



Re-visiting college students' attitudes toward the Internet-based on a 6-T model: Gender and grade level difference

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ABSTRACT

The purpose of this study is to propose a 6-T model (Tool, Toy, Telephone, Territory, Treasure of Information, and Trade) to explore college students' Internet-related attitudes, and to examine whether gender and grade level make any difference in their attitudes. Data from 1069 participants were collected from 96 Taiwanese universities and colleges. A Confirmatory Factor Analysis validated the proposed 6-T model and shows that it can well explain the 6-T factors. Each T's magnitude of path coefficient shows that for these college students, the most recognized factors were Tool and Toy, followed by Treasure of information, Territory, and Trade, and that the least weighted factor was Telephone. Male students seem to have had a more positive attitude toward the Internet-related Toy and Telephone dimensions than did female students, and graduate students seem to have had a more positive attitude toward the Internet-related Tool, Information, and Trade dimensions than did undergraduate students. This study discusses limitations, future research directions, and implications for college educators and administrators.

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1. Introduction

As Internet access and applications have become parts of the basic information infrastructure on college campuses, the vast majority of college students are frequent Internet users. Survey data indicate that the Internet has indeed become an indispensable part of college students' lives. For example, Jones, Johnson-Yale, Millermaier, and Pérez (2009) collected data online from 7421 university students in the United States in 2005. About 40% of the students reported spending more than 3 h a day on the Internet, and about 25% of the students spent between two to 3 h a day on the Internet. In Taiwan, a recent national survey on broadband-network use reported that two age groups (15–19 and 20–24) have the highest percentages of online users (99.45% and 97.24%) (The Taiwan Network Information Center, 2009). Therefore, it is obvious that almost *all* Taiwanese college students use and will be using the Internet.

Researchers have also advocated the necessity of exploring students' attitudes toward the Internet because of the close relationship between students' attitudes and their online learning (e.g., Duggan, Hess, Morgan, Kim, & Wilson, 2001; Durndell & Haag, 2002; Peng, Tsai, & Wu, 2006; Torkzadeh & van Dyke, 2002; Tsai & Lin, 2004; Wu & Tsai, 2006). In addition, some research findings have identified the relationships among students' Internet use, students' attitudes, and students' various psychological conditions (e.g., Joiner, Brosnan, Duffield, Gavin, & Maras, 2007; Özcan & Buzlu, 2007; Swickert, Hittner, Harris, & Herring, 2002; Whitty & McLaughlin, 2007). Therefore, students' attitudes toward the Internet serve as a foundation on which researchers can better understand not only students' use of and learning with the Internet, but also their well-being in real space as well as in cyberspace. Moreover, students' attitudes often correlate with the students' engagement in certain online activities. Since college students intensively use the Internet for their study and leisure lives; hence, it is necessary to understand college students' attitudes toward the Internet.

To adequately illustrate college students' attitudes toward the Internet, researchers proposed various frameworks/models and instruments (e.g., Cheung & Huang, 2005; Duggan et al., 2001; Zhang, 2007). On the basis of the T frameworks presented by Tsai (2004) and Chou and her colleagues (Chou, Chen, & Wu, 2007; Chou, Yu, Chen, & Wu, 2009), the present study proposes a new 6-T model (i.e., Tool, Toy, Telephone, Territory, Treasure of Information, and Trade) to re-investigate Taiwanese college students' attitudes toward the Internet. In addition, this study examines whether students of different genders and of different grade levels significantly present different attitudes toward the Internet.

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2. Literature review

2.1. College students' Internet-related experiences and attitudes

This study investigates college students' attitudes toward the Internet. Researchers studying college students' Internet-related experiences and attitudes have argued that students' attitudes toward the Internet can critically influence students' online learning in higher education (e.g., Duggan et al., 2001; Durndell & Haag, 2002; Peng et al., 2006; Torkzadeh & van Dyke, 2002; Wu & Tsai, 2006). The students with positive attitudes toward the Internet have exhibited higher Internet self-efficacy (Peng et al., 2006; Torkzadeh & van Dyke, 2002; Wu & Tsai, 2006) and have tended to use the Internet more often (Duggan et al., 2001; Durndell & Haag, 2002) than the students with negative attitudes. Research findings confirmed that the students with higher self-efficacy in computer use or Internet use tend to consider technology-based learning tasks interesting and important and are more willing to persist in the learning tasks while facing challenges (Coffin & MacIntyre, 1999; Peng et al., 2006; Torkzadeh & van Dyke, 2002; Wu & Tsai, 2006). Cheung and Huang (2005) found that college students' attitudes toward the Internet positively correlated with the students' Internet use, job prospects, and general learning. These researchers further suggested that instructors should exploit students' Internet-related attitudes as extrinsic motivators (e.g., social pressure) and intrinsic motivators (perceived enjoyment) to promote students' Internet use relative to university-level academics. Therefore, the better we understand college students' Internet-related attitudes, the better able we will be to improve student learning in Internet-based instruction.

