Structural models of internet use for college students

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Abstract

Structural models are developed and tested that relate internet use on college students' adjustment. A volunteer sample of 415 freshmen was collected in Taiwan. Results suggested (1) the effect of internet use on adjustment, and (2) the relation between academic self-concept and internet use was mixed. The relation between internet use and motive for internet was not supported, as suggested by goodness of fit indexes and path coefficients. Limitations are discussed and additional research is suggested.

摘要

爲瞭解大學生網路使用與使用動機、生活適應、學習適應、社會適應之因果關係，本研究以 2003 年 8 月入學之彰化師大一年級學生爲對象，共有自願樣本 415 人，於 2004 年 6 月進行問卷調查。

本研究使用結構方程式模式分析資料，發現：（一）網路使用行爲對生活適應、學習適應、社會適應的影響無法取得一致性的結果；（二） 網路使用行爲與學術自我概念的關係亦未取得一致性的結果；（三）網路使用行爲與使用動機的關係未受支持。

從以上的分析結果，顯示本研究可能的限制性，首先是受試者可能未誠實的填答網路使用動機，若受試者上網的動機爲網路性愛，受試者可能有所顧忌，而未誠實地填答；此外本研究使用立意抽樣所得的樣本，研究結果可能無法推論到其他團體，例如職場中的專業人士。

In Taiwan, approximately 43% of families have access to the internet in 2001 (http://www.find.org.tw/news_disp.asp?news_id=1355), and most college students have a free internet access upon matriculation. Whether and how internet use affects college student's adjustment is of concern to parents, clinicians, and policymakers. There is a growing body of research addressing this question. Research has suggested that internet use lead to decline in participation with family members in the household, decrease in the size of their social circle, increase in the degree of depression and loneliness (Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998), rise of academic dismissal (Kandell, 1998), and interfere with social, psychological, and academic lives (Brenner, 1997). Young (1997) speculated that college students who suffer from low-esteem use the internet for social support. Since college students have ready access to internet, they are most vulnerable to excessive internet use. Hence, it is prominent to examine the relationship among internet use, social, learning, and living adjustment for college students.

Most internet-related research has centered on the description of internet addiction. In contrast, little has been done to investigate the relations between internet use, and other equally important constructs, such as motive for internet, academic self-concept, social, learning, and living adjustment. Models relating these constructs are proposed and tested.

College students and internet use

Most colleges provide free internet access to students upon their matriculation. The ready access to the internet was one the factors that lead to excessive use on campus (Kandell, 1998). Young (1998) speculated that an internet addict might denied the compulsive use as a problem because the internet was viewed as a promoted technology. This belief was supported in Scherer (1997). She examined

internet use among a sample of volunteer students from a southwestern university in the United States. It is reported that most college students perceived internet use as positive. Only 2 percent of students feel that the internet has a negative effect on them. The overall positive view might make it difficult for internet addicts to identify the issue.

Research into the percentage of internet addiction among college students is little to date. Most research into the percentage of internet addiction are based on volunteer sample that responded to online survey. A notable exception, Scherer (1997) sent questionnaires by mail and found that 9% of college students felt that their use was excessive and significantly interfered with personal functioning. The impairment to personal lives includes declining grades, failure to fulfill academic, professional, or social responsibilities, health problems, legal and financial problems. Because this study was based on volunteer participants, the non-randomness might limit the generalizability.

Gender and internet use

There are considerable evidences that males were more likely to be internet users than females. For example, Brenner (1997) used a self-selected sample that filled out an online survey existing as a WWW page. He found that the majority (73%) of sample in his study were males. The male dominance of the internet was consistent across countries. Morahan-Martin (1998) reported that the use of internet has dominated by males in United States, Britain, Japan, and Australia. In the panel study, Pitkow and Kehoe (1996) found that although male still dominate the internet, the gap declined over time. More specifically, 5.1% of the respondents were females in the first survey conducted in the January of 1994. The percentage of female users increased to 29.3 % at the fourth survey conducted in the October of 1995.

Scherer (1997) also found that internet dependent students were more often male than female (71% men, 29% women). Similar findings were reported in Shotton (1991) and Young (1996). In terms of time spent on the internet, a few studies have shown that males used the internet longer and more frequently than females (Graphics, Visualization and Usability Center, 1997a, 1997b, 1998). A notable exception, Kraut et al. (1998) examined the effect of internet use on social and psychological well-being based on 169 participants in 73 households during their first 1 or 2 years of internet use. Their finding suggested that females did not differ from male participants in their average time of internet use. Taken together, most findings seem to suggest that males are more vulnerable to excessive internet use than females.

The attitude toward the internet is a plausible explanation for gender difference of internet use. Morahan-Martin (1998) concludes that males feel more competent than females using the internet. The computer ability might be the cause that males are more likely to be (excessive) internet users and to spend more time online.

