0.08

Notes: GFI = Goodness-of-Fix Index

AGFI = Adjusted Goodness-of-Fix Index

CFI = Comparative Fit Index

RMSEA = Root Mean Square Error of Approximation

d.f. = Degrees of Freedom

Table 5: Second-order Confirmatory Factor Analysis for Research Model (n = 2113)

Item	Mean	Factor loading	R-square	Indicators	Structural equation coefficients	t_value
X1: Forget unhappy things	2.85	0.73**	0.53			
X2: makes me happy	2.93	0.80**	0.64			
X3: makes me concentrate	2.60	0.73**	0.53			
X4: lower loneliness	2.63	0.73**	0.53	Online games	0.69**	25.82
X5: increasing topics with friends	2.81	0.71**	0.50			
X6: sense of accomplishment after the game	2.82	0.70**	0.49			
X7: sense of adventure in a virtual world	2.87	0.71**	0.50			
X8: share commonality with net pals	2.26	0.72**	0.52			
X9: improve interpersonal relationships	2.67	0.73**	0.53			
X10: I think the Internet is more interesting	2.69	0.72**	0.52	Cyber friendships	0.89**	31.48
X11: feel comfortable	2.56	0.79**	0.62			
X12: reduce parental stress	2.50	0.72**	0.52			
X13: provide more fun in life	2.67	0.79**	0.62			
X14: better understand my strengths	2.53	0.70**	0.49			
X15: improve knowledge quality	2.78	0.74**	0.55	Knowledge growth	0.80**	25.84
X16: improve lateral thinking	3.05	0.52**	0.27			
X17: prefer surfing the Internet at home	2.25	0.60**	0.36			
X18: virtual world people know more about me	2.14	0.70**	0.49	Family Life	0.88**	23.77
X19: I spend more times on the Internet	2.28	0.61**	0.37			
X20: improve communication skills	2.68	0.55**	0.30			
X21: get along better with virtual world people	1.83	0.55**	0.30	Peer Relationships	0.97**	23.73
X22: more active and willing to help people on the net	2.44	0.64**	0.41			

*:*p*<0.05, **:*p*<0.01

Confirmatory Factor Analysis Validity

Using CFA, the LISREL's maximum likelihood estimates of Model B's standardised parameter estimates are presented in Table 5. For the observed variables, Table 5 presents factor loadings, their corresponding t values, R-square values, path coefficients, and structural equation fit values. With t values above 1.96 being considered significant, factor loadings can be interpreted as indicators of validity for the 22 items.

All 22 items exhibit significant factor loadings (t values above 18.63) on their corresponding

factors. Only six items (X16, X17, X19, X20, X21 and X22) failed to exceed the 0.70 factor loading criteria. All item R-square values ranged from 0.27 to 0.64. Also, 16 items showed acceptable reliability (above 0.49 R-square), while six were slightly below the accepted level.

Assessment of the Structural Equation Model

In the second-order CFA for cyber lives, the second order latent variable is added to complete the measurement model. As illustrated in Figure 2, the path between the factors (online games, cyber friendships, knowledge growth, family life, peer relationships) and cyber lives are positive and of high magnitude.
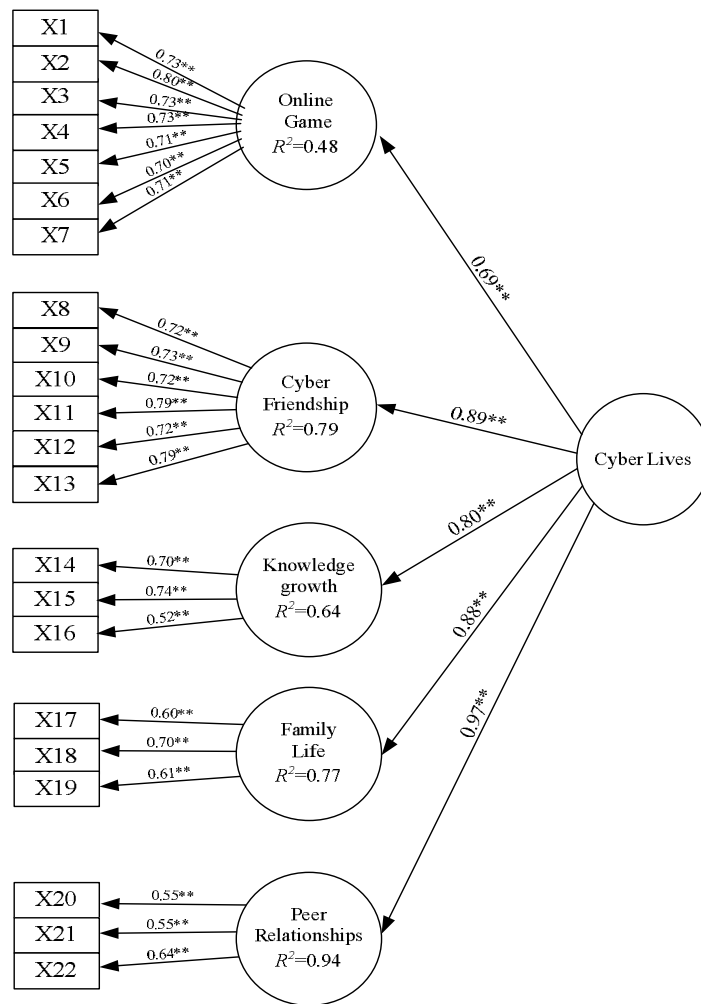