Researchers have continuously illustrated college students' general Internet experiences such as their use frequencies and online-activity preferences (e.g., Jones et al., 2009; Schumacher & Morahan-Martin, 2001), and researchers have strived to identify the relationships among college students' Internet use, attitudes, perceptions, and other psychological conditions. For instance, college students' involvement in leisure Internet activities (e.g., instant messaging and playing games) could positively correlate to the students' perceptions of social support (Swickert et al., 2002). Whitty and McLaughlin (2007) found that college students with higher Internet self-efficacy and higher levels of loneliness were more likely to use the Internet for purposes of computer-based entertainment. Joiner et al. (2007) examined the relationships between Internet identification, Internet anxiety and Internet use. The aforementioned study surveyed 446 university students in the United Kingdom and in Australia, and found that students possessing relatively high Internet identification (i.e., students considering themselves Internet users and considering the Internet an important part of their lives) used the Internet more often and experienced less Internet anxiety than was the case with students possessing relatively low Internet identification.

In Özcan and Buzlu's study (2007), 730 university students in Turkey reported the relationships between personal Internet use and personal psychosocial conditions. The researchers employed an online cognition scale (OCS) covering four dimensions (i.e., loneliness/depression, diminished impulse control, distraction, and social comfort) to assess users' problematic Internet use. The results show that students possessing increasing OCS scores exhibited a higher likelihood to *refrain from* Internet activities such as general information searches and academic research and a higher likelihood to *engage in* Internet activities such as chatting, making financial transactions, playing games, looking up sexually explicit material, downloading programs, and listening to MP3s than was the case with students possessing declining OCS scores. The students' problematic Internet use also correlated to loneliness, depression, and weaker perceptions of social support.

In sum, college students' Internet-related activities and experiences are closely related to the students' internal attitudes, perceptions, or psychological conditions. Therefore, investigations into college students' attitudes toward the Internet can shed light on how to improve the students' online learning experiences and on how to prevent possible negative effects and problematic online behaviors.

2.2. Gender differences in college students' Internet use

Research on college students' Internet-related attitudes and experiences usually tests the existence of gender differences, and relevant studies conducted in different countries have yielded the similar finding that male students tend to exhibit a more frequent use of computers and the Internet, stronger technology-related self-efficacy, and a more positive attitude toward the Internet than do female students (Durndell & Haag, 2002; Li & Kirkup, 2007; Peng et al., 2006; Schumacher & Morahan-Martin, 2001; Torkzadeh & van Dyke, 2002; Wu & Tsai, 2006). For example, Sun (2008) examined the relationships among 471 US college students' Internet self-efficacy, Internet anxiety, Internet use motivations, and Internet involvement. The results confirmed that male students reported significantly higher Internet self-efficacy and lower Internet anxiety than did female students. Li and Kirkup (2007) compared 220 Chinese college students' and 245 British college students' Internet experience, attitudes, and self-confidence, and found that males are (1) more confident with their computer skills than females are and (2) more likely to view computer use as a male activity than females are to view computer use as a female activity. In Durndell and Haag's (2002) study, 150 Romanian university students completed questionnaires about their computer self-efficacy, computer anxiety, and Internet attitudes, and males reported higher computer self-efficacy, lower computer anxiety, a more positive attitude toward the Internet, and longer use of the Internet than females. In Wu and Tsai's study (2006) on 1313 Taiwanese university students' attitudes and perceptions of self-efficacy relative to the Internet, male students presented higher self-efficacy and a more positive attitude relative to their self-perceptions of personal control over the Internet than did female students.

However, some studies provide evidence that females may underestimate their Internet-related abilities. In Bunz, Curry, and Voon's study (2007) on 61 college freshmen's perceptions of and actual—computer-email-Web fluency, the results indicate that despite no gender difference in actual fluency, females' perception of personal fluency was significantly lower than males'. Hargittai and Shafer's study (2006) came across a similar finding: among the 100 Internet user participants, women tended to under-assess their own online skills in contrast to their male counterparts although the findings showed no significant gender difference in online skills. Some researchers suggest that the gender differences in college students' Internet-related attitudes and abilities may gradually disappear as the Internet becomes accessible to all students and as female students acquire more experience in Internet use (Coffin & MacIntyre, 1999; Durndell & Haag, 2002; Schumacher & Morahan-Martin, 2001). For instance, Schumacher and Morahan-Martin (2001) compared data obtained between 1989 and 1990 with data obtained in 1997 to understand the changes in college freshmen's Internet and computer attitudes and experiences, and found that gender differences in computer experience and skills were generally decreasing. The researchers of the aforementioned study also envisioned that gender differences currently present in levels of Internet-related comfort and competence would disappear with time, experience, and easier Internet access.