Self-concept and internet use

The empirical evidence about the relationship between internet use and self-concept is sparse. Some researchers suggested that computer dependents are shy, introverted, low self-esteem (Scherer, 1997; Young, 1997). This hypothesis has been speculative and anecdotal.

Scherer (1997) reported that internet dependent students viewed themselves as social and extroverted. Along the same line, Shotton (1991) suggested that computer dependents were intelligent, interesting, and hospitable. Young and Rogers (1998) examined the relationship between personality traits and internet addiction. They found that internet dependents have shown the characteristics of high level of self-reliance, sensitivity, reactivity, and vigilance, low self-disclosure, and

non-conformist. That the evidence is inconsistent provides an impetus to examine the relationship between self-concept and internet use.

Motivation of internet use

The use of internet can be for information, companionship, or relationship. These motives for internet can be healthy or pathological. Suler (1996) identified six types of need for internet, including needs for sex, an altered state of consciousness, achievement and mastery, belonging, relationship, and self-actualization and the transcendence of self. Tsai (1995) found that surveillance, instrumentality, personal identity, diversion/sociability, and anonymity are the primary motivation for the use of BBS. In Taiwan, the most used functions of internet are BBS, WWW, email, and games (Hsio, 1998). Little research was devoted to examine the relationship between motives and internet use.

Social adjustment and internet use

Whether the internet use has a negative effect on social adjustment has attracted some researchers' attention. It is argued that the internet might provide a context that allowed low-esteem individuals to interact in a secure environment. For instance, Turkle (1995) indicated that internet offer a platform for social interaction and interpersonal development. The establishment of online relationship is relatively easy due to anonymity. Therefore the internet could improve psychological well-being of isolated individuals. However, most empirical research supported that cutting off from genuine social interaction will lead to impairment to social functioning. More specifically, Kraut et al. (1998) found that the primary use for internet at home was interpersonal communication. The internet use was related to decrease of communication with family members and decline in social circle. Young,

Pistner, O'Mara, and Buchanan (1999) surveyed 35 therapists who reported an increase of caseloads of clients who had problems associated with internet use. They found that over-reliance on online relationship has impairment on interpersonal functioning.

Learning adjustment and internet use

The use of internet has important learning benefits. For example, many instructors use internet to post homework assignment, syllabus, and handouts. Internet thus could provide comparatively efficient access to information and help students to be more productive on their studies. According to existing research, overuse of internet could interfere with the aspect of learning. Kandell (1998) suggested a relationship of high internet use and double rate of academic dismissals. Scherer (1997) reported that critical symptoms of excessive use include declining grades and failure to fulfill academic responsibilities. The hypothesis of high internet use interferes learning adjustment was supported here in Taiwan (Chou & Hsiao, 2000). Little research investigate how non-addict students perceive the effect of internet use on learning adjustment. This omission provides the impetus of this research.

Living adjustment and internet use

It seems that the impact of high internet use on the aspect of living adjustment is negative, especially for time management. Brenner (1997) reported that 80% of 563 respondents had at least 5 problems, such as failure to manage time, cutting short on sleep, missing meals, etc. Along the same line, Egger, a Zurich researcher, compared the differences between addicts and non addicts (See Griffiths, 1998). He found that addicts felt guilty about the time spent on the internet and lied about the

amount of time they spent online.

Scherer and Bost (1997) found that 2% of internet dependent students perceived the internet to have an overall negative effect on their lives. Because of flexible hours and ready access to internet, there is no doubt that college students are vulnerable to excessive use of the internet.

The purpose of this study is to determine how internet use affect college students' adjustment. More specifically, this study examines (1) the relation between internet use and motive for internet, (2) the relation between internet use and academic self-concept, and (3) the effect of internet use on three adjustment factors (social, learning, and living adjustment).

Method

Analytic methodology

The hypothesis of directional relation between internet use and student adjustment was tested in LISREL 8(Jöreskog & Sörbom, 1993). To arrive at a model that best describe the relationship between internet use and college students' adjustment, this research compare alternative models with dependent constructs added in a piecewise manner. Specifically, model 1 was fit where internet use predicted only social adjustment. This hypothesis is supported by the work of Kraut et al. (1998), who report internet use lead to poor social functioning. In model 2, social and learning adjustment was both predicted. This hypothesis is supported by research emphasizing high internet use was related to high dismissal rate and poor academic performance (Kandell, 1998; Scherer, 1997). Social, learning, and living adjustment was tested in model 3. These three models were not nested and therefore statistical comparison was not pursued. Once an appropriate model for the relation between internet use and adjustment was established, independent constructs can be

added to test relation between internet use and covariates. Two versions of models that relate internet use to motive for internet were tested. In Model 4A, motive for internet and internet use were hypothesized to be correlated. The effect of motive for internet on internet use and interconnecting effect of internet use on adjustment factors are examined in Model 4B. Finally, two versions of models describing the relation between internet use and academic self-concept was explored. These latter two hypotheses are supported by emphasizing the interrelatedness of self-concept, motive for internet, and internet use (Scherer, 1997; Young, 1997; Shotton, 1991; Suler, 1997).