Figure 2: Second-order Confirmatory Factor Analysis

In this study, the standardised path coefficients between cyber lives and its underlying first-order latent variables were 0.69 for online games, 0.89 for cyber friendships, 0.80 for

knowledge growth , 0.88 for family life, and 0.97 for peer relationships, respectively. Further, the results shown in Figure 2 indicate that for the second-order latent variable represented by user cyber lives, the standardised path coefficients at least 0.69 of the first-order latent variables. Squared multiple correlation (R-square) indicates that online games (0.48) scored relatively low among the indicators in terms of individual reliability. This implies that factor contributions to adolescent cyber lives are somewhat unique. It is notable that the mathematical manifestation of these relationships is consistent with the developed instrument perspectives outlined in the opening sections of this paper.

Integrated Multi-Dimensional Adolescent Attitudes towards the Cyber Lives Scale Index

Within the cyber lives attitude construct, the structural variables are recorded as latent constructs and the multi-dimensional ones are based on indicator variables. Moreover, this model provides correlation data between the five constructs (e.g. online games and cyber friendships) and the specific attributes (e.g. online games as a new attraction attribute). These path coefficients and factor loading scores can then be used as weightings for index computation. The calculation of the Adolescent Attitudes towards the Cyber lives Index (AATCI) follows Anderson and Fornell (2000) and Fornell, Johnson, Anderson, Cha and Bryant (1996) in using the American Customer Satisfaction Index (ACSI):

$$\text{Adolescent Attitudes towards the Cyber lives Index } = \frac{\sum_{i=1}^{n} W_i * \overline{x_i}}{3 * \sum_{i=1}^{n} W_i} * 100$$

W_i: factor loading score; $\overline{x_i}$: variable mean

In this study, the index for AATCI (83.72) was calculated using the weights of these factor scores with a better result. In order to get more information on adolescent cyber lives, we also calculated specific adoption behavior driven indices. The index was 92.90 for online games, 85.28 for cyber friendships, 91.93 for knowledge growth, 73.94 for family life, and 77.41 for peer relationships, respectively. The index for family life was the lowest value among the five constructs.

The AATCI is used to look at the influence of gender roles on the usage patterns of Internet at home in terms of online games, cyber friendships, knowledge growth, family life and peer relationships. The results (see Table 6) for male students show that the online games value was the highest (99.53), while the family life value was the lowest (78.73); based on the weights of the factor scores, the index for cyber lives was calculated (88.13). In contrast, the results for female adolescents show that knowledge growth had the highest value

(90.32), while the family life value was again the lowest (68.61); the index for cyber lives was again calculated based on the weights of the factor scores (78.88). As such, online games and knowledge growth were the two most important Internet leisure activities for the adolescents who participated in this study.

Table 6: Cyber Lives Scale Index

Variables	Total sample	Males	Females
Online games	92.90	99.53	85.54
Cyber friendships	85.28	89.86	80.24
Knowledge growth	91.93	93.56	90.32
Family Life	73.94	78.73	68.61
Peer Relationships	77.41	82.35	72.17
Cyber Lives	83.72	88.13	78.88

The development of indices enables comparisons of all educational systems with a similar context. From the benchmarking perspective, understanding how Internet use characteristics influence student usage behavior facilitates the understanding of what constitutes a good score. Consequently, the model estimation leads to a greater perceived objectivity in terms of students' cyber lives and their use of the Internet.