Surveys on people's use of the Internet in the United States (e.g., Dholakia, 2006; Wasserman & Richmond-Abbott, 2005) have showed no evidence of gender difference in Internet access, but have found some evidence of gender bias in people's use of Internet applications and of Website types. Colley and Maltby (2008) analyzed 200 postings from men and 200 postings from women on a question regarding whether the Internet had changed their lives (the question was posted on a news Website). The researchers found that the postings showed significant gender differences in the frequency component of several categories such as "made new friends," "international news sites," "general information search," "travel booking," and "shopping." In Hills and Argyle's (2003) study, 220 UK adults reported their use of 16 Internet services, and the findings indicate that men have tended to use more work-related services (e.g., mailing lists, information about work and downloading) and leisure-related services (e.g., chatting and online gaming) than women, who have been inclined to use home-based services (e.g., banking and shopping).

Studies on college students' Internet-related experiences and activities have indicated gender differences in students' involvement in certain online activities. Jones et al. (2009) collected data online from 7421 students of 29 colleges and universities in the United States in 2005, and male and female students reported somewhat different frequencies and time periods of Internet use and different preferences of online activities. For example, male college students were inclined to check sports scores, listen to music or watch videos, download music, form online romantic relationships, and visit adult sites than were their female counterparts. About 44% of females updated their blogs at least once per week while 31% of the male students reported that they did so. The research findings of Imhof, Vollmeyer, and Beierlein (2007) on 48 German university students showed that there was no gender difference in many online activities but that males frequented online shopping, email, and gaming services more often than did females. Chen and Tsai (2007) surveyed 1866 Taiwanese college students to understand their attitudes toward Web-based learning. The female students reported a more positive perspective of Web-based learning content than did males, who seemed to enjoy virtual relationships in Web-based learning environments more so than did females. Hence, examining whether gender difference plays a role in college students' attitudes toward the Internet should be meaningful.

2.3. Frameworks for studying Internet attitudes

To adequately categorize and measure people's attitudes toward the Internet, researchers have proposed different frameworks and developed different instruments. For example, in their investigation into university students' Internet use, Cheung and Huang (2005) defined three variables to address students' personal perceptions of and attitudes toward the Internet: perceived usefulness, perceived enjoyment/fun, and social pressure. Zhang (2007) developed an instrument consisting of four dimensions (i.e., Internet enjoyment, usefulness, anxiety, and self-efficacy) to assess people's Internet-related attitudes. Duggan et al. (2001) developed a scale to measure university students' attitudes toward the educational use of the Internet but the whole scale yielded only a one-dimensional construct. Schumacher and Morahan-Martin (2001) investigated college freshmen's Internet and computer attitudes and experiences, and measured the students' attitudes in terms of competency and comfort with the technology.

The present study refers to students' attitudes toward the Internet, focusing on the roles—as perceived by college students—that the Internet plays in people's lives. In this regard, the T frameworks presented by Tsai (2004) and Chou and her colleagues (Chou et al., 2007, 2009) substantially contribute to our overall inquiry into Taiwanese college students' attitudes toward the Internet.

Tsai, Lin, and Tsai (2001) modified items in Selwyn's (1997) computer attitude scale and developed an Internet attitude scale comprising the constructs of affection, usefulness, control, and related behaviors. Afterwards, based on a 4-T framework proposed in his study on Taiwanese adolescents' perceptions of the Internet (Tsai, 2004), Tsai and his colleagues conducted a series of studies on Taiwanese college or high school students' attitudes toward the Internet (Peng et al., 2006; Tsai, 2006, 2007; Tsai & Lin, 2004; Wu & Tsai, 2006). Tsai's (2004) framework includes four categories: Technology, Tool, Toy, and Tour/Travel. The Technology category means people consider the Internet a technology of live improvement, and the Tool category highlights various functions afforded by the Internet such as information acquisition, communication, and trade. The Toy category emphasizes the pleasure and entertainment that people derive from the Internet. Finally, the Tour/Travel category specifies that the Internet enables users to navigate different locations and sites. Chou and her colleagues (Chou et al., 2007, 2009) contended that the categories of Technology, Tool, and Tour/Travel in Tsai's framework share some characteristics and that the overlapping definitions can cause confusion.

Therefore, Chou et al. (2007) proposed another 4-T framework (i.e., Tool, Toy, Telephone, and Treasure of Information) to provide a more distinct categorization of people's perceptions of the Internet. Afterward, owing to the widespread applications of Web 2.0, Chou et al. (2009) decided to add a category, Territory, to reflect the fact that the Internet has become a personal place where many users can accumulate their own life experiences and can express themselves. Thus, the 5-T framework of Chou et al. comprises Tool, Toy, Telephone, Territory, and Treasure of Information. The definitions of the five categories are as follows: the Internet is a Tool enabling people to perform various tasks (e.g., play music and download files); the Internet is a Toy with which a user can spend enjoyable time (e.g., online gaming); the Internet is a Telephone enabling users to communicate with others; the Internet is a user's Territory for self-construction and self-expression; and the Internet is a Treasure of Information representing the stupendous collection of online information. This 5-T framework has been validated by confirmatory factor analysis (CFA), and it lends a valuable framework to research about people's attitudes toward the Internet.