Participants

The students in this investigation were freshmen in the fall semester of 2003 at the Changhua University of Education, Taiwan. Students were recruited to participate in the study. The sample consists of 415 freshmen at the first assessment. Males comprised 45.34% of the sample.

Measures.

Academic self-concept

Dimensions of Self-Concept (DOSC) developed by Michael and Smith (Michael & Smith, 1976; Michael, Smith, & Michael, 1989) is one of the widely used scale for assessing noncognitive factors associated with academic self-concept. This multidimensional scale has 5 subscales: level of aspiration, anxiety, academic interest and satisfaction, leadership and initiative, and identification versus alienation. Items in each form represent activities or attitudes toward school learning situations.

Internet use

The internet use was measured by three variables: the total hours in which a participant spent on WWW, email, and BBS in a week.

Living adjustment

The living adjustment scale measures how well the college student cope with the living style away from home. The emphasis is on time management and quality of living condition that is needed for adolescents to successfully complete school work. This scale requires respondents to specify their degree of agreement on a 5-point Likert scale from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly disagree).

Social adjustment

The social adjustment scale measures how well adolescents get along with parents and peers (opposite and same sex). Students with high scores on this scale imply good social adjustment. This scale uses a 5-point response format ranging from 1 (never), 2 (rarely), 3(sometimes), 4 (usually), and 5 (always).

Learning adjustment

The learning adjustment scale assesses how well student adjust to learning-related activities. This scale determines if the student perceive the course as difficult, workload as heavy, instructor as friendly… et al. Students with high scores for this scale adjust well to college learning. This scale requires respondents to specify their degree of agreement on a 5-point Likert scale from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly disagree).

Goodness of Fit

Although a large number of goodness of fit indices is available, the relative performance of them still leaves room for debating. The multiple indices recommended by Hoyle and Panter (1995) are reported in this investigation.

χ^2

The χ^2 index reflects the discrepancy between a priori model and data. A

significant value of the χ^2 index indicates the proposed model deviates from the data and a hypothesized model should be rejected. On other hand, a nonsignificant value of χ^2 suggests a model is a good representation of the data. One of the limitations associated with the χ^2 value is the dependency on the sample size. In other words, a large sample size will lead to a rejection of a model even though the discrepancy between the model and data is trivial; whereas a small sample size will result in an acceptance of a model despite of the large disagreement between model and data. Hence, practical measures of fit as well as statistical fit were used in this study.

Goodness of Fit Index (GFI)

The formula for GFI is defined in Jöreskog & Sörbom. (1993) as:

$$GFI = 1 - [F(S, \Sigma(\hat{\theta})) / [F(S, \Sigma(0)) \quad [1]$$

Where $[F(S, \Sigma(\hat{\theta})]$ denotes the minimum of the fit function for the hypothesized model and $[F(S, \Sigma(0)]$ denote the fit function when all parameters are zero. GFI captures the amount of variance and covariance of sample covariance matrix that can be accounted for by the implied model covariance matrix. It ranges from 0 to 1 with analogous interpretation of R^2 in regression analysis.

Tucker-Lewis index (TLI, Tucker & Lewis, 1973)

The formula for TLI given by Marsh (1995) is:

$$TLI = [(\chi^2_B / df_B) - (\chi^2_T / df_T)] / [(\chi^2_B / df_B) - 1] \quad [2]$$

where B denotes a baseline model and T for a target model. As in LISREL, the independence was used as a baseline model in this study. TLI reflects the improvement of fit per degree of freedom of the target model over the baseline model. Because degree of freedom is associated with the number of estimated parameter, TLI takes into account the inclusion of estimated parameters. A value of .90 or greater for TLI indicates a psychometrically acceptable fit.

Incremental Fit Index (IFI)

The formula for computing IFI is

$$IFI = (\chi^2_B - \chi^2_T) / (\chi^2_B - df_T) \quad [3]$$

with similar interpretation of TLI.