CONCLUSIONS

This study demonstrates a rigorous empirical scale that can validate a general measure of adolescent cyber lives attitudes; explores the effects that recent cyber lives scale development practices on item content, cyber structure, and examines adolescent use on the psychometric qualities of these measures. The main purpose of this study is to develop a comprehensive model and instrument for measuring student's cyber lives. Based on published literature, we determine the five most pertinent factors on which to base our 22 questionnaire items. All of the R-square values range from 0.27 to 0.64, and the Cronbach's alpha coefficients range from 0.60 to 0.89. As such, the AATCI instrument can be used to better understand the cyber activities of students that attend senior high schools in Taiwan. More specifically, administering the scale to students at a senior higher education institution may assist policy-makers, program developers and administrators in better clarifying the most serious types of cyber addiction, as well as potential ways to resolve this type of issue. Moreover, the instrument can be used to investigate the reasons for cyber addiction, which can help administrators to devise ways to eliminate these reasons. We believe that the AATCI will be able to contribute to cyber psychometric areas in terms

of the assessment of adolescent cyber lives attitudes.

The index for online game was the highest value among the five constructs. The results show that adolescents spend much of their daily leisure time on using computers, the Internet, and often playing online games or making friends through social networking sites. In terms of the online game index, online gaming have become an extremely popular leisure activity and have gained millions of users around the globe (Appel 2012; Trepte, Reinecke and Juechems 2012). In the realms of online gaming, other players seem to enjoy playing any character as their virtual identity and fit in the virtual world. Therefore, by playing online games may make players feel pleasurable and forget unhappy things; meanwhile, these games bring players sense of adventure and sense of accomplishment after playing. However, online gaming has been shown to trigger a considerable number of negative outcomes. Online games are so tempting that some adolescents spend too much time on them. Therefore, concerns about Internet and game addiction from too much online gaming are expressed (Boyle, Connolly and Hainey 2011; Trepte, Reinecke and Juechems 2012). Today, online gaming has become a major leisure activity. To prevent adolescents' online game addiction, AATCI scores from this research could help educational institutions or teachers to analyse adolescents' attitude toward online gaming.

On the gender differences in terms of the online game index, female students were lower than male students. According to previous studies (Boyle, Connolly and Hainey 2011; Holtz and Appel 2011; Appel 2012), males' preference for the recreational use of Information and Communications Technology (ICT) is perhaps rooted in the male-oriented online game tradition (Chen, 2010). The gender gap within ICT has also been attributed to sex role stereotypes, male-oriented online games and boys' earlier access to computers, which collectively result in girls lagging behind boys in computer usage and experience (Tsitsika et al. 2009; Haddadain, Abedin and Monirpoor 2010; Austin and Totaro 2011). In a recent effort to make ICT more attractive to girls, several girl-friendly computer games have been developed; moreover, the Internet and the World Wide Web have made computer technology more accessible, interesting and appealing to girls (Tsitsika et al. 2009; Hedman et al. 2010).

According to the research findings, the family life value (73.94) and peer relationships value (77.41) did not meet Anderson and Fornell's (2000) recommended value of 80 or above. The results show that the Internet is changing central aspects of everyday life for many adolescents, including how they keep themselves informed, communicate, participate in leisure activities, and allocate time during the day. Our findings also indicate that cyber lives has a strong social foundation for adolescents, in that peer relationships may be the most important factor that accounts for elevated incidence rates of adolescent cyber lives.

When people use Internet technologies intensively for retrieving information, they often require large blocks of time, most of which is spent alone. Greater use of the Internet is therefore associated with smaller social networks and reduced communication with the family; for adolescents, it is also associated with declines in social support, increases in loneliness, and symptoms of depression (Haddadain, Abedin and Monirpoor 2010; Odacı and Kalkan 2010; Austin and Totaro 2011; Stetina et al. 2011). The Internet is becoming an integral part of many people's lives. Internet overuse would impact peer relationships and family life. Therefore, AATCI scores of this research are expected to efficiently assess adolescents' attitude toward for family life and peer relationships.

Finally, one potential limitation of this study is that we measured variables in only one timeframe using self-report questionnaires, suggesting the potential for common method variance (CMV). We tested for CMV using the Harman one factor test, which showed that all constructs explain roughly an equal amount of variance, suggesting that common method bias is not an issue in this study. However, given the cross-sectional design nature of the current study, we are unable to rule out alternative causal inferences. Since the integration of operational capabilities with strategic improvements must take place over an extended period of time, a longitudinal design would allow for inferences related to causal ordering. In this way, a longitudinal investigation might reveal more about the effects of time on adolescent Internet usage.

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