In this present study, we add another dimension, Trade, to Chou et al.'s 5-T framework to highlight the fact that many people have viewed the Internet as a space for commercial activities. Buente and Robbin (2008) reviewed a variety of studies conducted from 2000 to 2004 on Internet activities and concluded four major types of Internet use: communication (e.g., send or receive email), information (e.g., read news online), leisure (e.g., go online for fun or for passing the time), and financial transactions (e.g., buy a product online). In addition, some studies that were mentioned in the previous section on people's engagement in online activities (e.g., Colley & Maltby, 2008; Dholakia, 2006; Hills & Argyle, 2003; Imhof et al., 2007) included online shopping/selling and financial services as important aspects of online activities. In addition, an official national survey report (Taiwan Research, Development and Evaluation Commission, 2009) found that 75.5% of 15-to-20-year olds and 70.7% of 21-to-30-year olds have participated in some kinds of online shopping activities. Therefore, it may be reasonable to add the role of Trade to the five Ts. Thus, the new 6-T model consists of the following six dimensions: Tool, Toy, Telephone, Territory, Treasure of Information, and Trade.

The purpose of the present study, then, is to use the 6-T model to re-visit Taiwan college students' attitudes toward the Internet. Based on this 6-T model, the present study answers the following questions:

1. Could the 6-T model herein be constructed and validated through CFA? In other words, does the 6-T model of Internet attitudes exhibit good construct validity?
2. What are college students' attitudes toward the Internet from the perspective of CFA?
3. Does the gender of college students make any difference in their attitudes toward the Internet?
4. Does the grade level of college students make any difference in their attitudes toward the Internet?

3. Methods

3.1. Subjects and distribution process

In this study, we harnessed the survey method to collect our data. Because past research has proved the feasibility of online surveys (e.g., Chou, Chang, & Jiang, 2000) and the equivalent validity and reliability between Internet-based and paper-based psychometric questionnaires for Taiwanese samples (Yu & Yu, 2007), both online-version and paper-version questionnaires were used in this study. The online-version questionnaire was located on the Internet server of the researchers' institute, and solicitations for participation were posted on popular online forums and bulletin board systems (BBSs). The paper-and-pencil version was distributed to students through teachers after class. A total of 1134 surveys were returned, and 1069 valid surveys were collected. Of the valid survey respondents, 128 (11.97%) were freshmen, 173 (16.18%) were sophomores, 205 (19.18%) were juniors, 202 (18.90%) were seniors, and 361 (33.77%) were graduate students. Of the 1069 valid surveys, 8 were missing data regarding the respondents' sex; from the remaining valid surveys (totaling 1061), we can see that 530 respondents (49.95%) were male and 531 respondents (50.05%) were female.

3.2. Instruments

The questionnaire used in this study had two major sections: (1) demographic information (gender, grade level) and general computer use (the time and place); (2) an Internet attitude scale to assess students' attitudes toward the six T categories of the Internet. The second section involves 64 Likert-type statements. Most of the items came from the original scale (47 items) developed by Chou et al. (2009). There were five more items for Tool (such as "The Internet is my life helper," "The Internet is a good tool for my studies," "The Internet allows me to download useful software") to strengthen the distinction between the Tool dimension and the Toy dimension. In order to include the new Trade dimension, an addition of 12 items was designed into the scale. Example items include "It is convenient to shop online," "I think that online shopping is becoming a future trend," and "There is ample information about the merchandise on the network."

Students were required to read the statements and to indicate the extent of their agreement on the basis of the options provided on a 4-point Likert scale: strongly agree, agree, disagree, and strongly disagree (counted as 4, 3, 2, and 1 respectively). A higher score indicated a more positive attitude toward the Internet.

4. Results

4.1. Validation of the hypothetical 6-T model

We employed confirmatory factor analysis (CFA), a top-down method for theory verification (construct validity), to examine the assumptions underlying the hypothetical 6-T model, comprising the six factors of Tool, Toy, Telephone, Territory, Trade, and Treasure of Information. Furthermore, we selected several fit indices to determine the model acceptance or rejection. To sum up from previous studies and reviews (Boomsma, 2000; Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 1999; Kline, 2005; McDonald & Ho, 2002), it was necessary to report indices of dispersed kinds, because there is no single "magic index" for all models and because different indices demonstrate a different aspect of model fit. Hence, to evaluate data-model fit in this study, we used three measures of absolute/overall fit (Chi-square in tandem with its degrees of freedom and p value, root mean-square error of approximation, or RMSEA, and standard root mean-square residual, or SRMR), one measure of comparative fit (comparative fit index, or CFI), and one measure of parsimonious fit (parsimonious normed fit index, or PNFI). With the exception of the Chi-square statistic, we selected all the indices after considering insensitivity to sample size, model misspecification, and parameter estimates. The set criteria for indicating a reasonable/moderate fit were as follow: Chi-square statistic insignificant, $RMSEA < 0.08$, $SRMR < 0.10$, $CFI > 0.90$, and PNFI "the higher, the better" (the value should be within 0 and 1). No item would have zero loadings on the measured first-order factors.