5.Comparative fit index (CFI)

Because Fit Index can exceed the range of 0 to 1, CFI was developed (Bentler, 1990) to lie within o and 1. A value of .90 or greater suggests an acceptable fit to the data. CFI is

$$CFI = 1 - \max [(\chi^2_T - df_T), 0] / \max[(\chi^2_T - df_T), (\chi^2_B - df_B), 0] \quad [4]$$

Results

The Prediction of social, learning, and living adjustment

The fit indexes for alternative models are presented in Table 1. The first model hypothesized the direct influence of internet use on social adjustment was tested. This model fit the data quite well, χ^2 (8) = 14.01, p = .082, GFI = .99, TLI = .96, CFI = .98, IFI = .98. However, the path coefficient from internet use to social adjustment (.003) was not statistically significant. Although the fit of model 2 in which both social and learning adjustment were predicted was statistically significant at .001 level with χ^2 (33)=153.02, the practical fit indexes were marginally good with GFI = .93, TLI = .85, CFI = .89, IFI = .89. This offers support of the direct impact of internet use on social and learning adjustment from a practical standpoint. In contrast, the path coefficients from internet use to social and learning adjustment were not statistically significantly (.23 and .63, respectively). The hypothesis of prediction of social, learning, and living adjustment was not supported, χ^2 (62) = 292.02, p = .00, GFI = .90, TLI = .77, CFI = .81, IFI = .82.

Relation between internet use and motive for internet

After establishing the relation between internet use and adjustment, the independent constructs were added to test the relationship among internet use, motive for internet, and academic self-concept. To test the relation between motive for internet and internet use, two versions of structural models were tested. The first model in which motive for internet was added as an independent construct was referred as Model 4A. Convergence problems were encountered. Model 4B hypothesized the effect of motive for internet on internet use and interconnecting effect of internet use on social and learning adjustment. This model did not fit the data based on most of the indexes, χ^2 (101) = 450.81, GFI = .88, TLI = .78, CFI = .81, IFI = .82. Although overall fit of the model was certainly of concern, testing the hypothesized causal relations is one of the primary interests. The effect of motive for internet on internet use were positive but not statistically significant (β =1.08, t=1.59). Still, the effects of internet use on social (β = .21, t=1.64) and learning adjustment (β = .52, t=1.64) were marginally significant. As these results, the relation between internet use and motive for internet was not supported.

Relation between internet use and academic self-concept

To address the relation between academic self-concept and internet use, two version of structural model were tested. The first model in which academic self-concept was added as an independent construct was referred as Model 5A. The fit indexes were marginally good, χ^2 (85) = 370.92, GFI = .90, TLI = .83, CFI = .86, IFI = .86. The direct positive effect (.20) of internet use on social adjustment was statistically significant after controlling the effect of academic self-concept, but was in the opposite direction from that found in Kraut et al. (1998). The effect of academic self-concept on social adjustment was negative and statistically significant after

controlling the effect of internet use. This finding is quite puzzling. Further, the effect of internet use and academic self-concept on learning adjustment was not statistically significant. Model 4B hypothesized the effect of academic self-concept on internet use and interconnecting effect of internet use on social and learning adjustment. This model did not converge to proper solution.

Conclusions and Discussion

The importance of internet use for college students cannot be overstated because of its relation with adjustment factors. Several things should be noted concerning the results mentioned previously. First, the results for internet use on adjustment were mixed. Although model 2 in which both social and learning adjustment were predicted by internet use provided marginal fit to the data based on practical fit indexes, the paths from internet use to social and learning adjustment were not statistically significant. Second, the relation between internet use and motive for internet was not supported, as suggested by goodness of fit indexes and path coefficients. Plausible explanations for the lack of significant relation between motive for internet and internet use could be the problem associated with the items in the motive scale. Additional item that are more generic may improve the psychometric properties of the scale. Further, it is unreasonable to expect students honestly identified the motivation for the internet. Recall that student motive for internet could be for sex.

Finally, the results concerning the relation between academic self-concept and internet use were mixed. The effect of academic self concept and internet use on social adjustment was in opposite direction from that was expected. These paths may represent a type I statistical error. Thus, it seems safe to conclude that the

relation between internet use and academic self-concept is not supported.

The primary limitation of this research is its generalizability. The major purpose of this research was to test the relationship among motive for internet, academic self-concept, internet use, social, learning, and living adjustment for college students. Volunteer student sample was well suited this purpose. The relations identified in this research may reflect the general population. To address this issue, models tested in this research should be examined with data from other user groups, such as engineers.

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Table 1: Goodness-of-Fit Indices for Null and Alternative Models

Model	df	χ^2	GFI	TLI	CFI	IFI
Model 1	8	14.01	0.99	0.96	0.98	0.98
Model 2	33	153.02	0.93	0.85	0.89	0.89
Model 3	62	292.02	0.90	0.77	0.81	0.82
Model 4A	This model did not converge to proper solutions.					
Model 4B	101	450.81	.88	.78	.81	.82
Model 5A	85	370.92	0.90	0.83	0.86	0.86
Model 5B	This model did not converge to proper solutions.					