4.2. College students' CFA-derived attitudes toward the Internet

The analysis was initiated with 64 items, and the initial estimation did not provide a satisfactory result. According to the suggested modification index (MI), therefore, we deleted items 16, 17, 18, 33, 44, 45, 46, 47, and 54, specifically because its factor loading was less than 0.3. The factor loading of the left items varied between 0.32 and 0.71. Though the Chi-square value ($\chi^2 = 7587.35$, $df = 1424$, $p < .001$) of the final 6-T model indicates a bad fit, it should be noted that a high Chi-square value and model rejection would result from a large sample ($n = 1069$). Other fit measures, hence, should be taken into account. The values of RMSEA, SRMR, CFI, and PNFI are 0.064, 0.071, 0.966, and 0.918 respectively. Except for the Chi-square statistic, the values of the chosen indices meet the set criteria. It is our overall conclusion that the data fit of the hypothetical model is moderate. Simply put, the scale should retain six factors with a total of 55 items to sustain the validity of 6-T model. In light of these findings, we can assume that the 6-T model proposed in this study could adequately depict college students' Internet-related attitudes.

The path coefficients in the standardized solutions of SEM represent the standardized regression coefficients and the relative factor weightings. As Fig. 1 shows, the path coefficients between the 6-T model and the six factors in the present study are 0.87, 0.83, 0.49, 0.74,

0.77, and 0.63. The results indicate that weighted factors from the highest to the lowest were Tool (10 items), Toy (13 items), Treasure of Information (8 items), Territory (8 items), Trade (11 items), and Telephone (5 items). This order suggests that Tool and Toy were the principal dimensions of the respondents' attitudes toward the Internet while Telephone was the least weighted after other dimensions.

4.3. Gender differences in Internet attitudes

In order to investigate whether gender makes a difference in college students' attitudes toward the Internet, we categorized the 55 items into six T factors (subscales). To calculate each student's mean score for every factor, we identified the sum of the responses to each item in that factor, and then divided the sum by the number of that factor's items. As Table 1 indicates, the mean scores of all factors are between 2.37 and 3.45 on the basis of a 4-point Likert scale. The MANOVA served to examine gender differences in each factor. The analytical results reveal that the male students' mean scores of Toy and Telephone were higher than their female counterparts ($p < .05$ and $p < .001$ respectively). However, no significant difference was found between female and male students in the Tool, Territory, Treasure of Information, and Trade factors of the attitude scale.

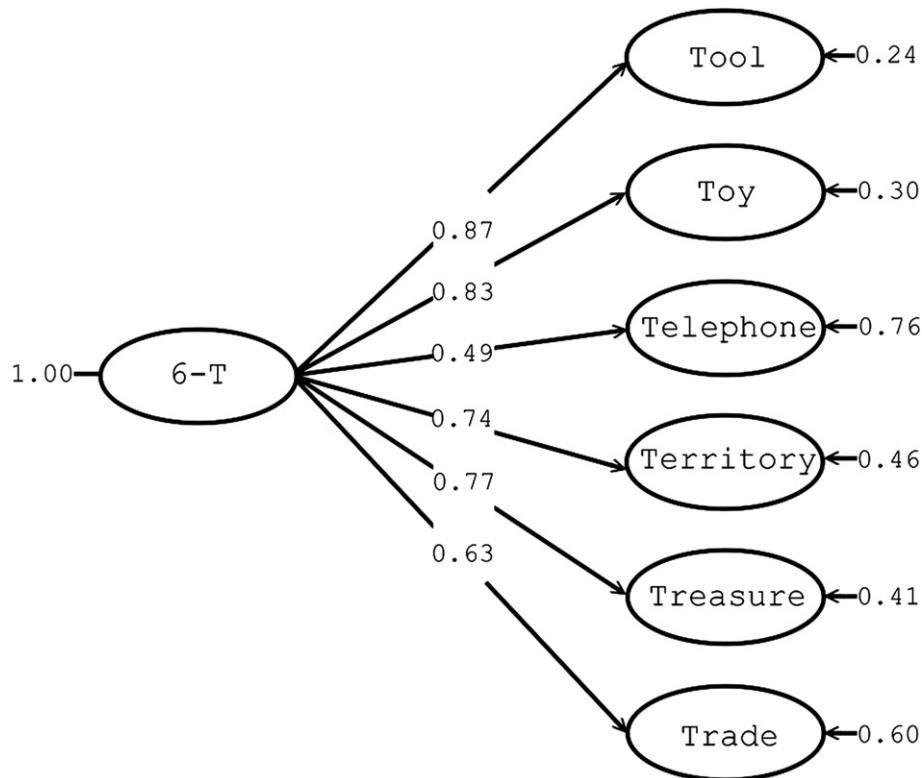
4.4. Grade differences in Internet attitudes

This study furthermore analyzed the relationship between students' grade levels (i.e., level of accumulated academic credits) and the 6-T dimensions. This study divided the sample students into three groups: (1) freshmen and sophomores, (2) juniors and seniors, and (3) graduates. Table 2 presents the results of the MANOVA and post hoc tests. The mean scores of all factors vary between 2.47 and 3.49. According to our findings, students' grade levels made a significant difference in the Tool, Treasure of information dimensions, and Trade, ($p < .01$, $p < .001$, and $p < .05$, respectively). The results of the post hoc tests revealed that graduate students' mean scores were higher than freshmen/sophomore students' mean scores in the dimensions of Tool, Trade, and Treasure of Information, and higher than junior/senior students' mean scores in the dimensions of Trade and Treasure of information.

5. Discussions

5.1. College students' Internet attitudes relative to the 6-T model

This study presents a conceptual model for understanding Taiwanese college students' attitudes toward the Internet. Students' were required to read the 64 statements and to indicate their responses on the basis of four agreement levels. Based on the final 55 statements, our confirmatory factor analysis supported and validated the six factor structure of the assumed 6-T model: that is, Tool, Toy, Telephone, Territory, Treasure, and Trade.



Chi-Square=7587.35, df=1424, P-value=0.00000, RMSEA=0.064

Fig. 1. The second-order factors of the 6-T model with standardized solution.

Table 1
Results of the MANOVA and post hoc tests on gender difference in the 6-T model ($n = 1061$).

| | Gender | | | | F | Post Hoc |
|-------------------------|---------------|------|---------------|------|-----------|----------|
| | Male | | Female | | | |
| | ($n = 530$) | | ($n = 531$) | | | |
| | M | SD | M | SD | | |
| Tool | 3.27 | 0.42 | 3.25 | 0.40 | 0.62 | |
| Toy | 3.10 | 0.47 | 3.04 | 0.47 | 4.46 * | M > F |
| Telephone | 2.57 | 0.58 | 2.37 | 0.56 | 31.93 *** | M > F |
| Territory | 3.04 | 0.46 | 3.06 | 0.44 | 0.21 | |
| Treasure of Information | 3.45 | 0.43 | 3.40 | 0.37 | 3.20 | |
| Trade | 2.90 | 0.45 | 2.88 | 0.46 | 0.38 | |

* $p < .05$, *** $p < .001$.

Territory, Trade, and Treasure of information. In addition, in order to examine college students' attitudes toward the Internet, we evaluated the relative weight of these six factors by calculating their coefficients' magnitudes. With these coefficients arranged from the highest to the lowest, the order was Tool, Toy, Treasure of information, Territory, Trade, and Telephone. In other words, the Tool factor was the major factor while the Telephone factor was the lowest one among the six factors. From this sequence, it can be concluded that college students consider the Internet mainly a powerful tool, which is not only helpful for their academic work, but also useful for their daily life.

These findings somewhat meet our expectation on how the computer/Internet was introduced in computer-related curricula in school. However, college students also consider the Internet a Toy, not only because the Internet itself is interesting and playful, but also because the Internet can help them relax, avoid boredom, and look for happiness. This finding is consistent with that of Chou et al. (2009), in which Taiwanese fifth graders considered Tool and Toy the major two roles that the Internet has played. The difference between the two studies is that the fifth graders in Chou et al.'s (2009) study considered the Tool and Toy roles (functions) to be very similar to each other, without clear-cut differences, whereas in the present study, college students clearly distinguished the two roles from each other (as was evident from the students' ratings on the related items in the scale). In sum, the two studies demonstrated that not only elementary school students but also college students may consider the Internet a major entertainment device, and this may further explain why students like to play with the Internet: to greater or lesser extents, they consider the Internet a toy itself.

Findings in this study indicate that college students recognized the information dimension of the Internet as they rated it the number three in the Ts sequence. In a sense, the college students acknowledged the importance of online information to broadening their knowledge base, to enabling them to do creative and interesting things, to facilitating their school work and life routines, and to societal progress. In general, the college students appreciated the Internet as a treasure of information available for them. However, it is worth noting that the Internet is not just a *read-only* information resource but also a Territory in and to which college students can *write*. This finding supports the arrival of the "Read/Write Web" in the age of Web 2.0 (Richardson, 2006). Indeed, as online publishing tools increase ease of use, and as more blog-hosting sites become available to users, college students have significant—and will have more and more—access to cyberspace, in which they can create personal journals of their lives, share their interests and experiences with other people, and probably experiment with different personas. Therefore, as Internet technology has transformed itself, the significance of the Internet's Territory dimension and of related attitudes has become more prominent in this study.

In this study, the new factor—Trade—bears a path coefficient of 0.63, meaning that Trade has become one of the key dimensions in Internet-related attitudes, and that the addition of Trade to the previous 5-T model of fifth graders (Chou et al., 2009) strengthens the comprehensiveness of the new 6-T model of college students' Internet attitudes. However, when scrutinizing the order of the Ts' sequences, we found that college students assigned the Trade factor a rating of five in the 6-T model. This rating means that even though the college students may have had better purchasing power, and even though online financial transactions have become an important Internet application, the function of trade was not more obvious than the other functions in college students' Internet-related attitudes.

Last, findings indicate that the Telephone factor of the Internet attitudes is inferior to the other five factors in our 6-T model. This last-place status means that for these college students, the communication functions of the Internet were not substantially significant compared with the other functions. One of the possible reasons is that college students have other occasions or devices (such as hallway encounters, traditional phones, and mobile phones) for communicating with other people; if true, then college students do not totally rely on the Internet's communication function. Another possible explanation is that other applications, such as blogs or social-network sites in the

Table 2
Results of the MANOVA and post hoc tests on grade difference in the 6-T model ($n = 1069$).

| | Grade-level | | | | | | F | Post hoc |
|-------------------------|------------------------|------|-------------------|------|---------------|------|----------|------------|
| | (1) Freshman/Sophomore | | (2) Junior/Senior | | (3) Graduate | | | |
| | ($n = 301$) | | ($n = 407$) | | ($n = 361$) | | | |
| | M | SD | M | SD | M | SD | | |
| Tool | 3.21 | 0.44 | 3.26 | 0.40 | 3.30 | 0.39 | 4.26 ** | (3)>(1) |
| Toy | 3.03 | 0.49 | 3.08 | 0.48 | 3.11 | 0.45 | 1.97 | |
| Telephone | 2.48 | 0.56 | 2.47 | 0.59 | 2.47 | 0.57 | 0.07 | |
| Territory | 3.08 | 0.47 | 3.02 | 0.46 | 3.06 | 0.43 | 1.69 | |
| Treasure of Information | 3.36 | 0.44 | 3.41 | 0.40 | 3.49 | 0.36 | 7.93 *** | (3)>(1)(2) |
| Trade | 2.85 | 0.47 | 2.87 | 0.46 | 2.94 | 0.43 | 3.45 * | (3)>(1)(2) |

* $p < .05$, ** $p < .01$, *** $p < .001$.

category of Territory, have also performed the communication function to some degree (Stefanone & Jang, 2008). In other words, when students represent themselves on the Internet (i.e., Territory), they simultaneously open up a communication channel to form or maintain interpersonal relationships (i.e., Telephone). Definitely more research is needed to address the interplay between students' territory boundaries and the Internet's social uses.

5.2. Gender difference in college students Internet-related attitudes

Does college students' gender make any difference in their attitudes toward the Internet? According to the MANOVA results (see also Table 1), gender made a significant difference in some factors of Internet-related attitudes. In particular, male college students seemed to possess a more positive attitude toward the Toy and Telephone factors than did female students. One possible explanation is that male college students generally use the Internet (Gordon, Juang, & Syed, 2007), play online games (Chou & Tsai, 2007), and seek Internet-based entertainment (Jones et al., 2009) more often than do female college students; thus, male students have evolved a more positive attitude toward the Internet's Toy dimension than have female students. In addition, past studies have concluded that male students were more reliant on online communication (such as email in Imhof et al., 2007; or chat rooms in Wasserman & Richmond-Abbott, 2005) than were female students. In Jones et al. (2009), male students were more likely to consider (1) themselves amenable to forming online romantic relationships and (2) the Internet a substitute for certain social activities than were female students. It is possible that male college students thus use the Internet more for communicative purposes and have a more positive attitude toward the Telephone dimension of the Internet than is the case with female students.

Yet, in this study, no gender difference was found in the factors of Tool, Trade, Treasure of Information, and Territory. This finding means that both male college students and female college students equally perceived the importance of these four dimensions of the Internet. Past research has shown that females usually are less comfortable and have lower self-efficacy with computer/Internet use than is the case with males (Imhof et al., 2007; Schumacher & Morahan-Martin, 2001). However, in this study, we found no significant difference between male and female students' consideration of the Internet as a Tool. In other words, the gender gap relative to their Tool-related attitudes perhaps had decreased to such an extent that it was no longer visible in our study.

Moreover, we found that male and female students equally recognized the Internet as a virtual space in which they could present themselves in many forms and styles. Stefanone and Jang's (2008) study found that gender made no difference in either blog content or use of blogs for maintaining relationships. Jones et al. (2009) found that female and male college students had similar percentages in terms of keeping a blog (34% of females compared with 31% of males). The findings of the current study further confirm the absence of gender difference in young adults' (college students') attitudes toward the Internet's Territory dimension (i.e., blogs). Furthermore, no gender difference was found in this study's Treasure of Information dimension. In line with the findings of Hills and Argyle's (2003) study that men and women used Internet information for different purposes, Jones et al. (2009) found that male college students had a greater tendency to check sports scores, to look for information on leisure activities, and to visit adult Websites than their female counterparts, who themselves were more likely to use mainstream information sources (e.g., library Websites) than male students. It seems that both female and male students were able to find a variety of online information to meet their specific needs, and therefore, they might develop equivalent attitudes toward online information. Finally, this study found no gender difference in the Trade dimension of the Internet-related attitudes, meaning that both male and female students are equally positive in their attitude toward online commerce. Colley and Maltby (2008) suggested that males and females do not differ from each other in their practical use of the Internet for banking and trading and that college students have similar attitudes in this regard.

5.3. Grade level difference in college students' Internet-related attitudes

Does college students' grade level make any difference in their attitudes toward the Internet? According to the MANOVA results (see also Table 2), grade level made a significant difference in some Internet attitude dimensions. Specifically, graduate students had a more positive attitude toward the dimensions of Treasure of Information and Trade than undergraduates had, and that graduate students had a more positive attitude toward the Tool dimension than freshmen and sophomores had. We found no significant difference between graduate and undergraduate students in the dimensions of Toy, Territory, and Telephone. Undergraduate students, regardless of their grade levels, presented no significant difference in all 6-T dimensions. On the basis of these findings, we proposed three interesting observations and possible explanations regarding the difference between the graduates and undergraduates.

First, because graduate students probably have a stronger need for conducting research, they seem to acknowledge online information more so than do their undergraduate counterparts. On college campuses, *all* students indeed have benefited from the recent and rapid development of digital publications (e-books, e-journals, or databases); and owing to the demands of their professional development, graduate students may have a greater appreciation for convenient access to the Internet's massive digital academic resources and services, as well as for the Internet's general information (see also Wu, Chou, Ke, & Wang, 2010).

Second, there are two probable reasons for the current study's finding that graduate students exhibited a greater positive attitude toward the Trade dimension than did undergraduate students: (1) in general, graduate students may have more purchasing power but less time to go real-store shopping, and (2) in general, graduate students may be smarter than undergraduates regarding Internet use for price-checking/price-comparison, resulting in graduate students' relatively significant use of the Internet's Trade function and—consequently in these students' demonstration of the notably positive attitude. Third, graduate students may have more and better knowledge, skills, and experience in using the Internet than do younger students (e.g., the freshmen and sophomores in this study) and, therefore, may have a more positive attitude toward the Tool dimension of the Internet.

Last and a rather noticeable result of our study was that no significant difference was observed in the dimensions of Toy, Territory, and Telephone among all levels of college students. In other words, college students, regardless of their grade level, equally identified these three roles that the Internet has played. One explanation might be that these three dimensions of the Internet perhaps seem to possess low levels of academic usefulness. College students, long prior to entering college, can very well have been using the Internet as an entertainment

device, as a cyber-representation of the self (e.g., Chou et al., 2009), and as a communication channel (e.g., Chou & Peng, 2007); therefore, while moving up to the position of senior on campus, these students would not be changing their related attitudes.

6. Conclusions, limitations, and implications

The ubiquity of Internet access on college campuses has changed students learning and life. It is clear that the Internet is an important component of college life, but it is relatively unclear what attitudes toward the Internet students have possessed and developed. The purpose of this study is to propose a 6-T model to explore college students' Internet-related attitudes. Based on a large sample of Taiwanese college students, this study's statistical analyses helped validate the proposed 6-T model and perhaps greatly strengthen explanations of college students' multi-dimensional attitudes toward the Internet.

The results strongly indicate that for the participating college students, the most recognized factors were Tool and Toy, and the least recognized factor was Telephone. Male students seem to have had a more positive attitude toward the Toy and Telephone dimensions of the Internet than was the case with female students, and graduate students seem to have had a more positive attitude toward the Tool, Information, and Trade dimensions of the Internet than was the case with undergraduate students. This study tentatively concludes that most college students today neither interact with nor perceive only one dimension of the Internet. As Internet technologies have continued evolving and have become ubiquitous, focusing on a specific dimension of the Internet may fail to account for the multiple and complex ways in which students interact with and perceive the Internet. The 6-T model proposed in this study is a relatively comprehensive framework to address this complexity and provide a basis for future relevant studies.

The current study has limitations, two of which are noted here: First, the main focus of the study is to validate the 6-T model and to use this model to explore college students' Internet-related attitudes. Therefore, the study did not include students' actual Internet use, motivations, experiences (such as with applications), and Internet performance (such as e learning effectiveness). Future research could explore the relationships between Internet-related attitudes and these variables. Second, this study is partially based on the convenience of an online self-selected sample of college students. The nature of this sample limits the generalizability of our findings. Future research may use stratified samples to capture a better representation of college students.

The results of this empirical study and of the delineated prior literature may provide helpful information to college educators. In general, educators need to recognize college students' multi-dimensional attitudes toward the Internet: students have considered the Internet a powerful tool, an interesting toy, a rich information resource, a personal cyber-territory, a convenient commercial place, and a useful communication channel. Therefore, college educators and administrators should better help students benefit from the Internet's enhancement of convenience and productivity, but at the same time, should better help students avoid the Internet's possible hidden risks and overuse-related problems. In particular, the results of this study emphasize the Toy dimension in students' Internet-related attitudes. By recognizing this important dimension, administrators could develop more realistic expectations, better communication languages, and better network-management strategies: for example, administrators could strengthen the allocation of school-network resources to address the sleep deprivation that accompanies students' over-involvement with online games that are powered by poorly allocated school-network resources. Finally, school administrators and researchers can *work together* not only to allocate resources but also to conduct larger-scale, longitudinal studies that probe students' evolving Internet-related attitudes and behaviors, thereby drawing a clearer, updated picture of the Internet's impact on campuses.

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